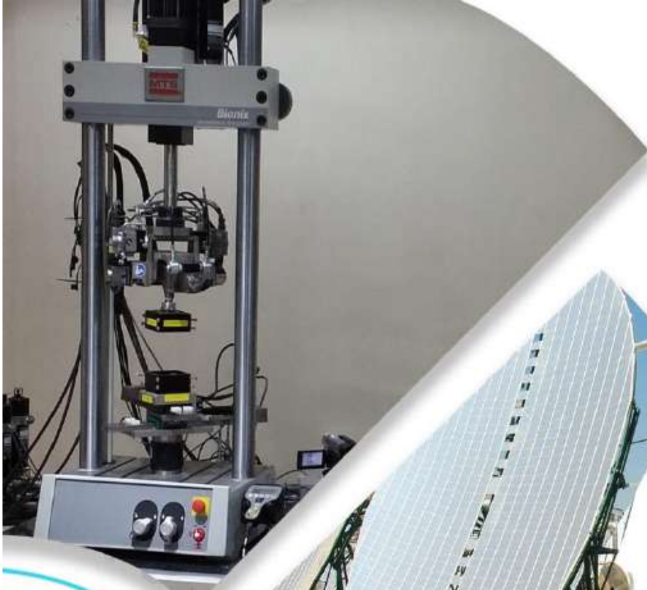

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INSTITUTE OF SCIENCE & TECHNOLOGY
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3rd INTERNATIONAL CONFERENCE ON ADVANCES IN MECHANICAL ENGINEERING (ICAME 2020)

Associated

1st INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN COMPOSITE MATERIALS (ICRACM 2020)

ICAME 2020

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Organized by
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PROCEEDINGS

3rd International Conference on Advances in Mechanical Engineering (ICAME 2020)

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February 24-29, 2020

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PREFACE

The Department of Mechanical Engineering, SRM IST is proud to bring out the proceedings of the 3rd International Conference on Advances in Mechanical Engineering **(ICAME 2020)** and 1st International Conference on Recent Advances in Composite Materials **(ICRACM 2020)** in printed and PDF form. This conference is one of the most comprehensive Mechanical Engineering related conference to take place in India. The conference will be held during 24-29, February 2020 at the SRM Institute of Science and Technology, Kattankulathur.

ICAME 2020 and ICRACM 2020 focuses on a range of issues related to applied mechanics, bioengineering, and computer aided engineering and information technology processing, design and analysis, energy systems, etc. The purpose of the conference is to bring together the Multi - disciplinary community of engineers, scientists, and academics to discuss recent trends and future developments in Mechanical Engineering. The conference features invited and contributed talks as well as poster sessions organized in different sessions. The invited speakers are globally recognized experts in the respective fields' viz., **Prof. Dr. Debes Bhattacharyya.** University of Auckland, New Zealand. **Prof. Dr. Tuan Ngo,** University of Melbourne, Australia. **Prof. J. N. Reddy,** Texas A&M University, USA. **Prof. Dr. Seung Nam Min,** Shinsung University, South Korea. **Dr. S.Balamurugan** Director-Research and Development, Intelligent Research Consultancy Services (IRCS), Coimbatore. **Prof. Dr. Shantanu Bhowmik,** Professor, Amrita Vishwa Vidyapeetham, Coimbatore. **Jinsong Leng** Editor-in-Chief: International Journal of Smart and Nano Materials, **Prof. Ir. Dr. Jaharah A. Ghani** University Kebangsaan Malaysia, **Prof. Dr. Mayank Mittal** Indian Institute of Technology (IIT) Madras. **Prof. Dr. Mohamad Ali Bin Ahmad,** University Teknologi MARA, Malaysia. **Prof. Dr. Ranjit k Ray,** INAE Visiting professor, SRM IST.

More than 500 technical papers will be presented in the conference and the presented papers will be submitted as full manuscripts for possible publication in the technical **Journal of Thermal Analysis and Calorimetry (ISSN: 1388-6150), IOP conference series: Material science and Engineering (ISSN: 1757-899X) and Journal of Applied Science and Engineering (ISSN: 1560-6686).** The participants from various countries have contributed for these technical papers that will be presented during the conference. The main sponsored of this conference by **N.B.Enterprises, Hitech India Equipment Pvt Ltd., M.S.Pande and Sons, Vivekam. Sr.Sec.School and HOT Dosai Pure Veg Restaurant.**

The organizers are grateful to SRM IST for its financial assistance. The Department of Mechanical is particularly thankful to **Dr.T.R Paarivendhar,** Chancellor, **Mr.Ravi Pachamoothoo,** Pro-chancellor (Admin), **Dr.P.Sathyanarayanan,** Pro-chancellor (Academics), and **Dr.R.Shivakumar,** Vice President, SRMIST or their encouragement and full support for the success of the conference. The organizing committee thanks the authorities, the **Vice Chancellor, Pro-Vice Chancellor (P&D), Director (E&T)**, and the **Dean (SME)** SRMIST for their valuable, encouraging and motivating messages for the International conference.

Dr.S.Prabhu
CONVENER

ABOUT THE SRM IST

SRM IST is one of the top ranking Universities and most premier engineering destinations in India, which is established in 1985 by the Founder Chancellor, Dr. T.R. Paarivendhar, SRM IST and now it is functioning in four campuses located at Kattankulathur, Vadapalani and Ramapuram in Tamilnadu and a fourth campus at Modi Nagar, Ghaziabad with over 38,000 students and 2,600 faculty members, offering wide range of undergraduate, post-graduate and doctoral programs in Engineering, Management, Medicine & Health Sciences, Law and Science & Humanities.

SRM IST has been engaged in nurturing minds through a rich heritage of academic excellence. Essentially a hub of bustling student activities, the green and beautiful campus has been a second home to thousands of students in their journey to challenge the times. The Institution has moved up through international alliances and collaborative initiatives to achieve global excellence. SRM IST International Advisory Board (IAB) is actively involved in building a stronger international dimension in research and teaching methodology, which creates avenues for research and successful careers. The SRM IST also collaborates with foreign Universities like MIT, Carnegie Mellon University (CMU), and Pittsburg University etc.

Over 150 students sponsored to 35 foreign Universities like MIT, Carnegie Mellon, UC Davis, Warwick and Western Australia. Now the Institute enjoys an unsurpassed reputation in academia and corporate circles being the preferred manpower source for vision to be recognized as a world-class learning institution.

SRMIST has been accredited by NAAC with the Highest 'A++' Grade in the year 2018, valid for the next 5 years. It is placed in A category by MHRD. SRM is Category I status institute as per UGC accreditation.

ABOUT THE DEPARTMENT

The Department of Mechanical Engineering is one of the pioneering departments of SRMIST. The department is functionally divided into four broad areas of specialization: (i) Design (ii) Manufacturing (iii) Thermal and iv) Materials Engineering. The B.Tech - Mechanical Engineering program at Kattankulathur campus is accredited by Accreditation Board for Engineering and Technology (ABET), USA. The department also offers ranges of postgraduate programs including M.Tech in CAD, CIM, Robotics, Solar Energy and Doctoral programs in various specializations.

The present faculty strength is 133 in which 55 Faculties are PhD Holder. About 800 plus research papers and 850 plus conference papers have been published in national and international levels. More than 30 patents have been filed in national and international levels.

The following salient workshops and conferences conducted by the Department of Mechanical Engineering were International Conference on Advances in Mechanical Engineering 2006, Short Course on Mechanics of Composite Materials and Structures: 2015, Workshop on Development, Manufacturing and Analysis of Advanced Composites, 2015 and short course on FEM, 2015, National Conference on Advances in Mechanical Engineering (NCAME 2016), Brain Wave Robotics 2017, International Conference on Advances in Mechanical Engineering (ICAME 2018).

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Founder Chancellor

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MESSAGE

I am extremely pleased and delighted to know that the Department of Mechanical Engineering, SRM Institute of Science and Technology, is organizing the 3rd **International Conference on Advances in Mechanical Engineering (ICAME-2020)** and its associated 1st International Conference on Recent Advances in Composite Materials (ICRACM-2020) and Preworkshop during 24-29,February 2020.

ICAME-2020 will provide a platform for students, faculty and researchers from academic & industry progress in the field of Materials. Robotics. Computer Aided Design. Thermal Engineering,Bio-Engineering and Manufacturing engineering etc.,

I hope that the ICAME-2020 shall inspire and ignite the young minds which would lead to the growth of knowledge, creativity and ultimately, greater benefit to the society. On this occasion, I am delighted to give a warm welcome to all the delegates and convey my best wishes to the organizers and all associated with activities of ICAME-2020.

I wish the conference a grand success.

Dr T.R.Paarivendhar
Founder Chancellor

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Dr. P. Sathyanarayanan
Pro Chancellor (Academics)

12 Feb 2020

MESSAGE

It is a pleasure to learn that the Department of Mechanical Engineering is organizing the 3rd International Conference on Advances in Mechanical Engineering (ICAME-2020) & 1st International Conference on Recent Advances in Composite Materials (ICRACM-2020) along with a pre-workshop during 24th - 29th February 2020 at SRM Institute of Science and Technology, Kattankulathur.

ICAME has become an important event in SRMIST's calendar every year and is aimed at bringing eminent researchers from the academia and industry all around the world together so they can share their knowledge and insights which in return will impart valuable knowledge to our students.

I am proud of the efforts and consistency exhibited by the Department of Mechanical Engineering year after year in organizing this conference. On this account, I wish to extend my heartfelt felicitations to the organizers and participants of ICAME-2020.

I wish the conference a grand success.

Pro Chancellor
(Academics)

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Email: registrar@srmist.edu.in, Website: www.srmist.edu.in

Dr.T.P.Ganesan
Pro VC (Planning and Development)

MESSAGE

I am very delighted to note that the Department of mechanical Engineering is organizing the 3rd International Conference on Advances in Mechanical Engineering (ICAME-2020) and its associated 1st International Conference on Recent Advances in Composite Materials (ICRACM-2020) and Pre workshop during 24-29, February 2020 at SRM Institute of Science and Technology, Kattankulathur.

The conference aims to promote cutting-edge research in current & futuristic areas on applied mechanics, manufacturing engineering, bio-engineering, robotics, computer aided engineering and information technology processing, design and analysis, energy systems etc., I am sure that, this platform will be an enriching experience for the participants and the confluence of ideas will develop solutions to the problems faced by the industry.

I express my gratitude to the advisory committee, organizing committee, keynote speakers, session chairs, review committee, contributing authors and conference participants for making this conference a grand success.

T.P.Ganesan
7.2.20
Pro VC (P&D)

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Vice Chancellor
&
President - Association of Indian Universities, New Delhi

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MESSAGE

I am extremely happy to note that the Department of Mechanical Engineering is organizing the 3rd International Conference on Advances in Mechanical Engineering (ICAME-2020) from February 24 - 29, 2020 at SRM Institute of Science and Technology, Kattankulathur. Mechanical engineering plays a major role in manufactured technologies be it transport, medicine, entertainment, space or the environment. In fact, engineering is behind everything that makes our life comfortable. The purpose of the ICAME-2020 is to bring together the multi - disciplinary community of engineers, scientists, and academicians to discuss the recent trends and future developments in the area of advances in Mechanical Engineering. I am sure the deliberations will certainly create better awareness and pave way for Industry-Institution collaboration that lead to further innovations in advancing technology.

I wish the conference a grand success.

Sandeep

Dr.Sandeep Sancheti

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Prof. C. Muthamizhchelvan, Ph.D.
Director- Faculty of Engineering & Technology

MESSAGE

I feel delighted to observe the efforts of the Department of Mechanical Engineering is organizing the 3rd International Conference on Advances in Mechanical Engineering (ICAME-2020) and its associated 1st International Conference on Recent Advances in Composite Materials (ICRACM-2020) and Pre workshop during 24-29, February 2020 at SRM Institute of Science and Technology, Kattankulathur.

ICAME-2020 will set a platform for academic scientists, leading engineers, researchers and students together to exchange and share their experiences and results about all aspects of Mechanical Engineering and discuss the practical challenges encountered to solve critical problems.

I would like to express my sincere appreciation to the organising committee for their dedicated efforts to materialize the conference. I wish this conference to pave a new path towards attaining the best possible developments that would fulfil the demands of the fast growing economy of the country.

Wishing a grand success.

Director (Engg. &Tech.)

Dr. C. MUTHAMIZHCHELVAN
Director
Faculty of Engineering & Technology
SRM Institute of Science and Technology
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Dr. D. Kingsly Jeba Singh
Professor & Dean
School of Mechanical Engineering

MESSAGE

I am happy to note that the Department of Mechanical Engineering is organizing the 3rd International Conference on Advances in Mechanical Engineering (ICAME-2020), 1st International Conference on Recent Advances in Composite Materials (ICRACM-2020) and associated pre workshop during 24-29, February 2020 at our Institution.

ICAME 2020 will give a platform for our researchers and academicians to showcase their research findings and gain benefits. Such conferences will also help to build strong inter-institutional networks and pave the way for synergy among the research community.

I would like to express my sincere appreciation to the organizing committee for their dedicated efforts to materialize the conference. I heartily welcome the guests, delegates, experts and keynote speakers to the conference.

I wish the conference a grand success.

D.Kip
Dean (SME)

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Dr.S.Prabhu
Convener
Professor & HOD
Department of Mechanical Engineering

MESSAGE

The 3rd International Conference on Advances in Mechanical Engineering (ICAME-2020) and its associated 1st International Conference on Recent Advances in Composite Materials (ICRACM-2020) and PreworkshopOrganised by Department of Mechanical Engineering, SRM Institute of Science and Technology at kattankulathur during 24-29,February 2020.

The ICAME 2020 is a global event focused on mechanical Engineering and this International conference route in the spirit of open communication among all participants and yield scientific profit to all of you, I am sure the practical experience, technical ideas, analytical results and innovations from delegates going to be shared during the ICAME 2020 conference would be treasured.

I take this opportunity to thank Management of SRMIST, for providing timely guidance to organise this conference. I express our sincere gratitude to the reviewers and all the authors. The efforts put by the organising committee of ICAME2020, Faculty members and student volunteers are appreciated and acknowledged.

HOD (Mechanical)

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MESSAGE FROM PARENTS

Mr. Debabrata Chowdhury
Father of Dhrubajyoti Chowdhury (RA1611002010629)
4th year B-Tech/ Mechanical Engineering

The Department of Mechanical Engineering SRM Institute of Science and Technology Kattankulathur has given my son ample opportunity to explore areas related to his academics. In my opinion, the curriculum coupled with essential co-curricular activities plays a pivotal role in the holistic development of every student.

I wish the ICAME2020 conference grand success

- ***Mr. Debabrata Chowdhury***

Mr. P.Thirugnanasambandan
Father of T. Harisudhan (RA1711002010039)
3rd year B-Tech/ Mechanical Engineering.

As we know, every moment is a fresh beginning likewise, This 3rd ICAME'2020 organised by the Department of Mechanical Engineering at SRM IST Kattankulathur will definitely leads all our students in the right path. To boost the level of confidences to meet the crest of commitment in their future and to deliver "The Best" at par with expectations as dreamed by global achievers.

Hearty congratulations to win the race always with grand success once again.

- Mr. P.Thirugnanasambandan
Manager (Civil),Project Management Division,
M/s.Tamilnadu Newsprint and Papers Limited, Tamilnadu.

MESSAGE FROM ALUMNI

“When the going gets tough, the tough gets going!”

The culmination of my research journey under the exemplary guidance of the faculties of Mechanical Engineering happened when I graduated in 2018 and got placed at Saint-Gobain. The skills which I learnt and the learnings which I took away from the department is helping me in the corporate culture and workplace environment, even to this day! With the guidance of my mentor, our group published numerous research papers in international publications and presented our interesting findings in many international conferences. I would also like to thank the Department of Mechanical Engineering who have never felt short of providing us with the right resources to carry out our research activities.

I wish the ICAME2020 conference grand success

Mr. Rishabh Maggirwar

B.Tech- Mechanical 2014-2018

Keynote Address-I

RECENT ADVANCES IN MECHANICS OF MATERIALS AND STRUCTURES: MATHEMATICAL MODELS AND COMPUTATIONAL APPROACHES

J.N. Reddy

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Abstract

The lecture will present (1) a brief summary of the author's professional journey through mechanics of materials and structures research and education and (2) recent advances in the mathematical models and computational approaches to model damage and fracture and architected materials and structures. The brief review includes the development of the well-known Reddy third-order plate theory [1,2] and the Reddy layer wise theory[3-5] and the development of locking-free shell finite elements for large deformation of laminated and functionally graded plate and shell structures [5-8]. His current research is focused on (a) the development of the graph-based finite element framework (GraFEA) suitable for the study of damage in brittle materials [9] and (b) computational modelling of architected materials [10]. Highlights of all these works will be presented in the lecture.

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Keynote Address-II

FIRE AND MECHANICAL CHARACTERISTICS OF POLYMERIC COMPOSITES WITH PROTEIN BASED FLAME RETARDANTS

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Abstract

In this research, protein based natural materials have been employed to investigate their effects on fire and mechanical characteristics of polymeric composites. In the first part of the work, keratinous fibres have been chemically modified and used as a flame retardant (FR) material for polypropylene (PP). Owing to the fibres' unique char formation behaviour in combination with phosphorus compounds, the resultant composites obtained improved flame retardancy compared to commercial ammonium polyphosphate (APP)/PP composites. Furthermore, the fibre addition was beneficial for the improved mechanical properties of the composites due to good bonding between FR and PP matrix.

The second part deals with casein from bovine milk as a novel green flame retardant. Due to the presence of phosphorus, casein has good char forming ability. A casein based PP composite with 15 wt.% commercial FR (APP) was compression moulded, with the resulting composite successfully demonstrating the self-extinguishment (V-0) in the vertical burn test. Additionally, compared to that of neat PP, its stiffness improved by 26%,. The FRs and the modified PP composites have also been characterised by inductively coupled plasma mass spectrometry, infrared spectroscope, scanning electron microscope, thermal analysis, vertical burning test, cone-calorimeter and tensile test.

Keynote Address-III

FLOW AND COMBUSTION DIAGNOSTICS FOR INTERNAL COMBUSTION ENGINES

Dr. Mayank Mittal
Associate Professor
Department of Mechanical Engineering
IIT Madras

Abstract

Internal combustion engines operating on fossil fuels provide about 25% of the world's power and produce about 10% of the world's greenhouse gas emissions. Modern engine development efforts are primarily focused on reducing fuel consumption and emissions. In doing so, it is important to understand various in-cylinder processes and their influence on combustion process and emission formation. Optical engines in conjunction with laser-based diagnostic techniques enabled measurements of in-cylinder flow, visualization of sprays and fuel distribution, and study their influences on combustion process and emission formation. This talk will summarize a series of investigations conducted over several years on optically accessible engines. Both particle image velocimetry and molecular tagging velocimetry techniques have been used to understand the fluid motion inside the engine cylinder and quantification of turbulence. Mie scattering technique has been used to visualize the liquid phase of the fuel dispersion in direct-injection engine. Fuel distribution has been measured using planar laser-induced fluorescence. These measurements have provided data for the validation of CFD models including real-time boundary conditions for more-accurate multi-dimensional numerical simulations. Simulations have also been conducted and compared with measured flow patterns. The talk will highlight the importance of conducting both experiments and simulations for future engine development efforts, and will conclude by highlighting future research directions and challenges involved.

Keynote Address-IV

"HYBRID COMPOSITE FOR HIGHER TENSILE STRENGTH AND IMPACT RESISTANCE"

Dr. Shantanu Bhowmik

Head of the Research and Projects at School of Engineering and Professor at the Department of Aerospace Engineering at School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore, India and Adjunct Professor: Center for Future Materials, University of Southern Queensland, Australia.

Abstract

A country can be technologically and economically developed subject to the country has significant evolution on materials technology with indigenous solution. However, India's aviation, space, nuclear and defence sectors are still depending on imported materials from North America and Europe resulting in out flow of several thousand crores of Indian currency to North America and Europe every year. Importing technology and materials from North America and Europe not only weakens India's economy but also strategically weakens India's system in these sectors. The technology developed and patented by us has essentially resolved these issue and will make "Make in India with Indian Materials" in aviation, space, nuclear and defence sectors a ground reality.

Keynote Address-V

AUGMENTED REALITY AND ITS MULTIDISCIPLINARY APPLICATIONS

Dr.S.Balamurugan,
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Intelligent Research Consultancy Services (IRCS), India

Abstract

Articulated Naturality Web (ANW), an advanced version of Augmented Reality (AR), is a re-birth of the method of approaching a technology. Computer Vision is an ability to see the world what it is, as a 'scene', and also the elements imbibed within. For instance considering a room, computer vision exhibits the capability to see the floor, wall, table, chairs, paintings, dustbins in the room. Once the details of inner elements are picture perfect, it is easy to cleverly rely on the information. ANW is capable to remove the barriers that exist in traditional Augmented Reality. Traditional Augmented Reality is very flat. Articulated Naturality Web (ANW) is a perfect synergy of many emerging technologies aimed to create a marvellous user experience of both real and digital world. Articulated Naturality is intuitive and thereby gives a natural experience to the user of digital world focussed on real. There is a huge improvement in human-to-human and human-to-machine interaction with the advent of new technologies. Articulated Naturality Web possesses senses similar to human being- including sight, hearing and even smelling!

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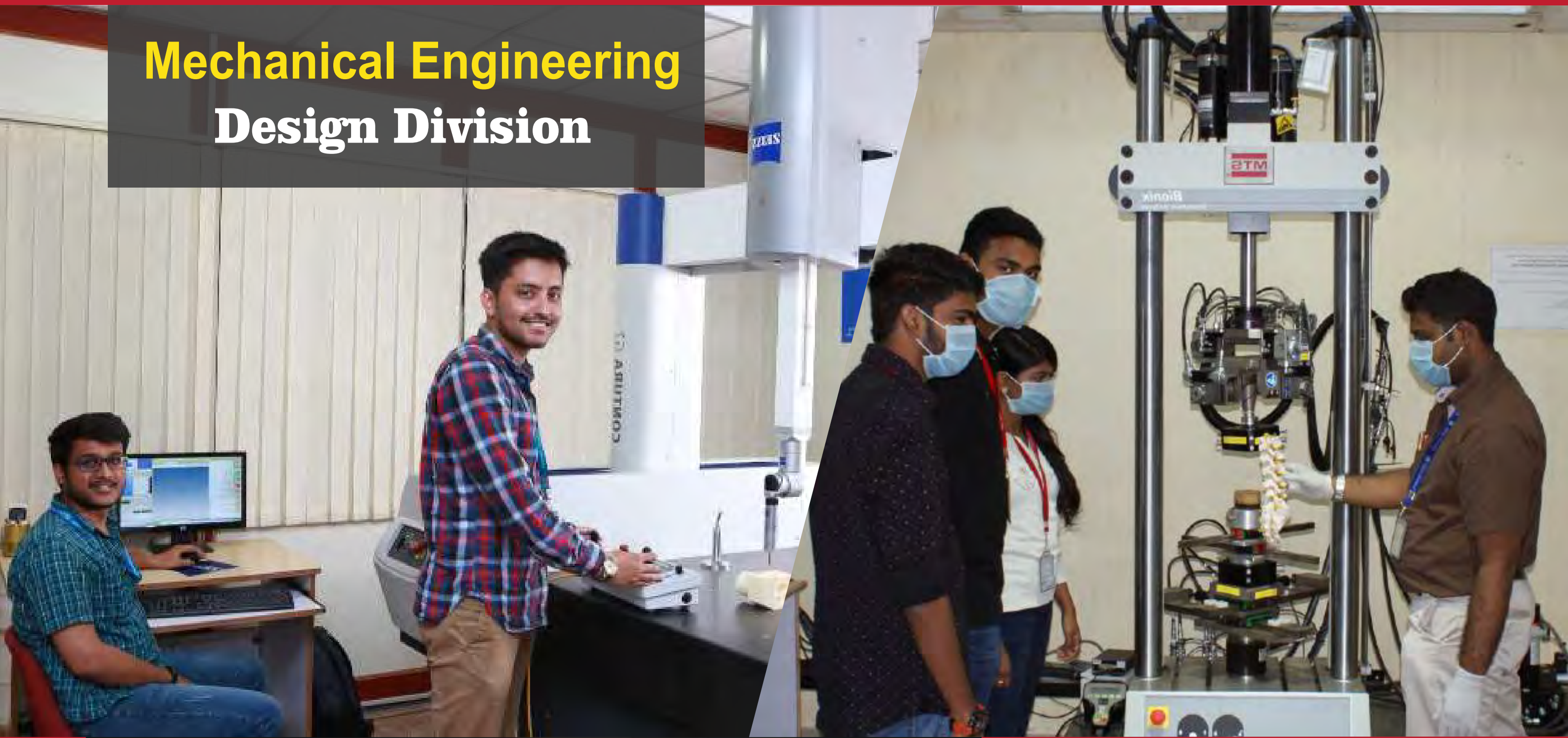

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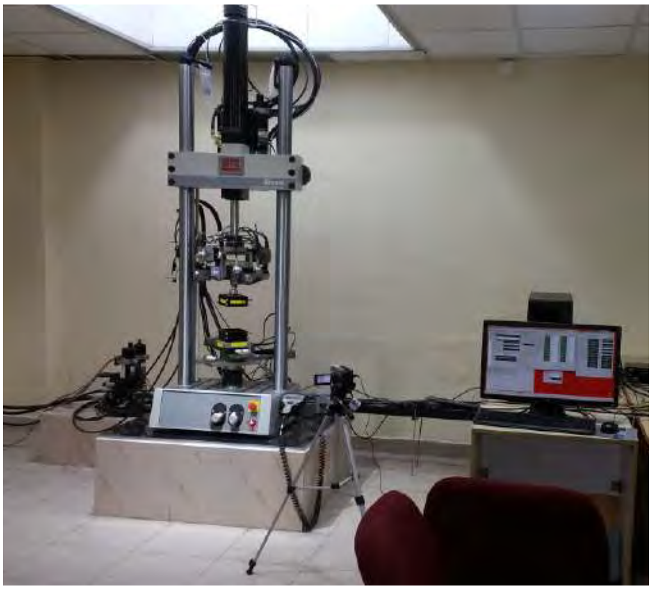

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DE001

Design and Development of an Instrument to Measure Coordinates of Spine Curvature

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Abstract

Human spine curvature data are required to detect spinal deformity/diagnose irregular spine curvature. The flexibility and weight distribution of the body are achieved by the shape of spine/spine curvatures such as cervical (lordotic curve), thoracic (kyphotic curve), lumbar (lordotic curve).Around the world, many countries have started collecting spine curvature data for more than five decades; however, India lacks in this field. Few countries have also developed various instruments to gather spine curvature data; on the other hand, they still seem inaccessible to Indian markets. A device which can collect the data is very much required as it has application in vast fields like product development on ergonomics principles. This study developed an instrument (simple and low cost) to measure coordinates of spine curvature. A wooden specimen (resembles human spine shape) designed with various angles was prepared to validate the measurement accuracy of the developed instrument. The selected curves of the template were measured using three machines, including CMM machine, FARO arm machine, and developed device. T-Test confirms that there was no significant difference in the measured curvature data (Developed instrument vs. CMM &Developed instrument vs. FARO Arm) and proves that the developed instrument providing an accurate measurement similar as existing CMM and FARO arm with the error percentage of 2.57 % (maximum).

DE002

A study of cervical spine morphology variations influence in loading and range of motions using finite element analysis

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Abstract

The most commonly found disease in aged people which can be dangerous and which affects the condition of an individual's life is disc degenerative disease. The shift in the anterior load-bearing column was caused by the disc height changes in posterior ligaments which could have adverse effects on posterior column. The lack of symptoms at early stages makes the identification of disc degenerative disease difficult but once identified, the treatment actions should be taken at right time. Biomechanical literature gives a static morphology of the finite element models of cervical spine. An upcoming tendency in the current day medical practice is the use of personalized medicines and the predicting capabilities of this trend gets affected by not considering morphology as a model parameter. Finite element analysis is used to find the effect of variations in spinal morphology intervertebral disc height, facet joint slope, facet joint articular process height and segment size were parametrized. Finite element study was done on variations on vertebral rotation and ligamental forces. Some of the most important morphological variations found in the anatomy were disc segmental size & height and body depth. The estimation of range of motion and calculation of impact loads were found to be the key elements in the examination of degeneration of discs. Nonetheless there are risks involved in the extensive use of instruments for direct measurement of range of motion. Fem models of the lower cervical spine are derived from a CT scan with dissimilar elements and then quality of these models is evaluated with the help of mesh element-related metrics. The range of motion values are then compared with the literature studies and the model with good mesh standard are used for future examination process. The individual components of spine are subjected to different types of loading situations and the stresses developed on them need to studied. The results gained from the finite element model helps us to plot stresses of subjects obtained from the respective lifestyles can benefit surgeons to suggest treatment actions.

DE003

Numerical Simulation of an Indian Auto Rickshaw Model

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Abstract

Most of the cities in India offers auto-rickshaw services for short and large distances at an economical price and yet not a lot of importance is given to its study provided that there is a lot of scope to improve its aerodynamic efficiency. The objective of this work is to carry out numerical analysis to predict the aerodynamic characteristics of the vehicle. This numerical study is carried out using CFD software ANSYS-Fluent by solving Reynolds Averaged Navier Stokes equations with K-ω turbulent model via high order schemes. The results obtained indicate the flow field variation in terms of pressure and velocity around the bluff body. This would also give an understanding of flow physics for further improvement in aerodynamic forces.

DE004

Flow Visualization over an Indian Auto Rickshaw Model

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Abstract

From late twentieth century, spark ignition engine powered Indian auto-rickshaw is treated as the most common mode of transportation for rural and urban area activities. This three wheeler vehicle is found to be an economic mode of transport for shorter distances. This study focuses on the flow visualization over the vehicle using smoke based visualization technique. The visualization is achieved by using a monochromatic laser sheet on the vehicle with seeding particles at various operating conditions. This visualization study helps researchers to understand the external and internal flow physics. The results in terms flow pattern obtained with the visualisation gives an understanding of the wake formation by the vehicle. The results also indicate the presence of complex flow field inside the cabin.

DE005

Design and Development of Low Cost Fluidized Bed Seeding Generator

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Abstract

Latest developments in hardware and software for laser based flow diagnostics enable the investigation of complex flow phenomena under enclosed, high-temperature and even pressurized conditions. However, the successful application of a velocimetry technique strongly depends on the presence of appropriate light-scattering tracer particles (seeding) in the flow. In this study, design and development of a Seeding Generator is effectively carried out with perfect measurements considering the flow characteristics. Compressed air testing was done based on the laser sheet visualization and the flow field was visualized. The results shows that the fabricated seeding generator will be able to supply seeding particles for flows from subsonic to supersonic regimes.

DE006

Design of an Impact Attenuator for High Speed Vehicles

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Abstract

Crashworthiness is the ability of a structure to protect its occupants during an impact. It is a measure of the vehicle structural ability to plastically deform and yet maintain a sufficient survival space for its occupants in crashes. Restraint systems and occupant packaging can provide additional protection to reduce severe injuries and fatalities. The crashworthiness of a structure indicates the value of absorbed energy per unit mass. One of indexes to measure crashworthiness (C) is given as, $C = Ed / Ms$ where, Ed is the absorbing energy of structure and Ms is the mass of structure. With rising motorization and expanding road network, travel risks and traffic exposure grow at a much faster rate. Today road traffic injuries are one of the leading causes of deaths, disabilities and hospitalization with severe socioeconomic costs across the world. As per the WHO Global status report on road safety 2018, road traffic accidents kill an estimated 1.35 million people and injure 50 million people per year globally. The frontal impacts are in the range of 55-60% among the accidents in which the occupants are injured. In high speed automobile collisions, the prime concern is to increase the chance of survival of occupants. To avoid the fatal injuries that occupant may suffer in case of frontal impact, an enormous amount of research is going on in the field of crashworthiness of vehicles and impact attenuator is one of the probable solution. An impact attenuator is a structural element placed on the front of a car to decelerate impacting vehicles gradually to stop by decelerating the vehicle. In a racing car the driver and frame of the car is protected from injury and further deformation. In Formula Society of Automotive Engineers (FSAE) car the Impact Attenuator is fabricated from DOW IMPAXX 700 foam which is being imported and it is very expensive. The aim of the present study is to provide a cost effective lightweight reliable substitute of the imported impact attenuator for high speed vehicles. Test Specimens of Aluminum and Thermocol (Polystyrene) combinations in different configurations were modeled and fabricated. These specimens were compressed on a UTM to find out the energy absorption of specimens of different configuration. Similar specimen made up of DOW IMPAXX 700 foam is also tested by the same method. Numerical simulations using Abaqus Implicit is also carried out for all four combinations. Experimental and numerical results were compared with specimens of different configuration. It was found that one of the specimen having corrugated aluminum sheet between the thermocol (polystyrene) layers performed better than existing standard DOW IMPAXX 700 Impact attenuator in terms of energy absorbed per unit volume and energy absorbed per unit displacement of the sample. Thus it may be a possible substitute of the existing expensive attenuator.

DE007

CFD Analysis of a CPC with Elliptical and Circular Type Receiver Tube

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Abstract

Concentrating solar collector is a new kind of device to collect solar energy. Concentrating collector has the capacity to convert solar energy to heat energy which is useful for varied domestic and industrial applications. Compound parabolic concentrator (CPC) is a non-imaging collector which gains much importance in the recent years as it involves no tracking system and is generally oriented in E-W directions. It is understood from the literature reviews that the efficiency of a collector predominantly depends on the solar intensity, ambient temperature and the type of working fluid. Absorber tube orientation and design also contributes to the improvement in the overall efficiency of the CPC significantly. Generally circular absorber tube is used in CPC's. In this Paper work, an attempt has been made to design, simulate and study the performance of the CPC with elliptical absorber tube and the results have been compared with the CPC with circular absorber tube. About 30% of the industrial process heat applications require operating fluid with constant temperature output. Further analysis has been carried out for CPC with absorber tube integrated latent heat energy storage system involving phase change material (PCM) for constant temperature output. Performance evaluation of the novel CPC system has been carried out using simulation involving circular evacuated absorber tube with PCM integration for better investigation.

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DE008

DeNOC based dynamic modelling approach of planar four bar mechanism

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Abstract

This paper presents and compares the two dynamic simulation approaches for a 4-bar mechanism i.e. Euler-Lagrangian approach and Decoupled Natural Orthogonal Complement (DeNOC) matrices method. A four bar mechanism is the simplest form of closed loop chain. It consists of four bars (links) connected in a loop within a plane by four revolute joints and termed as planar four bar mechanism. The dynamics of this mechanism was derived by two methods, one is energy based approach called Euler-Lagrangian approach and the other Decoupled Natural Orthogonal Complement (DeNOC) matrices method. Both formulations are validated under similar condition. Here, each approach's comprehensive formulation is clarified and a comparison is made in the formulation. The DeNOC approach eliminates the need of complex partial derivatives making its computation simpler. This method results joint motion equation which is vital for the simulation of manipulator. The simulation result will further be compared with the results of Euler-Lagrangian. This manipulator will be beneficial for precise and accurate tracking applications.

DE009

Study and Modeling of All-Terrains Planetary Rover Wheels

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Abstract

Rovers are being contrived for more than 50 years now and they have enhanced over the years in direction of making future generation rovers. Research is still being done to engineer a more competent rover which is capable of exploring the planetary surface. They are required to maneuver for many kilometers and one of the major factors for that is wheels which make them capable of enduring the rough topographies. For the voyage of the rover along the surface impeccably is ensured by wheels. This paper will present the wheels capability of maneuvering in soil varying from very loose to hard strata. These wheels have been designed and analyzed on a test bed and then on a six-wheeled rover. The wheels were designed keeping in mind the varying terrains on which a vehicle has to maneuver. Studies show that wheels with grousers need precise calculations for grouser placement so as to provide the obligatory amount of traction. The proposed model of the wheel has both grousers and mesh incorporated to increase the traction on loose soil giving more stability to the rover. Traveling performance of the wheel which includes Drawbar pull, tractive efficiency, slip ratio and resistance torque were tested experimentally using different size of grousers. The wheel was also tested at varying RPM so as to study its behavior on varying terrains for evaluating the conditions under which it would sink in the soil making the maneuverability of the rover difficult. Rover would be able to travel through rough and loose soil using these wheels with the help of required grouser height without wheel sinkage.

DE010

Case Study: Effect of Slenderness Ratio on Rod-Less Single Acting Pneumatic Cylinder based Brake System

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Abstract

Rod-less pneumatic and hydraulic systems are widely used in automotive caliper brake systems. They are mechanically governed by the slenderness ratio of the arm. The evolution of high speed transportation like the hyper loop requires a fail-safe brake system. The challenge is to develop a high pressure rod-less pneumatic brake actuator. The higher clearance requirement increases the stroke length of the system and increases its vulnerability to mechanical failure at the opening of the cylinder. The design hence incorporates a higher slenderness ratio compared to standard automotive caliper designs. These conditions reduce the life of the actuator. This study identifies design points and failure scenarios of the rod-less pneumatic actuators that is subjected to high lateral force due to friction and axial force due fluid pressure. The system is also simulated and analyzed using FEA module, and is optimized for size, performance and capacity to withstand deformation. The system is tested physically to its performance limits to overcome the possibility of operational failure. The results of this study can help in the development of durable, compact, high performance rod-less fluid power actuators.

DE011

Design Optimization of Single Expansion Ramp Nozzle Using Computational Method

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Abstract

The project is about the computational study of Single Expansion Ramp Nozzle (SERN). A comparison is carried out for four different cowls of length 2h with initial arc radii of 0mm, 10mm, 20mm and 30mm. The ramp and the cowl are angled. The study elaborates the effect of arc (0mm, 10mm, 20mm and 30mm) in the cowl on the performance of the SERN. The CFD procedure is validated by comparing with experimental results. The optimum design is obtained by analyzing the computational result.

DE012

Injector Embedded Rotary Vanes inside the Combustion Chamber

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Abstract

This project presents the design of combustion chamber and analyzing it by introducing rotary vanes embedded with the injector next to the inlet. Cold flow analysis is carried out to understand the turbulence of air and the behavior of the fuel inside the chamber. The fluid used here is ATF (Aviation Turbine Fuel) just to simulate the actual characteristics. In this study an attempt has been made also by using CFD approach using ANSYS FLUENT 15 to analyze the behavior of the fuel and the flow pattern within the combustion chamber and also parameters such as velocity distribution, and temperature at the chamber walls at the exit of combustion chamber is also obtained. And the comparison of turbulence characteristics is made between the experimental results and the CFD results.

DE013

Drag Measurements of an Indian Auto Rickshaw Model

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Abstract

Indian vehicle auto-rickshaw is considered as the most common and economic mode of transportation for day to day activities. It plays an important role in the auto-mobile sector both in urban and rural areas. The present study is about external aerodynamics of the vehicle considered which was tested in a subsonic wind tunnel. The forces acting on the vehicle especially the drag component was measured for various operating conditions. The drag forces were measured by load balance that consists of a load cell which is calibrated against known loads. The results obtained with the model helps in understanding of physics of the flow behind it. The results also suggest that the vehicle is moderately bluff to the flow and needs aerodynamics optimisation.

DE014

Development of a flexible and stretchable strain sensor for compliant mechanisms and biomechanical applications

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Abstract

This article presents the design, fabrication and characterisation of an elastomeric flexible and stretchable strain sensor using a variable resistance fabric. This provides a viable alternative to the micro fluid and nanoparticle based flexible sensors involving complex fabrication techniques. A nylon-spandex based stretchable fabric serves as the sensing element which is in turn embedded in an elastomeric substrate. A detailed analytical analysis is performed to determine the shape of the sensing element and the system performance is predicted through a Finite Element Method based study. The resistance of the sensor varies according to the applied strain, which is measured using a voltage divider circuit. The analog voltage is fed to a micro-controller through a Digital to Analog converter for calibration and sensing. The fabricated designs are characterised for determining their linearity, hysteresis, stretchability and gauge factor. The experimental performance results are used for the validation of the analytical and simulation study. These sensors have a wide range of potential applications in the constantly developing field of compliant robotics and mechanisms. In future works, these sensors will be utilized in the biomechanical analysis of human movements to track the various joint parameters.

DE015

Biomechanical Analysis of human walking for Optimization of Pneumatic actuator specifications in exoskeletons

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Abstract

This article presents a study on determining the specifications of a linear actuator to drive a lower limb exoskeleton for assisting knee joint. This study provides a technique to determine the required kinematic and dynamic characteristics of an actuator which are the fundamental criterion for selection of actuators in designing an exoskeleton. A set of experiments has been performed on several subjects, where data has been recorded for a specific uniform walking speed. The kinematic data of human walking has been acquired through a Motion Capture system following modified Helen Hayes marker protocol. Synchronous dynamic data of Ground Reaction Force has been acquired using force plates. Using these data, the torque profile at the knee joint has been computed using the ANYBODY biomechanical analysis software. The maximum contraction/extension of an actuator for the different possible lengths to be selected has been inferred from the kinematic study. The dynamic response, force-displacement and force-velocity characteristics required for the actuator is concluded from the dynamic study. Further, the optimized points of attachment of the actuator on the thigh and shank are determined using the previous studies. This study can be extended to determine the optimized actuator specifications for other limb joints as well. This article lays down a simple but efficient framework to select a commercially available actuator or to design a custom made linear actuator for building an assistive lower limb exoskeleton.

DE016

Mathematical Model of 3 Pivot Point Suspensions

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Abstract

Rovers are still in their evolving phase and NASA and other space organizations are unremittingly functioning to discover the life away from earth. Rovers are playing an imperative role to make this conceivable. Rovers are required to travel several of kilometers on the Martian surface and succour the astronauts in many ways and explore the Martian terrestrial to find the symbols of life. It is not easy for a rover to travel on Martian surface deprived of having a good suspension mechanism which can tackle any kind of bumps and grooves without any form of damage to the chassis. To design this kind of suspension, we must have a mathematical and analytical model of how rover interacts with the terrain and environment. This paper explains the mathematical model of the "3 pivot point mechanism". It illustrates how the chassis of the rover behaves while facing the harsh terrain of the Mars. The simple mobility of the 3 pivot point mechanism is highlighted in the paper. One bogie of the suspension is considered in a single plane and is analysed through Inverse kinematics and all the angles and heights by which chassis of the rover will move, are calculated. This mathematical model will help in making more efficient and robust and trustworthy suspension for rovers.

DE017

Design and Analysis of Hybrid Drive Mechanism for Serial Manipulator

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Abstract

The drive mechanism is one of the main aspects for defining the dynamic performance of a robot manipulator. This paper represents a systematic design of hybrid drive mechanism for a 3 DOF serial manipulator developed in a virtual CAD environment. The objective of the proposed system is to provide an integrated approach that combines the merits of pneumatic and electrical drives that is, generating enough force at the joint angles and positioning accuracy respectively. The intent of the hybrid mechanism is to provide a low-cost solution with improved work volume of the manipulator. Virtual prototyping of the system is executed to verify the system performance. Mechanical design parameters and static analysis of the design is discussed in detail. The simulation model to achieve motion control of the system is verified using Matlab/Simscape.

DE018

Seismic Analysis of the Over Head RCC Water Tank Using Slosh Tank Water Damper

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Abstract

Globally earthquakes occur frequently nowadays and because of that lots of damages happen to the structure, so, there are ways to improve the performance of the structure. The sloshing motion of the water can cause damage to the RCC Water Tank that can be further improved by the addition of baffle walls. The introduction of an obstacle in the water tank can cause considerable reduction in the vibration of the RCC Water Tank. The passive energy dissipation techniques like Tuned Water Damper method is adopted to reduce the vibration in the structure. In this paper, the seismic analysis of the RCC Water Tank with different methodology is carried out by considering RCC Water Tank designed with IS 456, RCC Water Tank designed with IS1893(PART-2), RCC Water tank with different water levels and RCC Water slosh tank with different baffle arrangement were studied using analytical methods. The modelling is carried out using the ABAQUS software and the sloshing tank effect was studied on the RCC Water Tank by giving el-Centro loading to the structure and its relative displacements with different baffle wall arrangements. The baffle arrangement with better energy dissipation along with the reduction in the displacement of the RCC Water Tank is found out. It will help to understand the RCC Water Tank behaviour during earthquake with slosh tank water damper. The baffles in the slosh tank will act effectively in the seismic performance by reducing the displacements and the stress distribution in the structure. The lateral displacement of the RCC Water Tank is reduced with the provision of the baffle walls. The stiffness of the structure is also increased considerably.

DE019

Design of automatic side stand and spring compression control system using Arduino programming

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Abstract

Motorcycles are undoubtedly heavy, which commonly poses a problem when erecting the bike onto conventional double foot kick stands as well as it seems difficult to lift the bikes. So, using side stands is better to handle while parking bike, but it makes severe injury if the stand is not released. Most of the street side accidents occur due to lagging in releasing the side stand. This work mainly aims in designing an intelligent mechanism that automatically lifts the side stand when the driver sits in the seat. By using this control system whose setup has the ignition switch, pressure sensor, relay switch, motor drive, dc motor all controlled by the Arduino uno board through the programming interface, when the ignition switch is turned on and when the person sits on the seat integrated with spring, the spring compresses and the signals the motor to turn on and hence the stand slides up. When the ignition switch is turned off and low pressure sensed the side stand automatically pulls out to withstand the two-wheeler.

Key words: Arduino Uno R3, Motor drive, spring movements, motor bi-directional rotation.

DE020

An Analytical Study on Fluid Flow Characteristics for Flow within a Microchannel of Rectangular Cross section

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Abstract

The present work considers fluid flow analysis within a microchannel of rectangular cross section with different exact and approximate analytical techniques. Thus, velocity slip at the solid wall of the channel is considered. The slip flow is transformed to a no-slip flow with some minor modifications by applying an average slip velocity. The flow is represented by the Navier-Stokes equation exposed to slip boundary conditions. The governing equation is solved considering separation of variables method (SOV) as an exact method and, Integral and Variational methods as approximate methods. The Poiseuille number and slip coefficient are also determined for each method. The present prediction agrees well with available literature. To predict accuracy level of all the techniques, the results are presented in a comparative scale along with numerical prediction. It is observed that the accuracy level for the velocity profile obtained in each technique depends on the aspect ratio where as for the prediction of Poiseuille number and slip coefficient, all the technique show less dependency on the aspect ratio.

DE021

Static Structural Analysis of an Open Wheel and Open Cockpit Race Car Chassis Using Finite Element Method

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Abstract

The aim of the present investigation is to model, simulate and perform the stress analysis of an FSAE car chassis consisting of tubular section of grade AISI 1020 steel by using PTC Creo, Hypermesh and Ansys. The design of the chassis is based on the rules sited by formula student rulebook of 2019. It is an open wheel single seater car which may roughly weigh up to 280 kg including the driver. To validate the design, various analysis such as torsional, bending, lateral, transversal and modal will be performed all over the chassis with a maximum loading condition of 3G (3 x gravitational acceleration). For design consideration, reference of suspension hard points and other components required for complete performing car and the chassis width and length is determined. According to the rulebook for the safety rules, chassis is designed in CAD software called Creo with a line drawing concept which includes only triangulation as it is known as strongest polygon geometry. Further those lines will be converted to a tubular section pipes and profiling of pipe ends at nodes of chassis will be performed. The static analysis will be carried out on software called as Hypermesh. By following the above procedures, various iterations of the chassis will be made for the optimum design that can withstand the loads from diverse internal as well as external factors.

DE022

Smoke based Visualization of Turbulent Swirl Jet Flow

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Abstract

The present study deals with the visualization of turbulent jet flow from swirl nozzles. A low cost turbulent jet facility developed was utilized for all the experiments. Two types of blades are considered for the present study viz. flat blades and airfoil shaped blades. All the blades are fixed to a circular hollow hub at the center. The flow is visualized by seeding smoke from incense material as tracer particles. A solid state laser with 532nm wavelength is used for the illumination via a glass rod thereby producing a laser sheet. Cross sectional visualizations are made at various axial downstream locations. The effect of blade angle has greater influence in the production of jet flow vortices due to swirlers. The present study reveals that the increase in blade angle increases the production of vortices.

DE023

Injection Effect on the Near-field Shock Structure of Non-Circular Sonic Jets

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Abstract

The present experimental study aims at investigating the effect of injection on the near-field shock structure of rectangular and square sonic jets at different levels of under expansion. The experiments were carried out using the supersonic open jet setup available at Aerospace Department, SRMIST. From the literature, it is evident that the non-circular jets enjoy better mixing than the equivalent circular jet. As a result, the supersonic core length of non-circular jets is shorter than the circular jet. The present study involves active control of non-circular jet, namely rectangular and square jets using fluidic injection at the exit of the nozzle. Since the rectangular and square jets are axisymmetric in nature, the injection was carried out along major and minor axis. Shadowgraph visualization was extensively used to study the injection effect on the near-field shock structure and core length of square and rectangular jets. For comparison, the equivalent circular jet was studied with and without injection.

DE024

Numerical Study of Sweeping Jet Actuators

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Abstract

Fluidic oscillators are based on the bi-stable states of a jet (or a pair of jets) of fluid inside a specially designed flow chamber. A Sweeping Jet Actuator emits spatially oscillating jets which are self-induced and self-sustaining. The pulsating jets are used to control flow separation over the bodies such as aircraft wing which eventually reduces the overall drag on the wing and ultimately the efficiency of the flight is increased with no complexity since there are zero moving Parts in the system. Here, we intend to characterise various fluidic oscillators (angled and curved) designs and to analyse the characteristics of the flow numerically using ANSYS (fluent) Software with the aim of finding an effective one for use in flow separation control. After analysing various parameters, it was concluded that the curved oscillator was found to be efficient in oscillating the flow.

DE025

Capturing of Space Debris by Multiple Web Structure System

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Abstract

It has been a long time since intellects have started noticing and acquired data on how much affect and danger, the existence of space debris could cause to space programmers and near-earth space activities. Even a minute debris segment of 1-10 mm could damage a system of upto 10 cm impact at least. Aiming to minimize and capturing space debris by development of multiple equipped system having capability of capturing various sizes of debris and hence being economical and more profitable. This paper presents the design and analysis of the concept of multiple concentric web structure converged, altogether connected to nodes at the end. it has specific features of capturing different web sized debris depending on the loading and sustainable capacity. The Absolute Nodal coordinate formulation (ANCF) model is used to validate, authorize the significant application and compute the ability of the system. The design is made with CATIA v5 software tool and synthesized in MATLAB. This technology will be able to capture those debris with range greater than or equal to the minimum net size and the maximum net size. The nodes of multiple web will direct and orient system selected coordinates leading the web full of active debris to the graveyard orbit.

DE026

Preliminary Aero acoustic Measurements of Free Rotating Rotor

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Abstract

The Rotor noise is known to be highly annoying and intrusive. Therefore, rotor noise will be one of the major design parameters for next generation quieter rotor-crafts or drones. This will only be possible by a better understanding of rotor aerodynamics and acoustics. The present study tries to use a simplistic rotor driven by an electric motor inside an anechoic chamber. A microphone is used to measure the acoustic signals and Fast Fourier Transform is used to find the dominant frequencies or the energy distribution. A swirl anemometer is used to measure the area averaged velocity along the axis. The characterization of flow field in terms of axial velocity variation and acoustic signal characterization will provide preliminary information on the physics of aerodynamics and aeroacoustics of rotor systems.

DE027

Preliminary Investigation of Flapping Paper inside a File

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Abstract

The present paper is about the flapping mechanism of a paper locked inside a file. The investigation consists of visualization of flapping phenomenon and acoustic measurements resulting from the flapping. The normal ceiling fan is used as a source for the flow. The axial flow is converted to wall jet flow by using a surface perpendicular to the axis of the fan. The file placed with an offset from the fan produces instabilities and in turn trigger the flapping mechanism. Camera is used to record the phenomenon and microphone is used for acoustic measurements. The time series results reveal the intermittent nature of the flow. The acoustic measurements reveal about the noise sources and its frequencies via Fast Fourier Transformation.

DE028

Preliminary Aero-acoustics Measurements of a Circular Mach 2 Jet

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Abstract

In this present experimental study, aero-acoustic measurements and flow visualization for a jet flow from circular convergent-divergent (CD) nozzle will be studied. The C-D nozzle is designed for a Mach number of 2 and the same is designed using a CAD package. The fabricated nozzle is connected to a settling chamber which is connected to a storage tank and regulated by a pressure regulator. The jet is allowed to expand freely and the acoustics measurement such as spectra, OASPL will be done using a microphone positioned perpendicular to the jet axis at 30 diameters. Shadowgraph will be used to visualize the jet flow due to its simplistic requirements. The flow field is recorded using a digital camera. The data from the microphone and the image from the camera will be processed using relevant software. The variation in nozzle pressure ratio and its effect on the flow field and acoustic characteristics will be discussed in detail.

DE029

Seismic Analysis of the RCC Structure Using Slosh Tank Water Damper

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Abstract

The earthquake occur frequently nowadays and because of that lots of damages happen to the structure, so, there are ways that can improve the stability of the structure using liquids. The sloshing motion of the water can reduce damage to the structure that can be further improved by the addition of baffle plates. The introduction of an obstacle in the tank can cause considerable reduction in the vibration control of the structure. The passive energy dissipation techniques like Tuned Water Damper method is adopted to reduce the vibration control in the structure. In this paper, the seismic analysis of the Reinforced Structure with slosh tank water damper were studied using analytical methods. The modelling is carried out using the ABAQUS software and the sloshing tank effect was studied on the RCC structure by giving el-centro loading to the structure and its relative displacements with different baffle arrangements like Reinforced slosh tank with 2 vertical baffle, Reinforced structure water tank with 4 vertical baffle(RCVB), Reinforced structure water tank with 4 vertical and a horizontal baffle(RCVBH), and Reinforced structure tank with fully meshed baffle arrangement (RCVF)and Reinforced structure tank with fully meshed baffle with horizontal baffle(RCVFH) is studied. The baffle arrangement with better energy dissipation and with the reduction in the displacement of the RCC structure is found out. It will help to understand the RC structure behaviour during earthquake with slosh tank water damper. The baffles in the slosh tank will act effectively in the seismic performance by reducing the displacements and the stress distribution in the structure. The lateral displacement of the structure is reduced with the provision of the baffle plates. The stiffness of the structure is also increased considerably.

DE030

Design, analysis and control of Unmanned Aerial Vehicle

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Abstract

According to data from the United Nations Office for Disaster Risk Reduction, there were 1.2 million deaths. 2.9 billion People affected. $1.7 trillion in damages, due to global disasters from 2008 to 2018. These staggering values are due to the inefficiencies in the disaster management programs. Time is the most important factor while disaster response aid. In situations where land access is off the table, government agencies are compelled to deploy manned aircraft to continue immediate search and rescue, and later on, relief efforts. This leads to loss of time and in countries where resources are already scarce flying a manned aircraft is not a viable option. A major hurdle that is commonly overlooked upon is the first responder safety. First responder safety refers to the safety of the ground rescue team in the calamity-affected region. Looking upon the aforementioned drawbacks in the traditional disaster relief methodology, the use of Unmanned Aerial Vehicles (UAVs) could drastically eradicate them. Aerial views are critically helpful in large-scale disaster zones such as forest fires, huge crowd management, stampede, earthquakes, tsunamis, etc. UAVs, designed to be agile, fast and robust, empower response teams with a substantial upper hand without costing as much as manned flight operations. UAVs can access hard-to-reach areas and perform data-gathering tasks that are otherwise unsafe or impossible for humans. This project aims to design a UAV capable of transmitting live video downlink to the operator during disaster relief, management or rescue. The objective of the project is to design a lightweight, compact, robust and cost-efficient frame without compromising its strength followed by complete fabrication of the UAV. This project addresses all the aspects of UAV ranging from mechanical design to electronics used. Along with this, finite element analysis is performed on the wing to test the structural integrity of the designed UAV wing. The UAV is fabricated and its flying along with video transmitting capabilities are demonstrated.

DE031

Preliminary Aero-acoustics Measurements of a Co-flow Compressible Jets

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Abstract

In this present experimental study, aero-acoustic measurements for a co-flowing jet flow from circular convergent-divergent (CD) nozzle as core flow and a secondary stream from a plain convergent nozzle will be studied. The C-D nozzle is designed for a Mach number of 2 and the convergent nozzle is designed for sonic conditions. The fabricated nozzle assembly is connected to a primary settling chamber for the core nozzle. The secondary stream is generated from a secondary settling chamber of relatively smaller size. The settling chambers are connected to a storage tank and regulated by pressure regulators. The co-flow jet is allowed to expand freely and the acoustics measurement such as spectra, OASPL will be done using a microphone positioned perpendicular to the jet axis at 30 diameters. The variation in nozzle pressure ratio for both the streams and its effect on acoustic characteristics will be discussed in detail.

DE032

Control of Mach 2 Jet using Sonic Co-flow

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Abstract

An experimental investigation was done to understand the effect of sonic co-flow jet on the mixing characteristics of Mach 2 jet at different levels of expansion. The sonic jet surrounding the primary Mach 2 jet is produced using a sonic nozzle, whereas a convergent-divergent nozzle was used for Mach 2 jet. The annular gap between the nozzle was kept at 1mm. The investigation was done for different nozzle pressure ratios (NPRs) of primary (Mach 2) and secondary (sonic) jets. For a fixed primary jet NPRs, the NPRs of sonic jet was varied from 2 to 5, which correspond to under expanded levels of sonic jet. The NPRs of Mach 2 jet was varied from 2 to 5 which correspond to over expanded states of Mach 2 jet. Detailed analysis was carried out to understand the effect of sonic co-flow on Mach 2 jet using the images obtained from shadowgraph visualization.

DE033

Visualization of Supersonic Flows over a Forward Facing Step

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Abstract

In compressible aerodynamics, the forward facing step geometry holds an important role in explaining basic shock wave formation and it's structure. In the present work, experimental study of supersonic flow has been carried out over a forward facing step geometry placed inside a supersonic wind tunnel. The schlieren technique using two mirrors was used to perform the visualization of the shock waves created over the geometry. Experiments were carried out over three Mach numbers to suitably understand its effect on the shock wave formation and it's structure over the forward facing step geometry.

DE034

Investigation on the Mixing performance in Microfluidic Geometry

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Abstract

Microfluidic mixing research is fundamental in study of medicine, chemistry fields which leads to improvement in biomedical diagnostics, development of better miniature biosensors and various chemical synthesis processes. The present study aims to improve mixing by introducing a new microfluidic mixing geometry. This microfluidic mixing is analysed for the various flow conditions to get optimum geometry. We are using multiphase mixture-VOF model to analyse the drops formation and dynamics. Concentration of 1%, 2% and 5% of foreign particles was used in the study. Computational study was done with different Reynolds number mainly at 100, 200 and 500 in laminar flow region. Primary results was observed that mixing length is greatly influenced with these input parameters. We have established a correlation for better mixing with various influencing parameters.

DE035

Investigation of sorting process in branched microchannel

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Abstract

With growing importance of microfluidic in significant fields like medical and aerospace fields, it is essential to introduce new approach to improve the accuracy of determining the droplet size of bubble. We use simulation in order to achieve the best optimal design for the determination of mean droplet size formed after branching. We have analyse the relationship between various process parameters and mean droplet size for a fixed geometry. Eulerian-mixture model was used for better accuracy of drops formed inside T-channel. Results shows that sorting is affected mainly by particle sizes, flow rates and branching.

DE036

Numerical Flow Analysis over a Cross-Shaped Tube using Open FOAM

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Abstract

Numerical simulations was carried out in the open-source software package Open FOAM over a cross-shaped tube (CST) geometry, with reference to its experiments conducted in a water tunnel setup. The parametric studies involved studying the effect on the geometry with respect to the variation of velocities based on Reynolds Number, and Angle of incidences. Para view was used to obtain post-processed qualitative data and numerical visualization of the flow over the geometry and comparison was carried out with the experimental visualizations.

DE037

Control of Mach 2 Jet using Sonic Co-flow

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Abstract

An experimental investigation was done to understand the effect of sonic co-flow jet on the mixing characteristics of Mach 2 jet at different levels of expansion. The sonic jet surrounding the primary Mach 2 jet is produced using a sonic nozzle, whereas a convergent-divergent nozzle was used for Mach 2 jet. The annular gap between the nozzle was kept at 1mm. The investigation was done for different nozzle pressure ratios (NPRs) of primary (Mach 2) and secondary (sonic) jets. For a fixed primary jet NPRs, the NPRs of sonic jet was varied from 2 to 5, which correspond to under expanded levels of sonic jet. The NPRs of Mach 2 jet was varied from 2 to 5 which correspond to over expanded states of Mach 2 jet. Detailed analysis was carried out to understand the effect of sonic co-flow on Mach 2 jet using the images obtained from shadowgraph visualization.

DE038

Experimental Analysis and Validation of Torsional Stiffness of Tubular Space Frame Chassis

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Abstract

Chassis is the part that integrates all components of the vehicle and to withstand the loads. It provides a load path for the forces that acts on it. Handling of a car can be improved by tailoring chassis stiffness so that chassis does not deflect during heavy cornering or breaking. In this work, the effects of overall chassis Rigidity on roll stiffness will be determined by creating a Finite element model of a Formula Student (FSAE) Chassis and suspension linkage. The Validation of the model is done by designing and fabricating a test rig to experimentally determine the Torsional Stiffness. The Suspension linkages are replaced with equivalent length solid tubes to eliminate the suspension compression. The test rig will be capable of applying force through one of the front wheel hubs, the other end of the front axle is kept at zero load. The deflection in chassis can be measured using a dial gauge. The objective of this project is to Design and optimize the chassis for meeting the Chassis Stiffness target value to obtain the best Lateral Dynamics. The optimization is done in such a way that the weight of the chassis is not affected. Increasing the Torsional Rigidity will reduce the twist in the Chassis and allows the suspension components to control a larger percentage of a vehicle's kinematics.

DE039

Seating Comfort Analysis: A Virtual Ergonomics Study of Bus Drivers in Private Transportation

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Abstract

Background/Introduction: Seating comfort is one of the most important indicators of the performance of automotive seats. Seat is one of the places in the vehicle where most of the drivers spent driving. A good seat can prevent a lot of painful disorders including low back pain, which is typical of bad posture. Driver posture is one of the most important issues that need to be considered in the vehicle seat design process. **Research Gap:** Around the world, there have been many studies on seating comfort including car seats, truck seats, bus seats, train seats, etc. However, in India there are not many studies focusing on bus drivers seating comfort. **Objective:** This study aimed at investigating bus drivers seating comfort in private transportation using virtual ergonomics. **Methods:** We have considered a group of male bus drivers with different percentiles. And, we have selected a bus seat typically used in private transportation. The anthropometry of drivers and dimensions of the seat has been measured and modeled in the virtual environment (CATIA V5). For the seating comfort analysis, RULA (Rapid Upper Limb Assessment) analysis was performed. **Results and Discussion:** The RULA score revealed that the drivers with 77th to 94th percentile felt comfortable with the seat. The rest had higher RULA score and felt discomfort. **Conclusion:** The bus seat design needs to be changed by considering Indian anthropometry. Also, this study only examined few subjects; hence, further investigation would give better recommendations. **Application:** The benefit of virtual ergonomics are used in this project. The methodology used in this study could be used for other seat studies.

DE040

Comparative Study on Seismic Performance of Steel Diagrid Structures with and Without Dampers

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Abstract

The quick development of urban populace and confinement of accessible land creates roots to the development of high rise building in recent days. In case of tall buildings, the lateral loads create considerable stresses and lateral deflection. In order to resist the lateral loads, various separate structural system such as shear wall, brace frame and diagrid structural system are introduced in high rise structures. In this paper, analysis of conventional steel structure and diagrid steel structures with friction dampers for 50 storey buildings is considered. A floor plan of 40m×20m size is considered and modelling has been done for the same high-rise structures by considering material properties and various specifications using ETABS software. The time history analysis is carried out for both the structures and the performance of structure under lateral loads is identified by comparing various parameters such as displacement, drift, storey shear and stiffness. Test results indicates that when friction dampers are introduced in the diagrid intersecting points, the storey displacement and storey drifts on every storey are seen to be less in Diagrid structure storey are observed to be less in Diagrid structure with dampers while contrasted with the traditional structures, and they will be considerable improvement in storey stiffness which tends to show that diagrid structure with dampers behaves better in lateral load.

DE041

Design of a Composite Race Car Chassis and Implementation of Aerodynamic Elements for Enhanced Performance Using FEA

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Abstract

Worldwide there are a lot of examples of carbon fibre composite monocoque and semi monocoque chassis that have been designed and constructed over the years, there is still a low number of open sources available on making one such example. This work deals with the basic designing of a composite monocoque chassis for a Formula Student race car. The major design constraints are governed by SAE International which organizes the various FSAE event all around the world. This work has taken torsional loading and vertical bending loading in the front and rear of the vehicle chassis. This work also shows the application of carbon fibre composite in the design of an impact attenuator, thus yielding results in an explicit dynamics frontal impact deformation and the equivalent static structural loading on the frame due to impact on the impact attenuator. For these race cars, traction advantage plays a major role in improving the handling characteristics of the vehicle. One of the ways of achieving this traction advantage for high speed cornering capabilities, employment of aerodynamic devices is carried out. These devices follow the principle of Ground Effect and produce negative lift (or downforce) due to low pressure region under the vehicle. All put together this work is a very basic outline to developing a full composite monocoque race car chassis, impact attenuator, and an aerodynamic package for a FSAE project.

DE042

Stress distribution in ceramic orthodontic bracket, tooth, bone and PDL contact assembly - A finite element study

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Abstract

Malocclusion (teeth irregularity) problems are increasing rapidly across the world in all age groups. Malocclusion is treated in orthodontics which is a specialty of dentistry. Orthodontic bracket is a component of fixed orthodontic appliance which is used to treat the malocclusion through archwire forces transferred to the tooth. In orthodontic treatment, the pre adjusted orthodontic brackets are most widely used compared to the conventional brackets as there is an in-built torque by the angulated slot walls. This study aim to compare the stress distribution in the pre adjusted ceramic brackets with and without Stainless steel (SS) metal slot insert along with tooth, alveolar bone and Periodontal Ligament (PDL) contact assembly using Finite Element Analysis (FEA). A pre adjusted maxillary right central incisor ceramic orthodontic bracket (with and without metal insert in the slot) are modeled using CATIA software. The solid model of a maxillary right central incisor tooth is obtained from a Computer Tomography (CT) scan using image processing software. The PDL and alveolar bone are modelled using CATIA as per the dimensions. The assembled solid model consists of bracket with and without SS metal slot insert, adhesive layer, tooth, alveolar bone and PDL. The contact between the components and the mesh is created using hyper mesh software. The archwire torque is applied as couple inside the bracket slot without using an archwire. The stress distribution in the assembly components are analysed for the applied couple (torque). The stresses induced in the assembly components are compared between ceramic bracket with and without metal slot insert. This *in-silico* study would help the clinicians to understand the behavior of commonly used ceramic bracket with and without metal slot insert and choose the appropriate bracket for successful treatment.

DE043

A Biomechanical Study on Post-Scoliotic deformity correction

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Abstract

Scoliosis is the deformation of the growing human spinal column such that the vertebral alignment is distorted to cause a sideways curvature and in some cases it also twists around vertebral column. A person with severely deformed spine may find it difficult to breathe as the ribcage may press against the internal organs compromising the functions of the lungs and the heart. Due to the altered load transfer, these patients also suffer from back pain and early arthritis. The scoliotic deformity is surgically corrected by using implants which are screwed into the vertebra. In severe cases, complete correction may not be achievable. As a result, the loads experienced by the implants may not be optimal, leading to their early failure. The objective of this work is to study the effect on the deformity correction in a scoliosis affected spine. A three-dimensional model of the surgically corrected spine was segmented from the computed tomography scan and converted in to a surface model. This 3D model was imported in to ANSYS and subjected to axial and bending loads to simulate weight bearing. The stress concentration across the entire spine as well as individual vertebrae was analysed and the effect on the implants was separately analysed as well.

DE044

A Biomechanical Study on Scoliosis affected patient before surgery

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Abstract

Scoliosis is a disease of the spine which leads to sideways curvature occurring due to a combination of genetic and environmental factors. The abnormal curve is generally observed during the growth spurt just before puberty. Scoliosis has been classified into three different forms namely idiopathic, congenital and neuromuscular. When no specific cause for spinal defect is identified, the deformity is called idiopathic scoliosis. The patient specific scan model falls in the category congenital scoliosis. Mild cases of scoliosis can be treated by physiological treatments. Severe cases of scoliosis may have vertebral twisting, vertebral fusion and semi developed vertebral deformation. Severe cases of scoliosis could lead to adjacent organ damage, especially the heart and lungs. Large number of patients experience various back problems rendering day to day activities and normal physiological motion difficult. In most of the cases, scoliosis needs multiple surgical corrections with various implant rods and screws attached to the vertebrae. The purpose of this study is to investigate the effect of upper body load on the scoliosis affected region located at the junction of thoracic and lumbar region of the spine before surgery. The CT scan of the model is segmented and meshed to conduct studies such as stress concentration analysis, strain analysis and deflection in the segments. The physiological motion for flexion, extension, lateral and axial rotation on the FE model before surgery were studied.

DE045

Disc Brake Design and Analysis Using FEA Study

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Abstract

Brakes are an integral part of an automobile. They are used for slowing or stopping a moving vehicle or prevent its motion. It works on the principle of friction. It can be defined as a mechanical device that inhibits motion by absorbing energy from a moving system. As vehicles are becoming more and more sophisticated, it is necessary to optimize the brakes being used in them, this will not only ensure passenger safety but help improving the performance of these brakes in turn reducing the overall wear on them. The main objective of this project is to design an optimum disc brake taking into account various loading factors under which the brakes will be in real environment and analyse the design using finite element analysis incorporating a better material and better performance. Static and thermal analysis would be carried out on the disc to find out the behaviour of the disc under different loading and thermal conditions .The result of this research provides a design approach for the validation (theory vs simulation) and optimization of the brakes to ensure better performance of the vehicle.

DE046

Design and Analysis of Prosthetic Arm using Finite Element Analysis

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Abstract

Prosthetics arm is a device which support for the disability of a person. The main factors to be taken into consideration is that the currently available options in the field of prosthetics are very limited and the ones available to our way out of the reach of the common people. The life span of such prosthetic hand with so many complex movements is really less compared to normal hand and for designing one many factor like the materials, comfort, weight is also a big factor. In the present study, static analysis has been carried out to determine the pre-tensile force exerted by a prosthetic hand shows a comparison of the pre-tensile force distribution between a human hand, a non-adaptive hand prosthesis, and an adaptive prosthetic hand. The analysis result will show the strength and weakness of the design before the stage of redesign and fabrication. This work uses the finite element method to perform a structural analysis of a prosthetic hand using FEA. Apart from that a detailed sustainability analysis of the arm has been carried out to show the effect of environmental factors on the bionic arm.

DE047

Design and Optimization of Internal Architecture of Cortical Bone Scaffold Manufactured Using 3d Printer

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Abstract

In this work porous cellular structure is created to provide mechanical and biological environment for cortical bone scaffold. The internal architecture is designed using hexagonal, hexagon with inter- connector and spiral. Over the past few years, according to statistical data in India and around the world, the need for implant for long bone fracture has increased enormously and rapidly. This study the special implants are designed with controlled characteristics of scaffold such as porosity, pore size, shape, surface area and stiffness. These scaffold are manufactured using 3D printer of biocompatible material of ABS and PLA. The mechanical characterization of scaffold are performed using mechanical testing and results are compared with Finite Element results. The design will be optimized to the segmental defect of cortical femur. The structural behaviour of scaffold with implants will be studied using Finite Element Analysis.

DE048

Investigation and Analysis on Child rescue system from open bore well

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Abstract

In recent days, there are a lot of causes related to a child stuck in an open bore well. The actual methods involved in rescue are pulling the child using a rope with different knots or digging a parallel line beside the open bore using machines to the depth at which the child is stuck, the child is then pulled from the depth. But at deeper bore wells, this method fails. This paper deals with a design to save a child who is stuck in manhole or open bore-well. Using this design the child can be easily rescued from the open bore wells, as this design includes hydraulic arm to hold the child with grips which won't slip due to sweat or wet condition of the bore well the locking mechanism to hold the rescue system in one place inside the pit once it reaches the depth at which the child is stuck. A live streaming camera for monitoring the child motion, oxygen supply channel for the child, caster wheels to provide free movement to the system inside the bore.

DE049

Effect of Nozzle Turbulent Intensity in Multiple Round Jets using Open FOAM®

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Abstract

The present work is about the effects of turbulent intensity on the flow field of turbulent multiple jets. The simulations are carried out by using an open source Computational Fluid Dynamics C++ code Open FOAM®. The governing equations invoked are Reynolds Averaged Navier Stokes equations by using simple Foam solver. Standard two equation turbulence model is used along with the mean flow equations to account for turbulence effects. The solved flow field shows significant effect of turbulent intensity on the potential core of both single and multiple jets which is supported by reference literature. Downstream the potential core, the turbulence intensity does not affect the decay rate of turbulent jets considered in the study. The performance parameters show that the higher initial values of turbulent intensity is favorable only for the single jet simulations. In contrast, the lower initial values of turbulent intensity is favorable for multiple jet simulations.

DE050

Design and Analysis of Plastic Shredder Machine

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Abstract

This project focuses on recycling of plastic wastage in domestic area, industries etc. Product recovery as an elongation of product life cycle can concern the whole products, theirs components and materials and raw materials, generally recovered value. The basic possibilities of recovery: reuse, remanufacturing, reclaim, recycling. In these areas the plastic waste is present in large quantity, but the available machines used to recycle this waste are very costly. They packs this waste and give them to the local processing plants. So the process of packaging and transporting is much costly. So the main intension behind this project is to process the plastic waste as cheap as possible by shredding where it is made for reducing cost of processing and transportation. A Plastic Shredder is a machine used to cut plastic into smaller pieces for granulation. Unlike plastic granulators, shredders are designed specifically for larger plastic Waste, like car bumpers, pipes, drums, and other items too big for granulators. In the process, large plastic items are fed into the shredder. Moving at a slower speed than a granulator, blades break the plastic down into smaller chunks. These pieces are then collected and washed and treated in washing and Recycling plants before being granulated and sent to manufacturers

DE051

Preliminary Aero acoustic Measurements of Conditioned Jet Flow from a Circular Nozzle

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Abstract

The present study deals with the design, development and fabrication of a nozzle with flow conditioning assembly and using it to study jet flow acoustics. The flow is conditioned by several means before the nozzle exit and the conditioned flow is allowed to exit the nozzle as jet. This conditioned jet flow produces aerodynamically generated noise and the same is measured using a microphone. The microphone is placed perpendicular to the jet axis and the measurements are recorded for various regimes. The results will be discussed based on the acoustic spectra and the jet decay characteristics.

DE052

Modify a helmet to increase the human comfort

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Abstract

The study aims to design and develop a helmet, combined with the design requirements of the helmet structure and analysis of the advantages and disadvantages of the system and the solutions to improve comfort are proposed, the detailed parameters for guiding structure are confirmed. Using the finite element method, the rationality of the solutions are simulated and tested. The model is subjected to loading and boundary conditions and then analyzed using the FEA techniques. The analysis was done for five different types of material which are PEEK-Plastic, Polycarbonate, Polyethylene, S-Glass, and Carbon fiber with the same load condition. The result obtained from the analysis were studied to check whether the design is safe or not and the analytical solutions of different materials are compared with each other. The solutions of helmet improve the lifetime of the structure and ensure the whole system more stable and impact resistant. This study surely provides the applicable criteria to the design and development in this field, as well as contributes the valuable tool in analyzing and simulating the Helmet systems.

DE053

Stress Analysis of different types of cages in cervical vertebrae: A finite element study

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Abstract

To facilitate cervical fusion, cervical cages filled with bone or bone substitute are inserted between the vertebrae. To improve the subsidence of the cage and to avoid its post-surgical migration, design optimization concept is being employed in the present work. In this study, finite element method is being used to design several cervical cages with varying shapes and sizes. The cages are designed using Solid modeling software. FEA optimization is done by varying the material properties as well as shapes and sizes of the cage. Stress analysis has been performed using FEA in the cervical vertebrae C3-C4 for the different types of cages.

DE054

Experimental Analysis of Aerodynamic Performance on asymmetric NACA 23018 Aerofoil incorporating a Leading Edge Rotating Cylinder

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Abstract

The effects of Momentum injection can play a vital role in increasing the efficiency of an aerofoil by increasing its lift and delaying the stall angle. Most of the studies regarding this concept analyzed the effects of momentum injection for higher velocity ratios (cylinder tangential velocity to free stream velocity) only. Almost no or less studies analyzed this effect for lower velocity ratios which created a research gap in this field. In this paper, a rotating cylinder is placed at the leading edge of an asymmetric aerofoil NACA 23018 and the aerodynamic performance with and without a rotating cylinder was studied for lower velocity ratios (<0.2). The experimental analysis was carried out for two Reynolds numbers (Re): 2×10^5 and 2.5×10^5 corresponding to two free stream velocities: 20 m/s and 25 m/s, respectively, for six different angles of attack (−5°, 0°, 5°, 10°, 15° and 20°). The experimental analysis showed that incorporating a leading-edge rotating cylinder increased the maximum lift coefficient by around 24% and delayed the stall angle by around 20%.

DE055

Column In Filled With Nano Concrete

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Abstract

This paper deals with the axial load carrying capacity of light gauge steel hollow circular section in filled with Nano concrete. Among the various infill materials, Nano silica is gaining attention in the concrete filled steel tube (CFST) columns. The main objective of this paper is to study the axial load carrying capacity, relation between the steel and concrete interaction and also the characteristic of hollow steel column, plain and Nano silica in filled steel columns, load–deformation, load – axial strain and load - axial shortening of CFST columns. Nano silica was optimized as 2%in the Nano concrete based on the tests conducted. A total of 21 specimens were tested with a dimension of 50mm diameter, 1.5m length and the thickness of the steel tubes were taken as1.2mm, 1.6mm and 2.0mm. Experiments were carried out with M30 grade of concrete and finally, these experimental results are evaluated and the experimental values are guide lines available validated with the existing codes such as Eurocode4 (EC4-2004), British code (BS5400-2005), American code (ACI-1999).

DE056

Design and Analysis of different types of surface textured material using FEA

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Abstract

Machinability has their importance in manufacturing area where tool life is a major factor. Enhancing in tool life can be done in many ways and surface texturing belong to them. This project is based on design and analysis of one of the techniques used to reduce the tool wear which occur during the machining process and the technique is called Tool Texturing. In this present study, 'pin on disc' has been modelled using FEA to observe the material behaviour of five different types of textured surface. To observed the stress concentration over the different textured surface Archard equation has been incorporated in the FEA model of "pin on disc". The active normal forces on the pin is varied (i.e. 10N, 30N, 50N) in the FE analysis to observe the wear results of the pin. In the FE analysis 15 models are carried out to find out the stress-strain behaviour of the 5 different surface textures having different groove depth (i.e. 0.25 and 0.2). Taguchi method has been applied to find out the optimal groove parameters. Result from analysis shows that hemispherical groove for texture surface having better result as compare to untextured surface.

DE057

Design and analysis of hybrid composite using the finite element method

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Abstract

Hybrid composites are those composites that have a combination of two or more reinforcement fibres and could be used for the superior properties that are unachievable by any monolithic material. The objective of the present study is to design the aluminium-epoxy hybrid composite of varying thickness, number of layers and fibre directions in each layer. The fibres are kept in 0/90 orientation and the number of fibre strands is varied in the analysis keeping the length and the height of the matrix constant. A 100 N load is applied on the hybrid composite block and the corresponding mechanical behaviour along with the material properties is obtained. The results observed in the 0/90 orientation of the hybrid composite include the assembly stress distribution and assembly displacement. The parameters are varied to obtain the corresponding set of results and the optimized structure is suggested using FEA.

DE058

Design, Analysis and Topology Optimization Of Center Pin Of Universal Coupling Using Fem

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Abstract

A coupling is a device, the primary purpose of which is to join two pieces of rotating equipment for the purpose of transmitting power, while permitting some degree of misalignment or end movement or both. A universal coupling is a coupling used to connect rotating shafts that are co-planar, but not coinciding. These couplings are used in the steering system of vehicles to connect the steering shaft to the steering pinion. Universal couplings are most prone to failure due to the high stresses induced in them. This occurs during the steering of a vehicle. In such an event, the driver will lose control, which could lead to a fatal accident. Therefore, a new design for the universal coupling with a very high FOS is of utmost importance. Such a design will prevent an accident due to its failure and thus, will be able to save lives. In this project work, three different models of the center pin in a universal coupling was designed and analyzed for two different materials, in which the safe size of the center pin is determined. Initially, the dimensions of Force Motors Tempo Traveller is used to determine the diameter of the shaft and the maximum torque applied on the coupling for Model 1. Model 2 was designed to counteract the reason of failure in Model 1. This was done by creating increasing the size of the center pin to reduce the stresses induced. Model 3 was designed by introducing a sphere in the centre and then conducting topology optimization on it. All the analyses of the models of the center pin were done on ANSYS Workbench. It was concluded that Model 3 had the highest factor of safety (3.03) and the least stress induced (82.37 MPa) for almost equivalent mass of Structural Steel used. It was also found that for the same design, using Aluminium instead of Structural Steel resulted in 34% mass reduction for similar stress (82.42 MPa) and factor of safety (3.34) values.

DE059

Synthesis and Characterization of Cost effective and Eco-friendly Magneto Rheological Fluid for Aerospace applications

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Abstract

MR fluid has the ability to change from a fluid state to semi-solid or plastic state instantaneously upon the application of a magnetic field. In this, semi-solid state, the fluid exhibits visco-plastic behaviour that is characterized by the field dependent yield stress. It is this field-dependent yield stress and their fast response time which make MR fluids an attractive technology for many applications. Magneto Rheological fluids is a fluid that behaves as Newtonian fluid in absence of magnetic field and on application of magnetic field, viscosity of the fluid increases due to the alignment of the magnetic particles present in the fluid. In this work, to achieve enhanced braking torque under limited small size, a modified magnetic core shape is adopted. An eco-friendly, cost effective MRF has been synthesized in house. Using different combinations of Silicone oil and flaxseed oil as the carrier fluid.MR Fluid is prepared using silicon oil and flaxseed oil as carrier fluid and triton X as surfactant. Efficiency of the synthesized MR Fluid is evaluated by performing the tests on Anton Paar Rheometer. Controller is also designed to vary the applied input torque to the brake and to measure the produced output torque of the brake.

DE060

Finite Element analysis of Patellofemoral joint Prosthetics

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Abstract

Prosthetics have been existed from the times of the old. Prosthetics were utilized numerous applications: work, restorative appearance and aesthetics from time of the Egyptians, psycho-profound feeling of being entirety. Chondromalacia patella is one of the knee joint is an disability that influences the ligament of the patella and is additionally regularly called sprinters knee. It cause part torment and furthermore require supplanting medical procedure for influenced knee with counterfeit segments. Kneecap typically dwells over the front of your knee joint. At the point when you twist your knee, the posterior of your kneecap floats over the ligament of your femur, or thigh bone, at the knee. Ligaments and tendons connect your kneecap to your shinbone and thigh muscle. At the point when any of these parts neglects to move appropriately, it can make your kneecap rub facing your thigh bone. The substitution of the entire knee is a tedious and maximally obtrusive procedure. Henceforth a patellofemoral embed can help in just be restricted cure but then take care of the issue caused due to chondromalacia. The patellofemoral CT images will be segmented and smoothed using MIMICS 14.0 software. This allows for meshing and assigning material properties to the bone to check how the bone interacts with the implants. Material properties are assigned using ANSYS Mechanical APDL 18 .The mechanical properties of two implant materials are compared to view the results. The scope of the project is that it is beneficial in the prosthetic industry as it can provide patients with the less painful method of replacement and hence they will be able to do their normal daily activities and it can be for the betterment of athletes and runner and other targeted condromalacic patients. The aim is to carry out Finite Element Modeling and analysis of Prosthetic for patellofemoral region. The objective is to carry out segmentation and thresholding of a CT image. Studying the various material properties that will used for prosthesis for the Patellofemoral region and to undertake a comparative Finite Element Analysis of the compatible materials.

DE061

Selection of In-active Vibration Isolator for Pump

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Abstract

In power plants the pumps are used to feed the water into the boiler. These pumps are mounted on the floor. They are subjected to heavy vibration. The amplitude of vibration is high and the transmissibility ratio is not within the safe limit. So the force transmitted to the floor is very high. This damages the floor where the pumps are mounted. This paper deals with the vibration isolation of a pump with one particular isolation method called passive isolation. In this isolator pads are used to reduce the force transmitted to keep the transmissibility ratio within the safe limit**.**

DE062

Industrial Automation Using IoT and Report Generation using Machine Learning

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Abstract

There is a clear intersection between the Internet of Things (IoT) and Artificial Intelligence (AI). IoT is about connecting machines and making use of the data generated from those machines. AI is about simulating intelligent behaviour in machines of all kinds. As IoT devices will generate vast amounts of data, then AI will be functionally necessary to deal with these huge volumes if we're to have any chance of making sense of the data. AI is beneficial for both real-time and post event processing: Post event processing – identifying patterns in data sets and running predictive analytics, e.g. the correlation between traffic congestion, air pollution and chronic respiratory illnesses within a city centre. Real-time processing – responding quickly to conditions and building up knowledge of decisions about those events, e.g. remote video camera reading license plates for parking payments

DE063

Performance Evaluation of Unpre-Processed and Pre-Processed Ultrasound Images of Carotid Artery

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Abstract

Detection of plaques is an important task especially that are prone to rupture, and thus for early risk estimation of cardiovascular and cerebrovascular events. Due to its low costs and wide availability, carotid ultrasound has the potential to become the modality of choice for plaque detection in clinical practice. However, its significant image noise, coupled with the small size of the plaques and their complex appearance, makes it difficult for automated techniques to identify plaque. In this paper, we propose to address this challenging problem by exploiting the unique capabilities of the emerging deep learning framework. More specifically, and unlike existing works which require a priori definition of specific imaging features or thresholding values, we propose to build a convolutional neural network that will automatically extract from the images the information that is optimal for the identification of the different plaque. We used approximately 1000 images of 100 cases to process and to validate the proposed convolutional neural network (CNN). The results of cross-validation experiments show a correlation of about 0.75 with the clinical assessment for the estimation of plaque indicating the potential of deep learning for the challenging task of automatic detection of plaque in carotid ultrasound.

DE064

Limiting stiffness coefficients analysis of texture foil journal bearing

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Abstract

The purpose of this study is to explore the limiting stiffness coefficients of a foil journal bearing with the texture bump profile of top foil. The limiting stiffness coefficients are evaluated based on simplified compressible Reynolds equation or large bearing numbers with high speeds of foil journal bearing. A limiting pressure gradient solution for a texture bump of top foil bearing is analyzed. The analytical model accounts for the top foil texture bump profile and bottom foil bump compliance. Results of linearized non-dimensional stiffness coefficients obtained using infinitesimal perturbation method are compared for various top foil texture bump profiles. The influence of top foil texture bump extent and height on the limiting stiffness coefficients of a foil journal bearing are investigated.

DE065

Design and Analysis of Multi Fuel Injector

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Abstract

The work is aimed at designing a multiple fuel injector using which will be compatible to both gaseous and liquid fuels. There are various types of fuel injectors currently available in the market which are particularly used for either liquid fuel or gaseous fuel but cannot be used for both. Government primarily focusing on green fuels and bio gas fuels, it becomes a great opportunity to design such new products which will be compatible with automobile engines, electrical power generators, turbines and gas stoves. A proper injection system for any IC engine will give a very good result in fuel economy and environmental pollution. Usage of fuel can be reduced and pollution can be rapidly reduced. Exact amount of fuel injected at right pressure will give the best combustion in the IC engine. A literature survey has been carried out from research papers published previously to determine the various conditions and parameters for designing the fuel injector, in order to design a very efficient multiple fuel injector. SOLID WORKS will be used for modelling and ANSYS CFD will be used for analysis of the fuel injector.

DE066

Estimation of critical speeds of cracked rotor supported on ball bearings

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Abstract

In this work study of a rotor supported on ball bearings and containing a fatigue crack is carried out. The primary objective of the work is to obtain the load-distribution of the ball bearings from which the support stiffness in two transverse directions are obtained. The other objective is the study and rotor-dynamic analysis of a cracked rotor supported on these bearings. A mathematical model of a rigid rotor is considered for the purpose. Effects of bearing stiffness, damping and gyroscopic effects are included in the study. Using analytical approach, the governing equations of motion are obtained. Based on numerical simulations, the whirl frequencies of the rotor system are obtained using Eigen value formulation of the problem. Then, the critical speeds of the rotor system are obtained by plotting a Campbell diagram. The critical speeds are compared for the cases of with and without crack. From this study, the effect of crack on rotor-bearing system vibrations is studied.

DE067

Mathematical simulation of vibration signature of ball bearing defect in a rotor bearing system

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Abstract

This paper presents the analytical model of a ball bearing with localized defect in the outer race. The outer raceway defect is modelled based on the reduction in the contact force due to localised increase in the clearance. The contact forces are modelled based on Hertzian contact deformation theory. The geometry of the defect is considered as a half sinusoidal wave. The contact between the ball and the outer raceway is modelled using non-linear springs, acted upon rotor mass. The system governing equations of motion are obtained and represented in state space form. Numerical simulations are carried out using MATLAB environment to study the effect of outer race defect on vibration responses. Time domain and Frequency domain characteristics of the simulated vibration signals are obtained.

DE068

Experiments and finite element simulations on Ti-6Al-4V alloy

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Abstract

In this study, we investigated the mechanical behaviour of microstructural Ti-6Al-4V by means of uniaxial compression experiments. Finite element simulations with the elasto-viscoplastic material model have been carried out by considering the crystallographic slip as the main deformation mechanism. The three-dimensional Voronoi tessellations are used for the creation of polycrystalline aggregates for the initial microstructure. The effects of polycrystalline aggregate on the mechanical behaviour were discussed. It was observed that the grain orientations have significant effect on the stress-strain response. The simulated stress-strain curves are compared with the experimental data.

DE069

Vibration Analysis of Metal – Polymer Sandwich Structure Incorporated In Car Bonnet

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Abstract

The weight of the car material plays an important role in its performance in terms of fuel efficiency, speed and smoke emission. Especially in hybrid electric vehicles, light weight materials are important for balancing the weight of its electrical components and also to enhance vehicle speed on account of its comparative low mileage. Nowadays, aluminium, magnesium and Carbon Fibre Reinforced Composites (CFRP) were introduced in making of car body panels since those materials can improve its performance. Yet the material costs, fibre orientation and fabrication techniques in case of CFRP in mass production remains a question. Also, the interior of the car panels was filled with vibration barriers or isolators with considerable thickness which can also add weight to the car. Hence a sandwich structure is presented in this work where the polyurethane foam of higher thickness (core) is bonded between two thin metallic face sheets (skin). The sandwich structure allows the combination of materials with varying densities and properties in layers in order to achieve high flexural stiffness with lightweight. The polyurethane foam was chosen as the core because of its low density, porosity and viscoelastic behaviour where it can provide better damping capabilities. Hence, the foam can also help in reducing the volume of internal vibration isolators. Since the car bonnet receives the vibration from sources like aerodynamic exposure to air during travel and mechanical movements within the vehicle (engine operation), it was chosen as the subject for vibration analysis.

DE070

Biomechanical investigation of C3-C4 spinal unit after anterior cervical discectomy and fusion

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Abstract

Anterior cervical discectomy and fusion (ACDF) is a surgery used for removing the degenerative or herniated disc from the vertebrate column. A biomaterial is inserted in this affected region and it is supported by a titanium plate to restore the required range of motion. Various injuries and hereditary problems leads to improper alignment and bulging of vertebrate discs leading to restriction of motions of the vertebrae. This problem is solved using anterior cervical discectomy and fusion (ACDF).A geometrically accurate and linear C3-C4 Finite Element model of the cervical spine was developed based on the actual geometry of CT scan. An incremental load of 1.0 Nm is applied on the superior surface of C3 such that the movements of the cervical spine under extension, flexion, axial rotation and lateral bending can be simulated with the inferior surface of the C4 vertebral body constrained fully to be analyzed. Predicted range of motion (ROM) were computed for every segmental motion and compared with published experimental data. The nonlinear moment-rotation relationship of the human cervical spine was predicted by the model. Keeping the loading magnitude as constant, the model predicted the least ROM in lateral bending, followed by axial rotation and flexion, with the largest rotation in extension. The lower cervical spines are less flexible than the upper levels. FEA model was created for intervertebral disc stress and motion amongst the two vertebrates. Higher ranges of motions are observed using anterior cervical discectomy and fusion (ACDF).

DE071

Bio-Mechanical behaviour of artificial intervertebral disc in lumbar spline

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Abstract

Total Disc replacement has a higher success rate for reducing lower back pain and increased mobility in intervertebral disc in lumbar spine region. An Artificial disc replacement, the procedure is designed to bring about pain relief by removing the painful disc, and the motion at that spinal segment is maintained with the use of a prosthetic implant. This creates a need for studies to be conducted to examine these failures. The main aim of this study is to develop and designing an artificial intervertebral lumbar disc based on literature and validates its function using finite element analysis based on literature. A finite element model of L1-L5 section of lumbar spine was created by using computer tomography scan images of a person. From that a surface model of the L1-L5 lumbar section model was developed. From that, Different components were added to complete the intact L1-L5 lumbar section model and concerned properties were attributed to each of the component model. This intact spine model was then validated with reported literature. To analyse the range of motion variation and also compared to the validated intact spine analysis results with the reported literature. Thus a biomechanical behavior study of the lumbar spine was conducted to analyse the range of motion where a semi-constrained artificial lumbar disc to be designed and checked for the normal motion by comparing intact model spine and artificial disc implanted spine results using finite element analysis.

DE072

Development of Rapid Numerical Quadrature in Finite Element Method

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Abstract

BACKGROUND: Typical problem areas of interest include structural analysis, heat transfer, fluid flow, mass transport, and electromagnetic potential. The analytical solution of these problems generally requires the solution to boundary value problems for partial differential equations. In particular, the focus will be on the Finite Element Method and its application to linear and nonlinear problems. OBJECTIVE: Aim of the present proposal is to: initiate the investigation on the Universal Matrix method which is introduced presently for linear elastic and transient heat transfer problems when applied to non-linear elastic and inelastic problems. METHODS: Multiple databases were searched for English literature and limiting to last ten years. The keywords selected for the search were a combination of the nonlinear heat transient, inelastic problems. RESULTS: Universal Matrix Method applied to nonlinear heat transient & inelastic problems which a time is reducing than the existing methods like Gauss Quadrature methods, etc. CONCLUSION: Research on usage of various methods other than Gauss Quadrature method applied to linear problems extended to nonlinear heat transient & inelastic problems.

DE073

Numerical Study of vibration Characteristics and damping Properties of Viscoelastic Shell Structure by Different Damping Models

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Abstract

The carbon nanotubes (CNTs) generally exhibits better damping properties in nanocomposites. A new material with 10% volume of CNTs reinforced into the polymer to prepare modified polymer based nano composite based hybrid composites. Dynamic mechanical analyzer (DMA) is used to obtain the viscoelastic mechanical properties of such carbon fiber reinforced CNTs embed polymer based hybrid composite (HC).An element is designed with eight nodes and five degrees of freedom per node for the vibration damping characteristics of viscoelastic shell structure. The frequency dependent material properties of HC are used to depict the dynamic responses of the shell structure. The laminated [0,90] HC based shell structure is analysed from different damping models. A MATLAB code is generated for comparison in two damping models. Namely, Modal strain energy (MSE) method and absolute value modal strain energy (AVMSE) methods are used. Comparison of modal loss factor of such shell structure has been done. Raleigh damping is employed to depict the damping responses of such viscoelastic shell structure. The dynamic analysis is carried out to depict the frequency response, and settling time in transient response. Result suggests due to the CNTs into the proposed modified polymer, CFRMP based shell structure shows good damping. Significant decrease in settling time with quick vibration mitigation is observed in the transient response.

DE074

Design Fabrication and Analysis of Automatic Pneumatic Bumper and Brake Actuation before Collision

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Abstract

The intention is to design and develop the automatic pneumatic bumper based on intelligent electronically controlled bumper activation system. The system contains IR transmitter, Receiver, Pneumatic cylinder, Adriano boards, bumper, connecting hoses, battery, compressor, IR sensor. The IR sensor can detect the obstacle which come closer to the vehicle then the sensor signal should be activated the pneumatic bumper automatic system. The pneumatic bumper is used to reduce the damage of the man and the vehicle. This type of pneumatic bumper activation system can be activated at the vehicle speed is not more than 50km/hr. The vehicle speed can be detect by proximity sensor and then the signal goes to Adriano boards and activated the pneumatic bumper. These days' accidents have become a major problem. This type of breaking system is used as new project for the purpose of reducing the accidents in the restricted roadways. We assembled on four wheeler vehicles. Generally this system consist of two types of mechanisms 1) Automatic braking system and 2) Pneumatic bumper system. The sensor gives feedback to engine through relay to stop the working of engine and automatically applied the brakes. Limit switches are used to fit the brake pedal it can be activated the pneumatic bumper and automatically applied disc brake to reduce the force of the collision in the vehicle.it can be used for pre-crash safety for the passengers in the vehicle during at the time of collision.

DE075

Analysis of Engine Mounting Bracket for an Automobile using FEA

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Abstract

Noise and vibration is a major problem in vehicles. Vibration is caused by running engine and due to imbalance road condition. In many areas across India the road conditions are not good enough to drive smoothly without any hustle to body of vehicle. To absorb the vibration caused by unbalanced system, low quality roads and running engine, engine mount bracket is used widely. In this paper an engine bracket has been designed with CATIA. Finite element analysis, Modal analysis with six different frequency modes, static structural analysis has been done for three different material alloys (cast iron, aluminium, and magnesium). As a result it is found that magnesium engine bracket is better than aluminium engine bracket because of its high strength and light weight as compared to the aluminium. Also light weight of the vehicle will result in decrease fuel consumption and better performance.

DE076

Parametric modelling and optimization of scaffold structures for cortical bone defects

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Abstract

In this study focused on parametric design and optimization of scaffold structures cortical bone defects. The patient specific implants have gained importance due to better performance than traditional implants in bone tissue engineering. Bone tissue engineering (TE) influencing to healing of damaged tissues with an artificial scaffold. Thus, scaffold implants are designed to have better mechanical and biological performance close to the properties of bone. The use of open porous cellular structure in bone tissue engineering can provide mechanical and biological environment. The internal and external geometry of the scaffold plays a crucial role in bone regeneration, especially pore size and shape and surface area-to- volume ratio and material determine mechanical strength of the scaffold. The structure of pore facilitates tissue growth and the scaffold specific surface plays a major role in cell adhesion. In this work, we have created a library of three-dimensional porous structures in parametric model using modelling software CATIA. The interlinked automatic change in features allows to study the porosity and the surface area of the structure easily with change in parameters of the structure. The flexible design allows better integration of with downstream application and reduce engineering cycle. The pore width is considered the key parameter that is controlled by the user. Porosity and the surface area are formulated as a function of pore width. The boundaries of the open cellular structure can be constrained by the user. All the models in the study are bounded within a cube of 1mm side. Porosity of Group 1 models vary from 62-98%. Porosity of Group 2 models vary from 52-97%. Porosity of group 3 models vary from 30-64%. And the porosity of negatives of group 3 models vary from 35-70% porosity. The models collapse outside the porosity mentioned. These structures can be used to build the internal architecture of the bone scaffold.

DE077

An Experimental Study on Strength Properties of Bacterial Concrete

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Abstract

Cement concrete is a massively used construction material throughout the world and cement is the only manufactured material and other ingredients are locally available natural resources. Cement is the binding material in concrete and it influences the cost of concrete and in the process of manufacturing of one ton of cement 850 kg of CO_2 is emitted into the atmosphere, hence there is a urgent need to use fly ash to replace maximum possible percentage of cement in concrete without affecting the required properties of fresh and hardened concrete. Class F fly ash is generated in huge quantities throughout the country from coal based thermal power stations and the use of fly ash improves the durability of concrete with a drawback of delay gaining early age strength of concrete. In this study, the effects were made to enrich Class F fly ash with selected bacteria to replace cement in concrete so that 28 days strength of bacterial concrete is at par with control concrete. Based on literature review and tests conducted on bacteria, *B.sphaericus* was selected to produce bacterial concrete by replacing part of cement used with class F fly ash enriched with bacteria *B.sphaericus*. Tests were performed on bacterial concrete with different percentages of replacements from 0% to 50%, to find the optimum percentage of replacement to cement in bacterial concrete. Fresh bacterial concrete with maximum of 25% replacement (CFB25) has shown higher slump and compaction factor than control and the Calcium Carbonate ($CaCO_3$) by bacteria fills the porosity in concrete makes the concrete to have higher strength. Compressive, Split tensile and flexural strength of bacterial concrete CFB25 has shown higher strength than control concrete. The bacterial concrete CFB25 will reduce the amount of CO_2 emitted to the atmosphere and save the natural resources like clay, gypsum, coal, water and electrical energy which are consumed in production of cement. Bacterial concrete will be very useful to reduce the pollution caused by fly ash storage. Hence Bacterial concrete is very advantages as it reduces the atmospheric pollution and saves natural resources and electrical energy.

DE078

Design & Analysis of Center Drive in Front Axle for 4 - Wheel Drive Tractor

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Abstract

The history of four wheel drive tractors traces backs to its origins from the years 1960's where they become conventional. Four wheel drive tractors are classified into various types based on the torque transmitted to the wheels. A typical four wheel drive tractor consists of a drive head unit where the torque from the engine is distributed to its wheels. This paper deals with one such drive head unit where the torque transmission to wheels is located on the center of the axle. This type of drive has significant advantages such has higher ground clearance & better steering angles when compared with other drive head units which are positioned on either side of the front axle. This paper is about shifting the existing drive head unit which is positioned on the left side of the axle and to accommodate the drive head unit on the center of the axle with minimal changes in axle parts. The proposed design changes are carried out using Creo 3.0 for the modeling part and subjected to a static analysis using simulation software such as ANSYS or SIMSOLID.

DE079

Lateral and Torsional Vibration analysis of Composite shaft

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Abstract

In Energy Industries reliability of rotating equipment's plays a key role in overall plant reliability and safer operation, in fact maintaining these equipment's in larger scale is a challenging task. Most of the failures in rotating equipment's are influenced by residue unbalance force of the rotor. This paper deals with the comparison study on existing alloy steel and laminated composite shaft's lateral and torsional vibration parameters, which aims to reduce overall residue vibration. The rotor system model represented here is simply supported bearing with single disc at Centre. The analysis reports the comparisons of both alloy steel and laminated composite, which features with frequency and time domain analysis, the unbalance responses, mode shapes and Campbell diagram. Furthermore, this paper refers American Petroleum Institute Recommended Practice (API RP) 684 for the purpose to facilitate engineers in adapting the composite shaft in suitable applications.

DE080

3D Modelling and Analysis of Encased Steel-Concrete Composite Column Using ABAQUS

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Abstract

This research paper presents 3D ABAQUS modelling of fully encased composite (FEC) columns and these are compared with reinforcement concrete columns at different strengths of concrete. The axial load capacity, deformation, stress and strain patterns is determined for a reinforced concrete columns and composite columns having I-section steel confinement. The results show that the composite column can be analyzed using ABAQUS software with a modified model. The behavior of composite columns and reinforced concrete columns can be determined by Finite Element Method (FEM) by using ABAQUS software. Based on the results of the analysis, it shows that the reinforced concrete column capacity has reduced the ability of the ultimate axial load. For the fully encased composite columns, it provides profile with steel grade results of improved ultimate load resistance, while influence the encased steel to ultimate axial load. The pattern of stress-strain distribution during yielding spreads throughout the column areas. A detailed parametric analysis was performed to study the behavior of FEC columns subjected to axial loads. The geometric and material properties are varied, and their influences were observed with respect to the peak axial load and corresponding moment, failure mode and overall column load-deformation response.

DE081

Analysis of carbon fibre bone plate for "B1" type periprosthetic femoral fracture

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Abstract

Fractures occur post-operatively around the total hip arthroplasty increasing frequently due to aging and day to day normal activities of the patient. This type of fracture happens below the cemented/uncemented stem, either straight/oblique direction concerning the transverse plane. Metal plates are used for surgical stabilization of periprosthetic femoral fracture (PFF). But stress shielding in bone due to metal plates can be reduced by designing the implants with fibre reinforced polymer composites. The present study aims to study the stress distribution in the composite plate using carbon fibre for B1 type periprosthetic femoral fracture and compared with metal plate by varying geometrical parameters, laminate stacking sequence and fibre orientation. To evaluate the axial stiffness and surface stress of composite plate fixation finite element analysis (FEA) was done. Various parameters like axial movement, shear movement, compressive normal force, strain and maximum stress are considered to measure the fracture stability and the healing process through FEA.

DE082

Numerical Prediction of Deflection of a Cylindrical Hollow Structure Due to Steady Wind Loads

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Abstract

A raising population and to meet the raising needs there is an increasing demand for tall structure both for commercial use and industrial purpose. Wind behaviour is a key design parameter for such structures and need to be assessed accurately in the preliminary and secondary design stages. This study is aimed at prediction and analysis of deflection of hollow structure due to steady wind loads. Hollow structures typically represent chimneys that are used in the coal fired stream power plant. A hollow cylindrical part with base diameter of 6 cm is fabricated and tested in wind tunnel at constant speeds of 10, 15 and 20 m/s. An accelerometer is mounted on top of body to measure the deflection. Next, the deflection of the body is predicted numerically using commercial ANSYS software. Initially Computational Fluid Dynamics (CFD) simulations are performed to predict the flow field and associated wind force acting on the body. The wind load is transferred to the structural solver to predict the deflection of the body. The predicted deflection compared well with the wind tunnel experiments. Further FSI simulations are performed by changing the thickness of the hollow structure. The results are analysed to study the effect of wind speed and thickness on the deflection. A cubic polynomial curve fit for the deflection, as a function of the wind speed and thick ness of the hollow structure is developed.

DE083

Experimental and analytical stress analysis of spur gear

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Abstract

Gears are most powerful machine element to transmit the motion between rotating shaft. It acts as a dominating transmission system from many years ago. In this work, a spur gear from stone crusher machine is analyzed using theoretical Lewis equation and Finite element analysis method. Here, the bending stress on the spur gear is analyzed since these stresses induced play a vital role in gear life. The analysis presented the effect of gear material on induced bending stress. The material C15 steel/CI 30 is replaced by C45 steel/CI 30.The C45 steel material has better mechanical properties than C15 material. The result explains that C45/CI30gives lower value of bending stress as compare to the existing material. Module is important parameter during modeling of spur gear. The parameter is varied and proportionally the bending stresses are determined theoretically for both new and existing materials. Finally the results of both gears are compared and concluded with the American gear manufacturer association data .The results shows that the bending stress reduces with increase in module. The future work is to find the bending stress induced on spur gear by varying the module using FEA and varying the shape of meshing structure.

DE084

Design & Analysis of Assembled Teeth Spur Gear

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Abstract

Gears are the most important components in modern mechanical engineering world. The use of gears has more common in all the industries. The advantages of spur gear are simplicity in design and can be manufactured easily, economically and less maintenance. At present scenario gears plays an important role in wide space of research especially in gear motors, gear pumps, electromechanical actuators and drive shafts for car etc. Gears predominantly fail in contact fatigue mode (pitting/spall) due to combined rolling and sliding motion. Pitting initiation has been experimentally investigated by many researchers under different loading and operating conditions. Contact and Bending stresses at pitch point happened due to a close agreement. The highest probability of pitting /bending failure initiation is observed in single tooth contact region due to full load sharing and the chance of contact fatigue failure is more in comparison to bending fatigue failure. But if the failure is happened in teeth - entire gear is replacing. So, it's is so expensive. Our Aim is to design and study the failures of assembled teeth spur gear. In this project, we are going work from the new conceptual design to detail design with CAD Model and proceed to check the failures using Analysis Tool. Aim to find out the contact stresses and deflection by using Solid works and Ansys software's. Also checking for suitable application of this detachable conceptual gear tooth design.

DE085

Spine Curvature Data Measurement and Its Application on Product Development

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Abstract

Human Spinal Column important structure that gives strength and support to the entire upper body. The complete spinal column made up of 33 small bones (Vertebrae). The entire vertebral column is divided into five different parts, namely Cervical, Thoracic, Lumbar, Sacrum, and Coccyx. The normal spine curvature consists of 4 curves – cervical curve, thoracic curve, lumber curve and sacral curve. The normal spine has an S-shaped curve when viewed from the sideways. Two alternating curves to create an S like structure are Lordotic Curve (Lordosis) and Kyphotic curve (Kyphosis). It has been suggested that deviations in one or both of these variables may increase a person's risk of developing back pain. Human spine curvature data required in various field including – to study how heavy school bags affects posture/curvature of school going kids, spine curvature changes due to aging, posture changes with pregnancy, upper body posture changes due to mobile phone use, body posture changes due to sitting posture / office ergonomics, etc. In addition, the human spine curvature data are required for product development such as mattress, chair, automobile seat, pillow, rehabilitation pads, school bag, baby carrier, assistive product for pregnant women/elderly, etc. The purpose of this study is to investigate the importance of spine curvature data measurement and its applications on product development.

DE086

Finite Element Modeling and Validation of a Human Foot through experimental studies

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Abstract

The mechanical experimentation in human beings is practically very difficult due to various laws and procedures. The use of finite element model of the human parts has a significant effect in research. The foot is one of the complex structures in the human body consisting of 26 bones and 33 joints. This paper aims in developing the finite element model of the human foot and its validation with published literature. Difficulty in modeling the bones, ligaments and tendons due to its non-homogeneous material properties, complex contours, structures and other constraints make the modeling a huge challenge. But, because of the advanced developments in the area of biomedical imaging and image reconstruction, now it is possible to develop the finite element model of the human foot. The position, orientation and contact between the phalanges, metatarsals, cuneiforms, cuboid, navicular, talus, calcaneus, tibia and fibula were defined and a three dimensional finite element model is developed. The plantar fascia, achiles tendon and few ligaments were also modeled. This finite element model would be used for studying the biomechanical behavior of the foot under different conditions. The stress distribution in the foot could be predicted for different stages in the gait cycle.

DE087

Experimental Investigation of Particle Impact Damping on Machine Tools

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Abstract

In machine structure, the boring operations are extensively used for enlarging an existing hole. For large sized workpieces, the overhang length of the boring tool increased, which disturbs the slenderness of the tool (length to diameter ratio) leading to high amplitude vibrations. The tool-workpiece interaction strains the shank and induces vibrations in the workpiece. These vibrations bring along a package of defects such as poor surface finish, dimensional inaccuracy, reduced material removal rate etc. In order to suppress the damping, small metal particles were used. Particle impact damping is a method of achieving high structural damping by using a particle filled enclosure in the region of high displacements. A series of experiments were performed where the closure was attached to the tool at three different locations, the material as well as the size of the particle was changed for obtaining different experimental observations. Further, a particle effectiveness or packing ratio of 25%, 50%and 75% was used for experiments. Using NI signal software and LabVIEW we were able to obtain the natural frequency with and without the damper, in an experiment the frequency of vibration was reduced about 15% with the damper.

DE088

Design and fabrication of high precision vacuum chuck for grinding of thin silicon wafers used in integrated circuits

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Abstract

The aim of this work is to design and fabricate a full-scale vacuum chuck for machining silicon wafers used in integrated circuits whose average thickness is around 2 mm and average diameter is around 25 mm. The designed vacuum chuck containing an assembly of mechanical parts which were machined with precession on a CNC machine, and assembled on a rigid steel angle plate framework. The wafer to be machined was mounted on a designed vacuum chuck whose maximum vacuum pressure was 2 Pa achieved by a single stage rotary vacuum pump. Grinding was done with a in-house designed ultrafine CBN micro-wheel in dry condition, as the coolant may contaminate the high purity silicon wafers. The maximum speed of grinding wheel was set at 100 r.p.m. with a mean feed rate of 3.5 mm/min, and the grinding was carried on a production type CNC vertical milling centre, up to a final thickness of 2.5 mm. FEA was performed using ANSYS software to predict the stresses developed and the maximum deformation of the whole assembly of parts. Scanning Electron Microscopy (SEM) images were taken to study the surface morphology of the after machined wafers, and Atomic Force Microscopy (AFM) images were taken to determine the surface roughness. It was found that the stresses developed in the material and the assembly was within the permissible limits and the average surface roughness was determined to be 0.6 nm. It was conclusive that the designed vacuum chuck is able to hold delicate and thin work piece like pure silicon wafers to be ground to required thickness and lower surface roughness.

DE089

Design and Fabrication of Beach Cleaning Machine

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Abstract

Beaches are one of the main tourist attractions in the coastal parts of India. They are also the most polluted. Most of the government neglected cleaning of beaches .The main reason being the difficult in nature of cleaning it. It takes up lot of resources and time. The workers need to manually pick the waste. The waste when thrown in the sand gets covered with the sand by the heavy coastal winds. This makes the spotting of waste difficult. It is difficult for the workers to clean as they have to dig each cubic feet to collect the waste. The heat and humid climate of the beaches makes the working conditions worse. Many organizations and government bodies are taking several steps to get rid of the waste accumulated in beaches more effectively. India has a long stretch of coastline of about 7517 km with nearly 170 famous beaches both on eastern and western coasts. Our aim of work is to design and fabricate the versatile beach cleaning machine. We have created a simple economical design so that it will be easy for maintenance and use. The parts have been sourced locally so replacement parts will be easier to get. The machine is environment friendly and can run in any conditions offered by the beach. We have designed and manufactured a beach cleaning machine which is both cheap and easy to use. It does not have a huge learning curve. The machine runs on human power or electric motor. The electric motor is powered by solar panels. This gives an advantage over the current models available in the market which runs in fuel motors. The entire machine is able to fit in the rear end of a car, which makes easy to carry.

DE090

Investigation on Structural Behavior of Concrete Filled Stainless Steel Tubular Stub Columns

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Abstract

Concrete filled stainless steel tubular (CFSST) Columns were the widely used structural application due to its unique importance. These were providing better strength, stiffness, ductility and seismic resistance than conventional concrete columns. The outside stainless steel provides the Confinement to the inside concrete throughout the lifespan of it and gives additional strength to the column without spalling of concrete. It was found that CFSST stub columns carrying high axial loads and exhibiting well energy dissipation. We have compared experimental results with Finite element analysis and with analytical approach.

DE091

Modelling and design of a drain cleaning robot

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Abstract

Underground sewers collect waste from domestic and industrial buildings. These pipes are designed to carry only liquid and semi-solid wastes such as soap water and human excrement. However due to improper disposal, solid waste materials such as rags, plastic waste, condoms, sanitary napkins, white cement etc. are also found. Since the pipes are not meant to carry these wastes, they cause blockages. Apart from sewer drains housing societies with sewage treatment plants (STPs) also face this problem. Clearing these blocks either require a human worker, which endangers human life due to presence of toxic gases, or a high-pressure water hose cum suction machine which is very expensive. The aim of this paper is to design an automatic robot which will be able to clear blocks quickly at a much lower cost without any threat to human life. The robot will be lowered into the sewer pipes through a manhole. It will propel itself till it reaches the block then clear the block. The robot is tethered by data cable for communication and to prevent it from flowing away. A rope is used to retrieve the robot once the block is cleared.

DE092

Design, Analysis and Development of Composite Matrix Material Upright of FSAE

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Abstract

Light weight material Upright plays a very important role in improving the performance of the car i.e. lowering down the unsprung mass of the car and improving the ride and handling characteristics of the vehicle. Due to excellent characteristic of Nylon66 of reducing noise, wear rate, light weight, simple to design and manufacture and for the same, light weight composite matrix material i.e. Nylon66 reinforced with Carbon fiber was used. The vehicle upright was designed in SOLIDWORKS in accordance to the FSAE rulebook. The static structural analysis was performed in ANSYS over the vehicle upright to find out the von-mises stress and total deformation. Final optimized design was manufactured using the technique of continuous fiber fabrication in order to get the desired strength of the Upright.

DE093

Influence of loading in cervical spine motion segment and stress distribution

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Abstract

The cervical spine is designed in a robust manner that it plays a major role in the structure & function of the human body. Neck pain and neck stiffness is a major problem faced by all working people and the everyday bending, twisting and turning are the main reason for these problems. These problems causes sagittal plane translation which may be an indication of disc degeneration. The aim of this study is to create a three-dimensional model of a cervical spine motion segment and to validate it by inspecting the model with similar FE method. FE models of the cervical spine are derived from a CT scan with dissimilar elements and then quality of these models is evaluated with the help of mesh element-related metrics. Different material properties were given for each part of the model and various loading conditions were applied. Ligamental forces and vertebral rotation variations was also done as part of the FE study. The individual components of spine were subjected to loading conditions and the stresses developed on them were studied. Range of motion of cervical spine was studied under lateral bending and axial rotation. Motions were defined as combined lateral bending and axial rotation. Some of the most important morphological variations found in the anatomy were disc segmental size & stress developed in the superior and inferior endplates and also the stress developed in the disc were analysed. The results obtained were collated with some external references and after validation of the model the model could be used for extended similar studies. The results gained from the finite element model helps us to plot stresses of subjects obtained from the respective lifestyles can benefit surgeons to suggest treatment actions.

DE094

Mechanical Response of Taper Dental Implants using Finite Element Analysis

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Abstract

Implants have created a great impact in the bio medical industry. There are different kinds of dental implants which are existing in the market. Every implant has a unique feature and withstands for different time period. This study on the dental implant creates a new model which includes the porous and tapered angle. Titanium alloy was used for making the implant and supporting bone tissue was considered. Computed tomography data were used to generate the mandible model. In the analysis both static and dynamic loading condition were considered. Three dimensional FEM was performed on the implant to find out the mechanical response for this specific type of implant. The von-Misses stress were calculated for implants and it was observed that safe when compared with yield strength of implant and abundant. In analysis it was also varied bone quality for cortical and cancellous bone and the effect of stress produced can be predated before the implantation done for the patients.

DE095

Study of Mesh Stiffness of Spur Gear Tooth Considering Pitting Defect with Dynamic Load Conditions

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Abstract

Gear drives are one of the most essential mechanism of power transmission systems in numerous industrial applications such as automobiles, aerospace and wind turbines etc. As the speed of gear transmission increases, the study of dynamic behavior of the gears are more important in the gear design. Gear mesh stiffness plays an eminent role in gear dynamics and it varies in the existence of gear fault such as pitting, spalling and crack. The dynamic performance of the gears are affected by module, contact ratio, pressure angle and transmission error etc. In order to understand the dynamic properties of spur gear system, it is necessary to calculate the mesh stiffness of the gear tooth pair effectively. In this paper, a comparative study has been carried out using FEM between healthy gear and fault gear with considering pitting defect. Gear mesh stiffness of healthy and fault gear with various pressure angle and module are compared with dynamic load distribution in gear tooth contacts.

DE096

Design and CFD analysis of Horizontal Axis Wind Turbine Blade with Microtab

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Abstract

The aerodynamics of a blade design plays an important role in the design theory of wind blade. The structural analysis and optimization of these wind blades increases the performance of the wind energy. The review provides a complete picture of wind turbine blade design and shows the dominance of Horizontal Axis Wind Turbine (HAWT) blades. The aerodynamic design principles for a modern wind blade are detailed, including blade plan shape, size and aerofoil structure profiles. Different airfoil profiles are chosen for modelling of the wind blade to increase the co-efficient of lift generated. The review produces a trial design of the blade and stress distribution analysis is performed on the wind blade for different materials of the blade. This is modeled and analyzed by the CATIA and ANSYS software. The concept of Micro tabs are familiar for airfoils used in aircraft wings to control both lift and drag generated on the airfoil. The usage of Micro tabs on wind blades are analyzed. The pressure, velocity and turbulence kinetic energy acting on the blade surfaces from the leading edge to the trailing edge are studied. The review also provides a new concept of double micro tabs that are placed on the pressure side of the airfoil structure to increase lift at low angles of attack and low wind velocity. Furthermore, the ideal positioning of micro tabs are determined for single and double micro tab blade design. A comparison study is produced to determine the flow characteristic of blades with and without micro tabs.

DE097

Analysis and Development of Mathematical Formulation of Interpolants for a 5-Noded Polygon Element using Wachspress' Interpolation Function.

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Abstract

In this work study of Wachspress' Interpolations is carried out for the generation of Interpolants for 5-Noded polygon Element. For obtaining so the use of Smoothed Finite Element Method (SFEM) is also done. Here the 5-Noded Polygon Element will be discretized into 5 Quadrilaterals using the SFEM methodology and the respective coordinates of the discretized element will be as same as of the Local Coordinate System without coordinate transformation. Once it is done then we form the C Matrix (Shape function Values Matrix) which remains constant. Here we consider the line that connects two nodes and using that we will generate the Wachspress' Interpolants. Later on multiplication of the B Matrix (First Derivative Matrix) with the C Matrix, D Matrix (Material Matrix) and the Area Matrix we can find the Element Stiffness Matrix and later the results will be validated with that of an already existing generic example.

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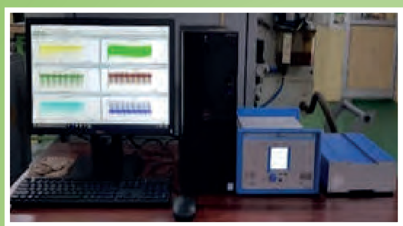
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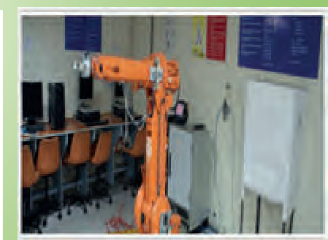
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ME001

Optimization of AWJ Process Using Fuzzy Taguchi Method for improving Surface characteristics of Silicon wafer

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Abstract

This research investigates the slicing capabilities and surface characteristics of Silicon wafer by optimizing the process parameters of Abrasive water jet machining process. Here used a garnet as an abrasive of mesh sizes 80 and 120 size and machining is carried out on pure silicon wafer. L9 Taguchi orthogonal array is used to optimize the abrasive machining parameters and compare the surface characteristics like surface roughness, topography and MRR using different input parameters like standoff distance, water pressure and Abrasive flow rate. ANOVA analysis is used to find the most influence parameter which affects the surface finish of silicon wafer and Regression model is used to find the empirical model of the machining process. Further Fuzzy logic analysis is used to predict the abrasive water jet machining process parameters with Mamdani fuzzy rules and Triangular membership function. SEM analysis is portrayed the surface morphology of different mesh size machined on Si wafer.

ME002

Effect of Heat Treatment and Plasma Arc Welding on the Mechanical and Metallurgical Properties of Hastelloy C276

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Abstract

Hastelloy is a superalloy which contains nickel, chromium, iron and molybdenum as its major constituents which possess outstanding high temperature strength and oxidation resistance. The objective of this work is to study the heat treatment effect on mechanical and metallurgical properties of Hastelloy C276. A total of four samples are prepared at two different temperatures (700^{o}C and 900^{o}C) and at two different soaking times (4 and 8 hours). Tensile strength, percentage elongation and hardness were measured for the heat-treated samples. Further plasma arc welding was carried out on the heat-treated samples to understand its effect on tensile strength and hardness. The results indicate that there is significant increase in tensile strength and hardness of the hastelloy after heat treatment. Sample processed at 900^{o}C and 8 hours soaking time has the maximum tensile strength and hardness of 378 MPA and 197 HV respectively. There is slight increase in tensile strength of the plasma arc welded samples. The percentage elongation of heat-treated samples is reduced after the welding process. The XRD pattern of the alloy revealed that the alloy is amorphous or microcrystalline in structure. The SEM image reveals the surface topography of the aged samples which confirms the experimental results.

ME003

Improvement in forming process using Magneto rheological Fluid Assisted Cushion in Hydraulic Press

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Abstract

The role of cushion pressure in hydraulic press plays a vital role in forming the component. In the present work, an attempt was made to analyse the influence of Magneto rheological cushion in addition to the existing cushion system, in forming small cup shaped component. The innovative Magneto rheological assisted hydraulic press of 1 ton capacity is designed and fabricated. The formability of Aluminium and Galvanised Iron sheet of different thickness was analyzed. The Magneto rheological cushion improves the formability of components with the reduced number of wrinkles in it. The forming process with the Magneto rheological fluid assisted cushion hydraulic press was more efficient than ordinary hydraulic presses.

ME004

Review on Bio-material used in rapid prototyping techniques and its application

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Abstract

Rapid Prototype is an innovative technology that has evolved in medical industries the use of RP technology coupled with the other techniques has led to improvement in services offered to patients by improvement in such areas as 3D visualization of a specific anatomy, surgical planning, implant design, prosthesis production, and polymeric drug delivery devices. Important challenges in Production of Bio medical implants in RP Technique is selection of materials for the specific application. The material should be Bio compactable and its application specific. In this article we review the current technologies available in RPT and the selection of Bio materials application in different fields of medicine.

ME005

Process parameter optimization of abrasive water jet machining on Monel K400 alloy

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Abstract

Nowadays it’s difficult to use a metal with high corrosion resistant properties in required applications. Monel 400 is one nickel based alloy having required property to be applicable in such scenarios. It is used in highly corrosive environments such as marine, chemical and aerospace industries as it has the property of maintaining its toughness over a range of temperature, however machining of this Monel alloy is relatively tough due to its characteristic work hardening properties. To tackle the mentioned issues, Abrasive water jet machining is used which is a widely known nontraditional machining technique. The process parameters and the response variables were chosen depending on the machine specifications, and parameter combinations were made using Minitab statistical software. The parameters and their interactions like the cut quality on the alloy, nozzle diameters effects, and water pressure were also studied. Response surface model and various statistical algorithms such as S-N ratio, ANOVA and regression equations were utilized for formation of the design of experiment, optimization of process parameters for the machining process were done using Grey relations. Reduction of surface roughness, maximization of Material removal rate while simultaneously reducing the cycle time for the operation was the primary objective. The results thus obtained indicate that the quality of cut was the most influential factor in the machining process followed by water-jet pressure value.

ME006

Review on materials used in rapid prototyping techniques in automotive industry

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Abstract

This paper reviews with the various materials used in Rapid Prototyping in manufacturing of critical components especially used in automotive industries. Rapid Prototyping is an ideal method for components that are complex in shape because it minimizes the time for developing the patterns, prototypes, and tooling. Automobile parts can be formed with any geometric complexity or intricacy without the need for elaborate machine setup or final assembly. The term Rapid Prototyping (RP) refers to a class of technologies that can automatically construct physical models from Computer-Aided-Design (CAD) data. RP techniques are often referred to solid free-form fabrication; Computer automated manufacturing or layered manufacturing. Even though RPT techniques have wide applications for the functional component developments but the selection of materials is a challenging task. In this paper the comprehensive review based on the different materials used for making automotive components directly or indirectly by rapid tooling method.

ME007

Design and development of waterless solar panel cleaning system

Sanjaya Kumar Kar[1], Atif Akhtar[2], Anant Singh Gambhir[3], Vignesh J[4], Ritesh Nair[5]

[1] Assistant Professor (Sr.G), [2 4 & 5] UG Students. Department of Mechatronics Engineering,
[3] UG Student, Department of Aerospace Engineering, SRM Institute of Science and Technology.

Abstract

With around 300 clear and radiant days in a year, the determined sun-based vitality occurrence on India's property zone is around 5000 trillion kilowatt-hours (kWh) every year. The sunlight-based vitality accessible in a solitary year surpasses the conceivable vitality yield of the majority of the petroleum product vitality holds in India. The everyday normal sun-based power-plant age limit in India is 0.20 kWh per m2 of utilized land territory. Efficiency of solar panels are poor when they are not clean. Water based manual cleaning is costly, brings about ecological damage. Apart from leading to an electrical hazard, water-based cleaning leaves deposits, and causes scratches because of scouring. With manual cleaning, there is a danger of harming the covering of the boards. Our design utilizes nylon bristled brushes making no harm to the panels. No weight or stress is applied on the photovoltaic cells. The cleaner robot is self-fuelled, and programmed. It navigates through the entire length and comes back to the docking position. This completes one work cycle. Cleaning is finished utilizing exceptionally planned brushes, lifting the residue far from the boards. The cleaner robot can be retrofitted to suit existing or customized solar panels.

ME008

A Comprehensive Study on Machining Characteristics, Effects of environmental aging on Vetiver fiber Reinforced Polymer Composites with Coconut Shell Powder as Filler

Aneesh Kumar B[a], Haran J[b], Vaibhav Gopikrishnan[c] and Shakthivel S[d]

[a,b,c,d]SRMIST,kattankulthur,Chennai 603203,India

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Abstract

Natural fiber reinforced polymer composites has now become significant domain of research due to its presence of variety of plant fibers as reinforcements, which are readily available and bio-degradable. There are many studies being taken using natural fibers viz., jute, flax, banana etc. as reinforcements with polymers as matrix material. These Natural fiber reinforced Polymer composites are finding it as alternative to synthetic fiber based composites. They are also explored for many industrial applications which possess equivalent and certain superior properties than conventional polymer composites. The latest investigations on vetiver fiber (Chrysopogon zizanioides) reinforced polymer composites shows good and desired mechanical properties. Further definite improvements are exhibited on adding Coconut shell powder as filler material to above composites. Machining becomes requisite to facilitate the production and assembly of parts and product respectively. Composites machining poses a new challenges due to its presence of multiple elements that encountered in machining of pure or alloy materials. This study concentrates on experimental analysis of drilling and milling on different compositions of vetiver fiber reinforces thermoplastic polymer composites with coconut shell as filler. The specimens would be prepared using the injection moulding techniques. Investigation on Drilling includes parameters viz., drill geometry, drill size, cutting speed and feed rate and its effect on specific cutting energy,(SCE), cylindricity, surface roughness, torque and thrust force. Further Milling characteristics are examined through feed rate and speed and its effect on surface roughness. Further analytical study would be carried using ANOVA, and Gray relation analysis to determine the optimum parameters. In addition environmental aging is performed on different specimens as per the standard and determine moisture intake by weight gain percentage and further the specimens were examined using scanning electron microscope.

ME009

Optimization of Process Parameters during Face Milling on Magnesium Alloy - AZ31 Using Artificial Neural Networks

M Suriya Ram, Niranjan S Raj, Abhishek P Diwan, Abishek C G, and J.Santhakumar*

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Abstract

This paper investigates the effect of the influencing machining parameters in the machinability characteristics of AZ31 Magnesium alloy during face milling operation. The input parameters selected are depth of cut, Cutting speed and feed rate. The output responses measured are Surface Roughness and Tool nose radius deviation. The Taguchi L9 orthogonal array was designed for the three input parameters and three level design. The experiments were then carried out based on the Taguchi L9 orthogonal array. After the machining on the material was completed the output parameters were measured and tabulated. The milling parameters were optimized by using the combination of ANN, and GA techniques and the following observations were made: Among different learning algorithms of ANN with three different types of curves, BBP learning algorithm and the learning curve with 20 neurons in the single hidden layer had better predicting capability. It was seen that there was negligible difference between the experimental values and the predicted values from the ANN model. The optimum ANN algorithm is given as input nonlinear objective function for Genetic Algorithm to arrive at most optimum input parameter for minimum tool nose radius deviation and surface roughness. The optimum parameters are found to be cutting speed of 78.5062m/min, Feed rate of 0.050625mm/tooth and Depth of cut of 0.6mm. Confirmation test was carried out with the obtained parameters and the results were verified.

ME010

To maintain a constant temperature in a closed loop system using LabVIEW

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Abstract

With the development and popularization of computer technology, digital technology, digital equipment's are replacing analog device gradually. The measurement and control technology plays an important role in the process of production and scientific research. As the time advancing the conventional instruments are emerging shortage. It becomes necessary to Improve &modernize conventional instruments .In this project work, the conception of virtual instrument and control of temperature for specific set temperature is introduced. The program system and programming environment of virtual instrument, LabVIEW will be mentioned as well. Around the anticipant target which the PC-based virtual instrument in this thesis is expected to achieve, the design thoughts and the whole structure on which the virtual instrument was built are described in details thoughts. Following these thoughts as principles, a temperature control system will be designed. Based on Virtual instrument (LabVIEW), the temperature control system will be designed to realize the data of the temperature of the objects. The sample input signals were analyzed and disposed to determine the output signal at given set point with specific delay time using by using the LabVIEW based program.

ME011

Omni Directional Bot Using Mecanum Wheels

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Abstract

This paper presents the mechanical design and fabrication of an Omni directional bot using mecanum wheels. The design of the wheels is kept simple and easy to fabricate using simple manufacturing techniques. The bot is required to travel through aisles and narrow passages in storage and retrieval facilities. The wheels are equipped with 8 rollers each which are mounted at 45 degrees to the plane of wheel passing through the longest chord. The paper focuses on the design calculations of the roller. Bot is required to travel through narrow aisles and take sharp turns without steering. For the smooth ride, the distance between the wheel axis and ground must always be constant e.g., equal to the radius of the wheel. The generatrix of the roller is elliptical in order to achieve the vibration free ride. The wheels can also be used in other applications like material handling in offices, document deliveries from one floor to another, surveillance bot at crowded places like airport and others.

ME013

Electric Arc Discharge Electro-mechanical Plotter

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Abstract

The work presented in the paper is based on the research, development and prototyping of an electro-mechanical system of three-axis actuators, electrical control circuitry and embedded system required to exploit the thermal power of electrical discharge or arc to plot any arbitrary figure on paper in the process of surface carburization of paper. This technology eliminates the need for inks and tonners which need frequent refilling with considerable expenditure and great environmental impact when their containing cartridges are discarded. An automated three axis Cartesian setup has been devised for studying the potential of plasma energy for printing on paper. The experiments of paper surface carburization have been performed on ordinary printing paper.

ME014

Optimization of turning parameters for Magnesium Silicon Carbide using TOPSIS method

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Abstract

A composite consists of at least two constituent parts, one being a metal necessarily, and the other material may be a different metal or another material, such as a ceramic or organic compound. As a lightest metal structural material, magnesium matrix composites exhibit many advantages over monolithic magnesium or magnesium alloys, such as high elastic modulus, high strength, and superior creep at elevated temperatures. Magnesium based metal matrix composites had been used in biomedical operations due to biocompatibility and ductility. Magnesium Silicon Carbide (MMC) is casted with Magnesium 90% by mass and Silicon Carbide 10% by mass through Stir Casting process. Turning operation was performed according to the DOE with the utilization of CCD. The input factors considered for the experimentation is of three levels and the output responses are surface roughness, surface hardness and out of roundness. Using Entropy method, weightage for TOPSIS method is calculated. The multi-responses were optimized using Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) and optimal parameters were determined and found to be cutting speed as 500rpm, feed as 0.2mm/rev and depth of cut as 0.2 mm.

ME015

Tool Wear Monitoring on Drilling of Magnesium Alloy

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Abstract

Cutting tools are subjected to high sheer and thermal stresses during drilling operation, this leads to tool wear. Tool wear can lead to increase in cutting force, surface roughness, vibration and chatter and also reduces dimensional accuracy. The purpose of this study was to find if cryogenic treatment of Tungsten Carbide cutting tools could reduce tool wear thereby improving cutting performance. Magnesium ally (AZ61) was prepared by melting process. The cutting tool was put into a Cryo processor for treatment using liquid nitrogen at -80 °C for 24 hours. For comparison another non treated Tungsten Carbide tool was taken. Both tools were used to drill nine holes each on the prepared magnesium alloy at varying speeds and feeds. The experimental results indicate that drilling with a treated tool resulted in lower tool wear, cutting force, surface roughness and average temperature raise when compared to the non-treated tool. It was found that using the cryogenically treated tool is preferable over the non-treated tool while drilling AZ61 Magnesium alloy.

ME016

Microstructure and Mechanical Properties of Nitinol by Pulsed TIG Welding

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Abstract

Ni-Ti is a shape memory alloy with super elastic property finds its application in Aerospace and Bio-Medical industries. Welding was done by Pulsed TIG welding for different peak current. Argon gas was used for the welding of the specimens. Welded samples undergoes tensile test. Fractrography was studied using FESEM, Phase transformation temperature was identified using DSC (Differential Scanning Calorimetry) , X-Ray Diffraction was carried to identify the phase changes occurred in the material during the welding process and EDS (Energy Dispersion Spectroscopy) was carried out to find change in Nickel and Titanium percentage after welding. Bead geometry (Depth of penetration and bead width) were measured using Machine Vision. Results of the work reveals that strength increases as the peak current increase with the formation of intermediate compounds.

ME017

A Study on Combined Effect of Drilling and Reaming Process

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Abstract

Drilling process for the hole machining and Reaming process for improving the Hole surface finish is widely used in original equipment manufacturing companies. As the surface finish of holes in the joints defines the smoother assembly and stable joint. So as to improve the hole surface finish in the lesser cycle time an idea of Combined Drill-Reamer is proposed. Around the world many Research teams and Tool manufacturers proposed combination tool for various application. But there are not many studies of combination tool on Drill-Reamer and not compared with the standard drilling and reaming process yet. Main aim of this study is to decrease run out error and increase surface finish of the hole in lesser cycle time. Firstly, a combined drill-reamer is designed and fabricated according to the industrial standards. The fabricated Drill-Reamer tool is used to machine 9 different holes, varying speed and feed on the Aluminium 6061 T6 blank. Similarly Drilling and reaming is done on two other blanks to compare the circularity, surface roughness and Surface hardness of the holes with the combination tool blank. Using Grey relational analysis, the best combination of speed and feed to get better surface finish of the hole is found to be H6 with 1300rpm and 50 mm/min. The surface finish of the hole and cycle time of the process is improved, when compared to standard drilling and reaming process. The ideal speed and feed input of the combined tool is also found. The combined tool can be used in various manufacturing applications where precise machining is needed, E.g. Crankshaft bore, Wheel Rims etc.

ME018

Fabrication and Testing of closed Cell Aluminium Foams with Sisal Fiber Face Sheets

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Abstract

The automotive industry wants to benefit also from the developments of new light-weight materials like in crash pads, body works. The applications of closed cell aluminium foams in various engineering fields such as civil, automotive and naval architecture engineering, less compressibility yield strength for its production cost still remains a persistent hindrance to widespread commercialization. We fabricated three different composite foams using$CaCo_3$and *Sic,* with and without blowing agent (TiH_2) by stir casting method.We also sandwiched these foams with natural fibre(sisal) reinforced epoxy polymer composite. The resulting sandwiched metal foams are then studied under uniaxial compression test. All foams produced are also characterized by measuring porosity, density and microstructure which is very useful when in the applications of sound proofing and insulations. Finally, all the results yielded by the sandwich foams show eight times better than the result of core foam.

ME019

Distillation of Water by Vacuum Dehydration

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Abstract

Water is one of the most important element for life. In today’s world, pure water has become a really scarce resource due to the exponential growing demand and limited availability. To meet this demand, cleansing, desalinating and distilating of waste water is necessary. In this project, the principle of vacuum dehydration shall be adopted to vaporize the waste particles in lower temperatures and pressure to separate it from other impurities and later condenses the water vapour in a separate chamber to obtain pure water. This process is currently being adapted in industries to remove moisture from oils used in hydraulic system. Similar methods shall be adapted in this project with minor modifications to the requirements.

ME020

Study the Mechanical Property of Aluminium Metal Matrix Composite with Boron Carbide Reinforcement Produce by Stir Casting Method

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Abstract

In this experimental study, Aluminium (Al) based boron carbide (B4C) particle reinforced hybrid composite materials were manufactured by stir casting. The microscopic and mechanical properties of these composite materials were investigated. Graphite is used as a die lubricant. It was found that with an increase in the B4C content, the hardness increased monotonically and ultimate tensile strength were decreased. This study revealed that the addition of a hard reinforcement (e.g., B4C) significantly improves the hardness of aluminium composites. These entire results designate that the aluminium composites can be considered as an excellent material where high strength and ultimate tensile strength components are of major importance, primarily in the aerospace and automotive engineering sectors**.**

ME021

Experimental Investigation on the Effect of Heat Input in $C0_2$ Laser welded Ti6Al4V plates

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Abstract

In this work an effort is made to investigate the effect of heat input in CO_2 laser welding of Ti-6Al-4V Plates. Ti-6Al-4V alloy finds wide range of applications in biomedical and aerospace industries owing to their properties such as very good corrosion resistance and high strength to weight ratio. Welding plays an important role in the fabrication of components made of Ti-6Al-4V. In this work, 3 mm thick Ti-6Al-4V plates were welded in butt joint position. Laser welding was done at different heat inputs by varying the laser power and keeping the welding speed at a constant value. The quality of the weld was analysed with respect to bead geometry, mechanical properties such as microhardness and Tensile strength. It was understood that, with increase in heat input, mechanical properties got decreased. The reasons for the variation of the properties are also discussed with the help of metallurgical analysis.

ME022

Robot optimization by reduction in number of joints using composite enhanced Compliant Mechanisms

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Abstract

We all know we are stepping into a world where most of the human work is now shifting towards automation where robots will either take over the work entirely or will assist in one way or other .We found that to get any robot to replicate human action a number of joints were required. These joins restrict the motion in one way or other or create other problems like backlash .Our idea is to design a robot which will have suspension system without joints and will get desired motion in well-defined path. Objective of this research project to get better climbing capabilities and increase the efficiency of other motion that a robot will make with composite enhanced compliant mechanisms to reduce backlash and other friction wear that occurs in jointed motion.

ME023

Multi Objective Optimization of Dissimilar aluminum alloy Friction stir welding Process Control variables

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Abstract

The progress of friction stir welding has offered an alternative approach for fabricating superior quality weld. In this paper deals with multi objective optimization of process control variables influencing weld features in customized friction stir butt welding of 6 mm thick dissimilar plates of AA7075 and AA6101 using Taguchi grey relational approach. The L9 orthogonal array has been employed to design the experiments and the joints have been fabricated in a laboratory stage friction stir welding machine by varying tool rotational speed, worktable translational speed, tool plunge force and tool pin shape. After welding, the weld strength and percentage elongations have been evaluated using universal testing machine. Based on the experimental results, empirical relations among the process control variables correspond to each output characteristic has been generated using simple regression method. Optimum levels of process control variables have been noted using grey relation rating.

ME024

The effects of cutting environment on surface roughness and tool life in milling of AISI 4340

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Abstract

In this work, AISI 4340 alloy was machined using PVD tungsten multilayer TiAlN/AlCrN coated carbide inserts under two different cutting environments: cryogenic cooling using liquid nitrogen (LN) and dry cutting condition. The experiments were performed at varying cutting parameters of cutting speed: 200–300 m/min, feed rate: 0.15–0.30 mm/tooth, axial depth of cut: 0.3–0.5 mm, and radial depth of cut: 0.2-0.5 mm. Nine variations in tool life and surface roughness were observed when machining under different machining parameters of AISI 4340 at 32 HRC. The analysis includes the tool life and surface roughness as well as its relationship. Cryogenic LN showed significant improvement towards increasing the tool life to a maximum of 41.7% relative to dry cutting. The experiment showed that the cryogenic application was able to reduce the surface roughness by up to 43.9 % when compared to dry machining. Thus application of cryogenic cooling reduces tool wear, reduces cutting temperature and produces good surface quality which is believed to be the main factor causing an improvement compared to dry cutting.

ME025

The Role of Laser in Manufacturing of Shape Memory Alloy (SMA)

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Abstract

Shape Memory Alloys are widely used smart materials in recent times for various applications from aerospace to biomedical field. Shape Memory Alloy (SMA) is made of mixture of different metal powders (Ni-Ti with 50 – 50 Wt% (approximate) can give Nitinol) and/ or by using filler metals. However, fusing the selected powder mixture and making as SMA is a challenging task. Researchers used various techniques for making SMA which can be classified into two major categories likely casting method and powder metallurgy method. Laser power to make SMA is widely used by most of the researchers. These processes are further classified by conventional and non-conventional methods. Under this method various classification like Direct Laser Melting, Selective Laser Melting, Laser Sintering and Laser Cladding are available. In this article, the above-mentioned production methods using laser as major source are studied carefully. The advantages and limitations are also discussed on justifying the suitability of processing SMA by lasers. Along with their limitations the influence of each parameter is focused. Finally, a conclusion is made based on this detailed study.

ME026

Strain Gradient and degradation in magnetic properties of CRGO Electrical Steel

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Abstract

Cold rolled grain oriented (CRGO) steel was subjected to deformation in tensile and compressive loading. The former involved elastic and plastic deformation, though deformation in compression was kept within elastic limit. In both the cases significant degradation in magnetic properties, permeability and watt loss were noted. Stain Hardening exponents were estimated from tensile stress stain curves did scale with such degradation. Degradation in magnetic properties also correlated with various aspects of microstructural developments: namely, in-grain misorientations, estimated change in dislocation substructure and inter-planer d-spacing. This study provides the insight about mechanical and microstructural development in CRGO steel during deformation.

ME027

Green sand mould production of Aluminum alloy bimetallic castings

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Abstract

A green sand moulding system was applied to produce aluminum alloy bimetallic castings. Al alloys 6101 and 242 were combined in the production of the bimetals. Mould firing temperature, pouring temperature and grain fineness number taken at three levels were the parameters used in the study. This was done to know the number of times the experiments would be run using L9 orthogonal array of Taguchi's approach to design of experiment. Nine experiments were conducted in all, taking into cognisance the role of design of gating system for each of the castings to avoid turbulence. UTS and hardness values were determined as core mechanical properties of the components. There was a down trend of the values as the values of the process parameters increased. However, there were exceptions to this pattern of behaviour perhaps some hot spots were in the castings that exhibited the kind of behavior

ME028

Investigation on AISI 430 Ferritic stainless steel weldment by TIG , MIG Welding and Continuous Drive Friction Welding

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Abstract

This work describes the study conducted on the macrostructure, microstructure and Tensile strength characteristic of AISI 430 Ferritic stainless steel joints by TIG Welding, MIG Welding and Friction Welding. A detailed analysis was conducted on mechanical property by ANOVA for each of the weldment. The output of the investigations exhibits that the weldment made by MIG has the high tensile strength (580 MPa) than the weldment made by FW (536 MPa) and TIG (492 MPa). The influence of process parameters on mechanical characteristics of weldment by MIG, TIG and FW were individually discussed. The fracture surface analyzed using SEM and found that FW weldment free from defects like carbide precipitation, stress corrosion cracking, sigma phase formation, high heat affected zone, joint distortion were usually occurs in stainless steel weldment by TIG and MIG. The microstructure of the weldment by MIG and TIG is found to be heterogeneous and the same is found by schaeffler diagram.

ME029

Experimental Investigation of milling operation during machining process of Monel alloy

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Abstract

End milling is one of most vital and common metal cutting operations used for machining parts because of its capability to remove materials at faster rate with reasonably good surface quality. Monel is a group of nickel alloys, primarily composed of nickel and copper, with small amounts of iron, manganese, carbon and silicon. Monel is used for marine engineering, chemical and hydrocarbon processing equipment, valves, pumps, shafts, fittings, fasteners, and heat exchangers. In this work, we measured power consumption, tool wear and tool life without compromising surface quality with different spindle speed during end milling processes of Monel alloy. The various tool wear such as flank wear, crater wear and web wear is found using Tools makers microscope. The tool life is analyzed by Taylor's equation with different spindle speed. Power consumption is analyzed during end milling process using cutting velocity and cutting forces. The result showed that Monel alloy has good machinability property and produce better surface finish during end milling process using CBN coated tool. Higher level of spindle speed produces higher tool life with large power consumption. Medium level spindle speed produce more wear rate and built up edges and abrasion wear in BN coated tool.

ME030

DeNOC based Dynamics of Hexagon Closed Planar Kinematic Chain Robotic System

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Abstract

Closed chain manipulators possess numerous advantages including faster and precise as compared to open loop manipulators. The cantilever structure of the open chain manipulators induces vibration at higher speeds affecting its performance. Closed chain planar manipulators can achieve higher structural stiffness, accelerations and performance. The paper proposes a hexagon based closed planar kinematic chain. The paper studies the dynamics associated with the proposed parallel kinematic chain based on Decoupled Natural Orthogonal Complement (DeNOC) approach. The DeNOC based forward and inverse equations help to simulate codes of the manipulator and its control easier. The dynamics of the proposed mechanism is further compared to the complex partial derivative based Euler Lagrange (EL) approach. The approach to DeNOC is much simpler and reduces the cost of computation as compared to EL method. The effectiveness and performance of the DeNOC approach will be presented in the paper for various trajectories. The proposed closed kinematic chain manipulator can be applied to monitor, pick and position any object.

ME031

Selective Breeding Model for Optimizing Multi Container Loading Problems with Practical Constraints

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Abstract

Multi container loading problem have been considered in this research for optimization of its packing pattern to yield maximum utilization of the container volume by satisfying the practical constraints such as boundary crossing constraint, weight constraint, stability constraint and placement constraint using selective breading algorithm. To be useful in real time packing, developed model also checks the feasibility of packing pattern and also uses best fit tuning algorithm for forbid possible empty spaces inside the container with the available bins and thereby avoid cargo displacements at the travel. The boundary crossing constraint conforms that the pallets are completely packed inside the containers without any overlap between themselves and with container boundary. Weight constraints are to check the total weights of the bins to be packed are within the threshold limit. Stability constraint is to satisfy the center of gravity of the cargo is in line with the container and also the load bearing capacity of the bins. Placement constraint is to build pallets by considering the ease in loading and unloading respectively. In order to validate the developed model, the computational study had performed with large number of instances from ORLIB and the obtained solutions were satisfactory in most cases.

ME032

Flow Analysis of Abrasive Micro-Blasting with Glycerol and Acrylamideas Carrier Medium Using Computational Fluid Dynamics

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Abstract

Continuous growth is observed in the field of Non-Traditional machining where the machining of newly developing materials is the need of the current segment. Nowadays Abrasive Fluid Jet Machining has used to machine a wide range of elastic and plastic materials including aerospace, automobile, ordinance and combat as well as day to day life applications which require high strength to weight ratios. In Abrasive fluid jet machining, the abrasives are mixed with a liquid to form a slurry. The cutting performance is degraded by the rapid wear of the nozzle by the flow of the Abrasive Fluid mixture through the nozzles that lead to the divergence of the Abrasive Fluid Jet. The Angle of impingement affects the machining responses such that total cutting time has its influence. The Wear characteristics of the Nozzle Material are critical for such machining. The Nozzle inlet pressure of the abrasive fluid jet has a magnanimous effect on the erosion characteristics inside the nozzle. An analysis was carried out with constant Nozzle Taper angle and with Glycerol & Acrylamide solution as a carrier medium. The aim of this work is to analyze the effect of inlet operating pressure on wall shear and exit kinetic energy with respect to glycerol and Acrylamide solution. The two-phase flow analysis was carried by using a computational fluid dynamics tool CFX. The availability of optimized process parameters of abrasive fluid jet machining is limited to water practically. The other Carrier Medium of Abrasive Fluid Jet Machining can be explored widely. In this case, computational fluid dynamics analysis might provide better results than the real-time experimental work.

ME033

Controlling an Humanoid Robot Using IOT

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Abstract

The internet of things makes peoples life easier, smarter and allows them to control over their surroundings. The project describes the design and understanding of the mobile application for the Android based system which is focused on manual control of humanoid robot using wireless technology. Node Mcu - ESP8266 is a Wi-Fi enabled chip, which is used for controlling the robot. Programming is done based on the requirement and uploaded to the Node MCU by using Arduino IDE. Google Firebase is used as a cloud provides that helps information to be synchronized between users and to store that information on to the cloud. MIT APP INVENTOR is used to develop an application for Android phones. Robot can be now controlled from any device which has this application specifically developed for this robot and the major advantage is we control this robot from any location through internet.

ME034

Integrating the Automated Car Manufacturing System Based on RFID and Analysis Using Modules

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Abstract

In this module the analysis of the automated car manufacturing system is done. RFID tag is used to read each section of automobile manufacturing. There is an IR sensor in each segment of work envelops to detect the job completion. The first segment is for engine front and rear suspension module of the car, the second one is to integrate the Chassis Marriage Module, the third for integrating the Trim line of a car, and the fourth for implementing the Final line and testing the Quality of the Car. Here the RFID tag reads and stores the information detected by IR sensor. The Arduino controller connected to the IR sensor sends the data wirelessly to the MATLAB software through ZigBee module. This makes the production work simpler and effective. Also the throughput can be checked and analysed. Thus the performance and efficiency of manufacturing process can be analysed. Also the failure performance at distinct levels can be calculated. This will certainly help in analysing the working condition of each work envelope at regular intervals.

ME035

Optimization of MIG Welding Parameters to Improve Joint Strength of SS304 Material

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Abstract

Welding is one of the most important methods of metal joining process which provides a permanent joint of the components. The objective of this work is to study the influence of various welding parameters on AISI 304 stainless steel in terms of tensile strength, impact strength and hardness of the welded joint. All the joints are done by Metal Inert Gas (MIG) welding process. Three controlling parameters namely welding speed, weld current and tool travel speed with three levels are varied based on the L9 orthogonal array. To model the welding process, a Taguchi based method has been employed for experimental tests. Next, analysis of variance (ANOVA) was employed to determine optimal values of input parameters to achieve maximum strength and hardness as the process output characteristics. Based on Taguchi design of experiments and analysis of variance (ANOVA) the optimum conditions were drawn for effective welding joint.

ME036

Experimental Investigation and Optimization of Manufacturing Processes on the Magnetic Properties in Electrical Steel 50C530 for Electric Motor Applications

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Abstract

The growing industrial demand for small size electric motors for robotics, space based systems and electric vehicles require adaptable manufacturing process. The performance of an electric motor mainly depends on the magnetic properties of the core material. Commonly used core materials include Electrical Steel. The manufacturing processes have significant influence on the magnetic properties of such material. It is processed by various techniques, which includes Electric Discharge Machining (EDM), Laser Cutting. This paper investigates the optimization of manufacturing process parameters of such material. This is done by varying the input voltage, duty cycle and wire feed rate, in EDM; power, cutting speed, and laser thickness for laser machining. The core material in electric motors needs to have a minimum hysteresis loss, high saturation value, and low iron losses. By evaluating these changes as the responses the optimization is carried out for a given profile using Response Surface Methodology (RSM). The results of this investigation are analysed for the least effect on the magnetic property of the material.

ME037

Friction welding of dissimilar aluminium 6061and SS 430F steel and its characterizations

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Abstract

Friction welding is a process to weld similar and dissimilar metals and it finds widespread applications in mass production method for joining the parts in various industries. In the present work, the joining of two dissimilar materials such as Aluminium 6061 and SS 430F steel using friction welding was investigated. Aluminium 6061 and SS 430F steel bars were cut into pieces having the dimension of 75 mm x 20 mm as length and diameter. Process variables such as upset force, friction force and burn off length were considered for this friction welding process. The welded region was analysed to investigate the mechanical testing like hardness test, impact test, bend test and pull load test. The XRD studies indicated the presence of Al, Fe and intermetallic phases in the welded region. The hardness studies were conducted at different zones of the samples indicating highest hardness at the weld interface. Toughness and bending strength increased and pulling strength decreased with an increase in friction force and burn off length for low upset force as well as high upset force. The SEM image of fracture surface of pull load test specimen showed the ductile failure of friction welded joint. This solid-state structure of dissimilar materials can be used in the structural applications of aircraft, marine and automobile engineering with an aim to meet weight reduction.

ME039

CAD/CAM/CNC in Manufacturing

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Abstract

CAD/CAM/CNC denotes the Computer assisted design and manufacturing of products with the integration of the computer with the CNC Machine tools resulting in high productivity and profits to the company and enables international standards of manufacturing in a multinational corporate company. Manufacturing of Car components, Aircraft components, Railway spares by mass production requires the application of CAD/CAM/CIM and CNC Machine tools for accurate manufacturing at a faster speed. Efficient utilization of Men, Materials and Machines in the workshop floor requires Careful planning, Scheduling, Materials Management and interconnecting various departments in a factory. Integrating the workshop department with the design department, Production, Purchase, Materials planning and testing department needs the high speed wireless LAN network of IBM Personal Computers with Software like oracle manufacturing, SAP, ERP and oracle financials software Productivity tools. Design and development of the products by CAD design using IBM Mainframe computers with AutoCAD 2010, ANSYS, CATIA design software enables repeatability and accuracy of manufacturing conforming to ISO standards conforming to the International standards of Manufacturing. Integrating the Cad design computers with the CNC Machine tools in the workshop enables fast Production at a high quality conforming to the client's International standards. Fanuc controllers, Siemens PLC controllers and General Electric Mark V Control systems enables linking of the PLC Controlled Machine tools, MCC to the DCS Computer server located in the control room of the Workshop. This enables monitoring and efficient control of the production process increasing the Productivity and Profits in Manufacturing.

ME040

Fundamental Investigation on Wiper Coated Ceramic Tool during Dry Cutting of AISI 01 Tool Steel

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Abstract

Recent developments in machinability study have gained wide popularity because of various advancement in computerized control systems and related improvements in the cutting materials with developments in protective coatings and specialized geometrical shapes. These developments in cites investigations in machining processes like cryogenic machining, heat assisted machining and other non-conventional machining processes. Even so, the degree of use of the conventional dry machining process has remained significantly relevant. Few investigations on AISI O1, oil hardened tool steel have been reported, so far. This study was conducted to test the machining responses of wiper coated ceramic tool during conventional dry cutting of AISI O1 hardened tool steel, at different cutting speed of 100, 155 and 210 m/min and feed rate of 0.05, 0.125 and 0.20mm/rev. The study maintained a constant depth of cut of 0.2mm throughout the machining settings. Machining was conducted using dry turning on 200E-axis CNC lathe. Tool life and tool wear mode were studied. Mathematical models were developed to predict machining responses in terms of tool life using response surface methodology (RSM). Analysis that were carried out revealed that model for tool life can be used to predict the machining response within the limits of cutting speed and feed rate that have been investigated. The study observed to due large nose radius of wiper geometry shaped ceramic tool, wear was dominant on the minor cutting edge on the rake face. Additionally, the study revealed that better performance of wiper shaped geometry ceramic tool could be obtained at lower cutting speed and feed rate.

ME041

Fine Grain Formation during Phase Transformation of a Thermo-Mechanically Treated Al8090 Alloy

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Abstract

The objective of the present work is to study the formation of fine grains during phase transformation of a thermo mechanically treated Al8090 alloy. During friction stir welding (FSW) the alloy is subjected to thermo-mechanical treatment. Friction stir welding (FSW) was carried out by varying the parameters, tool rotational speed as 800, 1000 and 1200 rpm, welding speed 2.5 mm/s and 3 mm/s and axial force 2000 and 5000 N. The maximum tensile strength of the joints and the Vickers hardness values were 467 MPa and 119.4 VHN, respectively. Grain boundary and dispersion strengthening effect was noted in the thermo-mechanically treated zone with the rise in hardness values and strength. FSW of Al8090 alloy plates produced fine grains of 1-2 μm at the joint region because of the thermo-mechanical treatment. The solid solutions formed between Aluminium-Lithium and Aluminium-Copper were broken and the intermetallic compounds formed between Al and alloying elements such as Mn, Fe and Mg were refined during thermo-mechanical treatment. The EDAX confirmed the presence of Al, Cu, Fe, Mn and Zn. The XRD report revealed the presence of compounds $FeAl_2$, $Mn_3Si_2Al_{12}$, AlLi, AlCuLi and β-phase at the weld region.

ME042

Formulation of Galerkin's-Integral Based Model for Predicting Abrasive Wear in Hot Forging Dies

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Abstract

This study we have investigated the abrasive wear distribution in a forging die under constant dimensional wear coefficient .The abrasive wear differential governing equation was used in the analysis. The finite element technique, using quadratic shape interpolation functions elements was employed to carry out the analysis over the cross-section of the die which involves discretizing the domain into finite element ,analyzing these finite element, assembling the results from the analysis of the analyzed finite element, imposing the boundary conditions and finally, getting the results that represent the entire domain. The results obtained were shown in a graph plot(wear depth against time, sliding velocity and force) for time the depth wear increased initially but as forging progresses the wear becomes uniform .It was shown that the relationship between depth of wear and sliding velocity was linear. The result obtained for the plot of wear depth against force shown that wear increases with force and produce a parabolic profile. When the result compared with results of exact results, there was strong positive correlation between results which is an indication that this analysis is of higher accuracy and efficiency. It can be concluded that the model can be used to predict abrasive were in hot forging dies.

ME043

Synthesis and Characterization of Cu Filled Multi Walled Carbon Nanotubes by Arc Discharge Technique

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Abstract

Carbon nanotubes (CNTs) are the rolled sheets of graphene atoms in cylindrical shape. The size of the CNTs varies with few nanometers to sub-micrometer ranges in diameter. Depending on the shape, CNTs have wide range of applications in Science, Engineering and Environment. In the present, a simplified and cost effective technique is adopted to synthesis Cu filled carbon nanotubes. The equipment used for the process is a commercial arc welding machine. A graphite rod and plate is used to create an arc using the power source of welding machine. The soot produced is cleaned by physical and chemical methods to produce high pure carbon nanotubes. The synthesized carbon nanotubes are characterized by XRD, TEM and Raman Spectrometer.

ME044

Computational Analysis on Two Stage Super Plastic Forming of Aluminium coated Magnesium Alloys

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Abstract

Severe plastic deformation (SPD) is a generic term describing a group of metalworking technique. Processes of Severe Plastic Deformation (SPD) are defined as metal forming processes in which a very large plastic strain is imposed on a bulk process in order to make an ultra-fine-grained metal. The objective of the SPD processes for creating ultra-fine-grained metal is to produce lightweight parts by using high strength metal for the safety and reliability of micro-parts and for environmental harmony. Super plasticity is a phenomenon indicating exceptional ductility that certain metals and alloys exhibit, when deformed under specific conditions. Recent advancements in finite element tools have helped in the analysis of complex superplastic forming operations and have made the analysis easier and output closer to the real-world results. These tools can be used to develop optimized superplastic forming techniques by controlling the required parameters, in order to make the forming more productive and economical. Computational analysis is conducted on complex contours with different D/H ratios with on AZ31B alloys coated with Aluminium by Superplastic forming in MSC MARC MENTAT. Observation is made to evaluate the effect of process pressure on the thinning of the sheet metal during first and second stage forming. The variation in sheet thickness is observed to be minimal throughout the component. Better results are achieved with two stage forming as compared to single stage forming.

ME045

Error Analysis & Point Data Processing of Reconstructed Surface by Reverse Engineering

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Abstract

Reverse engineering is the processes of extracting design information (data points) from a product in an attempt to duplicate it. But when generating a surface using the acquired data points, there are a lot of surface inaccuracies compared to the original CAD model. The goal of this work is to reveal the errors between the shapes through a comparative study of the original CAD models and the generated surface models. To accomplish this task a mouse structure and an aerofoil are modelled in CAD Software and their NC codes are generated using master CAM. The models are then machined with these codes in CNC milling machine. Using portable CMM, laser scanning is performed on the fabricated models to collect the data points. With these data points the surface models are generated in GEOMAGIC and compared with the input models structured using CAD software. On comparison, it has been found that the number of input data points of point cloud data significantly affects the surface accuracy of the reverse engineered model especially at the edges of the model. Experimental results on error analysis are reported which validates the above work.

ME046

Performance Analysis of Wire EDM Process on Aerospace Materials

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Abstract

Wire cut EDM is a non-traditional machining process which is used to cut hard materials. Wire electrode is one of the key factors in determining the performance of wire EDM which develop high performance wire electrode is an effective method for meeting the ever increasing requirement of modern manufacturing. In this work, hard materials like Inconel and Titanium alloys are to be cut with combination of different parameters using a Brass electrode and their surface quality, MRR will be analysed. The effect of process parameters such as pulse on time, pulse off time and wire tension are the input parameters on surface quality to be studied. The result was observed that there was a increase in MRR with increase in pulse on time and Input power. With the increase in pulse off time the MRR value decreases gradually. It was also found that surface roughness is decreased with increase in pulse off time. Great care should be taken in constructing both.

ME047

Squeeze Casting Process Optimization using Cohort Intelligence Algorithm and its Variants

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Abstract

In recent years, several nature inspired metaheuristics have been proposed and applied across various domains. The cohort intelligence (CI) algorithm is one such socio inspired optimization method proposed and applied recently. In this paper, CI along with its variations of CI has been applied for optimizing squeeze casting process. Squeeze casting is widely applied near net shape manufacturing process because of its capability to result in the highest mechanical properties attainable in cast product. The objective functions are referred from Rao (2019). Squeeze pressure, melting and preheating temperature, and compression holding time are considered as process parameters. The responses are Hardness and tensile strength of cast product which is to be maximized. The objective functions considered are multimodal, non-linear and non-separable complex problems. CI Solutions are compared with Taguchi method, teaching learning based optimization algorithm, Jaya algorithm and its variants. Application of CI and its variants has resulted in improved tensile strength and hardness. It shows the applicability of socio inspired metaheuristics for optimizing casting processes. In the near future, CI and its variants could be applied for solving constrained, multiobjective manufacturing problems.

ME048

Optimization of Process Parameters using Taguchi Technique for Drilling Aluminium Matrix Composites (LM6 / B_4C)

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Abstract

Due to their abrasive behaviour, metal matrix composites (MMCs) are difficult to machine. Due to the potential widespread usage of MMCs, it is necessary to develop a suitable technology for their efficient machining. The current study focuses on exploring the appropriate parameters of drilling aluminium matrix composites using the analysis of the signal to noise (S/N) ratio. The ultimate goal of the research is to study the impact of process variables such as reinforcement, drill type, speed and feed rate on the thrust force during AMC drilling. Aluminium Matrix Composites were manufactured with 413 aluminium alloy as matrix and B_4C as reinforcement through the low cost stir casting process. Experiments were performed with that of the cutting tool dynamometer on a CNC Vertical Machining Center to calculate thrust force. The Taguchi experimental design approach is a widely accepted strategy used to produce high-quality low-cost components, so that the experiments use an orthogonal array of L_{27}. The response table, response graph and analysis of variance (ANOVA) are employed to determine the optimal condition and effect of the parameters of machining on the thrust force. Experimental results demonstrated that this strategy enhances the performance characteristics expected in the drilling phase.

ME049

Drilling Parametric Optimization of Aluminium Matrix Composites ($LM5 / ZrO_2$) by Taguchi Method

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Abstract

Metal matrix composites (MMCs) are difficult to machine due to their abrasive nature. Because of the potential widespread usage of MMCs, it is necessary to develop a suitable technology for their efficient machining. In the present study an attempt is made to find out the best machining parameters in the drilling of Aluminium matrix composites ($LM5/ZrO_2$) using Taguchi Technique. A novel composite made of LM5 aluminium alloy reinforced with Zirconia is fabricated by stir casting process. In the fabricated composite material the influence of input parameters like speed, feed, percentage of reinforcement and drill bit material on the response thrust force is determined by performing drilling operation in CNC Vertical milling machine. The analysis is done by L_{27} Orthogonal array. The response graphs (main effects plot) are used to analyse the response characteristics of the parametric results. S / N Data Variance Analysis (ANOVA) are performed to classify the relevant variables and measure their effect on response characteristics. Process variables are the most suitable values (optimal settings) in terms of the mean response characteristics.

ME050

A study on the combined effect of aging and severe plastic deformation on the mechanical properties of AA6061 alloy

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Abstract

Severe plastic deformation (SPD) process is used to attain ultra-fine grains in the material. Twist channel angular pressing (TCAP) is an effective SPD technique that is used to achieve more grain refinement in less number of passes. This work explores the combined effect of aging and TCAP on the mechanical properties of aluminium-6061 alloy. Finite element analysis (FEA) was performed by DEFORM 3D to predicted the load for two coefficient of friction (μ=0.2&0.5). Based on the strain to load ratio, μ=0.2 was used to perform the experiments. The samples were aged at 350ºC for 9 hours and extruded by twist channel angular pressing process. The hardness and tensile strength of the aged and un-aged samples before and after twist channel angular pressing was measured. Hardness was measured by Macro-Vickers tester and ASTM A370 standard was used for the tensile test. Compared to the un-aged sample the tensile strength and hardness is increased by 11% and 8% respectively for the aged specimen after the twist channel angular pressing process. SEM image reveal un-aged sample has homogeneous grain refinement than the aged sample.

ME051

Investigation and Statistical Analysis of Electrospinning of PVDF Fibres

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Abstract

The aim of Science and Technology has always been to design devices which are portable, have an increased efficiency, consume less energy, and possess improved efficiency. Fabrication of nano-fibers of different polymer solution and their increasing use in wide range of applications is directing towards this. Out of different manufacturing techniques of nano-fibers, Electro-spinning is the simpler, more productive and low cost method. In this study, the nano-fibers of Polyvinylidene Fluoride (PVDF) in solvent Dimethyl formamide (DMF) are spun with the help of Electro-spinning technique. The diameter of the Electro-spun fiber is studied and plotted according to different combination of input parameters such as voltage, flow rate and distance between collector and syringe tip. Taguchi method of design of experiments (L9) is used for combination of these input parameters. Further, the diameter and morphology of collected nano-fibers are studied with the help of SEM images. The objective is to understand the extent of influence that these parameters have on the nano-fibers diameter through statistical analysis. Also, by using the regression formula, the parameters that affect the fiber diameter are formulated and the extent to which each parameter affects the diameter is also identified and quantified.

ME052

Effect of Sn addition in the Foaming Behaviour of Powder Metallurgical Al4Mg6Si4Cu Precursor

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Abstract

Powder route foaming suffers a major drawback i.e. the mismatch between the decomposition temperature of the gas releasing from the foaming agent and the pure aluminium (Al) or its alloy, leading to crack like pore formation and metal drainage resulting in collapse of foam. This problem can be overcome by either to preheat the foaming agent for different temperatures or by mixing the elemental powder (Cu, Mg or Zn) for shifting the decomposition temperature of the blowing agent, Titanium Hydride (TiH_2). In this paper, first the foamable precursors of composition Al4Mg6Si4Cu + x. %Sn (0,1,3) + 1.0wt.%TiH_2were prepared by uni-axial cold compaction using 100 tonne hydraulic press. These precursors were foamed in electric resistive furnace at 700-720 ^oC for 20 minutes. The dispersion of elemental powders, micro-structure, porosity, and the presence of elements were characterized by scanning electron microscopy (SEM), optical microscopy (OM) and X-ray Diffraction (XRD) tests. It was found that Tin had a significant effect on the porosity and expansion of the foams. Moreover, precursor with 3% Sn showed more number of pores with reduced pore size than 1% which showed large sized and irregular shaped pores. It was concluded that addition of tin increases the cell wall thickness, stability and expansion during foaming.

ME053

Investigation of Microstructure and Mechanical Properties of Welded Super Duplex Stainless Steel UNS 32750 by Friction Welding

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Abstract

Super duplex stainless steel of grade UNS 32750 is a material with high corrosive resistance and strength finds its application in chemical industry, oil industry and water boiling plants. Friction stir welding was carried out in the super duplex stainless in order to achieve the low heat affected zone and uniform properties. Welding was carried out with different input parameters that were found using L9 orthogonal array with input variables such as friction load (kg), friction time (s), forge load (kg) and forge time (s). The experiment was conducted for three levels keeping speed cooling and soft load as constant. welded samples are tested for tensile test, Rockwell hardness for mechanical property and microstructural analysis for metallurgical properties. The input parameters of specimen 9 were found to be the most suitable set of input parameters as it showed the highest tensile strength and smaller grain size.

ME054

Investigation on the Effect of Rotating Electrode in Spin Arc Welding Process for Cladding of Din8555 on En19 Steel

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Abstract

Cladding on EN19 steel with DIN8555 electrodes is done commercially using arc welding methods. The arc may be rotated to obtain a flat and broad weld bead by the centrifugal force of the rotating arc during Gas Metal Arc Welding (GMAW). In the present work, traditional gas metal arc welding process is modified in which the electrode wire is continuously fed and made to rotate to change the fluid flow in the molten pool by the rotary motion of electrode during welding. The main objective of the work is to achieve a hardness of about 48 HRC with 11.5-13.5% Cr, 2-4% Ni, 0.8-1.4% Mo and 0.12% C on the cladded surface while using DIN8555 electrodes. This can be achieved only when the numbers of passes are increased so that the dilution effect in GMAW process is reduced. However, in rotating electrode or spin arc welding, the % dilution is reduced due to spin effect on the molten pool so that the required composition and hardness can be achieved in minimum number of passes during cladding. Spin Arc Welding (SPAW) was done by maintaining 25 mm circumference, clockwise direction and 1200 rpm rotation of the electrode at a travel speed of 200 mm/min. current, stick-out distance, wire speed and oscillation speed are varied to optimize the process parameters to get the required properties. Two passes are done to achieve 10 mm thickness of the cladded layer. Visual inspection showed the cladded surface having a bead width of 22 mm with consistent penetration profile without any defects like porosity and slag inclusions. Then the cladded surface was machined using universal milling machine for further characterization to ensure the composition and hardness. From the macrostructure analysis, it was observed that there is no lack of fusion and porosity throughout the cladded layers. Positive Metal Indicator (PMI) was used to determine the composition variation from the surface to the depths of about 3 mm, 6 mm, and 8 mm. From the chemical composition analysis, it was confirmed that the required composition was achieved 8 mm depth from the surface. The hardness survey from the base material surface to the cladded surface ranged from 34 to 49HRc. It was found that the increased bead width, reduced number of passes, low dilution of alloying elements from the electrode, less time consumption and reduced energy are the advantages of this new process. Hence, this process is more cost-effective.

ME055

Effect of MQL, wet and dry lubrication on functional behaviour of end milled nimonic-263

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Abstract

The demand for lower costs with eco-friendly characteristics has stimulated the use of alternate machining practices. The intrinsic properties of Ni-based aerospace alloy make it an uphill task to perform machining on it. The ease of machining of these alloys can be achieved by optimizing the cutting conditions with use of efficient and effective cooling mechanism. The methodology aims to predetermine the MQL performance on surface characteristics over dry and wet conditions and to determine the optimum machining parameters which provides substantial influence on functional attributes such as load bearing ability, wear resistance, etc. The feed rate (2, 20 and 50 mm/min), flow rate (5, 8 and 11 ml/min for MQL) and spindle speed (1000, 2500, 4000 rpm) were used as machining parameters (Independent variables) to govern the alterations in surface profile characteristics such as surface roughness, surface topography and surface morphology of the end milled Nimonic-263 alloy. Furthermore, the ANOVA statistical analysis shows the strong influence of the machining environment over the surface profile parameters. Additionally, the chip morphology (dry machining) was analyzed to examine the effect of variation in machining conditions over the shearing mechanism and its impact on generation of surface profiles. Finally, it has been found that the MQL with intermediate cutting conditions can be an alternative which offers better functional characteristics.

ME056

Optimization of Cutting Parameters Based on Surface Roughness and Cutting Force during End Milling of Nimonic C-263 Alloy

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Abstract

The surface integrity of machined surfaces greatly influences the functional properties of the components such as fatigue life, etc. Nickel-based superalloy such as Nimonic C-263 is termed as difficult to machine material due to its unique properties as well as high strength at elevated temperatures. This study intends to optimize the cutting parameters (cutting speed, feed, and depth of cut) during the end milling of Nimonic C-263 and the machining has been carried out using solid tungsten carbide tool coated with TiAlN and Vertical Machining Center. Experimentation is carried out using Taguchi L_9 orthogonal array technique and based on signal to noise ratio data, optimum machining parameters were achieved for preferred observable characteristics such as cutting force and surface roughness. Additionally, Multi-purpose optimization (Grey analysis) of the observable characteristics was conducted to predict the optimum machining parameters combination which offers better producible surface finish and lowest cutting force requirement. Further, the analysis of variance (ANOVA) reveals that the feed rate is the farthest influencing factor followed by the depth of cut, cutting speed, and the variations in cutting force and surface roughness are confirmed through chip morphology using Scanning electron microscopy.

ME057

2D Finite Element Analysis of INCONEL 718 under Turning Processes

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Abstract

Nickel-based alloys like INCONEL 718 are extensively used in manufacturing aero-engine components due to their excellent mechanical and chemical properties at high elevated operating temperatures. The machining of these alloys often poses a challenge due to its rapid changes in machining parameters such as microstructure of the material, hardness and surface behavior due to high plastic deformation during machining. Also, thermal properties such as low thermal conductivity contribute to high temperatures in the cutting zone. This paper aims to create a numerical model to examine the cutting forces induced by orthogonal machining. The FE method was used to simulate and analyze the cutting tool temperature and cutting forces. In this work, the Finite element model has been developed using ABAQUS to model 2D- orthogonal cutting of the INCONEL 718 using the WC tool coated with TiN. The cutting forces and tool temperatures were predicted using Johnson-Cook formulation under different conditions like dry and cryogenic conditions. For the cryogenic model, all types of heat transfer coefficients were considered. A dynamic explicit time integration technique with arbitrary lagrangian eulerian (ALE) adaptive meshing technique was employed to simulate the model. The simulations are conducted at speeds 1000 mm/sec, 1250 mm/sec, 1500 mm/sec, it feeds 0.08 mm/rev, 0.1 mm/rev, 0.15 mm/rev, and depth of cut of 0.5 mm, 0.75 mm, 1 mm. For the given tool –work combination it is found that at speed 1250 mm/sec, feed rate 0.08 mm/rev, depth of cut 0.75 mm the cutting force results are good.

ME058

Sustainable Machining: A Review

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Abstract

The purpose of this paper is to review the relevant literature in machining using minimum quantity lubrication for sustainable manufacturing. Sustainability has become a very significant research topic because it influences many different manufacturing industries. The acceptance of sustainable manufacturing practices and technologies offers the industry a cost-effective route to develop economic, environmental, and social performance. As a major manufacturing process, the machining system plays a vital role in sustainable manufacturing on the factory floor. Therefore, technologies for monitoring, analyzing, estimating, and optimizing the sustainability impact of machining systems are critical for decision makers. This paper has also focused on various workpiece materials, tool material; various vegetable-based cutting fluids used for the experimentation and results observed. The results indicate that the MQL system reduces the friction, washing away the chips, cooling the workpiece, also improving the surface finish. The literature review shows that MQL system provides better performance than dry machining and wet machining.

ME059

Structural Design of Zoomorphic Robot

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Abstract

In recent years many Zoomorphic robots have come into usage and this robots have an animal like structure and one of the type is known as Social Robots. The social robots are been developed to help mankind to progress their day to day challenges and tasks more efficiently. Social robots have been a focal point of research for quite a while. This mechanical legs base give the robots have amazing maneuverability so, flexibility which decides the commands can be executed. Enlivened naturally, where these flexible components in muscles and ligaments largely add to the amazing headway abilities, the Zoomorphic robots is assembled precisely agreeable. For this Project we have designed and developed a Zoomorphic robot structure. Which is integrated with Android framework? A large portion of them have been produced for a dedicated scenario that is defined so as to demonstrate skills and features of the robot. The Inverse Kinematics Solutions is determined for the created structure utilizing Denavit Hartenberg show and utilizing those arrangements the developments reproduced utilizing a specially designed 3D programming. An Android application has created, to control the robot utilizing using Bluetooth module.

ME060

Automatic Traffic Signal Analyser and V2V Communicator Using Regression Convolution Neural Network (R-CNN)

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Abstract

Traffic Signal detection has become one of the most modern topics in intelligent traffic system because of its potential applications in driver assistance and automatic driving. This paper proposes a method that uses a Regression Convolution Neural Network (R-CNN) to detect traffic signal position (TSP) and traffic lights (TLs) inform of images captured by camera mounted in vehicles. In this study, a fast Traffic Signal detection and dynamic communication with the help of vehicle-to-vehicle (V2V) are proposed. They have a CNN architecture of traffic detection framework for real-time Traffic signal detection and v2v communicator system is developed. First, a cascade classifier, based on selected Haar-like features, is trained to detect traffic signal position (TSP) and then reposition itself to detect traffic lights (TLs) inside the region of interest in this case traffic signal position.

ME061

Design and Fabrication of Soft Gripper for Robot with Vision System

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Abstract

Robot with vision system has an ability to manipulate the desired object for pick and place Operation in correct location. The soft gripper with three finger design has been developed in the CAD software. It grabs fruit items. In vision system Apple and Orange fruits has been detected in their known position in robot work space and it placed in their appropriate bins respectively. Conveyor is used to feed the fruits. Robot used in the system is jointed arm configuration. The individual joint has been programmed to defined angle for picking and placing of the items.

ME062

Multiple Oriented Robots for Search and Rescue Operations

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Abstract

Search and rescue (SAR) operations in a tragedy affected area is challenging. The rescue robot helps in the exploration of unknown, confined and cluttered environments. Multiple robots are developed will to explore the disaster affected region and will be able to detect any people or living beings present there. The robots have living beings as their targets in tragedy affected area. The multiple robots deployed in the field, traverse through the tragedy affected area. A novel algorithm has been developed which helps in finding the target. The rescue robots are programmed to find the shortest and less obstacle path to reach the target. Due to the tragedy affected environment, the robots decides the moving direction based on the information gathered by sensors such that the optimal path between start and goal positions can be found. The path to target by the robots are shared among them and best path is chosen among them. The robots explore and searches the region avoiding the obstacles and whenever it comes into contact with a living being it shares the information among other robots. The CO2 level of the particular region is also checked to know whether the person is in breathing state. The algorithm will be developed in order to increase the pace of the search and to locate the living being. The SAR robots have application over tragedy affected areas like earthquake, avalanche, etc.

ME063

Design and Fabrication Of Vision Based Dual-Axis Solar Tracking System

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Abstract

This project paper is about the design and develop of dual-axis solar tracking which makes use of a vision system for tracking the sun. The solar energy is clean, abundant, eco-friendly and it is almost like renewable energy. In order to obtain maximum efficiency, the solar plate in the tracker should be exactly perpendicular to the solar rays so dual-axis solar tracker is implemented with its code and the tracking is based on the parameters which are considered like AZIMUTH and ELEVATION angles of the sun. These angles give the locus of the sun which is converted to the grid to find the position data for the tracker to tilt the solar panel so that it always receives solar irradiation perpendicularly.

ME064

Zero Defect Assurance of Three-Wheeler Product Using IoT Systems

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Abstract

By considering quality improvement in three-wheeler vehicle, IOT based Zero Defect Assurance framework is created which can keep up basic discharge related processes and product parameters and parts alongside the vehicles. This includes various forms like IOT products and procedure parameters catching and child part capturing against the vehicle number and quality creation. The system will be created utilizing different IOT gadgets, sensors, PLC's, programming's and databases. This application will be conveyed in Engine Assembly, Vehicle Assembly and Sub Assembly lines. These frameworks will be utilized for maintaining a strategic distance from abandons going to the next stage and additionally to recover the information for dissecting field grumblings and emanation related grievances. It is likewise used to enhance the procedure and product characteristics in the system. The hard-wares utilized in this work are useful to peruse the information from the parts and to show the on-time capacity of the parts and guide against the Unique Vehicle Number (UVN).

ME065

Comparitive Study of Tungsten Inert Gas and Friction Stir Welding of Aluminium Alloy AA5083 (Armor Grade) Aluminium Alloy Joints

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Abstract

Aluminium-magnesium alloy AA5083 is used widely as a structural material in aerospace, automobile, and marine industries. This Work finds the comparison of AA5083 (armor grade) – 6mm thickness plate weldments mechanical and microstructure properties on Tungsten Inert Gas (TIG) and Friction Stir Welding (FSW) processes. Welding is performed with different input parameters for similar metal, Welding input parameters play a significant role in determining the weld quality. The input parameters are found by analysing of research papers and the parameters are used for welding and the tool used for welding is H13 Tool Steel as the tool has less deformation due to high chromium content. Generally, the welding processes are aimed at achieving a welding joint with superior mechanical properties with minimum deformation. Scanning electron microscope (SEM) is used to analysis the micro structural characteristics at weld zone of the welded material and tensile strength of the weldments is found by testing in Ultimate Tensile Strength (UTM) machine. The hardness test is performed by Vickers Hardness tester to characterize the weldments. From the above results, the comparison is made and an efficient way to join Aluminium Alloy AA5083 (Armor Grade) is found by the welding joints of the TIG and FSW welding process. Micro Vickers hardness test performed though the thickness of FSW & TIG Welded Joint permit to finalize the general fester of mechanical properties in HAZ, TMAZ and Flow Arm Zone. In both weldments and HAZ Phase transformation induced along the beading. In FSW joint allow to point out the great differences among four different main zones: nugget zone (including flow arm), TMAZ, HAZ and unaffected zone (i.e. parent alloy).The first two zones are characterized by a general drop of mechanical properties, even though the nugget and flow arm zone show a slight recovery due to very fine grain structure, while the third one show a very faintly increased grain size.

ME066

Automated quality monitoring system for heat treated materials

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Abstract

This paper deals with an Automatic Quality monitoring system for heat treated materials. This proposed system will help the industries to bring out zero defects during heat treatment process which plays a vital role in the strength and hardness of the product that is manufactured. With the help of an IR Sensor, the developed system responds using PLC control system, wherein using logic gates decision making has been done. This decision is based on the extracted surface temperature of the specimen which is used to identify the heat energy achieved during any heat treatment process like annealing, quenching, etc. We also need to analyse the results by comparing same product with different heating conditions. This can be facilitated with the help from industries from where random and specific data can be obtained and evaluated. Also specific lab reports can be generated by obtaining specimen from industries, this obtaining maximum test values like hardness and strength. Hence using these reports we can prove this system’s reliability and apply the same in industries

ME067

Experimental Study and Optimization of Residual Stresses in Machining of Ti6Al4V Using Titanium and Multi-layered Inserts

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Abstract

Residual stresses are those types of stresses that are preserved in the material even after the applied force has been removed. These stresses have a direct influence on the properties of the metal alloy and the surface integrity of the same which plays a very pivot role in industrial applications especially aerospace. In this paper, the effect of the residual stress has been given importance alongside with the study of surface roughness, tool wear, machining force, heat generated and chip morphology. Super alloy commonly used aeronautical material Titanium (Ti6Al4V) work piece have been taken and machined using CNC turning lathe with the help of titanium insert and multilayer insert. The residual stress is obtained through the use of XRD technique. On the other hand material removal rate, surface roughness and chip thickness have been determined using defined machines and compared with respect to various machining constraints like machining speed, depth of cut and feed rate. The tool wear and built up edge morphology using scanning electron microscope (SEM) images were interpreted and analysed. The machining parameters has been designated through the use of Taguchi Technique where L9 array have used to determine the operational parameters. Grey relational analysis have also been performed to optimize the machining parameters and to obtain the optimum result. ANNOVA analysis is also used in this paper to acknowledge the best optimum result.

ME068

Optimization of FSW Parameters to Improve the Mechanical and Metallurgical Properties of Aluminium Alloy AA 5083 Joints

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Abstract

Friction Stir Welding (FSW) is carried out on armour grade AA5083 aluminium alloy having the dimension of 100X75X6.35 mm. The FSW process and tool parameters play a major role in deciding the joint strength. Many processing conditions and material properties affect the microstructure evolution and mechanical behaviour of the produced joints. The main parameters involved in the welding process studied in this work. Various parameters such as welding speed, tilt angle, spindle speed and various tool profile are used. Analysing the mechanical behaviours of joints welded like tensile strength and hardness were investigated. The tool rotation and welding direction on side are similar is called Advancing side (AS) and opposite on the other known as retreating side (RS). The input process parameters which influence the strength of the joints. Main consideration is to select the best parameter to produce the defect free joints. Experiment is designed to determine the major factors affecting the hardness and tensile strength of the joints. Effect of rotational speed, welding speed and tilt angle on tensile strength and hardness are studied. The contribution of each factor is determined from ANOVA analysis "Tensile strength and hardness increased with increasing the rotational speed 1000 rpm to 1400 rpm, traverse speed from 30 mm/min to 40mm/min". This investigation mainly deals with Taguchi and ANOVA were performed to revise the effective characteristics of welding inputs.

ME069

Prediction of Optimum Welding parameters for Friction stir welding of Aluminium Alloy AA5083 Using Response Surface Method

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Abstract

Friction Stir Welding (FSW) is carried out on armour grade aluminium alloy AA 5083 with dimensions of 100X50X6.35 mm. The process parameters like tool profile play a significant role to enhance the welding. Many processing conditions influence the microstructure progression and mechanical behaviour of the produced joints. The main parameter involved in the welding process is discussed under this work. Various parameters such as welding speed, tilt angle, spindle speed and various tool profile are used. Analysing the mechanical behaviours of joints welded like tensile strength and hardness is investigated. In this work tool profiles are designed according to the specific dimensions and the tool material chosen is H13. The tool profiles which are chosen are Cylindrical, Tapered and Hexagonal. So, for this profile, the welds are made accordingly. The Study involves the process which is going to take place are Tensile strength, Impact strength, Hardness, and Microstructure. After the finished AA5083 welded aluminium alloy, it is cut in using the EDM machine according to the ASTM standard. Experiment is designed to determine the major factors affecting the hardness and tensile strength of the joints. Effect of Tool rotation speed, Traverse speed and tilt angle on tensile strength and hardness are studied. The contribution of each factor is determined from RSM; Design of Experiment (DOE) is applied to determine the most important factors which influence the hardness, ultimate tensile strength of AA5083 joints produced by friction stir welding. Effect of three factors which include tool rotational speed, welding speed and tilt angle on UTS and hardness are investigated. The optimum process is determined by RSM. The percentage contribution of each factor on tensile and hardness was determined by ANOVA analysis. "Tensile strength and hardness increased with increasing the rotational speed 1000 rpm to 1200 rpm, traverse speed from 30 mm/min to 40mm/min.

ME070

Design optimization and development of an Automated Storage and Retrieval System

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Abstract

This project discuss about the planning and building up an framework for the automated material handling system by diminishing the lead time in the transportation or development of the item and furthermore concentrating the development of the Automated Storage and Retrieval System in the businesses for expanding generation rate and furthermore to improve the material handling warehouse. The objective of the study is to structure and manufacture an Automated Storage and Retrieval system for a mechanical stockroom and upgrading, reworking it dependent on the parameters like deals point, item prerequisite pitch or physical parameters like tallness, width, weight and so forth by utilizing a streamlining procedures.

ME071

Experimental Study and Finite Element Analysis of the Impact of Tool Edge Geometry in Orthogonal Machining of Super Alloy Inconel 718

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Abstract

There is a huge hunger for super alloys of extraordinary hardness and resistance for aerospace and aeronautical applications. However, the machining of super alloys like Inconel 718 are very tough because of various factors like the formation of built up edges, increased machining forces, increased machining temperature, high tool wear, etc. These reasons may lead to poor surface finish, reduced tool life and improper chip formation. The edge dimensions of tool inserts play a vital in the orthogonal machining of aerospace super alloys which are hard to machine alloys. This tool insert geometry also directly have an influence in chip formation mechanism which in turn controls the chip thickness. In this paper, orthogonal machining test on Inconel 718 have been conducted to examine the impact of the edge geometry in machining outputs like surface roughness, machining forces, temperature and tool wear. The effect of process parameters are also studied on the above mentioned outputs. Cutting edges are modified using Wire EDM technique. Silicon Nitride and Cubic Born Nitride tool inserts were used for orthogonal machining. This paper is mainly focused to compare the machining outputs before and after modification of tool insert geometry. The tool cracks and built up edge formation by means of microscopic images were inferred and examined. The parameters which are to be varied in the experiment are defined by L9 orthogonal array. The machining process was also simulated in Advant EDGE Workbench to study corresponding stress and strain distribution.

ME072

Characteristic Study of Friction Stir Welding of Aluminium Alloy AA7075 Using H13 Surface Hardened Tool Steel with Variable Tool Pin Design

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Abstract

Friction Stir Welding (FSW) is a solid-state process where a non- consumable tool rotates between two metals or alloy. In Friction Stir Welding process heat is generated by friction between the tool and the workpiece below the melting point of the material. When compared to conventional welding this Friction Stir Welding process can be used for welding alloys such as aluminium, copper, etc. In this process, we can even weld two different types of alloy together which is not possible in conventional welding. High strength aluminum alloy AA7075 (Al–Zn–Mg–Cu) is precipitate hardenable alloy widely used in the aerospace, defence, marine and automobile industries. Use of the heat treatable aluminum alloys in all these sectors is ever-increasing owing to their excellent strength-to-weight ratio and reasonably good corrosion resistance. The friction stir-welding (FSW) process and tool parameters play a key role in determining the joint's characteristics. Here, aluminium alloy of series AA7075 of thickness 6mm is welded by Friction Stir Welding Process. This alloy contains zinc with a minimum amount of 5.8%. This zinc acts as a sacrificial-anode in sub-marines application, where this zinc forms like an outer covering layer on the surface of the submarine. So, this zinc gets corroded first keeping the sub-marine safe for a long period. After the Friction Stir Welding Process is completed, different tests are performed in the welded portion of the alloy. The test starts with the Ultimate Tensile Test followed by the Impact hardness test and the microstructure of the welded portion is studied. The welding parameter such as rotational speed, transverse speed is optimized in this process by using the Taguchi analysis Taguchi method greatly improves the design and engineering productivity. This method is very effective on regard of its simple experimental design and systematic approach to produce better quality at lower costs. The optimum results can be obtained by providing the input functions and can easily produce better results. By this effect of input variables the results can be formed by S/N ratio and response means. The Larger is better criteria is employed to our problems.

ME073

Enhancement of Ductility and Strength in 410 Stainless Steel through Cyclic Heat Treatment

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Abstract

The 410 stainless steel alloy is used to manufacture small components like nuts and bolts and also larger components like gas turbines. In this paper, we aim to improve the strength and ductility of the 410 stainless steel alloy by cyclic heat treatment process. In this experiment, the process of annealing, normalizing and quenching followed by tempering were performed on the steel specimens. On heating the specimens to 900^{0}C, and cooling it from slower to a faster rate, we were able to observe and compare the changes in the microstructure, hardness, tensile strength, wear rate and the impact strength of the specimens before and after the heat treatment.

ME074

Prediction of Tool Life and Surface Roughness in Machining of En8 Steel Using Artificial Intelligence

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Abstract

This project involves in taking experimental readings by taking three input process variables Cutting speed , feed, depth of cut and calculating two output process variables such as tool life depth of cut in a CNC turning centre while machining EN 8 steel rod using Tic coated carbide tool. By using Artificial Intelligence the results obtained through experimental studies were used to develop an ANN training kid so that we can predict the tool life and surface roughness within the selected range of process variables without conducting experiments. Neural networks are models of biological neural structures. The starting point for most neural networks is a model neuron, as in Figure. This neuron consists of multiple inputs and a single output. Each input is modified by a *weight*, which multiplies with the input value. The neuron will combine these weighted inputs and, with reference to a threshold value and activation function, use these to determine its output .Learning in a neural network is called *training*. Like training in athletics, training in a neural network requires a coach, someone that describes to the neural network what it should have produced as a response. From the difference between the desired response and the actual response, the *error* is determined and a portion of it is propagated backward through the network. At each neuron in the network the error is used to adjust the weights and threshold values of the neuron, so that the next time, the error in the network response will be less for the same inputs.

ME075

Optimization of welding parameters in CMT welding of Al 5083 alloys using VIKOR optimization method

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Abstract

In this paper, an effort is made to examine the cold metal transfer (CMT) welding of Al 5083 sheets having a thickness of 3 mm. The CMT welding was performed based on the L9 Taguchi orthogonal array with welding current (A), welding speed (mm/min) and welding frequency (Hz) as input parameters. The quality of weld was studied by measuring the reinforcement, bead width (BW), depth of penetration (DOP) and heat affected zone width (HAZW). The optimized parameters were found by the VIKOR multi-objective optimization method. The eighth experimental was identified as the optimized parameter from the VIKOR method.

ME076

Experimental Investigation of Heat Treated Tool on Wire Electric Discharge Machining of Titanium Alloy (Ti-6Al-4v)

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Abstract

Wire cut EDM, a non-conventional machining method is used for machining Titanium alloy (Ti-6Al-4V) which is one of the most commonly used alloys of Titanium. It is known for its lightweight, high tensile strength, exceptional corrosion resistance, and low thermal coefficient of expansion. Due to these properties, it finds its application in aerospace, marine, aeronautical and marine engine parts, precision surgical instruments. In this work, the main focus is to bring out an experimental investigation using brass wire and zinc-coated brass wire of 0.25mm. The zinc coated brass wire is medium tempered and the brass wire is hard tempered. T_{on}, T_{off}, I_p, wire feed are the input parameters which are analyzed using TOPSIS analysis of L_9 experiments. In doing this comparative study it is found that the response parameter such as Material Removal Rate (MRR), Surface Roughness (Ra), and Tool wear rate were better when the work piece was machined using the zinc coated brass wire.

ME077

Performance Analysis of Process Variables on Laser Beam Machining of Inconel-718 Alloy

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Abstract

Carbon-dioxide laser beam machining is a non- conventional process for machining intricate shapes and hard materials which are inconceivable with conventional machining methods. Inconel 718 has its applications in aerospace industries, manufacturing high pressure turbines, etc. Inconel 718 alloy exhibits superior physical and mechanical properties at elevated temperature, higher corrosion resistance and Strength-to-density ratio. The objective of the current work is to determine the optimal setting of the process parameters like laser power, gas pressure, cutting speed while machining Inconel-718 material using oxygen gas. The experiment was conducted using Taguchi L_9 orthogonal array. A square washer with four holes of diameter 8 mm and one hole of diameter 64 mm was machined using laser beam machining and the optimal combination of process parameter to acquire better response parameters is found. The optimized value of surface roughness 3.5μm and material removal rate is 45.56 m^3/min when operated at 2.1m/min cutting speed, cut of type rough, 1mm of focal point and 4000bar gas pressure, The effect of process parameters on various response parameters namely surface roughness (Ra), material removal rate (MRR), Heat affected zone thickness (HAZ), Taper, Circularity, hardness were studied. The SEM analysis was carried out to investigate the morphology of the machined surface.

ME078

Experimental Investigation of Milling Operation on GFRP Composites

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Abstract

This work attempts to investigate the aspects of machining performance and its optimization during milling operation of glass fibre reinforced composites. Using Taguchi's design approach, experiments are conducted as per the orthogonal array. The three input parameters considered for the milling operation are the number of flutes, feed rate and cutting speed. The various responses studied during this milling operation are machining force, cutting torque, surface roughness and delamination factor. Also optimization of the machining parameters (ie) number of flutes, feed rate and cutting speed are carried out on milling in order to minimize the surface delamination, machining force, cutting torque and delamination factor. The optimized results obtained after the study are found to be as feed rate of 0.05mm/rev, number of flutes as 4 and cutting speed as 1500 rpm and under these conditions the milling operation performed yielded better surface characteristics.

ME079

Effect of Process Variables on Electrochemical Micromachining of Titanium Alloy (Ti-3Al-2.5)

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Abstract

Electro-chemical Machining (ECM) is mainly used for shaping, deburring, milling and finishing operations in various precision industries and its use in micron level machining is called Electro-Chemical Micro Machining (EMM). EMM and ECM are receiving considerable attention from high-tech industries. It is because it allows manufacturing structures of complex shapes, it has high precision and accuracy, it is simpler and eco-friendly manufacturing technique and it can be used for different conducting materials. Different industry working with water which is saline, needs heat exchanger for the process. Titanium Alloy (Ti-3Al-2.5) due to its high corrosion resistance under saline conditions is preferred by these industries. This present work is mainly concentrated on identifying the Material Removal rate (MRR) of Titanium Alloy (Ti-3Al-2.5) workpiece by varying the process parameters like voltage, electrolyte concentration and duty cycle on electro-chemical micro machining.

ME080

Performance Characteristics of Ni-coated copper tool electrode on machining Pure Titanium in ECMM Process

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Abstract

Owing to its hardenable nature and corrosive resistant, Titanium is mainly utilized in fabricating turbine blade applications. Since it is very tough to creating the complex shape on this material by using traditional machining process. Generally micro holes are produced over the turbine blades to reduce the heat using EDM and LBM process. These processes can produce a heat affected zone over the machining surface and higher operating cost. The target of this present study was to made a micro hole on titanium by using electro chemical micro machining process and also attempt to identify the performance of nickel coated copper electrode for embellishing the ECM process. Since the process involves with no tool wear and less heat affect zone, it is possible to improve the machinability of the material. Titanium specimens have been machined using ECM process with uncoated copper electrode and nickel coated electrode under different process parameters combinations. From the experimental results, the better MRR and surface finish were observed from the nickel coated copper electrode.

ME081

A novel three axis Semi Elliptic Manipulator Configuration for simultaneous Multi Point Operations

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Abstract

A new three axes robotic configuration named as "Semi Elliptic Configuration" has been explored here. The configuration's topology, working principle, forward kinematics, inverse kinematics and application have been described in this article. The configuration's name has been derived from the unconventional geometry of the work volume within which it operates. Unlike the cubically shaped work volume of a typical XYZ Cartesian robotic configuration, its shape has been warped towards the edge containing the vertical Z- axis. It was found that the edges enclosing the face opposite to the Z- axis is part of an Ellipse. Two mutually perpendicular co- planar arms originating from the Z- axis enclose the semi elliptic boundary. Two manipulators of such configuration could be accommodated and be made to work independently within the cubical volume occupied by the perpendicular arms. It was found that the configuration's work volume leaves a void region within the volume of occupancy of the configuration's structure, which proved to be a disadvantage in certain real life applications and an advantage in others. A modification has been proposed to work around this restriction. The modification allows the configuration to expand its work volume into the void regions.

ME082

Direct ink writing of ceramics for bio medical applications – A Review

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Abstract

The 3D Printing technique has been globally used in bone tissue engineering as well as biomedical applications owing to its advantage of the quick, precise and controllable freeform fabrication process. In this printing technique, anatomical information of defected parts is gathered and converted into a CAD model, which is translated into Printer language. Among different additive manufacturing methods, direct ink writing (DIW) has gained attention among the academic and industrial communities due to its ability to build up the structure on any surface without any masking or tooling as well as no powder bed and the expensive laser source is required for printing. Bio-ceramics are utilized in biomedical fields because of the properties like high stiffness, bioactive, biocompatibility, osteoconductivity, therefore helping for bone regeneration and growing in vivo and in vitro environment. This paper reviews the current status and case studies involved in DIW of Bio-ceramic/composite for different biomedical applications.

ME083

Failure of adhesively bonded single lap joints with MWCNT and Fullerene C_{60} in the adhesive due to tensile loading

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Abstract

To create a better and stronger single lap joint that has the potential of sustaining the damage load to a greater extent, nano particles like multiwall carbon nanotube (MWCNT) and Fullerene C_{60} were dispersed in the adhesive. Though the joints made by adhesive bonding are stronger in themselves but the use of nano particle can further increase the damage load carrying capacity. The current research focuses on developing adhesively bonded single lap joints (ABSLJ's) by dispersing MWCNT and Fullerene C_{60} in the adhesive at a weight percentage of 1% and 3% by ultrasonication. Carbon fiber fabric was used as adhered and a two part epoxy system was used as an adhesive. By using the metallic shims, the thickness of adhesive was retained at 0.5 mm and 1 mm. Results reveals that the joints made with the use of MWCNT showed better load bearing capacity compared to that of the joints made with Fullerene C_{60}. It was even revealed that with the rise in the thickness of the adhesive, the joint strength decreased. An increase of 154% in the joint strength was obtained for joint sample with 3 wt % MWCNT and 0.5 mm adhesive thickness compared to non-doped joints. As the adhesive thickness was raised to 1 mm, for the same weight percentage the joint strength dipped by 16%. While for Fullerene C_{60}, increase in the joint strength was seen at 1 wt % with 0.5 mm adhesive thickness followed by a 15% dip in strength at 1 mm adhesive thickness.

ME084

FRICTION WELDING OF DISSIMILAR METALS (ALUMINIUM Al 6061 T6 and STAINLESS STEEL AISI 304)

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Abstract

In friction welding, welding takes place due to exterior pressure applied on the cylindrical rods. Both the specimen to be welded is having a linear motion or a rotary motion. The main benefit of friction welding is that it produces low distortion. The other advantage is absence of defects and comparatively high weld strength. Friction Welding also helps to reduce the costs of process by a significant amount. This also has shown prominent reduction in overall weight of the component. This study encapsulates the work done in friction welding, presents the summary of the testing done in this field till date in brief. The identification of proper welding parameters such as Friction Load, Friction Time and Forge Load is an important task. The problem of obtaining good weldability of Al 6061 T6 and AISI 304. Friction welding could be a discovery in production technology, a leap which will profit a large variety of industries, as well as the aviation, naval industries. It also has use in manufacturing drilling tools.

ME085

Robot Nano Spray Painting-A Review

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Abstract

Since 1970s, robotic painting has been widely adopted to manufacturing and automobile industry, because of its many advantages over manual painting in its high efficiency, economy and keeping workers away from hazardous chemicals. During the automated painting process, the spray gun, the end-effector of the painting robot, is guided to paint the targeted surface along the planned trajectories. Nano-sized additives are placed in the latex paint to enhance the quality of paint. The purpose of this study is twofold: examine the trajectory planning of robot and discuss the most influential parameters to increase the quality and lifetime of paint. Multiple databases were searched for literature and limiting to last ten years. The keywords selected for the search were a combination of the Paint thickness, Robot Spray Painting, Trajectory planning, Simulation, Nano Paint, Characteristics of paint, State of the art technologies. From the literature survey, few works were carried out using the robot paint and no work was conducted using the CNT and Graphene based Nano paints and analysing the environmental characteristics, surface characteristics are very limited. This study will identify the factors that enhance the paint characteristics and will be useful for coating and paint industry. To identify the control parameters to improve the quality of Robot Nano spray paint coating. Understand Robot Trajectory planning of Nano spray paint. Examine the control parameters to increase life time of painting and shining characteristic in current scenario of industry.

ME086

Investigations on the machinability of titanium alloy using low frequency vibration assisted turning under minimum quantity lubrication

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Abstract

Titanium alloy is widely used in aerospace, automobile and chemical industries due to its high strength at elevated temperature, good corrosion resistance, low thermal conductivity and light weight. Because of its superior qualities, this alloy found difficult to machine. The machinability of titanium alloy can be improved by adding low frequency vibrations (less than 1000 cycles per second) to the cutting tool. An enhancement in the machining performance can be attained by applying minimum quantity lubrication (MQL) in the cutting zone. In this study an attempt has been made to improve the machinability of titanium alloy by the application of MQL technique during low frequency vibration assisted turning (LFVAT). Experiments were conducted and the influence of low frequency vibrations plus MQL on the turning process was evaluated by measuring the surface roughness, main cutting force and tool wear. The performance of LFVAT, LFVAT + MQL, continuous turning (CT) and CT+MQL compared in terms of the aforesaid output parameters.

ME087

Two-Dimensional Nanomaterials and its Application as a Reverse Osmosis Membrane: An Overview

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Abstract

Due to the rapid growth of global population, increased industrialization and energy needs the clean water crisis aggravating all over the world continuously. Membranes based reverse osmosis (RO) desalination technology is a promising solution to the shortage of safe drinking water as it has a high water recovery with low energy consumption compared to other separation techniques at minimum cost. Two-dimensional (2D) nanomaterials such as graphene and its derivatives with sub-nan pores have potential to excel as a RO membrane. Recent development in such materials addressed the capability of RO membrane in terms of both mechanical aspects and desalination performance. Developing the 2D materials with controlled pore (vacancy defect) sizes, pore chemistry and applied pressure is attracted vast interest in designing such type of materials as a RO membrane. In this article, author reviewed various 2D nanomaterials and its performance as a membrane in RO process.

ME088

Optimization of Tube Hydroforming Process Parameters for CRDQ Steel using FEA Simulations

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Abstract

Tube hydroforming process uses fluid pressure to form components. Here the metal blank is confined to the shape of the two die halves by fluid pressure and axial feed on the axial plunger. Hydro formed parts have a number of manufacturing benefits such as seamless bonding, increased part strength and high quality surface finish. The parameters essential for the success of tube hydroforming process are material properties, process sequence and the die geometry. For analysis 3D finite element modelling for Tube hydroforming (THF) developed using SOLIDWORKS, pre-processing on HYPERMESH, solvers used are LS DYNA R7 solver and post processing on HYPERVIEW. The input parameters for this process used in this paper are internal pressure, die corner radius, axial feed, length of tube thickness of tube and output parameter considered is percentage thickness reduction of the tube. This paper aims at understanding effects of various parameters and interaction among them on the tube hydroforming process by taguchi analysis and ANOVA.

ME089

Design and structural analysis of AISI12 FE and nicu30FE by comparing their residual stresses in castings

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Abstract

Two individual high beyond words geometries were created so as to contemplate impact of procedure parameters and diverse compounds on contortion conduct of castings. These geometries were a pressure grid and V-molded example tending to frame remaining worry because of various divider thickness individually by an intentional gigantic gating framework. In the exploratory castings impact most significant procedure parameters, for example, pass on temperature and bite the dust opening time and cooling system was inspected. The time advancement of procedure temperatures was estimated utilizing warm imaging. The warmth move coefficients were adjusted to watched temperature circulations. Castings were created from the two compounds AlSi12 and AlSi10MnMg. The contortion castings was estimated by methods for material estimating gadget. For compound AlSi10MnMg thermo physical and thermo-mechanical information were gotten utilizing differential filtering calorimetry, laser streak strategy, dilatometry and pliable testing at raised temperatures. These information were utilized for displaying material conduct AlSi10MnMg amalgam in numerical model while for compound AlSi12 (Fe) writing information were utilized. Procedure and stress reenactment were led utilizing business FEM programming ANSYS Workbench. A study on aftereffects examination among reenactment and analysis is given for both compounds. In this task we are doing material enhancement to build holding quality for two materials. Here 3D model structured in professional e programming and investigation done on ANSYS programming.

ME090

Taguchi Based Optimization of coated and Uncoated Tool Insert for Turning Ti6al4vusing Grey Relation Analysis

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Abstract

The titanium alloy Ti6Al4V has been widely used due to its high strength to weight ratio. The titanium machinability is very troublesome because of its hardness, low elastic modulus at elevated temperature and thermal conductivity, and has high chemical affinity. In this paper we have studied surface roughness, material removal rate for CNC Turning of Ti6Al4Vby comparing it with two inserts, one is tungsten carbide coated having a coating of TiAlN and the other is the uncoated tungsten carbide inserts by varying the input parameters such as cutting Speed, feed rate, depth of cut (DOC). These experiments were based on Taguchi's orthogonal array for three factor and three levels and experiments has been conducted based on L27 orthogonal array for turning operation on computer numerical control machine. Further optimization is done based on multi response optimization-Grey Relational Approach (GRA) to get the optimized parameter for the maximum Material Removal Rate (MRR) and minimum Surface Roughness (Ra). However the surface roughness of the coated insert was found to minimal than the uncoated insert in which the coating just improves the life of the cutting tool.

ME091

Robotic Gripper with Force Feedback System

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Abstract

The aim of the project is to design an accurate responsive robot gripper that is capable of measuring the grasp force exerted on the object and varying its grasp force depending the material of the object. A parallel gripper is used which is actuated by a servo motor. The force is measured by mounting the force sensor on one finger of the gripper and the current to the servo motor is measured by a load current sensor. Hence by combing the force measured with the load current consumption of the servo motor, a control system is designed which will help in adjusting the grasp force of the gripper.

ME092

Acoustic emission analysis for damage mechanism in fiber reinforced polymer composite under torsional test behaviour

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Abstract

In this study the torsional behaviour of fiber reinforced polymer composite rods are tested, studied and observed different types of failures for different matrix materials like PEEK, Aqua bond, Epoxy. The FRP composite rods are fabricated by using VARTM method as per the standards. For testing the FRP composite rods the digital torsion testing machine (MTS100NM) was used. The AE sensors are used to analyse the nature of the cracks. The defects in FRP composite rods are identified, like surface micro cracks, matrix failure and reinforcement failure. After getting AE signals based on different AE Parameters like Time, Frequency, AE hits and AE energy from the obtained results the failure initiation and crack propagation was observed, so the AE method is best suitable technique for identify the micro failures.

ME093

Effect of Infill Percentage on 3D Printed PLA Specimens

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Abstract

The advancement of three-dimensional printing has accomplished interest in the creation of low-cost customized objects, both in personal and commercial uses. The cost and quality of objects produced rely on various processing parameters. Infill percentage is one such parameter. A total of 7 “dog bone” tensile test specimens were 3-D printed according to ASTM (American Society of Testing and Materials) standards with PLA (Polylactic Acid) plastic material, where the infill percentages were varied, keeping the same infill pattern (honeycomb), for each of the specimens. Tensile tests were performed on the printed parts in order to determine the stress-strain curves, ultimate tensile strengths, yield stresses and elongations. It was found out through tensile testing that the ultimate tensile strength (MPa) was highest for 70% infill percentage and then starts to decrease. Therefore, the specimen with 70% infill was considered to be the strongest. Finally, the deformation and stress-strain values were calculated computationally, with the help of finite element analysis.

ME094

Mathematical Analysis of Process Parameters in Drilling of Various Aluminium Matrix Composites Using TOPSIS

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Abstract

Drilling is one of the major material removal processes to produce holes and the key parameters involved in the process are, spindle speed of the drill and feed rate of the tool into the work piece. A conventional study would include the geometry of the drill bit as a key feature that affects the output parameters: thrust, torque, circularity error and the surface roughness. Drilling experiments are performed on three different hybrid composite specimen of Al7075 alloy. Keeping the diameter constant and by varying the point angle of the tool, drilling is performed and the responses of the output parameters are recorded and tabulated. Using the data from the experiment, analysis of the data is done by the TOPSIS algorithm. This analysis determine the optimal condition to drill a particular specimen of the composite. In this method, the data is ranked based on performance of the drill, to find the parameters which are ideal to obtain a hole with minimum roughness, circularity error and thrust force. But it is enough to keep the goal as minimum roughness because the other parameters will invariably get minimized as they are dependent. Finally the drilling parameters and point angle which are suitable for a particular specimen were found out to improve the quality of the drilled hole.

ME095

Experimental Investigation on machining parameters of Ti6Al4V Titanium alloy using cryogenic coolants

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Abstract

Machining of super alloys becomes highly demanded in aerospace industries. Titanium alloys tend to fall under the above category due to its high strength to density ratio and high strength. Machining under dry conditions and conventional coolants were performing better under normal conditions. Also, disposal of contaminant coolants created a necessity to find an alternate to it. Cryogenic coolant is an emerging sustainable green manufacturing process which is considered as one of the efficient process to replace conventional coolants. In the current work, cryogenic coolant (liquid nitrogen) was used to machine the Ti6Al4V titanium superalloy at varying investigative parameters speed, feed rate and depth of cut. This work was also focused on comparing cryogenic coolant with dry machining by measuring its surface integrity. Cryogenic machining has given beneficial results when compared to dry machining. Taguchi L9 orthogonal array was utilized for design of experiments and corresponding ANOVA was done to find the most influencing parameter and optimized values. At higher speeds and feedrate (i.e., 5000rpm and 0.6 mm/min) around 15% improvement was found in cryogenic machining when compared to dry machining. In view of environment and health, cryogenic machining leads to clean and green manufacturing without compromising the quality of output.

ME096

Design and fabrication of Abrasive Jet Machining Systems

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Abstract

ABRASIVE JET MACHINE presents the working of machining and removing materials from the brittle and heat sensitive materials by the application of high speed stream of abrasive particles carried by air through the nozzle. In particular drilling of holes of minimum diameter and maximum depth is also possible in this machine with greater accuracy and surface finish. Since no heat is induced while machining the surface, the workplace is not subjected to thermal shocks. Tumbling machining apparatus is used for determining the material removal rate (MRR) for materials like glass, ceramics and aluminium sheet by varying the parameters like pressure, nozzle tip distance (NTD), type of abrasive and its flow rate. In this project we have designed and fabricated the tumbling machining apparatus for removing unwanted material, drilling holes and cutting glass, ceramic plates and aluminium sheet.

ME097

Mechanical properties and Metallurgical characteristics of friction stir welded AZ91/CeO_2 metal matrix composite

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Abstract

Friction stir welding, FSW is an attractive as well as environmental friendly solid-state technique for welding Mg and Al to achieve good combination of properties and a promising technique for structural applications. Welding of Al and Mg alloys has gained importance in recent years, because they are difficult to weld by fusion welding techniques. Application of this welding spreads through automobile, aerospace and marine industries are in requirement to flight weight materials particularly magnesium and its alloys. The density of the Mg is considered to be lighter than aluminium. There find a lot of difference in mechanical as well as metallurgical properties by joining the metal with fusion and solid state welding processes. In this paper Magnesium AZ91 alloy was chosen as a base matrix metal, and it is reinforced with 5, 10, and 15% of Cerium oxide (CeO_2) particulate based on weight fraction method. Stir casting method is used to cast AZ91)/CeO_2 composite material. The cast samples were subjected to physical and mechanical test viz., hardness, tensile, impact. The feasibility trial weld was carried out on the developed composite similar metals using friction stir welding process and then welding sample was prepared. The welded samples are subjected to various mechanical test such as tensile, hardness and bend test to evaluate the strength of the friction stir welded joints. Then welded samples are also subjected to optical microscopy analysis to evaluate microstructures of the base and the weld regions using scanning electron microscopy.

ME098

Path Planning of Serial Two Link Planar Manipulator for Avoidance of Steam Generator Plugged Tube

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Abstract

Prototype Fast Breeder Reactor (PFBR) has 8 Steam Generators (SGs). Inspection of SGs requires a remote tooling to reach each of the 547 tubes. In PFBR SG, Sodium flows through the shell side and water/steam through the tube side. Degradation of the SG tubes are caused by corrosion, pitting, wear due to flow induced vibration ; so it is necessary that degraded SG tube must be plugged at both ends in order to increase the availability of plant. So the plugged tubes will have some protrusion above tube sheet. As robotic device for inspection is two-axis Selective Compliant Assembly Robotic Arm (SCARA), so during movement from one tube to another tube, plugged tube has to be avoided for safe operation. In this paper path planning technique using vector algebra has been used to find out via point in the Cartesian space. The via point is selected such that robot can avoid plugged tube& ensures healthy operation of device.

ME099

Experimental studies on magnesium metal matrix composites processed by twist extrusion.

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Abstract

Metal matrix composites (MMC) are a group of engineering materials that has superior mechanical properties over the pure metals and its alloys. Magnesium and its alloys are identified as a suitable alternative for the aluminium in the automobile, medical and aerospace industries because of their low density, high specific strength but magnesium is more brittle compared to aluminium. This problem associated with the brittleness of magnesium can overcome by the magnesium metal matrix composites. Magnesium AZ91 composite reinforced with SIC and B4C result in high porosity. So twist Extrusion of mg composite reduces the porosity and improves the particle distribution. Thereby a required mechanical property is achieved.

ME100

A study on influence of peak current and ultrasonic vibration during powder mixed electrical discharge machining process

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Abstract

This paper presents the influence of peak current and induced ultrasonic vibration into the dielectric medium during powder mixed electrical discharge machining (PMEDM) process. Molybdenum-di-sulphide powder of 90nm size is used as conductive particle mixed in hydrocarbon based dielectric medium during EDM process. Peak current is varied at 0.5A, 2A, 9A and 21A; parameters such as pulse duration 10μs, gap voltage 20V and duty factor 2 were maintained constant. Two set of experiments were conducted by varying peak current; one by induced ultrasonic vibration during PMEDM and another without ultrasonic vibration. The effect of peak current and ultrasonic vibration on material removal rate, surface roughness and crater diameter were analysed. Scanning electron microscope images and 2D roughness profile were used to analyse surface integrity. It is observed that the induced ultrasonic vibration improves MRR by 6 times, surface roughness (R_a) of 1.464 μm, small crater diameter and debris free surface is achieved.

ME101

Comparison on machining characteristics of AISI 304 steel during Micro and Nano powder mixed electrical discharge machining process

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Abstract

In this research, an attempt was made to investigate the influence of effect of peak current on machining characteristics of with ultrasonic assistance and without ultrasonic assistance during powder mixed electrical discharge machining. The molybdenum disulfide (MoS2) nano powder selected as powder material and the powder concentration was 1 g/l kept constant. The selected input parameters for the experiments comprise of pulse duration, gap voltage, duty factor were kept constant 10 µs, 20 V, 2 respectively and the peak current is varied in 0.5,2,9 and 21 A. the output parameters namely material removal rate, tool wear rate, surface roughness, surface morphology and stability of machining process were analyzed using pulse trains acquired during machining process. Scanning electron microscopy (SEM) and Energy dispersive X-ray spectroscopy were employed to examine the surface morphology and deposition of MoS2 nano powder particles on machined area. The results revealed that the use of ultrasonic assistance slightly enhance the material removal rate compared to the without ultrasonics and tool wear rate increases due to compression and rare fraction of the sonic waves and also influence the discharge energy and process stability was explained.

ME102

Machining Of Titanium Alloy Grade 5 (Ti-6Al-4V) By Using PVD Coated Cutting Tool Insert

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Abstract

Titanium alloys are metals obtained by the homogeneous mixture of titanium and other chemical elements (metal or non-metalloids). Titanium alloy (Ti-6Al-4V) has been widely used in aerospace and medical applications and the demand is ever growing due to its applications. In this project work the basic material used is Titanium alloy (Ti-6Al-4V) and micro grooves are prepared on the carbide tool with the help of LASER and coated with TiN (PVD method of coating). The experiment is done on the CNC turning machine by varying the input parameters such as depth of cut, cutting speed and feed rate. The different cutting conditions like dry, wet with uncoated carbide tool and their results are compared with the PVD coated carbide tool. The output parameters that are checked during this work are chip formation, surface roughness, temperature, MRR and vibration with three set of machining parameters.The result is showed that good surface finishing with less temperature formation is observed with PVD coated carbide tool. This type of machining will be encouraged as an eco-friendly process.

ME103

Finite Element Analysis and Experimental Investigation on Welded Joint of MIG Welding with SS316

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Abstract

Welding is the process of permanently joining two or more materials together, usually metals, by heat or pressure or both. It is one of the important parts of fabrication process. Welded joints are more economical as less labour and less material is required so the analysis of it helps to increase its overall efficiency. The primary objective is to use finite element analysis to define normal stress and tensile strength of butt welded joint with optimized welding parameters. MIG 400 welding machine is used for welding with SS filler material. The two different grades of SS316 steel plates are welded using metal inert gas welding and experimental investigation is carried out using tensile and impact testing machine. The experimental results are also compared with the Finite element analysis results using simulation software. Residual stresses developed during the welding process of different metal plates are also calculated and compared using the simulation software.

ME104

Optimization Approaches of Industrial Manipulators to Improve Energy Efficiency: A Review

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Abstract

The objective of this paper is to provide a comprehensive review of existing approaches and techniques developed in the field of industrial robotics to make it energy efficient. The usage of industrial manipulators is increasing globally due to its repeatability and superiority. The considerable energy demand is also predicted because of the increased application of robots in industries, this can be overcome by making energy-efficient manipulators. Different approaches are already established in this field to make robots energy efficient such as; elimination of needless densities by topology optimization, selection of optimal path using trajectory optimization, usage of light-weight components, analysing speed, and providing energy storage devices, etc. Among different available approaches, major three methodologies are reviewed in this paper. The first group comprises the topology optimization method that optimizes the design space by eliminating needless densities based on given boundary conditions and constraints. Further, the topology optimization method sub-classified into two types based on loading conditions such as static analysis and dynamic analysis. The second group comprises trajectory optimization of robots; this is achieved by selecting the optimal path of the work-cycle, or minimization of torque. Again trajectory optimization classified into point-to-point and multi-point optimization. The third group includes the application of light-weight structural components in the field of industrial robotics and its challenges. Presented work will be useful to analyze different approaches to make the robot as energy efficient

ME105

Selection of optimal capacity for reconfigurable machines during lean manufacturing

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Abstract

Presently manufacturing industries are facing the challenge of increased market volatility and unpredictability. Capacity control is an effective measure to address this problem by utilizing the flexibility in the plant capacity. This research paper proposes a genetic algorithm (GA) based methodology to optimally select levels of capacity for machines which are reconfigurable in nature. The objective function for the optimization problem is minimization of an error with takt time. Takt as a key feature of lean manufacturing is considered in the model to manufacture the products in a fixed rate as decided by their respective demands and available production time. A hypothetical numerical problem is illustrated to describe the selection methodology, GA computation steps and the solution procedure.

ME106

Effect of hot corrosion demeanour on aerospace-grade Hastelloy X made by pulsed and constant current arc welding in molten salts at 820 °C

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Abstract

The effect of hot corrosion tendency of Hastelloy X weldment made by pulsed current tungsten inert gas (PCTIG) and constant current tungsten inert gas (CCTIG) welding has been studied. The welding has been done using ERNiCrCoMo-1 (Mo-1) filler. The hot corrosion demeanour of the Hastelloy X has studied in two different molten salt circumstance such as MS1 (molten salt-1) (75Na2SO4 + 20V2O5 + 5NaCl) and MS-2 (molten salt-2) (75Na2SO4 + 25V2O5) for 25 cycles (one hour in each cycle) at 820 °C. The MS-1 substrate shows the maximum weight gain compared to MS-2. Also, the largest parabolic constant (Kp) is observed for PCTIG MS-1. The existence of NaCl in MS-1 has improved the corrosion rate by generating more spallation and exfoliation on the surface. The trends of hot corrosion resistance are following the order of, CCTIG Mo-1 MS-1 < Base Metal MS-1 < PCTIG Mo-1 MS-1 < Base Metal Mo-1 MS-2 < CCTIG MS-2 < PCTIG Mo-1 MS-2. The smaller grain size and higher protective oxides (NiO, NiFe2O4, NiCr2O4, and Cr2O3) developed in PCTIG MS-1 and MS-2 improves the corrosion resistance compared to coarser gains and fewer protective oxides in CCTIG MS-1 and MS-2, respectively. The non-protective oxides (Fe2O3 and MoO3) improved the corrosion rate of the substrate. From this investigation, it is clear that PCTIG weldment in the MS-2 environment is providing better protection to corrosion at 820 °C.

ME107

Advanced Condition Monitoring of Machinery in Manufacturing Units using Machine Learning

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Abstract

Predictive maintenance and conditional monitoring of machineries has attracted many researchers and technologist as the advantages that it holds over traditional maintenance is far and wide. The conventional maintenance of machineries are done periodically irrespective of its need to be maintained. This is both time consuming and cost incurring. In many cases it is hard to detect failure of a component in time and it is almost always that the fault is found after the sudden failure. This causes the maintenance cost to rise up high and cause heavy impact on production time and schedule. Maintenance is one of the most cost incurring segment of a manufacturing industry. Machine learning algorithms coupled with IoT can provide dynamic and live data feed on different aspects of the machine such as machine vibration, temperature, RPM, coolant temperature etc., with these information and an algorithm that can actually visualize and sense a hidden pattern that is oblivious to our human perception can mean a great deal of saving in maintenance. These algorithms are far more capable of predicting the fault in a mechanical system and are also capable of defining the exact problem along with the faulty component to be repaired or replaced. This drastically reduces the cost, man power and energy that is spent an increases the productivity by ensuring right scheduling of time, reducing the machine break down, keeping the health of the machine in optimal condition independent of the expertise of the operator. This paper deals in details about the different methods such as Shock Wave Pulse measurement, vibration analysis and acoustics analysis by which we draw the raw data, feeding it into a machine learning algorithm. The future prospects and present challenges in predictive maintenance is also briefed out.

ME108

Robot optimization by reduction in number of joints using composite enhanced Compliant Suspension

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Abstract

It current times, most of the human work is shifting towards automation where robots will either take over the work entirely or will assist in one way or other. It was found that to get any robot to replicate human action, a number of joints were required. These joins restrict the motion in one way or other or create other problems like backlash. The idea is to design a robot which will have suspension system without joints and will get desired motion in a well-defined path. The objective of this paper is to get better climbing capabilities and increase the efficiency of other motion that a robot will make with composite enhanced compliant mechanisms to reduce backlash and other friction wear that occurs in jointed motion. Initially a composite material with desired flexibility and rigidity was carefully selected and analyzed. A compliant mechanism for suspension is designed using the composite material. The design is analyzed and optimized. Experiments are designed using different software.

ME109

Condition based monitoring for fault detection in windmill gearbox using Artificial Neural Network

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Abstract

Gears are condemning element in a diverse industrial application such as machine tool and gearboxes. An unexpected failure of the gear may cause economic losses. For that reason, fault diagnosis in gears has been the most influencing content. Vibration analysis has been used as a predictive maintenance procedure and as a support for machinery maintenance decisions. As a general rule, machines do not breakdown or fail without some form of warning, which is indicated by various factors. But the most efficient form of indication is increased vibration level. By measuring and analyzing the machine's vibration, it is possible to determine both the nature and severity of the defect, and hence predict the machine's failure. The vibration signal of a gear box carries the signature of the fault in the gears and early fault detection of the gear box is possible by analyzing the vibration signal using different signal processing techniques. The present work depicts about the predictive maintenance program implementation based on the experimental data set of the gear box assembly in wind turbines by using the artificial neural network and comprises of the prediction of variation in the accuracy of the experimental data set. The code values are generated using python 3.7 version software. The accuracy of the Mode laws found to be 61.86%.This accuracy indicates the functioning of the gears and can also be used for predictions in real time scenario.

ME110

Design and Development of Bio-Sensitive Robotic Arm using Gesture Control

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Abstract

In this paper, a model of a robotic arm is designed and manufactured using a 3D printer, which is to be operated via human gesture by using the Accelerometer and Gyroscope Module. This arm is proposed to help in the medical field, in military operations, in hazardous conditions and in industries to maximize human safety. The robot arm is designed such that, it has 5 degrees of freedom controlled by the 3-axis accelerometer mounted on the IC placed on the glove of the user. The module will replicate the movement of the user's hand to extend, retract, and rotate accordingly to accurately position as required for the application. The user's finger action is used to manipulate the working of the gripper. Therefore, gesture control in a broad sense is a computerized interface that allows computers to record and interpret those gestures into commands to adhere to actions.

ME111

Development and Workspace Analysis of Smart Actuation based Planar Parallel Robotic Motion Stage

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Abstract

The applications of light weight planar parallel robotic manipulators are increasing enormously because of their various desirable characteristics such as low weight, lower inertia, higher stiffness, energy efficiency etc. Higher accelerations and accuracies can be achieved using planar parallel manipulators (PPMs). Also, Shape Memory Alloy (SMA) based actuators are replacing huge and bulky actuators as SMA actuators provide higher work per unit mass as compared to other actuators and also undergoes silent actuation by simple actuation process. In the present study, three configurations (3PRP, PPR-2PRP and PRR-2PRP) of 3 degrees of freedom U-shaped base planar parallel robotic manipulator have been presented using SMA based smart actuators. The manipulator constitutes of one fixed base and one moving platform. The SMA spring acts as linear actuators mounted on the base which is connected to the end effector with the help of three limbs. A detailed experimental study was carried out to understand the workspace associated with each configuration. The movement of manipulators was investigated with the various combinations associated with the input SMA translation joints. And the study showed that the various configurations acquire different areas of workspace in the manipulator region. This study also shows the essence of SMA springs in PPMs for precise and accurate positioning of the end-effector and also its tracking ability for the development of future micro-motion stage.

ME112

Rectification of the Improper Mating of the Rack and Valve Assembly using Six Sigma Methodology at a Steering Manufacturing & Assembly plant

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Abstract

Precision automobile components and the automobile assembly systems are found to be the building element of any automobile, thus it is evident for the stakeholders to take utmost care and ensure that the most superior quality is delivered to the market. Failure of the quality or poor quality of a small component may lead to the failure of an automobile. Thus the conclusion derived is that for the best of quality component there should be a world-class process with standard operating procedures for the components of the same family. The minus cost principle says that when the quality is assured the time taken for the production is more which results in low volumes and where the volume is concerned the quality is compromised. Thus, focus on one parameter results in the disturbance of the other. Hence, it should be balanced in such a way that the quality achieved is superior and with high volumes. While concentrating on the two parameters the parameter which is often neglected is the cost and it is found to be one of the most significant parameters for which the stakeholders have to focus upon. The following study illustrates how the quality factor was accounting for the heavy loss in a Steering Manufacturing company and how was the problem addressed with the most optimized solution thus eliminating the cost of poor quality. During the assembly of the steering system, three major components; the rack gear, the pinion gear and the housing are clustered and allowed to fit perfectly according to the design specification. The problem encountered during the mating of the rack and pinion; was during the insertion of the pinion into the housing where it meshes with the rack gear. The insertion process was lacking the smoothness, efficiency and it found to be noisy in operation. This problem would damage the teeth of the Rack gear as well as the Pinion. This problem was a quality failure and the entire steering system had to be rejected. For a manufacturer of precision automobile components rejection was a threat to the business as it was killing the capital expenditure and creating a huge impact in gross margin. Thus this problem was to be addressed systematically to find out the root cause and eliminate the problem reverential so wipe out the cost of poor quality. Thus the method adopted to achieve the results was Six Sigma DMAIC Methodology. The DMAIC is an acronym for the Define Measure Analyze Improve and Control which widely used in industries to address the problems when no root cause is identified. In the initial phase of the DMAIC concept a sub concept, popularly known as the 4M method was used. The 4M method or the fishbone method is a standard method of root cause analysis by accounting the 4 major factors namely; Man-Machine-Material- Method. Based upon the significant root because identified, suitable statistical tools were used and the problem was addressed
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ME113

Evaluation of microstructure and mechanical properties of Magnesium alloys by Stir casting process

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Abstract

Magnesium alloys are light metal for weight reduction without compromising its overall strength to weight ratio. Mg Alloys containing Zinc, Manganese and Aluminium were found to be suitable for automobile and aerospace applications and is also cheaper to produce. Aluminium improves castability. Stir casting is one of the most economical processes suitable for the production of metal alloys due to its simplicity. Zinc contributes towards improvement of strength at ambient temperatures. Manganese offers corrosion resistance, but has low solubility. Change in composition of an alloy could change its properties, depending on the property imparted by the metal. In this paper, the detailed characterization of magnesium alloys was analysed and results showed that there is a significant improvement in mechanical and metallurgical properties in novel magnesium alloys.

ME114

Effect of cooling cycles and phase transformation on distortion and residual stress of Naval grade steel weldments

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Abstract

The objective of the present study is to develop understanding on basic mechanism involved in generation of residual stress and distortion in high strength low alloy material (HSLA) for naval application. The candidate material DMR 249-A is welded with gas tungsten arc welding (GTAW), gas metal arc welding (GMAW), Double pulse GMAW, (DPGMAW), Double side GMAW(DSGMAW) and hybrid laser arc welding (HLAW) processes. The weldment was analysed for distortion and residual stresses with respect to heat input, cooling rate and number of passes. The predominant factors that affect distortion and residual stress in weldments are shrinkage, quenching, and phase transformation. The effects of quenching and shrinkage (i.e. distortion) are analyzed using coordinate measuring machine (CMM). A matrix of 108 points is measured at each weldment to map surface topography. The residual stress is measured in transverse direction and longitudinal direction using X-ray residual stress analyser (Pulstec μ-X360). The phase transformation effect is studied using scanning electron microscope (SEM) on weldment at base metal (BM), heat affected zone (HAZ) and fusion zone (FZ). The results show that DSGMAW and HLAW has minimal distortion compared to other weldments. The residual stress at the fusion zone of HLAW and DPGMAW samples found to be compressive whereas other processes show tensile residual stress at fusion zone.

ME115

Identification of tool wear status and correlation of chip morphology in micro end milling of mild steel (SAE 1017) using acoustic emission signal

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Abstract

This work describes the identification of micro-end mill wear using acoustic emission (AE) signals acquired with an AE sensor during the micro end milling (slot milling) of mild steel (SAE 1017). The acquired AE signals were processed in the time-domain and frequency-domain to compute root mean square (RMS), dominant frequency and amplitude. The RMS value of the AE signal has shown an increasing trend with the increase in the tool wear, and helps to classify the tool wear regions, namely, initial wear (run-in wear), progressive wear and accelerated wear. The Welch power spectral density and spectrogram (short term Fourier transform) analysis help to identify the tool rotational, tool passing and machining frequencies. The discrete wavelet transformation (DWT) technique is carried out by decomposing the AE signal in five different frequency bands. AE specific energy was computed from the decomposed AE signals. The AE specific energy indicated that a shearing type of material removal mechanism occurred in micro-end milling, similar to that of the macro-regime end milling. However, ploughing is also observed from the surface topography. Chip morphology studies were also carried out, and correlated with the micro end mill wear for tool wear identification.

ME116

Experimental Exploration on Surface Roughness in Abrasive Water Jet machining using Response Surface Methodology

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Abstract

This paper presents research work involved in abrasive water jet machining of AZ91 magnesium alloy material. Abrasive water jet cutting has been proven to be an effective technology for processing various engineering materials. Surface irregularity of machined parts is one of the major machining characteristics that play an important role in determining the quality of engineering components. Process parameters namely, traverse speed, water pressure and stand-off distances are considered in the present study. The effects of these parameters on surface roughness have been studied based on the experimental results Maximum pressure and minimum stand-off distance cause reduction in the surface roughness in AZ91 magnesium alloy.

ME117

Experimental investigation and Modeling of Drilling Process Parameters for Surface Roughness and MRR of Al6063/SiC/Gr hybrid composite using RSM

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Abstract

Surface quality and material removal rate (MRR) are two significant factors in the manufacturing which influence precision thus mirrors the productivity of the industry. Objective of this work is motivated to determine the optimum operating parameters for the drilling Aluminum hybrid composite. The metal hybrid composite of Aluminum was fabricated by stir casting process. Silicon carbide and graphite particles were added to improve material properties. The main cutting parameters, namely, spindle swiftness, feed amount and type of coolant are considered in this study. In this work, the experimentations were planned by a Box-Behnken design (BBD) method. The impact of procedure parameters on the reactions are assessed and ideal cutting conditions for limiting surface roughness and boost the MRR were resolved utilizing reaction tables, reaction charts, association tables, 3-D surface plots and attractive quality investigation. To approve, affirmation tests have been completed and anticipated outcomes have been seen as in great concurrence with experimental discoveries.

Key words: Drilling, Stir casting, RSM, BBD and Surface roughness.

ME118

Deep Learning – A Review

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Abstract

In recent years, tech corporations in countries such as China and the United States like Google have increased their investment in artificial intelligence. Learning is one of the key research areas of artificial intelligence at present. This article presents the latest progress and also tries to paint a predictive picture of future research directions and developments in the domain of deep learning. Each of said research directions and avenues are analysed and summarized in a brief yet concise manner in this article. Firstly, an outline of the three basic models of deep learning, including multilayer perceptions and perceptron's, convolutional neural networks and recurrent neural networks. Building on this foundation, further analyses of the emerging new types of convolutional neural networks and recurrent neural networks are also undertaken in this current study. This article then summarizes deep learning and its applications in the domain of artificial intelligence, including speech processing, computer vision, and natural language processing. Finally, the purpose of deep learning is discussed. The current article also delves a little deeper into the inner workings of the neural networking architecture associated with object detection and computer vision. Current object detection and computer vision models like R-CNN, Fast R-CNN, Faster R-CNN, Mask R-CNN, YOLO are also briefly discussed in this study. The existing problems associated with the implementation of deep learning and possible solutions to solve said problems have also been briefly discussed.

ME119

Autonomous Mobile Robot for Part Retrieval and Storage

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Abstract

The mobile with the robotic arm combined with the vision system has an ability to manipulate the desired object for storage or retrieval purpose. The articulate arm configuration enable has to pick parts that are either lying on floor or placed in a platform. The vision system identifies and recognizes the object. Once the vision system identifies the part correctly coordinates system of that part position in a known environment is calculated by the program and the gripper is activated to pick part the part. For each part the storage location has been programmed to the robot where it is place the object in a sequential manner or just simply placing in storage bin

ME120

Microstructure and Mechanical behaviour of AZ91D magnesium composite reinforced with B_4C and graphite by casting process

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Abstract

In this study, we have manufactured AZ91D magnesium - based alloy and its composite reinforced with boron carbide (B_4C) at various weight percentage by stir casting process. The work is aimed at comparing the microstructure and mechanical properties of developed composites with its matrix AZ91D magnesium alloy. The B_4C reinforcement particles were added 1.5,3,4,5 weight percentage respectively to the matrix material. Density, Porosity, Rockwell hardness test, Tensile test, and Optical Microstructure were evaluated. The developed composites reveal increased 11.18% highest hardness value when compared to base material, which could be accredited to the occurrence of B_4C particles. Also, this study indicates that increase in percentage addition of B_4C leads to increase in density and tensile strength of the developed composites. Optical microstructure images show the uniform distribution of particles into matrix.

ME121

Effects of Sintering Temperature on Microstructure and Mechanical Properties of Aluminium Composites

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Abstract

Sintering temperature might have varied effects on the properties of composites in general. Through this paper, an attempt has been made to investigate the effect of sintering temperature on the properties of Aluminium composites fabricated by powder metallurgy process. Alumina and Silicon Carbide were different types of reinforcements in this work. Green compacts of Aluminium composites were made at a compressing load of 1 tonne and 2 tonne separately. These compacts were sintered at 2 different sintering temperatures of 400°C and 450°C in oxygen free environment using muffle furnace for 1 hour, followed by annealing process which took 12 hours. Sintered compacts were than subjected to microstructural examination and mechanical properties evaluation. Higher hardness has been attained for the composites containing 2.5% Silicon Carbide. Optical microstructure images show the uniform distribution of particles into aluminium matrix.

ME122

Effects of CNTs on the surface integrity of α – β Titanium: An Experimental Study

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Abstract

Carbon Nano Tubes (CNTs) have found an immovable niche in the world of manufacturing in the form of reinforcements in composites. Their many advantageous properties have allowed their usage in innumerable ways and this has led to a plethora of innovations in engineering. In advanced manufacturing of very-hard-to-machine materials like titanium, where surface integrity is of prime importance, the presence of CNTs even as less as 3% along with Cubic Boron Nitride (CBN) in the same grinding wheel, has demonstrated improved surface finish on titanium alloy (Ti-6Al-4V). This proposed grinding wheel for use on Titanium, reduces surface roughness as well as the heat burns that are otherwise a part of Ti surface when ground with other abrasive wheels. In addition to these two very obvious advantages, the material removal rates are also vastly improved using these newly designed wheels.

ME123

Experimental investigation and Modeling of Drilling Process Parameters for MRR of Al6061/SiC/Gr hybrid composite using RSM

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Abstract

Material removal rate is an important factor in the manufacturing which affect mass production in turn reflects the profitability of the industry. This study is focused to determine the optimum operating parameters for the drilling of Aluminum hybrid composite. The hybrid metal grid composite was manufactured by stir casting process utilizing particulates SiC and graphite each in Al6063 combination. The main cutting parameters, namely, spindle speed, feed rate and type of coolant are considered in this study. In this work, the experiments were designed by a Box–Behnken design (BBD) method. The effect of process parameters on the responses are evaluated and optimum cutting conditions for maximize the MRR were determined using response tables, response graphs, interaction tables, 3-D surface plots and desirability analysis. To validate, confirmation experiments have been carried out and predicted results have been found to be in good agreement with experimental findings.

ME124

Enhancement of surface quality in Wire EDM machining of Magnesium alloy using ANN modeling approach

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Abstract

This paper describes about the surface quality improvement by modeling the wire EDM process parameters using Artificial Neural Network (ANN). The work piece required for machining was magnesium alloy. The machining parameters such as pulse on time, pulse off time, current and wire feed were considered for experimental design. The experiment was designed by Response Surface Methodology (RSM), Central Composite Design (CCD). Surface roughness was predicted by ANN modeling. Different membership functions were used to optimize the process parameters for surface roughness. The predicted values were very close to the experimental value and the maximum variation was 4.3%. Confirmation experiment was also conducted to validate the results and predicted results have been found to be in good agreement with experimental findings.

ME125

Influence of Shot Peening on Surface layer Characteristics of Case Hardened SAE9310 Material

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Abstract

Shot peening is a manufacturing process commonly used to increase fatigue life in components for the automotive and aircraft industry. In this project the effect of shot peening is described for a case hardened Automobile differential gears. In this process, the surface is collided repeatedly with small spherical media called shot, making overlapping indentations on the surface. Thus, the surface layer characteristics of mechanical parts such as gear and spring can be greatly improved by shot peening. In a Conventional shot peening process, particle used for shot peening consists of small spheres. It is made of high carbon cast steel and the diameter is in the range from 0.6 to 2.0 mm. For differential gears, Bending fatigue failure is one of the main failure mode. The effects of a number of different shot peening process parameters upon the compressive residual stresses of an automotive steel bevel gear. Results to be presented include residual stress measurements. The project describes an experimental series where these parameters were measured for common industrial shot peening settings. The aim is to show the influence of shot peening on surface layer characteristics of case hardened Differential Gears. Also together experimental results that can be used for verification of shot peening simulations.

ME126

Influence of Arc Oscillation Amplitude on tensile Properties of Gas Tungsten Arc (GTA) Welded AZ31B Magnesium Alloy Joints

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Abstract

Magnesium alloys are very attractive in a variety of technical application, especially in automotive and aircraft industries, due to the excellent physical properties such as low density, high specific strength and stiffness. It is well known that gas tungsten arc (GTA) welding technology is still the main welding method for magnesium alloys because of its advantages of utility and economy although it would cause lots of problems due to the large heat input.Magnetic arc oscillation is one of the effective techniques for refining the micro structure in the fusion zone of welds. Hence in this investigation an attempt has been made to study the effect of magnetic arc oscillation amplitude on microstructural characterization and tensile properties of GTA welded AZ31B magnesium alloy joints. Five joints were fabricated using different levels of arc oscillation amplitude (0.2 mm – 1.0 mm). From this investigation, it is found that the joint fabricated using arc oscillation amplitude of 0.6 mm yielded superior tensile properties compared to other joints. The formation of refined grains, higher hardness, and uniformly distributed precipitates in the fusion zone are the main reasons for the superior tensile properties of these joints.

ME127

Analysing the Mechanical and Metallurgical Behaviours of Friction-Stir Welded Joints (Al 6082 & Al7075)

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Abstract

The friction stir welding process is an emerging solid state joining process in which the material that is being welded does not melt and recast. The FSW process and tool parameters play a major role in deciding the joint strength. A relatively new joining process, friction stir welding (FSW) can join aluminium alloys, copper, magnesium, zinc, steels and titanium. FSW produces a weld that is stronger than the base material. Melting does not occur and joining takes place below the melting temperature of the material, a high quality weld is created. This characteristic greatly reduces the ill effects of high heat input, including distortion. Analyzing the mechanical behaviors of welded joints like tensile strength and hardness and metallurgical behaviors like microstructure and macrostructure. Friction stir welding also is highly efficient, produces no fumes, and uses no filler material, which makes this process environmentally friendly. The process originally was limited to low-melting-temperature materials because initial tool materials could not hold up to the stress of "stirring" higher-temperature materials such as steels and other high-strength materials. Tool materials required for FSW of high-melting-temperature materials need high "hot" hardness for abrasion resistance, along with chemical stability and adequate toughness at high temperature. Material developments are advancing rapidly in different tool materials, each material offering specific advantages for different applications.

ME128

Artificial Intelligence: Methods and applications in Mechanical Engineering

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Abstract

Artificial Intelligence (AI) is a fast and vast growing branch of computer science that is being widely applied in almost every field. In mechanical engineering it can be used for fault detection, autonomous vehicles, manufacturing, smart buildings and many other things. In many cases AI enables dynamic communication, analysis, decision-making with high accuracy. But different fields or applications require different AI methodologies sometime combination of methodologies for accuracy. This paper gives us an idea about the applications of artificial intelligence in mechanical engineering that are widely used in the present and may become popular in the future.

ME129

Surface roughness evaluation in machining titanium alloys using non-textured and micro-textured cutting tools

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Abstract

Ti-6Al-4V alloy is well known for its difficulty in machining due to its ultimate hardness. The temperature generated at the tool-chip interface is typically high which results in poor surface finish and rapid tool wear. The present focus of study is to analyze the influence of process parameters such as cutting speed, feed rate and depth of cut on the surface roughness of both non-textured and textured cutting tools. Response Surface Methodology (RSM) was utilized to generate the analytical relation between the process parameters and their interaction with the response parameter namely surface roughness. Analysis of Variance (ANOVA) was implemented to identify the significant factors and the correctness of the model. It was found that the surface roughness was immensely controlled while using micro textured cutting tools. Finally, the surface roughness values are experimentally taken using both the tools and plotted to analyze the influence of process parameters.

ME130

Experimental Investigation of flax fiber laminated composite prepared by VARTM

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Abstract

Composite materials are a representation of evolution of science and technology, due to their overwhelming properties when compared with conventional metal. They are widely used much possible application because of its light weight, high strength, flexibility, durability and many more. In this work woven flax fibre (30, 35 and 40 wt. %) is reinforced with vinyl ester resin to prepare the composite samples using vacuum assisted resin transfer moulding. The finished laminated composites are then subjected to mechanical characteristics (Tensile, Flexural, Impact and Hardness) as per ASTM standards. Finite element analysis is employed as theoretical and numerical method to compute the mechanical properties of laminated composites .The experimented results were validated using an ANSYS model using ANSYS composite Prep- Post (ACP), where laminated member is subjected to constant strain at the free end while the reaction stress is found . The results for deformation and tensile strength are obtained and compared with the theoretical value. A statistical analysis such as regression analysis were carried out an all the samples to estimate the variables in manufacturing the composites specimen.

ME131

An Experimental and Characteristic Study of Abaca Fiber Concrete

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Abstract

The natural fibers can be an effective material to reinforce in concrete in order to improve the strength and durability, more compared to the effect of synthetic materials on concrete. This study states about the effect of concrete with abaca fiber. The specimens of concrete were cast with the addition of 0.5, 1.0 and 1.5% of abaca fiber and the respective tests were performed to determine the compressive strength, split tensile strength, flexural strength and impact strength on 7, 14 and 28 day of curing. The addition of super plasticizer along with the fiber helped in reducing the water content to match the high water absorption capability of the fiber in the concrete. Among the above mentioned fiber percentage added to the concrete, it was observed that 0.5% gives the maximum compressive strength, which concludes to be the optimum percentage of abaca fiber addition. The split tensile strength, flexural strength and impact strength were done optimum percent of abaca fiber. Scanning Electron Microscope and X-Ray Diffraction analysis were conducted on 0.5% of Abaca Fiber Reinforced Concrete (AFRC) to study the morphology and the chemical composition of the concrete.

ME132

Experimental Studies of Different thick Steels MIG Brazing Joints

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Abstract

Current automotive industry is focusing on developing the materials and technologies for automotive vehicle bodies to satisfy the latest stringent requirements like weight reduction and safer body. There are many solutions are explored to satisfy this requirement. the material having higher strength is used with less thickness. The relation between the standard higher and lower thickness steels design is of the joining established by brazing, which has several advantages compare to MIG welding. The results will be analyzed for designed mechanical properties and the practically measured differences between the higher and lower thickness side of the joint. mostly fusion MIG brazing welding processes, The paper is focused on the analysis of MIG brazing application possibilities of joining higher and lower thickness with various gaps using CuSi3 of brazing wire.

ME133

Product Design & development of High-Pressure moulding machine and analysis, comparison of various mould properties which effect casting quality

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Abstract

Green sand-casting method remains the most widely used casting processes even though there are many advanced methods developed, due to its low cost of raw materials, and ability to produce castings of different variety both in chemical composition and size of product, and also the ability to recycle the molding sand. The green sand-casting process is used for most metals and alloys even with high melting temperatures such as iron, copper, and nickel. By understanding the modern green sand moulding method, we can redesign the process for better manufacturability and modernize the foundry that meet specific requirements. There are a number of different moulding methods that are currently available which help us understand the flexibility in redesigning the moulding process. Each process offers distinct advantages and benefits when matched with the proper product application. This paper is to design a high-pressure moulding machine and analyze mould properties which effect casting quality achieved by using the designed machine and compare the results with different moulding methods currently available, using design of experiments.

ME134

A Review on Methods Used To Optimize Abrasive Jet Machining Parameters

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Abstract

This review paper proposed different methods used to optimize Abrasive jet machining parameters for different conditions. These techniques are used to find the best process parameters and Increased quality results. Different input parameters are involved in abrasive jet machining for obtaining output parameters like material removal rate and surface roughness. The removal of material will be done using mixture of high pressurized air and water and by using some chemical substance. The process parameters from Abrasive jet machining are optimized using Taguchi approach, Analysis of variance (ANOVA), Response surface method for good surface finish and material removal rate.

ME135

Comparative Study on Mechanical Behaviour of Clay Brick and Fly Ash Brick in Masonry Prism

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Abstract

The fly ash is the most unused material from the thermal power plants which is dumped in the yard. This fly ash has the high pozzolanic property so it can be used as a replacement for binding material in construction industry. In this study a high volume of type F fly ash is replaced with cement for 50% in preparing the mortars. The fly ash is used in raw type and also pulverized to micro sized particles for its better efficiency. By varying the water cement ratio with and without using of super plasticizer the mechanical properties are studied in detail by the compressive strength test. The optimized mortar is FFFA which is prepared by using the water cement ratio as 0.4 + 1% of SP. The characterization study for the optimized mortars have been studied to confirm the findings of this study. The brick prism is constructed as a triplet model and the mortar is placed over the shorter span of the brick to minimize the usage of mortar and bricks. This study helps in economical way of building the masonry walls by saving the mortar and bricks.

ME136

Influence of Grinding Process Parameters on Surface Roughness and Grinding Forces Of Aluminium Composite: A Review

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Abstract

This paper targets breaking down different pounding qualities of Al/Graphite/SiC composites created by mix throwing. Allure work-based methodology is utilized wherein the procedure parameters like wheel speed, work piece speed, feed rate and profundity of slice were differed to acquire ideal distracting granulating power and crushing temperature. Tests were directed on a round and hollow crushing machine utilizing Box-Behnken Design (BBD). Analyses were completed utilizing Al_2O_3 pounding wheel of breadth 350 mm. Observational models was created for the pounding procedure parameters of Al/Graphite/SiC composites for anticipating the ideal extraneous crushing power and granulating temperature. The outcomes demonstrated that high wheel speed, medium work piece speed, low feed rate and low profundity of slice are important to limit the digressive pounding power, surface harshness and granulating temperature for crushing of Al/Graphite/SiC composites.

ME137

Fabrication and Characterization of Magnesium Metal Composite by Stir Casting

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Abstract

In Automotive and Aerospace industries, the demand for lighter materials is increasing exponentially. The main advantage of Magnesium Metal Matrix Composites over Aluminium Metal Matrix Composites, there is an additional 15-20% weight saving without having to compromise on properties. Metal matrix composites reinforced with Boron carbide and molybdenum disulphide have significant advantage over conventional materials. Generally, these reinforcements are used to improve the hardness and tensile strength of metal matric composite. In this project, we have performed three castings each on magnesium alloy and composites with reinforcements of 2.5% Boron Carbide, 5% Boron Carbide and 2.5% Boron Carbide & 2.5% Molybdenum Disulphide by stir casting method. Mechanical test like Rockwell hardness were conducted to find hardness of the specimen. The Microstructure was observed through an Optical Microscope. The comparative study of these samples with and without reinforcement were carried out and analyzed. The results showed that there is an appreciable increase in mechanical and metallurgical properties of new magnesium novel composite material used in this investigation.

ME138

Experimental Investigation on Magnesium Composite Surface Property and Process Parameters on WEDM Machine: A Review

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Abstract

Wire electrical discharge machining (WEDM) is an important technology that deals with very high speed cutting performance characteristics and precision machining process to achieve efficiency and increased accuracy in the manufacture of stamping dies, prototype components, etc. Wire electrical discharge machine (WEDM) is a non-conventional spark erosion device for cutting rough and conductive material using a wire electrode. This paper shows the reviews about the Mg composite combined with other suitable composite prepared using stir casting setup and optimize the process parameters performance. There are some important process parameters in this machining process such as servo voltage ,peak current(IP),pulse on time(TON),pulse off time(TOFF),wire tension, wire speed to improve the different machining parameters such as material removal rate(MRR),surface roughness, kerf width. By using different optimization techniques such as taguchi technique ,response surface methodology. This paper gives the acceptable process parameters and its effect on different performance measures under different tool electrode conditions and machining of different materials.

ME139

An Experimental Study on the Effect of Magnetized Water on Mechanical Properties of Concrete

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Abstract

This study involves the examination of the effect of magnetized water on the workability and mechanical properties of the concrete. The water is magnetized in static treatment process with two different strengths of magnets with 0.986 and 2 Teslas. When the magnetized water is used in concrete on replacing ordinary water, it results to increase the workability and mechanical properties of the concrete. The compressive strength, split tensile and flexure strength tests were carried using 24hour magnetized water in production of concrete. Concrete made with magnetized water possess higher strength then concrete made with ordinary water. It is beneficial to use magnetized water to prepare concrete.

ME140

Multi-response optimization of cutting parameters for hole quality in drilling of Alsi7cu4

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Abstract

Reportedly, the drill geometry and treatment influence the drilling operation and its performance. In fact, the performance of the drill bit is strongly associated with its productivity, thus with the economy of production. Moreover, the typical performance indicators, i.e. deviation from diameter, cylindricity, burr size, surface roughness are altered by drill geometry. This fact that stress needed for a novel design of drills with further optimization of performance indicators of hole quality. In that perspective, herein, new drill geometries were designed and fabricated. Various Drilling trials were directed utilizing the L9 orthogonal array on CNC Milling machine. Various treatment processes like heat treatment, cryogenic or untreated (just as received) were carried out. Various tool nomenclature involving changing of helix angle were considered. The investigations were performed on AlSi7Cu4 alloy cutting tool of an ISO 460.1-1140-034A0-XM GC3 of 12 mm diameter with cutting point 140 degrees, utilized all through the trial work under dry cutting conditions. Afterward, those drills were employed to create holes on Alsi7Cu4, and their performances were investigated and optimized to suggest cutting parameters of best interest. To measure the performance of the drills, the quality of the drilled holes was studied in terms of the deviation from diameter, cylindricity, burr size, surface roughness the parameter optimization and percentage of contribution were carried out by VIKOR and ANOVA. As such, geometry 4 was developed by considering these negativities, and it was found to demonstrate superior performance compared to other geometries in terms of hole quality.

ME141

Effect of Current on TIG Welding of Hastelloy C-276

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Abstract

In this work, an attempt is made to study the effect of welding current on mechanical and metallurgical properties of Tungsten Inert Gas (TIG) welded Hastelloy C-276 sheets. Hastelloy C-276 sheets of thickness 1.6mm was used throughout this study. Three butt joints were made by varying the values of welding current in the steps of 1 Ampere. The weld quality was assessed by measuring bead geometry, tensile strength and microhardness. From the experimental results, it was found that the hardness proportionally varied with the change in welding current whereas tensile strength first increased and then decreased with increase in welding current. The weld property variation is discussed with the aid of microstructures taken from Scanning Electron Microscope (SEM), Energy Dispersion Spectroscopy (EDS) and X-ray Diffractometer (XRD).

ME142

Elevated Temperature Mechanical Properties of Rotating Arc Welded Reduced Activation Ferritic/ Martensitic (EUROFER97 RAFM) Steels

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Abstract

Reduced activation ferritic/ martensitic (RAFM) steels are often used as a structural material and as test blanket modules (TBM's) for fusion reactors. Its resistance towards hydrogen embrittlement is better in comparison with other steels and is an effective alternate in contrast with austenitic steels due to a higher swell resistance, thus, making it an interesting candidate. These are then welded together using Rotating arc welding. It is a Gas Metal Arc Welding (GMAW) process where the molten droplets are transferred to the weld pool and this enhanced by the rotary motion of the filler wire at a controlled speed and diameter. The centrifugal force detaches the small droplets from the welding wire and directs them at an angle into the sidewalls of the weld joint thus resulting in a consistent penetration and bead profile. Further, to reduce time and cost, preheating of parent metal is eliminated. To analyse the weld and test its soundness various tests have been implemented including Vickers hardness test, Microstructure analysis, Radiography, SEM, TEM, XRD, Tensile creep test and a phase field model.

ME143

Effect of Stone-Thrower-Walls Defect on Mechanical Properties of Bi-layer Graphene - A Molecular Dynamics Study

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Abstract

In this article the mechanical properties, response and failure behaviour graphene were studied using molecular dynamics (MD) simulation. Large scale molecular dynamics simulation was carried out using LAMMPS software which were visualized using OVITO. This article mainly focuses on analysis of the effects of topological defects like Stone Thrower Wales defect on the mechanical properties of bilayer graphene. The effect of STW defects on crack propagation and restriction of crack propagation were analysed using series of simulations at several distances from the crack tip. The results obtained are plotted to visualize the failure characteristics and the maximum stress that the material can withstand before undergoing fracture. These data were then compared with existing data which is experimentally obtained to validate the molecular dynamics model.

ME144

Fuzzy logic algorithm based optimization of Thermal Conductivity and behavior of Al-Si_3N_4 Nano and Al-Gr-Si_3N_4 Hybrid composite

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Abstract

The thermal behaviour of gravity die stir casted LM6 alloy with Graphite and silicon nitride nano particle is investigated in this study. Al-Gr-Si_3N_4 hybrid composite, Al-Si_3N_4 nano composite and Al-Gr nano composite were fabricated to investigate the thermal conductivity, specific heat, diffusivity and heat transfer rate. The density and porosity of the casted composites were found to check the soundness of the casted composites. The porosity is around 5% for both the nano and hybrid composite. The thermal conductivity of the nano composite is approximately 12% higher than hybrid composite. Heat transfer of all the composite increases with increase in power input. The application of the fuzzy logic analysis coupled with experimental methods to optimize the precision and accuracy of the Al-Gr-Si_3N_4 hybrid composite thermal conductivity and heat transfer rate. The developed fuzzy logic model can be used to evaluate the thermal conductivity produced by Al-Gr-Si_3N_4 hybrid composite and also with low prediction errors.

ME145

Autonomous Stair case climbing robot for Rescue Application

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Abstract

This paper discusses the construction and application of an autonomous staircase climbing robot. Such a robot has several applications in real life. It can be used in dangerous regions for surveillance, rescue and exploration with the help of a camera placed on it or by carrying resources. After going through various research papers a concept of such a robot was visioned. Following which a design was formulated and simulations were carried out. A prototype was fabricated with mechanical and electrical parts. It is a simple climbing robot with two rods as support at the front. A simple rack and pinion gear is used to lift the robot while climbing. An ultrasonic sensor is placed at the front to sense the width and height of the stairs. Various testing and analysis have been done on the prototype to eliminate all drawbacks. The robot has shown to successfully climb the stairs.

ME146

Combined drilling and reaming operations by using Robot and CNC

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Abstract

The drilling and reaming operation are two separate machining processes. In our project drilling and reaming operation are combined by using combined drilling and reaming bit. The industrial robot with agile motion is possible to machine a component. The Industrial robots with high precision and six Degree of freedom are considered as better, for manufacturing processes. This work is to significantly improve performance of robot drilling over conventional drilling. The manipulator used is ABB - IRB1410 with work volume of 2.6 meters, handling capacity of 5Kg and controlled by IRC5 Controller. Drilling machine utilized is specified with maximum speed of 2800 RPM and power of 600W. The speed of the drilling machine can be varied by using voltage regulator. Speed and feed are the two parameter that are varied and accuracy, roundness, surface finish are the parameter checked for. The drilling operation is also done in CNC machine. The parameters such as surface finish, accuracy, roundness are checked. Finally, comparisons between robot operation and CNC operation are checked.

MS001

Comparison of lamellar nanostructured cubical and spherical Statistical volume elements in terms of crystallographic texture and Deformation behaviour

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Abstract

This study presents the numerical homogenization of spherical and cubical statistical volume element (SVE). Numerical homogenization with periodic boundary conditions for spherical and cubical SVEs has been employed. The lamellar structure of eutectic Copper (Cu)-Silver (Ag) has been focused for the investigation of deformation behavior and texture evolution [1, 2]. The initial texture for cold-drawn eutectic Cu-Ag composite has been approximated by a set of 200 discrete orientations. The comparison of deformation behaviour and the crystallographic texture has been investigated for two dierent SVEs. It is demonstrated that the SVEs with cubical shape induce anisotropy when compared with the spherical SVEs. The numerical results for cubical and spherical SVEs in terms of deformation behaviour and crystallographic texture are in good agreement with the experimental observations.

MS002

Effect of fibre alignment on mechanical properties of natural fibre reinforced polymer composites

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Abstract

The effect of alignment of natural fabrics on the mechanical behavior of flax and jute fibre / epoxy composites was investigated in the present work. The epoxy composites were prepared using the compression moulding technique. To explore the variation in composite laminate properties, three composite laminates were prepared based on the fibre-orientation angle. The composite laminates produced having undergone mechanical characterization such as tensile, flexural and water absorption analysis. The test specimens were prepared to carry out the mechanical testing according to ASTM requirements. The findings of the density test showed that L2 composite laminate had maximum density and L3 composite laminate had minimum density. The results of the mechanical test indicated the highest tensile strength for L1 and L3 composite laminates and L2 composite laminate showed the maximum flexural strength. L1 composite laminate reported maximum water absorption percentage, and L2 composite laminate showed minimum water absorption percentage.

MS003

Comparison studies on mechanical and wear behavior of Stir Cast Al-SiC-B_4C Metal Matrix Composites

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Abstract

This paper studies the surface tribology and mechanical properties of AA6061 graded aluminum alloy matrix composite, reinforcing Silicon Carbide and Boron Carbide. In this work, the AA6061 graded aluminum alloy is reinforced with 3%, 6%, 9% (By weight) of B4C with constant 5% (By weight) of SiC under stir casting and producing three test samples A, B and C respectively. These Samples are subjected to Wear test, Tensile test, Impact test and Hardness test, calculating wear loss, wear rate, coefficient of friction, ultimate tensile strength, impact strength and Brinell hardness. From analyzing the results from the test conducted, it is inferred that maintaining the optimum B4C composition between 3% and 6% in Al-SiC produces better mechanical properties and wear resistance.

MS004

Thermal and micro-structural analysis of geopolymer paste synthesised from Fly ash, GGBS of variable blend ratio

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Abstract

This paper presents the thermal behaviour of Fly ash, GGBS and Fly ash-GGBS based geopolymer in order to evaluate their suitability for high temperature applications. Geopolymer is synthesized from Fly ash,GGBS at blending ratio of FA/GGBS: 100/0 (2:0),50/50(1:1), 0/100(0:2) activated by hybrid alkali silicate solution ($NaOH+Na_2SiO_3$) of Modulus (Ms: SiO_2/Na_2O):1.1 cured at ambient/slightly elevated temperature (80^0C). Thermal properties of these matrixes are analyzed by exposing it to 800^0C followed by mechanical strength test and the matrixes thermal stability studied by TGA/DTA analysis till 800^0C. It is observed that the residual strength decreases as the GGBS content increases in the matrixes. The microstructural changes observed on the matrixes exposed to elevated temperature up to 800^0C are investigated using MAS NMR spectroscopy probing ^{29}Si, ^{27}Al nuclei, X-Ray Photoelectron Spectroscopy and FESEM analysis. The major reaction products found in each of the matrixes are N-A-S-H (100/0),C-A-S-H(0/100) and (N,C)-A-S-H(50/50) gel and a major shift (60ppm) in the ^{27}Al MAS NMR is observed. A disordered structure along with the formation of new phases like sodalite, wollastonite, and nephline was observed on the matrixes exposed to 800^0C. This study will be useful for the development of new fire resistant material for construction application.

MS005

Analytical and Experimental Investigation of Basalt Fibre Reinforced Concrete Shot-Put Ball

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Abstract

Concrete technology and its advancements have let to creation of various eccentric entities, from cocn-wood to concrete canoes, baseball bats to skateboards and what not. On the same line one competition induced the idea of making a shotput ball out of concrete. The shotput ball was fabricated using various composite materials as it required high impact strength for which high performance fibre reinforced concrete (HPFRC) containing up to 1% volume fraction of chopped Basalt fibres was incorporated in the mix, the mix was designed such that proper workability is attained so that it can be moulded in the required shape of a standard shotput ball, the mould being made using a 3D printer. This paper presents the mechanical properties of the high impact resistant material used to fabricate the ball also In this study, the compressive, Impact and splitting tensile strength were studied after introducing chopped basalt fibres in comparison to plain concrete using the CTM and ITM, the cubes casted with basalt fibre reinforcement on compression testing resulted to be of M60 Grade as compared to M40 grade of the non-reinforced mix. The split tensile strength of basalt fibre reinforced concrete was increase by 24.10%, the impact strength was also increased by number of blows when compared to Plain Concrete mix (Non- reinforced). To attain the targeted strength of 65+ N/mm2 Cementous material replacement was done and 14% OPC was replaced by silica fume and additionally 1% superplasticizer was used to attain the required strength and provide proper workability at a low Water: Cement ratio of 0.3. The dimensions of the fabricated ball are in agreement with international standards with a mean diameter 110 millimetres. The structure of the ball was analysed by the method of FEA and the results were as desired, and the experimental results were comparable to the analytical results which have been discussed in the paper in detail.

MS006

Asymmetrical Light Weight Concrete Canoe For Racing

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Abstract

This paper examines the properties of the lightweight, stable canoe. The canoe is slim, open-boat, decreasing to a point at both ends, propelled by paddles or some of the time sails and generally shaped of light system. Hull design for the canoe was finished with the assistance of Max surf software and then pursued by stability and strength analysis. The compressive strength required for the canoe was determined. This Paper presents the low-density lightweight concrete nominal cementitious mix consists of namely cement, silica fume, fly ash (class c) and metkaolin of required strength was determined and the carbon fibre reinforcement of required strength is used to carry tensile strength. The wooden male mould was explicitly designed then with the help of clay to get the appropriate shape. Finally, the light weight cementitious mix is applied over the mould and cured with water for 28 days. Then the canoe is demoulded and tested for stability. The result shows that concrete canoe is economical, sustainable and easy to retrofit while compared with the conventional canoe. The work presented here as profound implications for future studies about light weight concrete and concrete canoes.

MS007

Lightweight Honeycomb core sandwich with hybrid Carbon-Glass fiber Composite skin for vehicle body application

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Abstract

Lightweight design and electrified power train have become important strategies in the automotive industry to reduce fuel demand and break down emission respectively. Light weighting vehicles with improved mechanical properties is consider a step forward because advantages of both EVs and lightweight design could be combined to reduce environmental impacts even further. Composite material which have high strength to weight ratio are the best choice for designing and manufacturing the lightweight structures. The carbon fiber reinforced plastic (CFRP) composite is relatively high cost in manufacturing process but has high mechanical properties compared to glass fiber reinforced plastic (GFRP). Thus in order to achieve both low cost compared to CFRP and high mechanical properties, hybrid composite is used combining both carbon/glass thus reducing cost and enhancing mechanical properties like tensile strength and tensile modulus better than GFRP. Sandwiching the Polypropylene, Aluminium, Nomex and Balsa core with hybrid carbon/glass fiber composite were investigated. Sandwich core is used to absorb shocks during low speed collision, increase mechanical strength and stiffness. Experimentally, hybrid carbon/glass composite was made in order to get higher mechanical properties. As a result increasing carbon fiber fraction % volume tensile strength and flexural strength of composite are increased. The good cost-effectiveness of honeycomb core with hybrid carbon-glass fiber skin has the potential to be used as a lightweight alternative material in body electric vehicle fabrication.

MS008

Simulation of High Velocity Impact Test on GFRP

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Abstract

The fundamental requirement in different applications of composites is resistance to high velocity impact loading. The present study is about simulating and investigating high velocity impact tests on E-glass/epoxy composite. The modelling of the composite plate and the projectile is done using Ansys Composite Prepost. The material used for the projectile is mild steel. The impact tests are carried out using gas gun method where a compressed gas gun bullet is used to penetrate the target. Then the impact tests are simulated in Ansys Explicit Dynamics with hemispherical projectile nose configurations. Additional simulations were carried out using conical and cylindrical nose configurations also. The ballistic limit of the composite is also obtained in each of these cases. Different aspects of the impact mechanism such as formation of cone on the back face of the target, distribution of stress on both the faces were investigated. These results were then compared with experimental observations. The impact tests were carried out using gas gun method where a compressed gas gun bullet is used to penetrate the target. It is concluded that the simulated results had a good agreement with the experiments.

MS009

An Experimental Study on Reinforcement of AL6061 Embeded with Bamboo fly ash in Metal Matrix Composites

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Abstract

In this paper, the main aim is to develop the Al 6061 alloy with bamboo fly incorporated and the addition of silicon carbide to produce the metal matrix composite and to improve the mechanical and corrosion characteristics of the developed composite such as hardness, tensile strength, impact value and wear behaviour analysis, First of all, 1.3kg of commercially available aluminium 6061 alloy is melted in a heat furnace and for this the temperature is maintained at 1000 C. At the same time, bamboo leaf ash (3%,6%,9%) and silicon carbide (5%) are heated at 500 C for about 2 hrs in the box furnace. After 2 hours, aluminium is then melted completely and now the pre-heated SiC and the bamboo leaf ash is added and continuous stirring is done for about 10 mins. Then the residue that is present at the top is removed. In this analysis we have used dies in the shape of rod which is 110mm in length and 20mm in diameter. The specimen is then allowed to cool down for some time. The specimens are then marked with a marker to differentiate between the different compositions. It was observed that for the tensile test and the wear behaviour analysis, the specimen 9% sample was found out to be the optimum one. The composition with 9 % BLA as reinforcement in the aluminium alloy 6061 is the most suitable one for all the mechanical properties such as hardness, tensile, impact and wear behaviour analysis.

MS010

Design of Age-hardenable Aluminium Alloys using ANFIS and GA

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Abstract

Age-hardenable aluminium alloys have higher strength compared non-heat-treatable alloys due to strengthening by the precipitates. Increasing the toughness of such alloys require improved balance between strength and ductility. In order to improve both strength and ductility through modification of composition and heat-treatment parameters of age-hardenable aluminium alloys (2XXX, 6XXX and 7XXX) an artificial intelligence based computational design approach is employed. Published data on all three alloy groups are used for developing the data-driven models for yield strength, ultimate tensile strength and %elongation. Fuzzy C means clustering is used to cluster the variables in the database into different levels and to generate fuzzy rule correlating those variables. Adaptive neuro-fuzzy inference system (ANFIS) used the fuzzy rules to develop the data-driven fuzzy predictive models for the mechanical properties of AL alloys. This model in turn played the role of objective functions for the multi-objective optimization using genetic algorithm (GA) for handling the conflicting objectives of increasing strength as well as ductility to design alloys. The Pareto solutions generated from the optimization are analyzed for finding suitable composition and process parameters fulfilling the purpose.

MS011

Experimental Study on Behaviour of Nano Material Concrete Column

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Abstract

Concrete is the most significant building material, without a close alternative, due to this there have been major advancement in concrete technology and the need to reinforcing has been made essential. It has been observed that cement-based material, on the addition of nano particles; develop distinctive properties at the molecular and nano level; in an experimental investigation made on square RC columns and nano concrete columns under axial loads. A total of 12 columns in which 6 numbers of RCC and 6 nos of nano concrete columns with 750mm height with square cross section (150mmx150mm) were tested. The loads are applied as concentric compressive loading up to failure. In this research, the behavior of nano concrete column is compared with conventional column. The parameters selected are stiffness, failure force and energy absorption, interpretation strength at ultimate state and service load conditions .Further the deflection and ductility behavior were also determined. The experimental studies showed a great improvement on the strength and energy ductility for nano concrete columns when compared with conventional concrete columns. This experimental study presents that nano concrete columns are capable of bearing increased axial load by 25% when compared to conventional concrete columns.

MS012

Rice-husk extracted silica reinforced graphite/aluminium matrix hybrid composite

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Abstract

Silica plays an important role in aluminium alloys. However, role of silica in aluminium matrix composite is not clear so far. In the present study, pure silica was successfully extracted from rice-husk by thermal and chemical treatments. The extracted silica had undergone FESEM, EDS, FTIR and XRD for testing the purity of silica particles. The results showed that the obtained silica particles were highly pure. The rice husk-extracted pure silica was used as reinforcement in graphite/aluminium matrix hybrid composites. Composites were made using powder metallurgy process followed by sintering. Reinforcements of silica and graphite in aluminium matrix composites were done at different compositions and hardness and microstructure were tested. The aluminium matrix hybrid composites had shown excellent physical and mechanical properties in terms of surface strength along with lightweight. The hardness of composite had increased significantly on the addition of reinforcement. Hence, the newly developed husk-extracted pure silica reinforced graphite/aluminium matrix hybrid composites can be used as potential materials for various advanced applications including engine piston, spacecraft, and automobile components.

MS013

Prediction of Corrosion Behaviour of Reinforced Concrete with Manufactured Sand Using Artificial Neural Network

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Abstract

The present study focuses on evaluating the corrosion performance characteristics of steel embedded in concrete, in which Manufactured Sand (M-Sand) is utilized as a fractional and full replacement for natural sand. Corrosion characteristics of steel that is fixed in concrete are analysed by accelerated corrosion test for M40 grade concrete supplanted with 60% manufactured sand for river sand which is found optimum. The modelling of corrosion currents is done using feed forward Artificial Neural Network. The test results exhibits that the durability property of concrete against the effect of corrosion is enhanced, by the partial substitution of 60 % M-Sand. Accurate modelling results for corrosion currents were obtained using Artificial Neural Network (ANN). The test results exhibits that ANN structures produced close prediction current values to that of experimental results.

MS014

Comparison Study on Dry and Wet Sliding Wear Behaviour of Aluminium/Nano Composites

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Abstract

In present study, the dry and wet behaviour of aluminium/ Nano composites are evaluated using pin on disc method under the dry and wet conditions. The Aluminium/ Nano composites were fabricated by ultrasonic cavitation stir casting process. The wet wear test was carried out using lubricating oil. The wear behaviour of Nano composites were evaluated by different loading conditions such as 15N, 30N, 45N and 60N with constant sling speed. The wear surfaces were analysed by scanning electron microscope. The test revealed that wear rate in increased with applied load and also more wear is observed in dry condition when compared with wet condition.

MS015

Experimental investigations on the effect of copper on the microstructure and shape memory characteristics of NiTi alloys

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Abstract

Shape memory alloys are fascinating materials, which have exclusively been studied over the last three decades owing to their distinctive functional properties, such as shape memory effect (thermal memory) and superelasticity (mechanical memory). These materials have a unique capability to react to external stimuli, such as heat and stress, because of the reversible martensitic transformation, when subjected to appropriate thermomechanical processing. They find applications in various sectors and are in particular used as actuators and sensors. Among SMAs, NiTi-based alloys are more common and have proven their utility in many practical applications. However, there is still a scope for improvement of the alloys in terms of their shape memory characteristics if they are to be exploited in several other critical applications. In this context, addition of copper proves to be an appropriate element to enhance the transformation characteristics and biocompatibility of NiTi SMAs. Hence, in this work NiTiCu ternary alloys were synthesized by vacuum induction melting followed by subjecting them to suitable thermomechanical treatment. These alloys were then characterized by X-ray diffraction, differential scanning calorimetry and optical microscopy in order to study the influence of copper addition on phases present, transformation temperatures and microstructure of NiTi SMAs. The results are discussed in detail in the paper.

MS016

Effect of Saw dust, Rice husk, and Groundnut shell on Properties of Mubi Vimtim Clay in Adamawa State Nigeria

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Abstract

Three agricultural wastes namely saw dust, rice husk, and groundnut shell were used as additives to Mubi Vimtim clay to evaluate its properties. The aim of the research work is to compare the properties of Mubi Vimtim clay when additives are added and when additives are not added. PW430 X-Ray was used to determine the chemical properties of the clay with additives and without additives. The results gave the highest % of oxides of Al_2O_3, SiO_2, SO_3, K_2O, CaO, V_2O_5 to be (19.67% with sample B, 67.7% with sample A, 0.40% with sample C, 4.98% with sample A, 1.33% with sample A , 0.04 % with sample A and with sample B, 0.05% with sample C and with sample D) respectively. The highest porosity was found to be 17.50% with 30% sample D addition. Bulk density was highest with 2.87g/cm^3 with clay sample A. The highest refractoriness of the clay was found to be 430^{0}C with sample A and lowest with 950^{0}C at 30% sample D addition. The highest thermal shock resistance was found to be 13 cycle at 10 – 30% sample D addition. The highest breaking load was found to be 380N with sample A. The highest compression strength was found to be 86 Mpa with sample A. The results obtained show the variation of the properties of Mubi Vimtim clay when saw dust, rice husk, and groundnut shell were added.

MS017

Optimization of Laser Parameters and Dimple Geometry for the Improved Tribological Behaviour of Titanium Alloy

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Abstract

Titanium alloys finds wide applications in the field of aerospace and biomedical engineering due to its light weight and corrosive resistance. However, wear resistance of titanium alloys are not satisfactory in the applications demanding sliding contacts. Laser engraving is widely applied to improve the wear resistance of the Titanium alloy surfaces. In this research work wear study using pin on disc experimental setup was carried out using four different patterns on the surface of the titanium pins. Patterns are made using laser engraving machine. The studies were conducted with three different laser beam power and with three different laser beam passes. Further these design parameters were investigated by the analysis of variance to understand their significance in affecting the mass loss of the test specimen. It is observed that the influence of shape of the pattern is highly significant in the design space with a contribution of 71.19%.Laser power and the number of passes of the laser beam were observed to be insignificant. The interaction between shape of the pattern and power of the laser beam is also observed to be significant with a contribution of 11.55%. The R2 value of 92.65% indicates that the model is satisfactorily explain the total variations. From the main effect plot, the combination of hatch pattern, 5W power and single pass of laser beam was found to be the optimal condition for the preparation of test specimen that favor minimum mass loss in the designed space.

MS018

Numerical Frictional Studies on different Composite Materials

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Abstract

Achieving high lifespan of engineering components is a paramount task and its attainment processes are complicated. Basically failure analysis and its reduction techniques play a vital role in high lifespan attainment. Especially failures due to creep, fatigue and frictional heat are severely affect the endurance's performance, which needs to be analysed. This research work compares the frictional effect of various composite materials using numerical coupling tool. The output of this work provides the way to increase the frictional contacted based applications by tackling the shear effect on the contacts. The uniqueness of this work is to numerically analyze the frictional behaviour of composite materials with and without addition of suitable mixtures, in which the focus is primarily targeting the connectional study instead of reduce the connection. ASTM standard provides the design dimensional data to conceptual design of a test specimen which is constructed in ANSYS Design Modeller 16.2. The structured mesh is generated with the help of Ansys mesh tool 16.2. The complete construction of various composites are formed in ANSYS ACP 16.2 in which epoxy resin fixed as matrix for all the cases and various fibers such as Glass, Carbon and Kevlar are used as reinforcement. The comparative analyses are executed by ANSYS Static Structural 16.2 under the primary loading conditions.

MS019

To Analyze Mechanical Characteristics of Aluminium Alloy Reinforced with Nitinol

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Abstract

As we realize that the interest of lightweight materials with best properties in its group are expanding step by step. The light weight material ought to be shoddy and effectively accessible .Aluminum is best light weight material accessible in the market and it is generally utilized in creation of aviation parts, Automobile segments and bio therapeutic apparatuses in view of its non-destructive property. Aluminum is the light metal, likewise third of the thickness of the compounds like steel, cooper and metal. It is likewise a decent in leading the warmth in view of that property it is broadly utilized in vehicle motor parts. So fundamentally in this examination I checked the mechanical properties of aluminum compound strengthened with nitinol. Nitinol is Nickel-Titanium compound which is recently used in automobile sector. It is additionally called shape memory composite since it recover its unique shape on warming over its progress temperature .In this paper we will perceive what will impact of Nitinol when it is blend with aluminum amalgam (grade 6061). In this paper I considered aluminum compound as a base material. In this paper I made four specimen for testing through powder metallurgy according to the ASTM standard. One specimen is of aluminum composite (grade 6061) and other three are of aluminum amalgam fortified with Nitinol (4%, 8% and 12%) and checked the properties with the assistance of SEM testing, surface hardness and surface roughness.

MS020

Evolution of mechanical behavior for animal fiber reinforced hybrid fiber composite for marine Applications

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Abstract

Natural fibers are low cost and environment friendly materials with improved mechanical properties when its together to synthetic material. There is a great interest in the application of natural fibers as substitute for chemical fibers containing potential advantages of weight saving, lower raw material price and ecological advantages of using green resources, renewable and biodegradable. These properties can be enhanced by combining natural fibers in different composition. In this investigation the natural material of goat woolen fiber, hen feather fiber, human hair fiber and synthetic aramid material of Kevlar 29 (K-29) are reinforced with Epoxy resin by hand layup technique and three samples are prepared at various combination. Compression molding method is followed to distribute uniform pressure on sandwiched layers. Tensile strength, flexural strength was performed as per ASTM standard. In addition to this Water Immersion test is also carried out to determine the amount of water absorbed under specified conditions. Bonding layers and structure characterized by Scanning Electron microscope (SEM). The result proved that composite material is enhanced good mechanical properties and very less water absorption. It is used for light weight and for enormous applications in engineering industries. mainly used for lining materials of marine environment.

MS021

Interfacial Performance of Treated Aluminum and Kevlar Fiber on Fibre Metal Laminated Composites

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Abstract

Fibre metal laminates (FMLs) are hybrid composite structures based on thin sheets of metal alloys and plies of fibre reinforced polymeric materials. The fibre/metal composite technology combines the advantages of metallic materials and fibre reinforced matrix systems. During the past decades, increasing demand in aircraft industry for high-performance, lightweight structures have stimulated a strong trend towards the development of refined models for fibre-metal laminates (FMLs).The aim of paper is to study the interfacial fracture of the fibre metal laminated composites by flexural and double cantilever beam (DCB) test. The optimum layer configuration of FML was determined from flexural strength and DCB test was performed to validate adhesion of pretreated Al with fiber reinforced composites. It was concluded that fracture strength of multilayered FML composites was improved by combination of treated Aramid fiber and pretreated Al.

MS022

Experimental Investigation on Delamination of Carbon/Glass Hybrid Composite Laminates used for Structural Applications

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Abstract

Fibre Reinforced Polymer (FRP) composite materials are having very high strength to weight ratio than the conventional metals. This characteristic behavior of FRP laminates has widened their usage from aerospace to domestic appliances, and new possibilities for their usage emerge almost daily. In many of the possible applications, the laminates need to be drilled for assembly purposes. During drilling of these composite panels, the layers of fibre peel out and get detached from its adjacent layers posing severe threat to the strength of the laminate material and quality of the drilled hole which is referred as delamination. This paper focuses that to reduce the degree of delamination of Glass/Carbon hybrid composite laminates during drilling process. In the present study, L9 orthogonal array was adopted in selecting the number of experiments to obtain the optimum results for three different control parameters of drilling process such as feed rate, spindle speed and drill bit diameter. Delamination factor of each drilled hole is measured by Digital Image Analysis Method (DIA) and analysed through Analysis of Variance (ANOVA). ANOVA results shows that feed rate and spindle speed have significant effect on delamination than the diameter of the drill bit for drilling of Glass/Carbon hybrid composite laminates.

MS023

Manufacturing and Adhesion Improvement of Sandwich Composites of Maleic Anhydride Modified Polypropylene and Natural Fibre Fabrics Via Trans-Reactions

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Abstract

Sandwich-structured composites were produced from polypropylene (PP) and five different natural fibres fabrics (flax, wool, silk and cotton) and polyester (synthetic fabric for comparison) through compression moulding. Composites of PP/fabric and MAPP/fabric with and without catalyst (antimony trioxide, Sb_2O_3) were produced,and the adhesion improvement was assessed. Here, the novel concept lies in the addition of catalyst improving effective trans-reaction. Mechanical characterisation of the composites assessed the effects of trans-reaction between functional groups such as COOH, NH_2, OH and maleic anhydride. It was noticed that Young's modulus (E,GPa) and tensile strength (σ, MPa) increase significantly with MAPP and further increase with the addition ofSb_2O_3in all the composites. This significant increase in adhesion between fibres and matrix was attributed to trans-reactions generated during composite manufacturing. This was confirmed by Fourier Transform Infrared Spectroscopy (FTIR) which showed the formation of ester groups around 1735-1750 cm^{-1}(wavenumber). Ester's carbonyls absorb at this diagnostic area due to a stretching vibration that is different from carbonyls derived from trans-reaction from MAPP, fabric, and Sb_2O_3functionalities. Particularly, flax fibre showed the highest improvements in mechanical properties because of its weaving and its active functional groups that were responsible for efficient trans-reaction to take place. Moreover, it could be judicious to do a more precise type of microscopy to observe the bonds between matrix and fibres.

MS024

Development of a novel flow visualisation method to perform parametric Studies on Wet Compression Moulding (WCM) process

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Abstract

The Wet Compression Moulding Process (WCM) is a novel production technique for fibre reinforced polymer components. This technique is increasingly adopted in industry, typically in the automotive sector for medium to large-scale production. This process reduces cost per part significantly by reducing the number of tools and processing steps. To date, the process parameters, their relations and influence on the part quality have been established through the knowledge gained by technologists. The drive of this research is to develop a fundamental understanding of the impact of process parameters (key process timings and cavity thicknesses, mould closing speed, edge clamping frame dimensions) and material properties (fibre reinforcement compaction response, permeability, and wettability together with test fluid viscosity and surface tension) on textile wetting, impregnation, and resulting composite part quality. In this study, 480g /m2 non-crimp unidirectional glass fibre reinforcement has been chosen and characterised for compaction response, in-plane, and through-thickness permeability. For ease of handling, motor oil (DTE heavy VG100) has been characterised and used as a test fluid. Two experimental flow visualisation setups have been developed at the CACM to investigate the influence of process and material parameters on initial resin application and textile wetting, and the subsequent compression flow stage. The lightbox setup has been developed to investigate the influence of test fluid viscosity and surface tension on textile wetting. The second apparatus is mounted within a Universal Testing Machine, enabling monitoring of the fluid flow front, localised fluid pressures and compaction tool force during the resin application, mould closure, and post-filling phases of the WCM process.

MS025

Influence of Stacking Sequence on Mechanical Properties and Wear Characteristics of Epoxy based Flax/Sisal Composite Laminates

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Abstract

Increase in demand for environmental friendly materials for engineering structures makes the natural fiber as best alternative material to synthetic fibers without much compromise in the mechanical properties. In the present investigation, the two natural fibers having different elastic modulus such as Sisal and Flax are preferred to study the effect of stacking sequence on mechanical properties and wear characteristics. The composite laminates for the study were fabricated by hand layup technique using low density epoxy resin. Mechanical properties like tensile strength, flexural strength, hardness and wear characteristics such as wear rate and coefficient of friction were evaluated according to ASTM standards and reported. This study reveals that the hybridization of natural fibers having two different elastic modulus values could be considered as viable solution for augmenting the mechanical properties and wear characteristics of composite structure used in automobile and aircraft applications.

MS026

Porosity dependent Capacitance of the Crust Layer of Vertically Aligned Carbon Nanotubes

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Abstract

Vertically aligned carbon nanotubes (VA-CNTs) have shown high material capacitance owing to their extremely high surface area. This property makes them an ideal candidate material for capacitive applications, such as capacitive sensors. Specifically, their top (crust) layer is characterized by a porous morphology that further enhances the capacitive area and induces an electrostatic fringe field when subjected to a voltage. In this work, we study how the porosity of VA-CNTs determines their electrostatic behavior. We observed that the porous surface of the crust layer generates a significant enhancement of the capacitance comparing to parallel plate capacitors. The rough surface of the crust layer results in amplification of the VA-CNT effective capacitor area, which further increases with the electrostatic gap. Thus, this study emphasizes the importance of the morphological structure of VA-CNTs on their electrostatic behavior and enriches the material library that can be used for capacitive applications in micro- and nano-scale devices. Our investigation has shown that due to the high porosity of VA-CNTs, they demonstrate significant electrostatic fringe field, which stems from the dense CNT formation on the top of the samples. As a result, VA-CNTs can be efficiently used as capacitive sensors, such as proximity sensors. In addition, they can be integrated into micro-electromechanical (MEMS) devices in order to enhance electrostatic actuation forces.

MS027

Thermal Fatigue Cycle Shock Effects on Physical and Structural Properties of H13 Tool Steels before and after Heat Treatments

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Abstract

Any tool that is subjected to repetitive thermal service will undergo degradation in loss of various properties such as, strength, structures, thermal stability, and so on. These natural changes lead to huge premature failures and unexpected break downs during production by causing uneconomical and undesirable situations. Therefore in this present research, the raw, heat treated, and heat treated and nitrided H13 tool steel specimens were subjected to a thermal shock cycle condition similar to a real industrial application using a unique in-house built thermal shock cyclic fatigue (TSCF) testing machine to impose the thermal gradients. All the TSCF tested samples were then characterized by physical and structural tests, including, hardness, (Rockwell, HRC), X-ray diffraction (XRD), and field emission scanning electron microscope (FESEM). The interesting changes in hardness, distorted crystal structure, and crack initiation due to the imposed cyclic thermal gradients by TSCF process up to 2000 thermal shock cycles were found to be different for differently treated H13 tool steel specimens. Therefore, this present investigation specifically would help in predicting the design parameters and to fabricate the proper mould components of various casting products

MS028

Development of natural fiber reinforced hybrid composites and its characterization

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Abstract

An attempt was made in this study to produce natural fiber-reinforced hybrid composite material using hand-layup method. Three different natural fibers were used to strengthen Kevlar/epoxy composites. The test specimens were prepared from the composites to carry out mechanical characterization according to the ASTM standard. Mechanical testing was performed to characterize the composites, namely tensile, flexural, impact and double shear. The results showed that Kevlar/epoxy hybrid composite has been reinforced by Aloevera and palm with superior mechanical properties relative to other hybrid composites. The tensile strength, flexural strength and load bearing capacity were increased by 50%, 14% and 54% respectively. To analyze the fracture surface of the tested samples, Scanning Electron Microscope was used. Fiber breakage and matrix cracking were the dominant failure mechanism of composites in tensile testing. Matrix cracking and delamination have been the dominant failure mechanism in impact testing.

MS029

Experimental and Numerical Studies on the Mechanical Characterization of EPDM/S-SBR Nano Clay Composites

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Abstract

The present work is to investigate the effect of Nano clay loading on the blends of Ethylene-Propylene-Diene Monomer (EPDM)/Silica-Styrene-Butadiene-Rubber(S-SBR) nanocomposites through experimental and Finite Element analysis (FEA) studies. The nanocomposite specimens were prepared according to ASTM standard using open-mill mixer processing. The physical and mechanical properties of EPDM/S-SBR nanocomposites were determined by measuring the tensile and tear properties, swelling properties, compression set, hardness and abrasion resistance properties. In the tensile tests for tensile strengthening evaluation, the tensile properties of EPDM/S-SBR nanocomposite specimens have been measured at different temperatures using universal testing machine. From the hardness test, EPDM/S-SBR nanocomposites appears to be a good material for high temperature applications than polymer/clay nanocomposites. As per standards of ASTM D-395 and ASTM D-471, compression set and swelling test specimens were prepared for determining the mechanical properties. Hardness, compression set and swelling resistance of nanocomposites increased due to increasing content of Nano clay as well as rebound resilience decreased. The failure modes of fractured surface are observed using Scanning Electron Microscopy (SEM) for EPDM/ S-SBR nanocomposite specimens. From the FEA results, the use of EPDM/S-SBR nanocomposite specimens provide better results for Von Mises stresses which are much higher than EPDM/ nano-silica composite specimens.

MS030

Failure Analysis of Connecting Rods and Engine Blocks of Small Generators

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Abstract

Three small generators were selected for conducting the failure analyses. The generators tagged FG1(2.7kVA, SG2700), FG2(2.7kVA, TG2700, TIGER) and FG3(2.5kVA ELEPAQ, EC2500CXS) were first dismantled and the components inspected for physical examination. In all the three generators the Connecting Rods were found to have broken into pieces. Two of the engine blocks were pierced by the broken connecting rods. Chemical analysis tests were made on the Connecting Rods and Engine Blocks using XRFNiton analyzer. The tests revealed that all the components were made from Aluminum alloys. The Copper contents for the Connecting Rods were found to be from 1.77% to 2.37% which were below 4.0% minimum requirement for Connecting Rods and other components of high performance engines based on Aluminum Association (AA) and British Standard (BS) specifications. The Connecting Rods also contained up to 2.01% Iron but none of the Connecting Rods had Magnesium which is an important element for increasing strength of Aluminum alloys. The high content of iron coupled with lack of Magnesium resulted in low strength and increased hardness, making the Connecting Rods brittle and highly susceptible to fatigue failure. Hardness tests conducted on the Connecting Rods using Rockwell Hardness Testing machine gave 160,151 and 175 BHN which were much higher than maximum of 105 BHN for AA and BS specifications. Similarly, the hardness values of the Engine Blocks were found to be 128,160 and 140BHN respectively. The corresponding tensile strengths of the Engine Blocks were 167,149 and 152MPa which were lower than the minimum AA and BS specification of 170MPa.The results concluded that the Connecting Rods of the three generators failed due to excessive brittleness.

MS031

Tribo-Effectiveness of co-equal concentration of hard ceramic and solid lubricant in the Aluminium matrix

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Abstract

Tribological applications of aluminum metal matrix composites are constantly endeavored due to formation transition layer between sliding surfaces. This greatly reduces friction and wear of components like automotive engine piston and brakes. Aluminum matrix was reinforced with equal amount of concentrations of boron carbide hard ceramic particle and graphite solid lubricant. In order to analysis its concentration potential towards tribo layer quality, the wear test was carried out using pin-on-disk apparatus with parameters like load (10,20,30,40,50N) and sliding speed of (0.7, 1.4, 2.1m/s) under a dry sliding condition. The behaviors of tribo composite with equal sharing concentrations of boron carbide and graphite (5%, 10%, and 15%) were unique rather than monotonically increase reinforced composites. The surfaces of worn after wear test were analyzed by SEM. Experimental results revealed that the wear rate of 5% equal concentration composite decreases with increasing in load. The wear of the 10% concentration composite was decreases almost 2 times of 5% composite. Similarly the wear of 15% composite decreases with one times of that 10% composite. However coefficient of friction (COF) of 10% composite decreases one times when compared to 5% composite whereas COF of 15% composite was 2 times less than the 10% composite.

MS032

Study of electronic structure and magnetic properties of substituted T graphene using first principles formalism

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Abstract

Carbon is a fundamental element of the periodic table which can exist in different forms like graphite (3D), graphene (2D) or carbon nanotube (1D). Among these classes of carbon compounds, the Planar T Graphene is a 2D stable tetra ring arrangement of carbon atoms. It has one sub lattice per unit cell. Planer T graphene has no linear dispersion like normal grapheme. The band structure of planar T graphene is like metal but buckled T graphene is a semimetal with zero band gap. This buckled T graphene band structure has a crossing point near Fermi surface and it shows linear dispersion at π and π ж bands. It is the host of Dirac fermion i.e., T graphene can also sustain the Dirac electrons under a certain pressure without hexagonal symmetry [1]. Introduction of the defect in 2D planar T graphene is important for modifying the electronic structure, band structure, and magnetic properties, transport properties like any other condensed matter systems. Substitution and adatom introduction on planar T grapheme sheet can influence the non-magnetic properties of carbons with a different type of hybridization. Using density functional theory (DFT), one can address the problem with substitution and doping of different kind of elements from the periodic table. In our work, we are trying to see how the electronic and magnetic properties change or varying with substitution of elements in T graphene sheet.

MS033

Understanding the Tribological Properties of Non-Ferrous Ductile Materials Using Pin on Disc

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Abstract

This paper investigates the tribological properties of ductile materials (Aluminium, Copper, Brass) using a pin on disc tribometer. A normal load of 10 N was applied and the disc (EN31) was rotated at 300 rpm. The roughness of the pin was in the range of 0.2-0.4 µm. It was observed that coefficient of friction in case of copper (0.217) was less than aluminum (0.426) and brass (0.529). In order to understand the wear mechanism, the disc was analyzed using Raman spectrograph and scanning electron microscope which indicated the formation of transfer layers.

MS034

Review of Research and Development in Application of Self Healing in Fiber Reinforced Polymer Composite Laminates

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Abstract

The paper aims at reviewing the developments in Fiber Reinforced Polymer Composite Laminates by application of self-healing technology. A good amount of work has been done in the world of self-healing but most of it has been done on bulk polymers and only few researchers focused on implementing it in fiber reinforced polymer composites. This paper concentrates on reviewing the current state of self repairing technology application in fiber reinforced polymer composites. It briefly covers the various techniques of achieving self healing and challenges in their implementation. Both intrinsic and extrinsic techniques are reviewed and discussed with respect to various processing parameters, response of self-healing fiber reinforced polymers laminates to mechanical loads. Suitability of various techniques for different damages is also discussed. This paper provides insight to the researchers and a designer on challenges encountered in implementation of self-healing in fiber reinforced composites and also gives them an idea about its future application in various industrial sectors like aerospace, defense and other machineries.

MS035

Development and Investigation on mechanical properties of NBR/PVC-CB-GNP hybrid nanocomposites

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Abstract

In this present work NBR/PVC conventional composite containing 70phr carbon black (CB) is taken for study. In order to reduce the utilization of CB, new hybrid nanocomposites containing varied content of both CB(40phr -55phr) and graphene nanoplatelets (GNP) (3phr-9phr) were developed by melt-mixing on a two roll mill and their morphology and mechanical properties were tested and compared with conventional composite. FESEM studies evident that the formation of exfoliated structures of GNP and formation of local CB-GNP hybrid filler network which ensures proper and compatible mixing in the composites. It is also found that mechanical properties such as tensile strength, elongation at break, swelling resistance, hardness and compression set increases with increase in GNP content from 3 to 6phr and whereas tensile modulus and tear strength increases with increase in GNP content from 3 to 9phr. Further the developed NBR/PVC hybrid nanocomposites containing 55phr of CB and 3phr of GNP exhibited an improvement of 6.8%, 27.9% +1 shore A and 4.1% in tensile strength, tensile modulus, hardness, swelling resistance in comparison to the conventional composite containing 70phr CB. The better performance of NBR/PVC hybrid nanocomposites can be mainly attributed to high surface area of functionalized nanographene and its enhanced interactions with the NBR/PVC matrix, enhanced CB-GNP interactions, improved dispersion of graphene in the rubber blend due the presence of COOH group on the surface of graphene layers and formation of more cross-links between rubber and fillers with increase in nanofiller content . These newly developed hybrid nanocomposites can be used in automotive sector especially for oil seal applications where low compression set and high solvent resistance are of prime importance.

MS036

A Study on Viscoelastic Characterization of Jute woven mat sandwich composites

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Abstract

Nowadays, the demand for damping material at light weight with environment friendly increases in automotive sector. Due to this opportunity, use of eco friendly fibrous materials gain importance for its use as reinforcement in polymeric matrix composite. In this present investigation, composite was fabricated using compression moulding machine. The jute fibers are added in woven form as layers (2.3.4 and 5) with pure polyester resin. Five types of samples were prepared i.e. Neat Resin(NR), 2 layer(2WJPC),3 layer(3WJPC), 4 layer(4WJPC) and 5 layer(5WJPC) respectively. The viscoelastic behaviour were examined by the Dynamic Mechanical Analysis (DMA) Analyzer . The storage modulus, loss modulus and loss factor (Tan $\boldsymbol{\delta}$) were found from the DMA test. The results exhibit that the DMA test, maximum value of storage modulus of 6.51E+10MPa is attained with the five layer woven mat at 5Hz frequency due to better interface stress transfer between the jute mat and polyester resin matrix and higher degree of stress transfer and at higher frequency and the Lowest damping ratio was obtained for 5 layer woven jute polyester composite (5WJPC) at all frequencies and the glass transmission temperature is 80 ^{o}C at 5 Hz. The comparision between experimental and theoretical analysis was carried out and found closely related with each other. From above results it is found that the woven jute mat sandwich composite can be used as a vibration absorbing material for low cost structure.

MS037

Investigating Suitability of Using Natural Fibre Based Composite As An Alternative For Asbestos Clutch Facing Material In Single Plate Dry Friction Clutch of Automobiles By Comparing Mechanical Properties

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Abstract

The aim of this paper is to study the suitability of natural fiber based composite as a clutch facing material in automobiles. The clutch which is an important component of automobile has advanced technologically over the period of time. At the same time it has impacted environment because of its non-biodegradable facing material. Asbestos has been replaced by the materials like Kevlar, Ceramic, Feramic and Feram Alloy as friction material in single plate dry friction clutch of Original Equipment suppliers of automobiles. They are also not environment friendly. Moreover asbestos clutch facing is being sold in spare parts market and still used for reconditioning of old clutch plates. So there is an urgent requirement to find a new environment friendly and non-hazardous dry friction clutch facing material. Therefore this paper investigates the suitability of using Coconut Shell powder/Coir/epoxy resin composite in place of asbestos as clutch facing material by comparing their mechanical properties. While studying the suitability of the above mentioned natural fibre based composite for being used as friction material in dry single plate clutch comparative study of mechanical properties like Resultant Displacement, Tensile strength, Compressive strength, Hardness and flexural strength of the clutch facings made up of Asbestos and Coconut Shell/Coir/epoxy resin composite was made.

MS038

Influence of nano-particles on Thermal and Morphological properties of hemp-glass fibres reinforced hybrid composites

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Abstract

The automobile, construction and packing industries has been showing great interest in incorporating technologically advanced materials with lightweight, eco-friendly, high strength, and stiffness properties in flooring and roofing etc. In addition to the mechanical properties, these materials should have good thermal properties as well. The objective of this work is to analyze the thermal properties and morphological characteristics of sodium hydroxide (NaOH) treated hemp natural fibre (HNF) and eggshell powder as natural nano particles (ESP) reinforced polymer composites. These composites are commonly used to increase thermal properties of structural components and to ensure integrity of structural application in the field of automobile, construction and packing industries. The composites were fabricated with ESP (0%, 7%, 14% and 21%) by hand-lay process and the thermal properties and morphological characteristics of samples were analyzed. The effects of different percentage of egg shell particles and fiber volume on the curing behavior, mechanical, thermomechanical, and thermal properties of the resulted composites were studied through fourier transform infrared (FTIR), differential scanning calorimetry (DSC), dynamic mechanical analyzer (DMA), thermogravimetric analysis (TGA), and scanning electron microscope (SEM).

MS039

Overview and importance of hole expansion ratio

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Abstract

Materials resistance to edge fracture in intricate shape forming is commonly quantified by hole expansion ratio (HER). Hole expansion test is normally used to evaluate HER. To date, the governing factors of HER have not well understood regardless of its importance for automotive part manufacturing with advanced high-strength steels. The recent progress on HER including fundamental deformation aspects, the effect of punch geometries, correlation with tensile properties and influence of microstructure are comprehensively discussed in this current article. This reviewed work explains why HER is currently an important topic of engineering research.

MS040

DSC analysis and reaction kinetics studies of mechanical activated TNM alloy composition powder mixture

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Abstract

In this study, reactions in ball milled TNM alloy composition elemental powder mixture at constant heating rate were studied using DSC analysis. High heating rates of 40, 50, 60 and 70 K/min were used to estimate the activation energy based on DSC data. During heating melting of aluminium at temperature close to its melting point, which was manifested as an endothermic peak in DSC plot. The molten aluminium reacts with titanium results in titanium aluminide formation. Apparent activation energy at different heating rates was calculated using Kissinger equation. A DSC curve comparison was made between non ball milled and ball milled samples. From the results it is observed that ball milling process alters the melting peak of aluminium and reduces the reaction synthesis temperature.

MS041

Influence of TiB_2 Particles on the Hardness and Wear behaviour of Al based Composites Prepared by Halide Metal Reaction

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Abstract

Lightweight high strength metal matrix composites are widely used in applications such as automotive, military and aerospace because of their improved physical, thermal and mechanical properties. In this paper, the synthesis and characterisation of TiB_2/ Al-7Si-0.3Mg composites were examined by optical microscope (OM), X-Ray diffraction (XRD), scanning electronic microscopy (SEM), and energy dispersive spectrometer (EDS).The composites with different amounts (i.e 0, 4, & 9 %)TiB_2 particles were developed by in-situ salt metal reaction of molten Al-7Si-0.3Mg alloy with inorganic salts K_2TiF_6 and KBF_4 at 820±20 ^{o}C. From XRD outcomes, the phases present in the composite were identified and also confirmed the presence of TiB2. The electron microscopy showed the formation and distribution of micron-sized TiB_2 particles mostly along the grain boundary of the alloy matrix. It was also clearly noticed that the structure of TiB2 particles are in hexagonal shape from SEM micro-graphs. The hardness and wear behaviour were studied for composites by using a lab scale-micro Vickers hardness tester and pin-on disk tribometer at room temperature. The hardness was observed to increase with increase of wt.% of TiB_2 particles in the composites .Normal loads of 10-90 N and Sliding distance of 500 – 1000 m were used for determination of friction and wear behaviour.The results of wear test indicated the amount of TiB_2 particles influence on wear rate and mass loss values, while wear rate and mass loss of material increase with applied normal load and sliding distance.

MS042

Experimental Study To Compare Thermal Behaviour And Mechanical Characteristics Of Non – Bio Degradable Epoxy And Bio- Degradable Neem Resin To Find The Possibility Of Replacing Epoxy By Neem Resin In Future Composite Engineering Applications

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Abstract

In the present day context the use of composite materials made up of synthetic resins has become inevitable and unavoidable in all the engineering branches. At the same time most of the synthetic resin based composites used nowadays are not bio-degradable. As a result the search for biodegradable eco-friendly resins particularly natural resins as the replacement for synthetic polymer resins is carried out by researchers in the field of Green Composite Engineering. In green composites both the resin and reinforcing materials are bio degradable and environment friendly. Resin taken from neem tree can be one of such eco-friendly resin to manufacture green composites. So the aim of this paper is to find thermal behaviour and mechanical characteristics of neat Epoxy and neat Neem resins and to assess the possibility of replacing Epoxy by Neem resin in future composite engineering applications. This was done by conducting thermal analyses such as Thermogravimetric (TG) and relative derivative DTG and Differential Scanning Calorimetry (DSC) to study and compare thermal properties of both Epoxy and Neem resins. Also FTIR was conducted on the above mentioned resins to study and compare functional groups and mechanical properties such as bond strength, toughness, rigidity and ductility.

MS043

Fire And Mechanical Characteristics Of Polymeric Composites With Protein Based Flame Retardants

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Abstract

In this research, protein based natural materials have been employed to investigate their effects on fire and mechanical characteristics of polymeric composites. In the first part of the work, keratinous fibres have been chemically modified and used as a flame retardant (FR) material for polypropylene (PP). Owing to the fibres' unique char formation behaviour in combination with phosphorus compounds, the resultant composites obtained improved flame retardancy compared to commercial ammonium polyphosphate (APP)/PP composites. Furthermore, the fibre addition was beneficial for the improved mechanical properties of the composites due to good bonding between FR and PP matrix. The second part deals with casein from bovine milk as a novel green flame retardant. Due to the presence of phosphorus, casein has good char forming ability. A casein based PP composite with 15 wt.% commercial FR (APP) was compression moulded, with the resulting composite successfully demonstrating the self-extinguishment (V-0) in the vertical burn test. Additionally, compared to that of neat PP, its stiffness improved by 26%, The FRs and the modified PP composites have also been characterised by inductively coupled plasma mass spectrometry, infrared spectroscope, scanning electron microscope, thermal analysis, vertical burning test, cone-calorimeter and tensile test.

MS044

Multi-Objective Genetic Algorithm Based Optimization of Age Hardening for AA6063 Alloy

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Abstract

Age-hardenable aluminium (Al) alloys are the most sought-after materials for the structural, automotive, aerospace, and marine industries owing to their attractive combination of physical and mechanical properties. Besides low weight, these alloys possess a range of strengths from 80-700 MPa, which makes them the ideal materials for various applications. The ductility is generally on the lower side for high strength materials; it is rare that the material is both strong and ductile at the same time. To acquire the optimum strength and ductility, age hardenable alloys should be heat treated using the appropriate combination of parameters; this is generally done by following trial and error method which is expensive, time-consuming, and requires a lot of manpower. To curb the mounting costs, researchers have been employing some optimization techniques like artificial neural networks (ANN) as an alternative for materials design. Although Al-Mg-Si alloys are widely used amongst other age-hardenable alloys, reports related to the optimization of their strength and ductility are scanty in the open literature. Therefore, the present article proposes to design the heat treatment schedule for an artificially aged AA6063 Al-Mg-Si alloy to achieve the optimum strength and ductility. For this purpose, a large dataset has been compiled from the experimental results of this study, as well as, results acquired from the open literature. Solutionizing time and temperature, ageing time and temperature, rate of quenching, and storage/pre-ageing time are used as input variables and ultimate tensile strength and total elongation as output variables. Using this data, an ANN model has been developed to find the relationship between the input and output variables which could be used as an objective function for further optimization studies. Accordingly, the genetic algorithm (GA) based multi-objective optimization has been implemented with mutually conflicting objectives. Here, the genetic search is performed following the theory of Pareto-optimality. The generated Pareto-front is analyzed to design the heat treatment schedule. On analyzing the optimum solutions, it has been established that slow cooling after solutionizing, high pre-ageing time and ageing at high temperature lead to the balance between high strength and ductility. The heat treatment schedule designed through these models has been applied to the selected alloy on an experimental basis which shows satisfactory results.

MS045

Thermal stability of acrylic rubber(ACM) composites filled with carbon black/halloysite nanotube hybrid fillers for oil seal applications

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Abstract

In this work conventional composite containing 70phr CB (used in oil seal formulations) and hybrid nanocomposites containing fixed content of 60phr CB and varied content of HNT (2-10phr)were developed by melt- mixing on a two roll mill. These prepared conventional and hybrid nanocomposites were tested for thermal stability using thermogravimetric analysis and oxidation induction time stud hybrid nanocomposites demonstrated higher Oxidation induction time(OIT) values in comparison to conventional composites. Further all the hybrid nanocomposites exhibited higher TGA characteristics (initial decomposition temperature at 10% weight loss (T_{10}),temperature at 50% weight loss (T_{50}), maximum degradation temperature(T_{max}) and% char residue weight at 600°C) than conventional composites. The better thermal stability of the hybrid nanocomposites were attributed to the uniform dispersion of HNT in matrix, presence of intercalated structures and formation of local CB- HNT filler network as divulged by Field Emission Scanning Electron Microscopic studies. The activation energy of the thermal decomposition of the hybrid composites increased with the addition of HNT. Further Dynamic mechanical analysis revealed that replacement of 10phr CB by 6phr HNT in hybrid composites improved the storage modulus by 79% at 30°C

MS046

Wear and corrosion behavior of electroless Ni-P- TiO_2- Al_2O_3 nanocomposite coatings on magnesium AZ91D alloy

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Abstract

In this work, the effect of electroless Ni-P- TiO_2- Al_2O_3 nanocomposite coatings on magnesium AZ91D alloy were investigated. Using Electroless coating, the Nickel phosphorus (Ni-P) were deposited on magnesium alloy with nano titania (TiO_2) and alumina (Al_2O_3) particles. The influence of nanocomposite deposit on surface properties alloy was characterized by an optical microscopy (OM), scanning electron microscopy (SEM), energy dispersive x-ray dispersive (EDS). The findings reveal that the increased microhardness, low friction coefficient high wear resistance at an optimum concentration of nanoparticles. Also, the corrosion rate was analysed by salt spray method showed an increase in the corrosion resistance can be attributed to the deposition of nanoparticles in Ni-P matrix. This increase in microhardness, wear resistance and corrosion resistance is significantly depended on the incorporation of nanoparticles. However, the results showed a converse trend when the concentration of nanoparticles exceeded optimum concentration due to agglomeration

MS047

Hardness and Surface Scratch Resistance of Polymer Composites

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Abstract

The scratch behaviourof the Basalt/Bagasse fiber reinforced Poly (lactic acid) hybrid composite is investigated to understand how the mechanical retaliations of plastics which undergo an induced scratch deformation by a diamond tip under a constant load and linearly increasing normal load. An attempt has been created to gauge the scratch deformations supported visual, optical observations of failure and fracture mechanisms and morphological surface examinations through Scanning microscopy. Elastic deformation dominates underneath high hundreds within the total deformation. The scratch deformations dependent on the type and physical nature of the wt % of the material added. Scratch sub surface erosion damage in polymers is studied using SEM images. It is observed that the parabolic shear is a the main cause of the plastic flow, while viscoelastic nature on the surface and shear induced fracture on the surface of PBaBg I, III & IV composites are the main damage mechanisms found in the fracture scratch pattern.

MS048

Investigations on thermal conductivity of beeswax based composite phase change material

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Abstract

Phase change material (PCM) is a kind of material which can be utilized for thermal energy storage where extra or waste heat is available. Extra heat generation is dangerous for various systems like electronics equipment, Solar panel, Li-ion battery etc. that can reduce the efficiency or damage the systems. So, with the incorporation of PCM one can manage that extra heat. PCM can also store the available solar energy which may be utilized for solar water heating system, solar air heater and solar stills. In the present study, beeswax is using as PCM and expanded graphite is incorporating with beeswax for property enhancer. The fabrications of composite PCM have been done with melt-mixing method. Expanded graphite is significantly utilized for enhancement of thermal conductivity and leakage prevention. Scanning electronic microscope and X-ray diffractometer were used to find out morphological structure and chemical compatibility. The results indicated that the distribution of particle is in proper manner and there is no chemical reaction occurs between the materials. Thermal conductivity analysis showed that as the mass proportion of expanded graphite increases thermal conductivity of the composite increases. Therefore, the fabricated composite PCM can be potentially applied in various systems for thermal energy storage.

MS049

Designing Fe-based high entropy alloy – a machine learning approach

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Abstract

High Entropy Alloys (HEAs) are constituted by at least five elements and can even increase to seven or eight different elements. Due to high entropy of mixing, the solid solutions of so many elements become stable and the tendency to form intermetallic compounds decrease. As a result, it is possible to develop alloys with high strength and high hardness using this approach. Changing the composition of such alloys, the mechanical properties of the alloy can be varied widely. In this work HEAs with high toughness are designed computationally using machine learning and artificial intelligence approaches. With so much potential in this new breed of alloys, we have tried to model iron-based alloys (having high iron content) to reduce the cost of the alloy. Here we have used supervised machine learning technique to map the relation between composition and properties of HEA. Multi-objective optimization is employed to search suitable composition for Fe-based HEA having increased strength and ductility, which will lead to improved toughness of the alloy.

MS050

Modeling of Journal Bearings with Date Seed Oil Blends

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Abstract

There has been a growing concern for the use of mineral oils as lubricants because of the worldwide interest in environmental issues. This has promoted the research and development of using vegetable oil as alternative base oil for fossil fuel lubricants. According to World Energy Outlook 2016 there is a pressing need for renewable energy, since the pollution rate is tremendously increasing. Vegetable oils are environmentally safe and a renewable energy source. From the preliminary studies carried out on date seed oils the viscosity, flash fire point are comparable to the commercially available lubricants SAE 20W40 and this is a good indicator for the development of date seed lubricant. This work presents an empirical relation of viscosity of formulated date seed oil blends. The static performance characteristics of plain journal bearing operated with date seed oil blends are computed.

MS051

The flexural properties of self healing fiber reinforced polymer composites

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Abstract

Fiber reinforced polymer composites composed of advanced fibers like glass and carbon are used in various aerospace structural applications. They are greatly recommended due to less weight, high stiffness and strength. They are preferred for the structural applications because these materials satiate multiple directional loading. They are anisotropic, so their failure is disparate from failure in a metal or an alloy. Due to complexity of damage prediction, their maintenance and repair is difficult and require a lot of time. To avoid these complexities researchers deviated towards implementation of new techniques like self-healing. Amendments in the existing material can modify its properties. So, it is necessary to study the change in property due to inclusion of self healing in fiber reinforced composite materials. This work aims to investigate the self recovery response of composites prepared by reinforcing glass fibers and carbon fibers in epoxy matrix. The healing was achieved by inclusion of dual microcapsules made of epoxy and hardener encased in separate capsules. To investigate the recovery activity of the composite laminate, a 5mm diameter indentation was produced at the centre of specimen and the healing was monitored by measuring the diameter of indentation after 12 hrs and 24 hrs. To notice the influence of micro-inclusions on flexural strength, flexural test was conducted on neat, indented and healed specimens. Results indicated complete healing of both carbon fiber reinforced polymer and glass fiber reinforced polymer composite specimens with healing efficiency of 103.4% and 101.8% respectively.

MS052

Ballistic Impact Analysis of 2d Woven Kevlar/ Basalt Composite

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Abstract

In defense industry, ballistic impact is common scenario occurs often. The materials used for making vests, automobile covering parts, aerospace parts affected due to impact of projectile. These materials should posses' good impact strength and energy absorption for its damage resistance and providing safety for the industry. Usually Aramid fiber Kevlar used for its well-known impact strength. Weaving Kevlar with Basalt tends to improve its property with respect to cost. Thus, it is important to calculate its impact strength and energy absorption factor of reinforced composites. In this thesis, Kevlar is weaved with Basalt for its good resistance and similar tensile property values, impact requires uniform cross section weaving fiber with equal GSM ensures uniform thickness. Three patterns of high tensile strength taken in account namely plain weave, satin weave and twill weave. The ballistic impact test carried out with lead projectile for studying its behavior, impact strength and energy absorption. From the results, it is sufficient to compare and conclude 2D woven Kevlar Basalt composite behavior with impact of projectile that gives the application in defense industry

MS053

Wear Testing Of Polypropylene Termina Chebula Fibers

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Abstract

The natural fibers, termina chebula is one of the most popular fiber used in several applications those varying from common fabrics to composites. In this polypropylenetermina chebula composites were developed and studied for wear behavior at two different applied loads and termina chebula concentrations. Wear tests were conducted using taber abraser or taber abrader apparatus. The composite discs were tested against E100-125 steel disc. The wear test is experimentally investigated for speeds of 500 and 1000 rpm. The specific wear rate of polypropylene reduced on addition of termina chebula powder.

MS054

Study of age hardening process on Al/SiC/Al2O3 hybrid composite

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Abstract

Versatile property of aluminum is most common used metal now days and it has been used in various sectors like automobile, aerospace, civil etc. Mixed with other materials properties like high tensile with high strength to weight ratio, high wear resistance low density and low coefficient of thermal expansion can be obtained. Aluminum with its hybrid like Sic, B4c etc. forms a wear resistance hybrid. Its application is mostly based on the brake drum of the automobile sector. Brake shoe of the brake drum is mostly manufactured of cast iron so therefore a detailed study is done on both the properties of cast iron as well as the Al/SIC/Al2O3 composite. This hybrids are also used in sectors like construction to construct light weight racks, claps etc. The Composition of the manufactured composite was varied and tested to get best fit for brake drum. Various test performed are tensile test, tribology test and scanning electron microscope to analyze properties of hybrid composite. Performance of the manufactured composite was mostly based and evaluated on the basis of wear test as wear resistance is the most effective property that should be possessed by the brake shoe. The method used here for manufacturing the composite is stir casting.

MS055

Experimental Investigation of Magnetic Abrasive Finishing (MAF) of Al 4061

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Abstract

Magnetic abrasive finishing (MAF) is one of the most important final machining processes, and the performances of finishing media play an important role in the finishing effects and efficiency. In this project, a new magnetic finishing media with semi-solid state was presented and prepared, and finishing setup for the outer rotary surface to be developed. In order to determine the optimum angle between N pole and S pole, simulation was performed using ANSYS Maxwell 14.0. MRR as a function of magnetic flux density, mass ratio, rotational speed of magnetic poles and diameter of abrasive particles and ferromagnetic particles. Finishing experiments of main parameters on surface roughness Ra and materials removal ratio MRR were examined. Experimental results indicated that the percentage change % Ra in surface roughness Ra and the material removal amount increased with the increase of the rotational speed, the mesh number of the abrasive particles, and the mass ratio of base polymer, ferromagnetic phase and abrasive phase.

MS056

Influence of core and matrix modifications on the mechanical characteristics of sandwich composites

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Abstract

Sandwich composites are increasingly being used for a variety of applications owing to excellent properties like high bending strength and stiffness, low strength-to-weight ratio and excellent damping and acoustic properties. However, there are certain issues faced while using sandwich structures for structural applications which includes debonding of face sheets from core, matrix cracking and core shear failure. In the current work, an effort is made to improve the resistance to de-bonding of face sheets from core by altering the poly vinyl chloride (PVC) foam core and adding multi-walled carbon nanotubes (MWCNT) to epoxy resin used as the matrix. Four different configurations of sandwich laminates were fabricated using vacuum bagging process: (1) plain core and neat epoxy resin (2) core with blind holes and neat epoxy resin (3) core with blind holes and epoxy resin with MWCNT (4) core with through holes and epoxy resin with MWCNT. Flexural and compression tests were carried out on these sandwich specimens according to American Society for Testing Materials (ASTM) standards. Sandwich specimens with through holes in the core and resin mixed with MWCNT exhibited better mechanical characteristics compared to the other sandwich laminates. Type 4 sandwich specimens were able to withstand 12% and 16% more flexural and compressive loads respectively compared to conventional sandwich specimens

MS057

A Review on Characterization and Applications of Titanium-based Shape Memory Alloys by Molecular Dynamic Simulation

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Abstract

Characterization of Shape memory alloys using simulations like molecular dynamics (MD) approach is a difficult but at the same time it is an effective process. In this article, recent works on MD simulation of titanium-based shape memory alloys which can be used as nano sensors for sensing various properties like temperature, pressure and relative humidity were discussed. The accuracy of MD simulation is based on potentials like modified embedded atom method to study its mechanical behaviour at different temperatures in atomic scale. Also, the force between individual particles of the alloy was calculated to determine the mechanical properties of shape memory alloys depending on the interparticle free space. Hence in this article authors were discussed various types of potentials and its effectiveness to characterize mechanical properties. Also, this article gives an overview of Nickel and Niobium based titanium alloy on various application.

MS058

Mechanical properties of graphene with defects and its application in Nano Composites – An overview

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Abstract

Graphene, monolayers of two dimensional (2D) carbon atoms arranged in a honeycomb lattice structure have distinct properties in the field of materials especially in Nano composites. Grephene is also a potential nano fillers compared to other materials with better mechanical and thermal properties. However synthesis of nano materials in its pristine form is challenging and defects are unavoidable during the synthesis through various techniques. Even though defects such as point and line defects may retard some physical properties, these are also intentionally created in specific applications such as nano composites, nano sensors and others. In this article various mechanical properties of nano fillers such as graphene with defects are compared in the application of composites.

MS059

Study on Solidification Characteristics of di-water based Phase Change Material for Cooling Applications

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Abstract

This study aims to investigate the solidification characteristics of de-ionized water as base PCM with various mass fraction of sodium chloride at 0.5 wt.%,1 wt.%, and 1.5wt.% which is nucleating agent along with 15 wt.% urea as thermoregulation additive and 2wt.% methyl cellulose as thickening agent making it the complete composite PCM. This study is carried out at bath temperature of -7ºC. The problem of super cooling and phase separation was tackled using the composite PCM. The results manifested decrease in the sub-cooling region and enhanced crystallization behavior. The composite PCM is also thermally stable, thus making it more energy efficient in cool thermal energy storage system.

MS060

Vibration Analysis of Nitinol Shape Memory Alloy in Carbon Fibre Reinforced Polymer Composites

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Abstract

Owing to high specific strength and stiffness, composites find wide applications in automobile and aerospace industry. In this paper, effect of embedded shape memory alloy wire (SMA) on the vibration characteristics of composites was studied. Earlier, experimental modal analysis was carried out on the carbon fibre reinforced epoxy composite beams (CFRP beam) embedded with shape memory alloy wire manufactured by hand lay-up process. Increased levels of pre-strain up to 4% on shape memory alloy wire resulted in maximum increment in natural frequency when activated at 75˚C . The experiment also investigates change in modal frequencies in CRPF plates embedded with the SMA wires. The selected pre-strain for experimentation was 4% pre-strain actuated at 75˚C.

MS061

Processing and testing of Aluminium composites with flyash and SiC as hybrid reinforcements

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Abstract

The present work deals with the fabrication and mechanical testing of an aluminum, Silicon Carbide, flyash hybrid composite. The metal matrix selected was aluminum and flyash, Silicon Carbide contents in different percentages were reinforced in it to fabricate the required hybrid metal matrix composite (MMC). Stir casting method was used to fabricate the MMC with (0, 2.5) (2.5, 0) (2.5, 2.5) % weight of flyash and Silicon Carbide contents in aluminum. Tribological analysis of the tribo pairs formed between the smooth surfaces of cast iron disc and smooth MMC pin has been considered and friction force and wear of the MMC were investigated by using a Pin-on-disc setup. Furthermore the morphological study and mechanical properties were evaluated as per ASTM standards. It was observed that the MMC with (2.5, 2.5)% weight of flyash and SiC content in aluminum matrix results in higher hardness value and it is also observed that the hybrid MMC shows very good wear resistant properties and can be used in applications of disc brakes of two wheeler automobiles.

MS062

Reinforcements, Manufacturing Techniques, and respective property changes of Al_2O_3/SiC Based Composites: A review

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Abstract

Researches in Aluminium oxide and Silicon carbide based composite are under full throttle to switch the traditional materials in aeronautical, automotive, defense, transportation, and sports industries. The Alumina-Silicon carbide based materials are having superior properties like high thermal conductivity, wear resistance and low thermal expansion. The reinforcements and processing techniques also plays a vital role in raising the different properties of the Alumina-Silicon carbide. For example, The tensile strength of the Al_2O_3-SiC composite augmented by doping magnesium oxide and the ZrB_2 reinforcement exhibited two different property when manufactured through two different methods namely sintering and hot pressing. In this paper, a close review about various reinforcements, different manufacturing techniques, respective property changes, futuristic scope and applications of Aluminium oxide-Silicon carbide is presented.

MS063

Thermal characterizations of Basalt fiber reinforced Poly (aryl-ether-ketone) Biomedical Composites

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Abstract

This article presents the development and characterization of Poly (Aryl-Ether-Ketone) (PAEK) reinforced with 10wt%, 20wt% and 30wt% of basalt fibers. Hot compressed specimens are subjected to various mechanical and thermal tests. The results of these tests reveals that, Rockwell hardness of the composite with 20 wt% basalt fibers reinforcement has highest B scale value. The hydrophilic nature of the composites is almost the same; there is a significant improvement in water absorption compared to pure PAEK. Differential Scanning Calorimetry curve shows high crystallization temperature and melting enthalpy for 20 wt% of PAEK/Basalt composite compared to other composites. Also the Thermogravimetric Analysis indicates low weight loss with increase in degradation temperature for the same composite. Dynamic Mechanical Analysis curve indicates high storage modulus and less loss modulus compared to 10 and 30 wt% basalt fiber/PAEK composites. Fourier transform infrared wave band indicates peculiar molecular structure of composites. The structures of the composites are analyzed using scanning electron microscope.

MS064

Wear Performance of UHMWPE Reinforced With Basalt Fiber

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Abstract

For total disc replacement (TDR), wear of the Ultra High Molecular Weight Polyethylene (UHMWPE) bearing surface is the common cause for failure and long term assessment. Wear of UHMWPE plays an important role in determining the life span of TDR implants. In order to obtain materials with improved wear resistance and improved mechanical characteristics basalt fibre of 5wt. %, 10 wt. %, 15 wt. % and 20 wt. % is added with UHMWPE. The wear tests were conducted on a pin-on-disk tribometer. The specimens thus prepared were subjected to hardness tests, tensile testing and wear testing. The results indicated that the hardness increased with increasing percentages of basalt fibre content, and the tensile strength of the specimens increased until 15% of additive content and post that it decreased thereafter, Wear tests indicated a decrease in wear with increase in additive content as the coefficient of friction decreased considerably.

MS065

A Comparative Study of Sandwich and Hybrid Sandwich Composites using Jute and Kevlar Natural Fibers

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The use of sandwich composites is increased day by day in the structural applications due to high strength to weight ratio, high environmental resistance with good thermal insulation properties. The Natural fibers like jute and Kevlar are biodegradable and eco-friendly in nature due to which these fibers are considered as an alternative to conventional materials. In this study jute and Kevlar fibers were used as a reinforcement and epoxy resin as a matrix material. The two different layers of composites using jute and Kevlar fibers with epoxy resin are prepared with a size of 300 X 300 X 1mm using hand layup process. The paper board honeycomb structure with a size of 300 X 300 X 12mm was placed in between layers of composites. In the case1, jute fibers were used to fabricate the two layers above and below the honeycomb structure to make sandwich composite. For the case2, combination of jute and Kevlar fibers were used to fabricate the two layers above and below the honeycomb structure to make the hybrid sandwich composite. The fabricated composites mechanical properties like tensile, compressive, flexural, and impact strength were tested. In the hybrid sandwich composites, increased tensile strength, impact strength, and flexural strength were observed as 118%, 97% and 33% respectively as compared with sandwich composites. There was no significant improvement in compressive strength.

SRM INSTITUTE OF SCIENCE & TECHNOLOGY
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Department of Mechanical Engineering
M.TECH IN ROBOTICS (2 YEAR COURSE)

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ROBOTICS LAB

The Robotics lab of department of Mechanical Engineering, SRM Institute of Science and Technology (formerly known as SRM University) was established in the year 2007 to conduct M.Tech robotics programme and B.Tech Mechanical engineering programme.

FACILITIES

- Industrial Robots Abb Irb1410
- Industrial Robot ABB Flex picker IRB 360
- Virtual Instrumentation laboratory-Robotic sensors
- Drives and control of robotics using various Microcontroller laboratory

HIGHLIGHTS

- Student Startups
- International collaboration with various Universities
- semester abroad program
- multi disciplinary projects
- Internship programs

PATENTS

1."Non-contact Axial Fan Type Suction Gripper for handling flat thin sheets " being under review for patenting . by Vasanthkumar.ch

Eligibility

B.E / B.Tech. in Mechanical Engg. / Production Engg. / Industrial Engg. / Automobile Engg. / Aerospace / Aeronautical Engg. / Mechatronics Engg. / ECE / EEE / ICE / CSE (or) AMIE (Mech) / AMAeSI(Aero) / IMechE (or) any equivalent degree in the above Disciplines

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Contact for Admissions:
Director (Admissions) SRM Institute of Science and Technology, SRM Nagar, Kattankulathur - 603203, Kancheepuram District, Tamilnadu, India. Phone: 91-44-2745 5510, 91-444743 7500
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MD001

Locating the Economic and other Performance Centres of Asia using Geodetic Coordinates, Haversine Formula and Weiszfeld's Algorithm

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Abstract

Due to the increasing economic activities in Asia, the Global Economic Centre is moving towards China from the Atlantic Ocean. According to the "Global Growth Generators, Citi Investment Research and Analysis, 2011" report, in the year 2050, India will become the world's largest economy (GDP: 85.97 trillion USD) closely followed by China (GDP: 80.02 trillion USD). US may slip to the third position with a GDP of 39.07 trillion USD followed by Indonesia (13.93 trillion USD). Japan may be at a distant ninth position with 6.48 trillion USD. The objective of this paper is to locate the performance centres of Asia that include the "Economic Centre" and "Population Centre" for the years 2005, 2010 and 2018. These centres will provide some idea about the concentration of the population and economic activities at a particular point of time. Identifying such Centres can help in supply chain management to establish the optimal 'Facilities' to manufacture, distribute or collect. The estimated three Economic Centres confirm the movement of Economic Centre towards China, especially Beijing. Haversine formula is used in combination with the Weiszfeld's algorithm to locate the centres from the geodetic coordinates. Codes are generated in MATLAB R2012b and run in an i5 PC with 4 GB RAM.

MD002

Design and evaluation of a Self-charging Battery electric two wheeler

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Abstract

With the world shifting to EVs from conventional fossil fuel run automobiles, there should exist a mediator to effectively make this switch effortless and smooth, atleast to overcome range anxiety and the resistance to use new technology. Therefore, we propose a self- charging HEV and not a complete PHEV. Since the Indian automobile market comprises of mostly two-wheelers that make up 50% of the total sales, it is a good platform to introduce a hybrid power train. Key factors are that it should be cheap [4], easy to run and maintain, highly fuel efficient and should give good performance than its traditional ICE only counterparts. The main idea for this paper is from old diesel-electric locomotives that used a rudimentary hybrid layout to put power to the wheels via an electric motor. Our concept uses the same principle but optimised for a two-wheeler. The bike is powered by single cylinder petrol or a single cylinder diesel engine that acts as a generator to power a battery which in turn powers a motor to drive the rear wheel. The older locomotives used traction motors to pull heavy loads, whereas our motorcycle can be set to a speed of high torque and low fuel consumption to increase its range which ultimately matters to the Indian consumer. The battery itself can be smaller to reduce the weight that is attributed to EVs. This kind of self-charging EV is especially useful in emerging EV markets like India who is planning a shift to EVs in the near future.

MD003

A Bayesian Model for Prediction of Stroke with Voice Onset Time

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Abstract

The purpose of this study was to examine the changes in voice onset time (VOT) of stroke patients (elderly) and healthy elderly, and to compare them. Also, to propose a prediction model by considering speech analysis data. Method: One hundred and fifty-one stroke patients and one hundred and seventy-three health elderly participated in this research study. Each group performed a plosive pronunciation of a Korean word 3 times, and voice signals were recorded. The speech analysis calculates probability parameters of speech signals. The parameters were mean, standard deviation, minimum value, and maximum value of the voice onset time. Finally, a Bayesian model was prepared with these parameters as inputs to predict stroke. Results: Both groups' speech signals were analyzed and confirmed that there were significantly different in their VOT parameters. And with the calculated probability of both stroke and healthy elderly, the Bayesian prediction model was proposed for stroke prediction. Conclusion: This present study shows that the proposed prediction model could assist in classifying whether the person having stroke or not through their voice onset time data.

MD004

Soil Structure Interaction Analysis and Design of a Overhead Liquid Storage Tank Located In Kathmandu Valley, Nepal Subjected To Earthquake Load

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Abstract

The previous earthquakes reveals destruction of essential lifeline facilities like overhead water tanks in recrudescence, governing to risky hazards even afterwards the event. Prevailing seismic design strategy of water tanks is not adequate in current scenario and so dynamic analysis of elevated tanks is encyclopaedically studied. In this paper, the interaction between the structure and soil is investigated by modelling a water tank as easier as possible to seizure the overall respond of the system. The tank modeled is overhead circular water tank located at Kathmandu, Nepal and time history of ELCENTRO is used to review the respond of the model in Midas gen. Simple water tank model with mat foundation is then employed in MIDAS GTX NX to convey the effect of SSI on the global respond of actual structures. This paper justifies the effects of soil structure interaction on natural period and displacements of water tank subjected to seismic ground motions. Results show soil structure interaction effect increases the natural period and reduces the deformation behaviour of soil under lateral loading.

MD005

Rice husk ash based cementitious material for concrete canoe

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Abstract

This article study about the properties of light weight concrete canoe using Rice husk ash, micro-silica and microsphere. Rice husk ash, an industrial by-product from boilers for parboiling rice, has been exposed as admixture to replace part of cement in structural mortar. Micro silica addition improves mechanical and durability behaviour in mortars. A microsphere is a lightweight, inert, hollow sphere made largely of silica and alumina and filled with air or inert gas, typically produced as a by-product of coal combustion at thermal power plants. In addition, as the rice husk ash comes from agricultural waste resources their use as secondary raw material will contributes to circularity in the economy. Parametric design of the hull form and internal arrangement of single rower canoe is designed. The Hull Design and stability analysis is done using MAXSURF software. Strength analysis is carried out for the designed hull and then analysed. After finalized the mix design and the hull design, the mould is prepared. Finally, the canoe is casted and tested for stability.

MD006

Experimental Investigation of Low Density Sound Insulated Concrete Fabricated Wall Cladding Tiles

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Abstract

The growing demand for the need of sound insulation in buildings such as hospitals, recreational institutions and religious buildings is rising in recent years. The material used should be of highly sound insulated as well as easy to install. In this study light weight concrete is used as Wall Cladding tiles in the building, as light weight concrete shows satisfactory sound insulation property. The light weight Wall cladding was fabricated by addition of Fiber glass powder and alccofine as a cement replacement and different sizes of Cenosphere such as Cenosphere 300 micron and Cenosphere 425 micron as a fine aggregate replacement. Various parameters of the light weight concrete Wall Cladding tile both physical and mechanical properties were investigated. The tests were conducted to determine the compressive strength, and the sound insulation ability of the fabricated Wall Cladding tile. The experimental investigation shows that Wall Cladding fabricated as a light weight concrete has reliable compressive strength of 6.5 N/mm^2 and satisfactory sound insulation property.

MD008

Brainternet

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Abstract

The Recent trend in connecting Brain and Internet leads to the study of BRAINTERNET. It has been a sci-fi creation until last decade, but scientists now created a way to connect them using certain devices that allow us to monitor, control and view at any time.

MD010

A Portable Automated Audiometer to Assess Acoustic Threshold

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Abstract

In India about 6.3% people suffer hearing deficiencies. Presbycusis is the most common type of sensorineural hearing loss caused by the natural aging of the auditory system. It occurs gradually and affects the ability to hear higher pitched (higher frequency) sounds. Over time, it can result in individuals being unable to clearly hear sounds at progressively lower frequencies. Audiometric tests can identify the frequencies lost: in middle ear disease, low-frequency loss is common, whereas cochlear nerve damage is associated with high-frequency impairment which is assessed using the audiogram. The audiogram is normally plotted manually by the audiologist on testing the subjects using the audiometer by controlling the frequency and intensity of the sound that is to be delivered to the subjects. By this research work, the need of well trained audiologist is eliminated. Based on the patient response, the intensity and frequency are varied automatically and the audiogram is plotted by Artificial Neural Network learning procedures. The patient can thus take the audiometric test independently without expert training at a minimal cost. The progression of Presbycusis can be monitored and tracked at regular intervals by the patients themselves. It facilitates regularly scheduled audiometric testing identifying people who are at risk of significant hearing loss by tracking changes in their hearing threshold over time.

MD011

Emotional Detection and Music Recommendation System based on User Facial Expression

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Abstract

It is often confusing for a person to decide which music he/she have to listen from a massive collection of existing options. There have been several suggestion frameworks available for issues like music, dining, and shopping depending upon the mood of user. The main objective of our music recommendation system is to provide suggestions to the users that fit the user's preferences. The analysis of the facial expression/user emotion may lead to understanding the current emotional or mental state of the user. Music and videos are one region where there is a significant chance to prescribe abundant choices to clients in light of their inclinations and also recorded information. It is well known that humans make use of facial expressions to express more clearly what they want to say and the context in which they meant their words. More than 60 percent of the users believe that at a certain point of time the number of songs present in their songs library is so large that they are unable to figure out the song which they have to play. By developing a recommendation system, it could assist a user to make a decision regarding which music one should listen to helping the user to reduce his/her stress levels. The user would not have to waste any time in searching or to look up for songs and the best track matching the user's mood is detected, and songs would be shown to the user according to his/her mood. The image of the user is captured with the help of a webcam. The user's picture is taken and then as per the mood/emotion of the user an appropriate song from the playlist of the user is shown matching the user's requirement.

MD012

Plastic Hinge Length Behaviour of Steel Fibre Reinforced Composite Slab under Monotonic Loading

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Abstract

Steel concrete composite section with shear connector creates bonding and increases the composite action. However, the plastic hinge is formed by the excess of limiting moment in the ductile composite slab. Composite slab restraint from deflection can be attained by the provision of fiber along plastic hinge length. This paper insights the experimental investigation by the effective and economical implementation of steel fibers usage at plastic hinge length with differential parameters. Parametric study deals with the test results in accordance with the deflection of the composite slab action. Axial load test is conducted on the composite slab. Steel fiber reinforced concrete and conventional concrete mechanical properties are found from the compression test, split tensile test and flexural test. Plastic hinge length calculation is obtained from the Park and Priestley expression. Different specimens are cast with diversified application of steel fibers at plastic hinge length. The behavior of plastic hinge length is analyzed under monotonic loading and the responses are recorded to study the performance of the slab.

MD013

Seismic Behaviour of RCC Frame with short column effect strengthened by Special Confining Reinforcement

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Abstract

Earthquake is a natural disaster which is caused by sudden movement in Earth's crust. Around hundreds of earthquakes are occurring every year in different regions of the world. Out of these, around 2% of the earthquake causes damage to the structure and human lives. From the past studies, it is found that the structure which are resting on sloped ground, are most vulnerable to the earthquakes. This is due to variation of column heights on ground floor. Experimental investigation has been carried out by making 2-D frame of normal and special confined reinforced frame by varying height of column at base. The parameters like stiffness, strain, load verses deflection, crack width, energy absorption and energy dissipation are used to draw comparison between the Conventional short column and Special confined RCC Structure and the detailed study of short column effect and failure due to this effect is carried out. Since, most of the studies agree that the short column effect is the major cause for the damage of the structure on sloping ground during earthquake because it attracts large number of forces as compared to long column of the same storey.

MD014

Modified Event Data Recorder for Automotives

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Abstract

Widespread development of Event Data Recorders (EDRs) sometimes called “black boxes' promise a new and unique glimpse of the events that occur during a highway traffic collision. The EDR in a colliding vehicle can provide a comprehensive snapshot of the entire crash event. Our motto of the project is to add some more specific details to the EDR so that it can record much more clear information than before. Most of all EDR records only for a short period of time and it overwrites each and every time so we have planned to increase the storage and make some minor changes in recording process of the data and keeping the data for a long period of time. In addition to that, the users can also get an indication about the tyre pressure loss so that they can check or refill the tyre and they can avoid future incidents. This will be done by using the ABS sensors present in the tyres of the car moreover they will accurate so that the user can rely on it and it will be of less cost so that it can be implemented in the economical vehicles and can be sold out in the market too.

MD015

Optimization of shopping product strategy using automatic billing and machine learning enabled smart trolley

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Abstract

This paper is about a smart trolley (Fute cart – fute means smart, cart means trolley) which can provide fast and comfortable shopping experience to shopping customer. The trolley has attached barcode scanner to scan the products dropped, load cell to detect the weight of the products dropped and raspberry pi to integrate all these components using python. Fute cart is designed in such a way that it undergoes machine learning process with the history of data available. So with these data, it is possible to form relation between a product sale and its relative position in the shop. Also from the history of data, it is possible to categorise the products as complementary, mutually exclusive and dependent products based on the sequence based prediction. This kind of strategic arrangement and prediction increased the profit rate of the surveyed shop by 21%. The trolley also has theft detection system. Fute cart serves to be beneficial for both the customers and shopkeepers. It gives fast and informative shopping experience to the customers. Also for the shopkeeper, it reduces the cost of appointing an operator and it provides theft detection service and customer attractive product arrangement ideas.

MD016

A Systematic Review on Visual Fatigue Induced by Tiny Screens (Smartphones)

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Abstract

The smart phone industry is overgrowing with ever-increasing options that influence users to follow through with newer adoptions and increased usage. Compared with computer use, the high accessibility of smart phone has led to devastating smart phone dissemination, the number of mobile subscribers in India alone had exceeded 813.2 million in 2019. Smartphone technology is based on blue light; there is a high probability of damaging vision due to the shorter wavelength of light when used for an extended period. Excessive use of the smart phone can cause physiological problems, including eye pain, decreased visual acuity, blurred vision, dry eyes, headache, neck stiffness, wrist or back pain, etc. If the visual fatigue continues in everyday life, it will significantly affect the attention, focus, and also create functional impairment to the individuals.

MD017

Application of Cohort Intelligence Optimization Algorithm for Convective Drying Process – A Heat Transfer Application of Socio Inspired Metaheuristics

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Abstract

The drying process is one of the prominent techniques for preservation of foods and vegetables. Convective drying is one of the most eminent drying technique applied for drying. It is critical during the drying process to maintain the nutrient level of foods along with minimum drying time and energy consumption. Apple is a vital raw material for many food products and apple plantations are cultivated across the world. Therefore, it is very essential to determine the conditions under which the properties of fresh apples can be preserved and to set optimal parameters for their storage and reuse. In the present work, control factors for drying such as temperature, velocity and shape of apple slices are optimized to minimize the drying time, energy consumption and to attain minimum shrinkage in apple slices. The objective functions are referred from Majdi.et.al. Contemporary socio inspired metaheuristics referred to as Cohort Intelligence (CI) is applied and solutions are compared with already available results. Results show that, with the application of CI, drying time and energy consumption has drastically reduced, saving electricity consumption cost without affecting the quality in terms of shrinkage

MD018

Automatic Volume Control Device for Interior Cabinet in Vehicles

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Abstract

In vehicles, there are multiple sources of noise ranging from aerodynamic acoustics, vibrational noise from power train and cabinet noise from infotainment systems. Sound levels from infotainment systems are a major source of distraction for driver and occupants. This paper deals with the development of circuit module for automatic volume control (AVC) of sound emanating from infotainment systems. The AVC module can automatically control the loudness of music from infotainment system based on the situation and thus regulates the noise level in the range of 55-85dB (AIS-020). Thus, it aids to maintain safety from accidents and enables to attend calls hands-free with reduced noise from infotainment system.

MD020

Analysis of Gesture Recognition to Evaluate Hand Signals

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Abstract

Human Computer Interaction is an effective tool of intersection between the human intellect and computers leading to improvisation in technology. Gestures help to communicate between two persons very effectively even without saying a word but it is really ideal to note that man's immense potential and intelligence has motivated him to interact through gestures with his own invention called computer. This paper has been prepared on MATLAB using effectively a simple algorithm and basically deals with the recognition of finger gestures. It is executed by simple steps where initially the image is converted into binary which is followed by cutting the image from the point where the longest finger starts and also an amount from the bottom to get a subtle image and then simply counting the number of white objects (i.e. fingers) and this process is repeatedly done by rotating the image in all the four directions and the result is selected taking into account the outcome of the direction where maximum number of outcomes have occurred provided the background is in a solid colour which can reveal the image of the fingers displayed clearly. The application of this work includes choosing an option from any user interface by merely displaying numbers as per the number of fingers shown. This simple and innovative effort is user friendly and can be effectively used in imparting knowledge especially to differently abled.

MD021

Landmark Detection Using Squeeze and Excitation Residual Neural Networks

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Abstract

Landmark Recognition is the technology that can anticipate landmark names straightforwardly from picture pixels, to help individuals better comprehend and sort out their photograph accumulations and for law enforcement officials to gauge the location of images submitted as evidence. Image classifications techniques have shown remarkable improvements over the last few years. To further improve computer vision technologies and methodologies, researchers are now concentrating on highly specific types of classification. Instead of classifying cats, cars or buildings, researchers are trying to classify among different types of landmarks - both natural and man-made. In the present age, a tremendous roadblock in landmark recognition research is the lack of large, well labelled datasets. To rectify this, Google has come up with the Google Landmark Recognition Dataset. The dataset contains 1.2 million images of 15000 categories of landmarks. For the project, a subset of Google Landmark Recognition dataset has been used. Various latest classification algorithms, like AlexNet, ResNet, SE-ResNet, VGG-16 and Inception v3 have been implemented to classify the images. Among them, the SE-ResNet architecture achieves the lowest loss value of 0.1822 and accuracy of 94.08% on the training set.

MD022

Comparative Review of Structural Optimization Approaches on Rectangular Concrete Beams

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Abstract

Increasing population demands considerable infrastructure, given that embodied energy accounts for most of the carbon emissions of concrete structures; efficient use of materials is of vital importance. This can be achieved through Topology Optimization. In this investigation, a brief review of cable and arch analogy in topology optimization of prismatic concrete design space is presented. Topology Optimization was conducted for a design space with two boundary condition configurations that correspond to the two analogies, Cable and Arch. Concrete damage properties were introduced in the model to find the optimum topology for the corresponding design space. Various topological configuration were obtained for both approaches by varying optimizing parameters. Considering the manufacturing practicality of the form, an optimum topology was chosen from both analogy approaches. A comparative study conducted between the two approaches exhibited the efficacy of cable analogy over arch analogy approach. Comparatively, significant volume reduction was observed in case of arch analogy approach, however manufacturing feasibility, comparatively superior structural response and partially eliminating load-specific behavior, testifies the overall efficacy of cable analogy approach.

MD023

Path Planning of AN UAV with the Help of LIDAR for SLAM Application

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Abstract

Today's world there will be always a value for path planning. Be it use of mobiles robots such as UAVs, UGVs, USVs etc., everything functions on the basis of SLAM input. The input parameter can be extracted by any kind of sensors such as Kinect, LiDAR, etc. Here I am using RPLIDAR (LiDAR) as Sensor for UAV path generation. By get single Plan reading from lidar I will generate 3D mapping by gazebo and visualize it by rviz in ROS. Here we use ROS as interface of robot and sensor.

MD025

Vehicle To Vehicle Communication Using Li-Fi

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Abstract

In this modern era of wireless communication technology, Li-Fi (Light Fidelity) can be used as an alternative for Wi-Fi (based on radio waves) for data transmission. Li-Fi uses Visible Light Communication (VLC) as a medium for transmission for data at a very high speed. It uses LED (Light Emitting Diode) as transmitter and photo detector as receiver. The concept of Li-Fi is data transmission based on flickering of light which occurs at a faster intensity not detected by a human eye. When the light is focused on photo detector, it converts the ON-OFF state of the LED into digital binary data and the transmitted information is obtained at the receiver. This technology is secured, faster and efficient suitable for future wireless communication.

MD026

A session key authentication system for smart homes

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Abstract

The Internet of Things (IoT) is a rapidly growing emerging topic of social, economic and technical significance. The spread of today's wireless information and communication technologies has changed people's lifestyle and social interactions - the next frontier is the smart home environments. A smart home consists of low capacity devices (sensors, for example) and wireless networks. These devices are networked together and they need to all work together as a secure system. The proposed scheme aims to offer a secure session key establishment scheme which can then be implemented in smart home networks. Every node (sensor and control unit) uses a small authentication token, along with a random number to establish a session key which is both secure and dynamic. A few popular attacks like denial-of service and eavesdropping are prevented by the proposed scheme.

MD027

Node to Node Secure Data Transmission for IoT Device

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Abstract

Security has become an increasingly important feature with the growth of electronic communication. Transferring the data more securely plays a vital role in today's communication world. Ensuring that the transferred is secure is a challenge and it is necessary to make sure that the information is hidden from anyone for whom it is not intended. Encryption is carried out by performing multiple restatements of complex mathematical operations on the given data using a secret key, such that the original data is hard to recover unless the secret is known. In this paper, describes the RC5 and AES algorithm which is one of the methods to provide security to the data. Implementing the both encryption and decryption algorithm in FPGA. Testing and development of RC5 and AES using VHDL was performed in Model Sim environment. The main goal of this paper is to show comparison results for design space consumed in the ASIC between the RC5 and AES will be demonstrated

MD028

Home/Medical Assistant Robot

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Abstract

Now days health-care facilities increasingly depend on health-care staffs. By aging populace, there is an upsurge in number of old people present in the labor force and even in health-care division. It is significant to take care of aging workforce present in healthcare sector. So, for this process hospitals are providing an opportunity to mobile robots because of rapid technological progress accomplished of working and cooperating with humans and surroundings. This paper presents a design of Hospital/home medical assistant robot consist of both combination of network system and robotics system for transmitting, receiving and sending information to care taker or doctor. As the robot gets a distress signal which is obtained from the patient, it tries to contact the care taker or doctor. If the robot is unable to contact, it will try to find out the location of doctor or the care taker and then display the condition of the patient so that the doctor can act as early as possible. Doctor or caretaker can access the robot at any time and get the live video feed of the patient at any time.

MD029

Assistive Technology for Deafended and Visionless Aided Object Recognition Using Artificial Intelligence

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Abstract

There are about 565,000 deaf-blind people in India alone who face great vicissitude in there every day routine. These impaired people form a helpless minority among the handicapped population and hence, are underprivileged for the minimal support services. These impaired people capacities to navigate in their house to recognise objects and readability issues in their daily activities are of vital importance for their entire life. In Organizing any kind of simple daily activity can be especially difficult without use of necessary objects and specially to read the data. Braille has been widely adopted universally to literate the visually impaired and has distinguished advantages over synthetic speech and the use of artificial intelligence makes visual recognition of objects for the impaired people. The main aim of this project is to make use of the visual recognition of objects and by rendering an affordable and portable technology for refreshable Braille. The visual assistive device converts the visual data by capturing image and video processing into an alternate rendering modality for an impaired user with neural network and later interface with voice input. Vibration sensor is used for tactile sensibility to the blind and deafened people for object detection nearby. Here with the detection of the object they make speech sense to recognise what the object and get information of the object.

MD030

Measurement Possibilities of Thoracic (C7-T12) and Lumbar (L1-L5) Curvature

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Abstract

Spinal cord provides the support to withstand the weight of the human body. The lumbar and thoracic curves mostly represent the spine curvature of human. They are also used to determine the normality of the human spine. If the normality doesn't exist these data are helpful in treating the human. Low back ache arises even if any of the curves shows abnormality. This study revolves around the available techniques or instruments in measuring of those mentioned curvatures and the standard of the instruments. Around the world, many countries have started collecting spine curvature data for more than five decades; however, India lacks in this field. Every instrument faces its own difficulties and providing its own advantages. Construction of one new machine which will be providing only the advantages is a hectic task.For collection of spine curvature data countries have developed various instruments such as (X-ray),Inclinometer, Arcometer, Goniometer, Flexicurve, Laser scanner, Fiber optic sensor, electromagnetic sensors, spinal mouse, etc.; some might not be accessible to Indian markets. Today, there is a die-hard need in developing of machine or instrument or technique which will overcome all the limitations that were provided by the above mentioned instruments.

MD031

Analysis of Muscle Fatigue and Head Flexion Angle while using Smartphone

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Abstract

With the introduction of smart phones the frequency of usage gradually increased when compared with keypad phones. The statistics shows that number of smart phone users in India alone increased from 200 million to 400 million in 2015 – 2020. In general, most of the young adults spend an average of 3 to 4 hours daily. The extensive usage of smart phone causes various disorders including cervical/neck pain, shoulder pain. The objective is to measure and correlate the relationship between the muscle fatigue and the head flexion angle. Also, to analyze the posture using RULA analysis. By utilizing both subjective evaluations through web based survey and objective evaluation by using both mechanical and biomedical sensors such as Gyroscope for neck angle measurement and EMG sensor for muscle activity for 15 subjects of age 17 to 25. Head posture including flexion angle will be measured and muscle activity will be observed while using smart phone in a sitting posture over duration of 1 hour. Expected to understand the correlation between head angle and muscle fatigue while using smart phone.

MD032

Development of Hologram tripod for Accident Prevention

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Abstract

Secondary accidents are happening all over the world in the case of existing(set up) tripods, when a car accident or breakdown occurs, the driver attempts to install them in a dangerous roadway. The incidence rate of night accidents is more than 80%. As a result, it was judged that holograms were used to distinguish night and day using holograms as a way to prevent night accidents. This work proposes a concept of hologram based tripod for preventing accident.

MD033

Development of Drone for fire suppression for High-rise buildings

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Abstract

Most of the developed cities are now highly populated with increased high-rise buildings. In general, high-rise structures are not preferred due to user perception of insecurity in case of fire and high cost of the building. Recently, there were fire accident occurred in an eight-story building that resulted in numerous causalities and property damage. Globally, there is a constant increase in fire accidents in high-rise buildings. Based on the National Security Agency, the total number of fires in the apartment was 5,798. In that, the high-rise building fire accounted for about 60.4% of all building fires — however, not much effort is taken to reduce the rate of fire accidents especially in high-rise buildings. The purpose of this study is to conduct basic research on how to overcome a fire at an early stage by placing a fire extinguisher in the drones. It also aims at increasing the speed of firefighters' responses to reduce causalities and property damage.

MD034

Design and Development of Drone Control System

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Abstract

Drones are used in various fields. However, they are not free to fly at nights in most cities by considering safety issues of it. Also, it is not allowed to fly over 150 meters high in invisible zones, especially at night time. Because these cause collision between drones and tall buildings and collision between drones. The purpose of this study is to propose a system to control drones, i.e., drone control center. Literature was done before selecting GPS, transmitter and drone information. Developed an application to transmit the information received from the controller to the cloud using the LTE network. The control system contain a Vworld's 3D map provided by the Ministry of Land, Infrastructure, and Transport. The calculated data applied to the 3D map on the drone control system. The system specifies the margin of error compared with the registered airframe information. The controller continuously monitor every drones connected to it and notify the pilot when necessary (example, during danger).

MD035

Point of Care Device for Diagnosis and Treatment of Diabetes Related Peripheral Arterial Disease

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Abstract

Diabetes is a leading cause of micro vascular complications such as neuropathy and peripheral vascular disease. It is also associated with an accelerating atherosclerosis. Peripheral arterial disease (PAD) is manifestation of atherosclerosis which can pre date the diagnosis of diabetes. PAD is prevalent in diabetes and has a silent nature of progression. ABI is used as a reproducible and accurate non-invasive method for measurement and detection of PAD and the determination of disease complexity. Toe pressure and Toe brachial index (TBI) is useful in the evaluation of people with medial arterial calcification, where the ABI is considered as less accurate. Hence the aim is to develop a device which can assist humans to predict diabetic vascular disorder and treat them. The proposed system uses the toe brachial index (TBI) for detection of PAD. The normal range of TBI is from 0.5-0.95, below this value the person is diagnosed for PAD and above this value would be considered as unclassified due to calcification of blood vessel. The proposed device is a microcontroller based system that can monitor TBI and accordingly treat the vascular issue by providing vibration.

MD036

Postural Discomfort Analysis of EOT Crane Operators

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Abstract

Ergonomics aims at ensuring good fit between the worker and the work station. It is an important field of research in the development process to increase safety, comfort and performance. A comfortable work station can help employees to work more efficiently and effectively by reducing the probability for Musculoskeletal Disorders (MSDs). This study has been carried out to evaluate the postural discomfort of Electric Overhead Travelling (EOT) crane operators in tubular products shop of a boiler manufacturing company located in southern India. The modified Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) is used to interact with 67 crane operators, working with 24 EOT cranes of three different models in alternative shifts. The study revealed that 48(71.6%) employees suffered with some kind of MSDs. Most of them suffered with lower back pain followed by neck pain. The discomfort level is increased with age. Sixteen anthropometric dimensions are measured from all the operators. Statistical analysis is carried out using ANOVA. Frequent working postures are analysed by RULA, using Egrofellow-3 software. The obtained RULA score is 6. Suitable ergonomic chair provided for comfortable sitting and front side cabin guard height 100mm reduced to increase the visibility. After 3 months of trail run again questionnaire survey is conducted which clearly indicates that discomfort level drastically reduced and RULA score also reduced to 3.

MD037

Development of Patient Specific 3D Printed Mandible Implant

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Abstract

Medical 3D Printing has a variety of uses in dentistry, oral surgery and dental lab works. Modern dentistry plays a major role in 3D printing technology. The designing of a patient-specific mandible implant for cancer and fracture cases is based on the patient's medical imaging data and 3D printing. This study procedure uses the patient CT image data in DICOM format (Digital imaging and communication medicine). The patient's corrupted mandible is extracted from the skull CT scan. The anatomical reconstruction approaches are used for the extraction of the final 3D printed image. The final design is printed and then the stress analysis for different polymers is made to provide efficiency. Analyzing the suitable polymer involves biting and chewing. The maximum values of von mises stress were measured. Thus, the reconstructed mandible was close to the mechanical behaviour of the normal bone. This 3D printed mandible implant is patient-specific compared to the existing system

MD038

Fuzzy Environment Replacement Model

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Abstract

This paper focuses on replacement of equipments in fuzzy environment. Fuzzy set theory is the main tool to emphatic the vagueness parameters which involving in many real life applications. All imprecise costs involved in this fuzzy replacement model are taken as triangular fuzzy numbers. The proposed method gives the optimal replacement time of the replacement problem in fuzzy nature and it is validated using a real life numerical example.

MD039

Thermal imaging method in the evaluation of obesity in various body regions – A preliminary study

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Abstract

Technologies like 3-dimensional scanners and thermal imaging are slowly overtaking the traditional means of evaluating the obesity. The purpose of this study was (1) to evaluate the mean skin surface temperature of different regions such as abdominal, shank, gluteal, forearm, neck, finger bed region and (2) to study the potential of feature extracted from thermograph of various region and its measured skin temperature values in the evaluation of obesity. In this preliminary study 30 normal and 30 obese young adult of age 20.7±1.42 were invited out of which 30 were female and 30 were male. Thermal imaging of abdominal, shank, gluteal, forearm, neck and finger bed regions was acquired and average skin temperature was estimated in various regions for obese and normal subjects. Among the six region studied, neck region shows the greater temperature variation between the study population. In total population studied, the feature extracted parameter depicted positive association with mean skin surface temperature in various regions. Among various feature extracted parameters, mean and total standard deviation depicted the highest significance in abdomen (mean- r = 0.877, TSD- r = 0.449), neck (mean- r = 0.910, TSD- r = -0.617) and in forearm region (mean- r = 0.918, TSD- r = -0.404).

MD040

Smart Helmet Arduino Kindled Optimization

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Abstract

The life of a trained pilot is too precious. Many pilots lose their lives in combat or during training while encountering serious medical conditions due to flying stress, combat action or inability to eject timely due to exceeding 'G' tolerance limits. This project is a synergy of sensors and software to actuate pilot ejection system when the physical/health condition of a pilot does not permit to actuate it manually. This invention is much simpler and economical to be installed with a purpose to take critical decision to 'eject' at crucial juncture of flight based on the health parameters of the pilot when he/she is unable to take the decision. This device can be a safeguard for the pilots by overriding the incapacitated pilot's decision-making action, and self-actuating the ejection system to save invaluable lives. Soviet Yak-38 had been installed with automatic actuation of pilot seats in case of failure of one of the two engines while take off or roll exceeding 60 degrees. This system had a pre-set condition and overrides the skill / capability of the pilot to handle the adverse situation. Whereas, this invention primarily focuses on the health parameters of a pilot by monitoring with help of various sensors and initiates the critical decision to eject when the life of a pilot is threatened .It is an improvement over previous such attempts because the self-actuation of ejection is based on the physical health parameters of an incapacitated pilot rather than based on rigid pre-set threshold of flying parameters. This invention overtakes the crucial decision-making capability of an incapacitated pilot to eject timely at a minimum safe altitude.

MD041

Posture Alert System for prolonged neck flexion while using smart phones

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Abstract

As the world gets digitalized, the use of smart handheld devices, namely mobile phones, has significantly increased along with the problems associated with their usage. One of the issues that are being faced by the user due to prolonged usage of mobile phones in wrong postures is the bending of the cervical spine. The stress injury caused due to constant neck flexion while using a mobile phone creates a modern spine ailment called Texting Neck or Turtle Neck. The paper discusses a technique by which the user can get prompt alerts with the help of a mobile application that continuously monitors the right posture for holding the mobile phone. This technique uses the inbuilt android mobile sensors such as Accelerometer, Geomagnetic Field Sensor. The warning alerts created in vibrations form, which reminds the user to straighten their posture, which eventually prevents stress injury caused at the cervical neck spine.

MD042

Affordable Human Motion Analysis System

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Abstract

An initial prototype of two-dimensional motion analysis system which uses less expensive cameras, markers along with a open-source software for precise tracking of human movements is proposed here to overcome the difficulties faced by the researchers in using the current technology. Gait analysis is normally used to treat the abnormalities in walking or running ability of an individual. The main objective of this work is to build a less expensive gait setup which will be capable of finding out basic gait parameters. Currently available expensive3D motion analysis system is not accessible to most of the people. This proposed system can be useful to people from all walks of life and especially beneficial to the people undergoing physiotherapy, autism patients, stroke patients and sportspersons etc. This setup is both reliable and portable which makes it quite different from other existing setup. This will open up new areas of biomechanical studies which would pave the way for most of the people to move into this type of research.

MD043

Thermal Imaging Method in the Evaluation of Psoriasis in Upper Limb Region

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Abstract

Psoriasis is a dermatological disorder that most often causes scaling, itching and lesions on various regions of the skin. This study aims to focus on just the upper limb region affected by psoriasis and perform image acquisition using thermo graphic imaging. Each and every bodily disorder has a unique heat signature and respective temperature differences. Similarly, Psoriasis also has a typical heat signature that can be clearly observed on performing automated segmentation of the thermal images. The aim of this study includes automated segmentation and GLCM feature extraction in order to understand the nature of the disorder from the thermal images, and to characterize it in a more precise manner. The segmentation algorithm used for the purpose of this study is the Fuzzy C-Means algorithm. Segmentation is performed in order to clearly characterize the region of interest (ROI). The skin temperature differences in the ROI between normal and psoriasis affected hand are important to evaluate the latter. The segmented images' features have to be extracted in order to clearly visualize the unique aspects of Psoriasis which may not be understandable upon just clinical trials. The GLCM features are extracted using the respective algorithms. The mean average temperature difference between the normal and psoriasis was found to be 3.98 ^{0}C. The percentage difference between the normal and psoriasis in measurement of average temperature was found to be 14.2%. Thermographic imaging is a non-contact method of image acquisition and is being extensively used in present day for medical study. This study will help understand Psoriasis in a more elaborate and clarified manner and aims to be used as diagnostic tool in the future.

MD044

Design and manufacturing of Mimosa Pudica inspired smart window and analysis of scale dependent constraints

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Abstract

Bio-inspired design is the practice where the form, function and behaviour of natural entities at different scales used for developing sustainable technologies. During this process, scaling up and miniaturization play an important role. The successful implementation or achievement of bio-inspired features in engineering systems depends on the scale at which the inspiration is taken. Hence the constraint analysis in scale up and miniaturization of bio-inspired design is an important aspect to study. The work take up the mimosa pudica as a bio-inspiration for smart window technology, analyze w.r.t its micro and macroscale design features. Unlike the other works, the macroscale features of mimosa pudica are taken as inspiration and microscale phenomena (Water molecular flow based turgor pressure etc) are replaced with macroscale viable phenomena (electronics and sensors..). The macro feature inspired smart window is demonstrated with multiple working states. Further, the constraint analysis in the scaling up process of bio-inspired smart window is presented. The analysis indicates the advantages w.t.r accuracy and responding time at the cost of high power consumption and also posts the requirements to achieve the trade off. This work also emphasizes on the significance of scale based design& constraint analysis, and importance of scale in bio-inspired engineering.

MD045

Scope and Impact of Big Data on Indian Railways through IoT

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Abstract

Indian railways are one of the largest organizations in the world and a major employer. Every day it transports millions of people and tonnes of freights across the country. Indian railways is both a major contributor to the growth and economy of the country at the same time, it consumes resources like energy, fuel and man power in a larger proportion. Because of being a larger organization, the effectiveness of service to the general public, maintenance of the trains and platforms and ensuring the rightful safety of the passengers is a herculean task for the authorities. Accidents of trains, uncomfortable passenger experience, prolonged maintenance time, delay in scheduled time, insufficient availability of compartments, security threats from radical groups and many other problems are frequently witnessed in railways. Tonnes of data are produced by the department and most of it is not put into proper use. Big data is a part of artificial intelligence that finds pattern, predicts the course of action and makes decisions that are either not visible to our eyes or is too vast for us to handle manually. Techniques like big data and IoT are transforming many other fields vigorously by reducing the chance of error and increasing the effectiveness. Having a vast variety of both classified and unclassified data, makes the railways an ideal and potential field for the application of data science and machine learning. By utilizing big data with artificial intelligence, the intensity effective of customer service along with passenger safety, maintenance of trains and platforms, accident avoidance, timely and dynamic scheduling of trains and prediction of unforeseen needs of the hour can be optimized to the maximum. This paper deals with the application, present challenges and future scope of artificial intelligence through big data and IoT in varied departments and avenues of Indian railways.

MD046

Application of Machine learning Algorithms in Autonomous Vehicles Navigation System

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Abstract

Autonomous vehicles are the future of transportation and it also expected to become a fully-fledged reality within a decade. The major giants in the automotive industry like Toyota with Microsoft and Amazon, Mercedes with Bosch, Audi with Huawei, etc. are hard pressing their transition from conventional vehicle to autonomous vehicles. The state of Karnataka, for instance, had approximately 205,200 registered taxis higher than Madhya Pradesh 174,900 registered cabs from 2014 to 2015. This results in higher traffic congestion, pollution and high fuel consumption due to unorganized driving practice. As a consequence, this presents a great deal of opportunities for autonomous cars as they can significantly reduce the accident rate and improve effective and stress free parking, optimal running time, fuel economy etc. It also reduces traffic congestion as all the autonomous cars can be synchronized together through cloud. But the crucial part is their navigation system. Although a number of sophisticated forms of technology like such as radars, lasers, and high definition cameras for mapping, localization, obstacle detection, etc, are used, autonomous vehicles are still trying to reach perfection to navigate precisely under uninformed terrains and dynamics obstacles on the way like pedestrians, erratic drivers, traffic and climatic conditions. Events like heavy snow and rain, improper lane marking makes it hard to detect an obstacle on the road for evasive maneuver within limited response time period. Machine learning is one of the fast growing technologies that provide optimal solution to overcome the challenges in the autonomous navigation system. This paper focuses on the application of different machine learning algorithms and compares the use, challenge and scope of the same. The paper also focuses on the future direction of machine learning with reference to autonomous navigation system.

MD047

Design of Battery Management System for Electric Vehicles

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Abstract

The use of green energy is increasingly gaining more importance in current era. Only about 15 to 20% of the fuel energy in gasoline gets converted into useful work in a combustion engine, whereas 75 to 85% of useful work is produced in an electric motor. Further, USDOE states that 133 million Americans live in areas that don't meet at least one of the National Ambient Air Quality Standard. Passenger vehicles produce 25 to 75% of chemical pollutants that pollute the ambient air causing smog and various other health problems to living organisms including mankind. In this regard, Electric Vehicle (EV) is already under the radar of every potential car manufacturer and is considered as a promising and viable option to a more environmentally sustainable transport system, leaving a reduced trail of the hazardous emission. The Energy Storage System (ESS) is a vital part of EV as it is the source of power for all functional requirements of EV. In order to ensure battery pack safety and maximize the cell life span and capacity, battery management systems (BMS) are imperative and crucial. From the aspect of the battery pack system, the main question remains of how to produce a cost and weight-effective system. In this work a possible cell size or a serial-parallel interconnection is proposed considering the efficiency, costs and thermal loss. The vehicle concept is to be developed with a focus on minimal distances for power conduction from battery to power electronics and electric motor, to decreased weight and material by design. This paper elaborates the study of both battery pack design for commercial vehicles and the working of battery management system for better efficiency of the vehicle along with its present challenges in implementation and future prospects.

MD048

Current Research and Future Prospects of Neuromorphic Computing in Artificial Intelligence

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Abstract

Neuromorphic computing is a budding avenue though it has been known since the 80's. The extensive research and development in the field of artificial intelligence particularly in the last decade is tremendous. The growth of artificial intelligence is expected to grow exponential in the years to come. Technologies like machine learning and IoT has made possible for many fields from industrial automation to business model prediction very affordable and far less complex. With growing digital devices, the number of devices connected to the cloud and in a network is doubling and in some cases are tripling in some ventures. Technologies like drones, autonomous cars, smart healthcare, smart cities and many other are moving towards more and more data and connected devices to the cloud. The present hardware system is at the verge of giving away as the data generation rate and processing volumes of the same is becoming a challenge. The hardware of today, though are advance are simply not adequate to support the expansion rate of growth of artificial intelligence in all fields. Increased devices result in increase data, increased processing raising challenges for current storage devices and processing devices. Neuromorphic chips, which promises to overcome this challenge, are currently being researched extensively by many computer giants who fear the future incompetency of hardware of which IBM is a major player. Ground breaking research in the field of memristor and artificial synapse have paved the way for neuromorphic chips which are expected to revolutionized the field for the better. This paper deals with the current research, physical and technical limitations and future scope of neuromorphic chips. The significance of memristor and artificial synapse towards neuromorphic computing is also dealt in detail.

MD049

Role of Data Analytics and Artificial Intelligence in Agriculture for Indian Scenario

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Abstract

Agriculture is one of the oldest and most traditional field of all especially in a country like India. The state of agriculture in today's context is not very comforting given the problems like water scarcity, failing of monsoon, fragmentation of land and so on and so forth. The resources and means to do agriculture in a way that it was traditionally done for many years is now are simply not available any longer. The resources that were once in abundance and replenishable like water, land, fertility of soil, climate have now become scare and either polluted or irrecoverable. These changes have pushed the traditional farming techniques to be deemed less productive and ineffective. Even fields that are allied with agriculture like animal husbandry are now facing the same consequences as agriculture. Agriculture in India is now under a greater transformation where technologies like IoT and machine learning are doing their fair share of work. Techniques like big data and machine learning are feeding and nurturing the growth of agriculture in a completely different manner. Data analytics powered by the immense pool of information will be able to predict drought, suggest crop rotation, control and monitor crop health, ration irrigation and monitor the health of cattle and other farm animals. This paper elaborates the different big data methods with machine learning algorithm that is aiding the growth of new era in the field of agriculture. The practical difficulties in implementing and running such sophisticated system in fields and the opportunities and future scope is also studied and briefed in detail.

MD050

Development of Advanced Driver Assistance Systems for Indian Cars

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Abstract

The rising incidence of accidents in countries due to the lack of safety equipment in vehicles has been a hectic situation these days. Advanced Driver Assistance Systems (ADAS) are the most promising technology for reducing road transport externalities (e.g. congestion, traffic accidents, and environmental stress). The purpose of this study is to increase the safety and efficiency of motor vehicles, commercial vehicles, and special vehicles and shape the mobility of tomorrow. Using a cross-sectional analysis, the study analyzed vehicle safety can be improved by using ADAS technologies such as radar, LIDAR, ultrasonic and infrared (IR) sensors, highly resilient and reliable cameras, optical sensors. A review of the most popular available technologies used in ADAS and descriptions of their application areas are discussed in this paper.

MD051

Method of Finding an Optimal Solution for Interval Balanced and Unbalanced Assignment Problem

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Abstract

Assignment problem is a well-known topic and is used very often in solving problems of engineering and management science. Transportation and assignment models play significant role in logistics and supply chain management for reducing cost and time, for better service. The assignment problem is one of the main problems while assigning task to the worker. It is an important problem in mathematics and is also discuss in real physical world. In this paper, we proposed a new approach for solving a balanced and unbalanced assignment problem. The results of new approach are compared with existing approaches. In many application this parameters are uncertain and this uncertain parameters are represented by interval. In this contribution we propose interval Hungarian method and consider interval analysis concept for solving interval linear assignment problems. The assignment problem without converting them to classical assignment problem. A numerical scheme is explored in detail in this paper.

MD052

Comparative Study on Flow Characteristics, Strength and Durability of GGBS Based Geopolymer Concrete

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Abstract

Use of OPC causes emission of CO_2, which is a global house gas, to reduce the usage of OPC; GPC can be used as an alternative. To study the impact of molarity in GPC and compared with conventional concrete. The grade of concrete tested are M30 and M40 by using OPC 53 grade to compare the strength and geopolymer concrete M40 by using GGBS with River sand and M-sand. In geopolymer concrete when strength compares with different molarities 8M to 16M are used in this project work. In GPC strength is directly proportional to the molarity of NaOH. The mechanical properties are conducted to find out the strength. Different molarities was conducted with (slump test; compaction factor) workability strength of concrete. Different acid test is conducted in durability (i.e., HCl, water absorption test, $MgSO_4$, H_2SO_4, NaCl). Geopolymer concrete energy absorption is more when compare the normal concrete. The strength increases to increasing the molarity of concrete in GPC.

MD053

Service Life Prediction of Geopolymer Concrete with Respective to Chloride Ion Penetration

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Abstract

Geopolymer concrete is an innovative constriction material which is produced by the chemical action of inorganic molecules like sodium hydroxide, sodium silicate. This acts as a binding material for the cementation's material. The cementations material used in the present study is Ground Granulated Blast-furnace Slag (GGBS). In this paper, the service life of the geopolymer concrete structure presented to know the life span. The sodium hydroxide solutions having the molarities of 8M and 10M are used. The ratio of the alkali activators used is 1:2.5. The normal concrete mix having the water-cement ratio of 0.45 is also cast. The cubes are exposed to the NaCl solution i.e.; 3.5% of NaCl with respect to water is taken. After 28 days,56 days and 90 days, the specimens exposed to the solutions are drilled in respective depths (5mm, 10mm, 15mm, 20mm, and 25mm). The powder is collected from the specimens and are titrated against with $AgNO_3$ to find the percentage of chloride ion penetration. The compressive strength of the specimens for 28, 56, and 90 days are taken. In this paper it was also observed that as the days increases the percentage of chloride ion penetration decreases.

MD054

Realtime Continuous Wireless Vital Parameter Monitoring Device

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Abstract

In today’s world citizens are tend to be more health conscious. This is the motto behind the fast growth in the emerging field of wearable technologies. Contemporary wireless technology gives a lot of new prospects for monitoring vital parameters. This study aim at developing a wearable compact vital signs monitoring system using non-invasive optical sensors which is currently not present at disposal. The system monitors vital signs measurement includes Heart rate, spo2, Respiration rate, Blood Pressure, Temperature, Haemoglobin count and Blood Glucose level. An android app called multi para-tracker (MTP) is developed which connects to the device via Bluetooth displays the value of the scrutinized parameters. This feature has a colossal advantage as it does not restrict the mobility of the patient and also diminutions the waiting time of the patients in hospitals and helps them in saving money, space, time and energy. The results can be transmitted over a longer distance through wifi when and the parameters could be monitored on a mobile phone. This system can most probably exterminate the erstwhile procedure of extracting blood from the patients for testing the blood glucose level and also for haemoglobin count measurement in the imminent. In today’s world where most of the people are prone to diabetics this developed prototype pave way to monitor the blood glucose level non-invasively. Hence the developed prototype shows accurate results when compared to the existing techniques.

MD055

Strengthening of RC Beams with M-Sand Using External Bonding of Steel Plates

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Abstract

Various methods are developed for the strengthening of reinforced concrete beams against flexural and shear. RCC beams are important load-bearing components in any building structure but we should strengthen beams when material deterioration, defective design and accidental disasters occurred. In recent years the external bonding of steel plates technique is used for strengthening reinforced concrete beams, which is an effective way to improve the strength of RCC beam. In this research 5mm, thick Mild steel plate is used for external bonding, M30 grade of concrete is used with different proportions of M-sand and Natural sand. The research paper aims to compare the compressive strength and flexural strength of RCC beams with and without steel plates. From comparative results, it was found that the plate bonded beam observes more strength than no plate bonded beam at 50% replacement of M-sand.

MD056

A handheld device to monitor Physiological changes using sweat

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Abstract

Sweat is a multi-parameter fluid that can be used to gain information on various functions of the body. Sweat is primarily a viscous liquid produced by sweat glands located just below the skin. The focus of this paper is to develop a prototype for a wearable device that considers factors such as temperature, pH, and conductivity of sweat to arrive at a conclusion about the current physiological condition of the user. Sweat is metabolite rich so it contains salts such as Sodium, chloride and potassium. The concentration of each metabolite varies the general conductivity of sweat. The protype will contain a temperature Detector, pH sensor as well as a galvanic response sensor. Any abnormal change in temperature, pH and the conductivity of sweat indicates an underlying problem that can be solved with correct diagnosis. Further the developed prototype can also detect fluctuations in sodium ion concentration by measuring the changes in voltage response from the galvanic response sensor. Increased amount of sweating indicates metabolite loss that can be solved by consumption of glucose. Variance in conductivity that is increased conduction may indicate increase in sodium and chloride ions capable of detecting cystic fibrosis or high blood pressure. The device will use machine learning and IOT concepts to detect immediate danger and could constantly display readings when the sensors come in contact with sweat. The transmission of information is completely wireless so as to provide flexibility to the user in terms of usage. The online dashboard will display data taken every 5-6 seconds so that even minute changes can easily be identified. This data will be stored on cloud, which can be accessed by the user as well as the doctor or trainer whenever necessary. This device will specially be catered towards either patients with excessive sweating conditions or by athletes.

MD057

Effect of Ferrocement Wrapping System on strength and Behaviour of Geopolymer Concrete Beam

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Abstract

Geopolymer concrete is an innovative, eco-friendly construction material. Geopolymer concrete (GPC) is made by mixing Ground Granulated Blast-furnace Slag (GGBS), fine aggregate, coarse aggregate and alkaline activator solution. GGBS is a by-product of the steel industry. An alkaline activator is a combination of sodium hydroxide and sodium silicate with ratio of 1:2.5 is adopted. The sodium hydroxide solutions having the molarities of 8M and 10M are used. Beams of size 1500x150x150mm are casted and cured at ambient temperature for 28 & 56 days. Both Conventional and GPC beams are wrapped with Ferrocement. The main objective of this experimental study is to compare the flexural behaviour of RCC beams and Geopolymer concrete beams with ferrocement application to enhance the strength property. Specimens are casted for compressive strength, split tensile strength and bending strength and tested for 7, 28 & 56 days. The obtained results were then plotted in a graph and the feasibility of using the mesh were identified.

MD058

Solving Interval Linear Programming Problem Using Generalized Interval Lu Decomposition Method

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Abstract

In this paper, we propose a method for solving interval linear programming problem by using generalized interval LU decomposition method based on Kaucher arithmetic for generalized interval numbers. Numerical examples are also provided.

MD059

A New Approach for Optimality of Fully Fuzzy Assignment Problems

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Abstract

In this paper, we develop an efficient approach for the solution of fully fuzzy assignment problems involving imprecise information without transforming to equivalent precise form. Here, the imprecise informations are represented as triangular fuzzy numbers and optimal solution is obtained applying branch and bound method and a new type of arithmetic operations, ranking on triangular fuzzy numbers. The efficiency of the proposed method is illustrated by a numerical example.

MD060

An efficient alternative approach for the solution of an interval integer transportation problem

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Abstract

Determination of an Initial Feasible Solution (IFS) of an integer interval transportation problem plays an important role in obtaining a minimal total interval transportation cost solution. Better interval initial feasible solution can result less number of iterations in attaining the minimal total interval cost solution. There are different methods available in the literature to obtain a better interval initial feasible solution to an interval transportation problem. In this paper, a new efficient approach is proposed with row penalties to find an interval initial feasible solution to an interval transportation problem. The new method is illustrated with a numerical example. A comparative study on a set of benchmark instances shows that the new method provides the same or better interval initial feasible solution to an integer interval transportation problem. Thus, our new method can be considered as an alternative technique of attaining an interval initial feasible solution to an integer interval transportation problem.

MD061

Seismic Performance of RCC Multistored Building with Base Isolators

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Abstract

Stability of a structure during earthquake plays a vital role for economical and human loss. Here seismic base isolation is most widely used protecting technique of a structure against earthquake forces. Base isolation is a system of flexible or sliding interface fixed between a structure and its foundation for the purpose of decoupling horizontal forces from earthquake ground motions, thereby reduces earthquake damage to the structure and its contents. In this study we have design lead rubber bearing (LRB) and friction pendulum system (FPS) type of bearings for G+9 RCC building. An equivalent static analysis and time history analysis is carried out as per IS 1893(part 1) 2002 for G+9 RCC building in ETABS 2016 with fixed base and isolated base (LRB,FPS).Finally it reveals the seismic performance of building with fixed base and isolated base(LRB,FPS) from equivalent static analysis and time history analysis, comparision is done for storey displacement, storey drift, storey shear and base shear.

MD062

Comparison of Kalman Filter and Unscented Kalman Filter to estimate a non-linear system's position

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Abstract

Estimating a real time location of an Autonomous Underwater Vehicle (AUV)'s is always of great interest. This paper discusses the use of Kalman filters to control AUV's. The Kalman filter (KF) is an ideal linear estimator when white Gaussian noise can be used to model the system noise and the measuring noise. But Unscented Kalman Filter has been proven to be superior alternative to Kalman Filter. So in order to cope up with the non-linearity of the system Unscented Kalman Filter has been adopted. There are two facets to the protocol:1)first, tracking of AUV using a kalman filter. 2) second ,tracking using UKF. The paper offers a contrast for a nonliner model between Kalman Filter and Unscented Kalman Filter. The results of the simulations demonstrate the efficacy of the proposed tracking scheme, error the estimated displacement and the displacement measured.

MD063

Experimental Analysis on Reinforced Inorganic Polymer Concrete Columns Using GGBS

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Abstract

Due to globalisation the demand for cement is increasing day by day due to construction activities. So geo-polymer concrete which is a green alternative to ordinary concrete can be used. In this type of inorganic polymer concrete (IPC) cement is replaced with other cementitious materials such as GGBS. Studying the performance of a new material in different applications is essential for its use in structural construction. This paper shows the behaviour of geo-polymer concrete columns under uniaxial load. Comparison of conventional concrete to inorganic polymer concrete with different molarities of sodium hydroxide are highlighted in this study. Two different alkali activators such as Sodium Hydroxide and Sodium silicate solution with different molarities are combined and used to form polymerization. Compressive strength of 40MPa and 2% reinforcement ratio was used in this design of columns. There is no variation in size or appearance of columns even after exposure to environmental conditions like sun, rain etc. Production cost of Inorganic polymer concrete is same as conventional concrete. It has been observed that strength of the IPC columns is slightly increased than conventional concrete columns.

MD064

Experimental Investigation on Flexural Deficient RC Beams Retrofitting with UHMW Polyethylene

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Abstract

This context aims to experimental research on flexural strengthening of RC beams with the help of Ultra high molecular weight polyethylene. An experimental investigation on RC beams was conducted in this study to test the flexure behaviour by contrasting control RC beams with retrofitted RC beams. Here UHMW PE was used as a retrofitting material. It is a one type of geosynthetic. UHMW PE sheet were bounded externally using EPOXY resin and hardener. RC beams were made weak in flexure and then retrofitted to detect the flexure action considered. Two sets of beams were considered. Set-1 consisting of three control samples with 100%, 70%and 40% of flexural reinforcement. Set-2 consists three samples with 100%,70%and 40% flexural reinforcement and retrofitted with UHMW PE. The results showed that the retrofitting samples had more capacity to carry load than those of control samples. Thus, retrofitting is a feasible solution to overcome the stresses in the structure. This study also involves ultimate load carrying capacity, failure mode and crack pattern of the beam are also investigated.

MD065

Study on Behaviour of Inorganic Polymer Concrete at Elevated Temperature

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Abstract

Production of cement results in emission of an equivalent amount of carbon dioxide which is a greenhouse gas into atmosphere causing global warming. Fly ash and ground granulated blast furnace slag (GGBS) possesses cementitious material properties and hence can be used as alternate material for cement to overcome the environmental problems. During power generation in thermal plants large quantity of fly ash is produced as a waste product, disposal of which is problem and similarly GGBS is produced in steel plants. River sand access is also becoming more costly and limited due to illegal dredging therefore manufactured sand is used as an alternate for river sand. Hence in this study an attempt is made to study the compressive strength and flexural strength of geo-polymer concrete made of Robo sand at elevated temperatures. This paper evaluates the effect of different combination of alkali activators, ratios of the activator solutions, molarities of alkaline solution, curing temperatures of 60 ° C and 70 ° C. Sodium Hydroxide and Sodium Silicate solutions were used as alkali activators in different mix proportions. Geopolymer is commonly known as inorganic alumina hydroxide polymer which is synthesized predominantly from silicon and aluminium particles in fly ash and GGBS.

MD066

Enhancement of shear strength of Deep Beams using Polypropylene Fibers and suggesting an alternative for Strut and Tie Model

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Abstract

This paper investigates the behaviour of 4 deep beams prepared by varying the percentages of horizontal and vertical shear reinforcement. First two specimens were prepared in a regular way of placing shear reinforcement and third specimen is made by introducing fibers. Since Indian Standards does not have any provisions for strut and tie model, the shear reinforcement is placed as an alternate in place of STM by meeting the design standards of Indian codes. Different parameters like percentage of horizonal shear reinforcement, vertical shear reinforcement, shear span depth ratio, web reinforcement was studied, and experimental results are validated analytically with Abaqus software.

MD067

Influence of Carbon Steel Fibers on the Flexural Crack Width of RC Beam

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Abstract

Reinforced concrete beams are the significant structural elements in the structure. They improve resistivity against flexural loads. The concrete portion in the RC beam is good in compression but at the time of bending reinforcement will take about the structural element. When the flexural stresses exceed the flexural capacity of the R C beam cracks will occur at the flexural portion. In this investigation for avoiding and delaying flexural cracks, carbon steel fibers are incorporated into the concrete mix. The carbon steel fibres are added in concrete with respect to the total volume of concrete. Different percentages like 0.5%,1%, 1.5% and 2% of carbon steel fibres are added to the conventional concrete. Another side large amount of CO_2 emission occurs while manufacturing the cement in the industry. Because of that the cement content is replaced 30% with GGBS. The mix design used in this investigation is M30 with a water-cement ratio of 0.4. Cubes, cylinders and RC beams of 1.5m X 0.23 m X 0.23 m are casted and placed in curing for 7 days and 28 days respectively. The compression and split tensile strength of concrete is enhanced by incorporating carbon steel fibres in the conventional concrete. The RC beams with 28 days affective curing was tested under the loading frame of 2000T capacity. The result shows the initial crack propagation time is increased by increasing fibres content and crack width is reduced by increasing fibres content with respect to conventional concrete.

MD068

Experimental Investigation on Mechanical Properties of Robo Sand Concrete

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Abstract

Demand for river sand rises exponentially due to its supply shortage. Manufactured sand or Robo sand (RS) made from crushed rock is considered a viable alternative to replacing river sand in concrete. This study's main aim is to explore the possibility of using RS in concrete structures with grades of 30 and 60 and IS method was used for mix design. In this paper experimental studies have been carried out on the production of the compressive strength, flexural strength and tensile strength of concrete with manufactured sand. The specimens were tested after 7, 28, 56 and 91 days of curing. A well-processed manufactured sand as a partial or complete substitute for river sand is the need for the hour as a long-term solution in Indian concrete industry until other suitable alternative fine aggregate is developed. Usage of Robo sand in concrete can overcome some disadvantages such as honey combing, voids, segregation.

MD069

Develop the Climatic Condition Ratio for Typical Building in India

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Abstract

Diverse climatic condition influences building performance and results in varying levels of energy consumption and Carbon dioxide emission. Thus comparing buildings in two different climatic zones will lead to unjustified outcomes. It is of utmost importance to know to what range the climatic conditions can impact the building's energy performance. To improve the accuracy of the building assessment rating tools, climatic condition ratio is developed for various climatic regions of India by performing energy simulation on typical building.

MD070

Experimental and Software Analysis of Cold Formed Steel Beam-Column Joint

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Abstract

There is currently an increasing tendency for CFS to be used in construction, shown by a great deal of solidarity in terms of cost. The adoption of CFS has increased considerably in structural applications due to its light weight, high strength to weight ratio, ease of manufacture, erection and economy. The analysis of connections is important for any type of structure, because it is always preferable for the structural member to fail first instead of connecting. The focus of creating innovative element profiles is not only complex but also time consuming, sometimes the element fails to achieve its ultimate strength because geometry plays a key role. This project deals with the development of the cold formed steel of the beam-column joint based on the Indian standard specifications. A laboratory model will be developed and tested by loading frame method. The final results will be compared by finite element analysis out comes.

MD071

Experimental investigation of RC Composite Deep Beams

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Abstract

Shear failure is a major criterion in RC Deep Beams and several investigations made in the past but only a few are succeeded. Alignment of shear reinforcement plays a crucial role in the shear failure and it helps to study its behaviour during critical cracking. This paper investigates the behaviour of 4 deep beams casted by varying the percentages of horizontal and vertical shear reinforcement. Two specimens were cast in conventional way of placing of shear reinforcement and third specimen consists of shear reinforcement in the form of truss since deep beams were more effective with strut and tie combinations. A Rolled I section is introduced in the fourth specimen to know the composite behaviour of deep beams. Various parameters like percentage of shear reinforcement, crack width, load vs deflection etc was studied and the experimental results are validated using Abaqus.

MD072

Game Theory in Military Decision: An Anecdote

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Abstract

The goal of this paper is to explore possibilities of applying game theory in making strategic decisions in military. The plot of the story revolves around the victory of the U.S over Japan in regaining control of New Guinea. The decisions leading to victory and failure are listed using Two-person zero sum game.

MD073

Experimental Investigation on Partially Replacement of Coarse aggregate with Ceramic in Concrete

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Abstract

The partially replacement of ceramic waste as a substitute for coarse aggregates in concrete has been investigated. Two types of ceramic waste, namely tiles and flowerpot were used. Concrete mixes with 28 days characteristic strength 30 N/mm^2 were prepared using water/cement ratio of 0.5. The strength development of the concrete mixes containing recycled ceramic waste aggregates was compared to that of conventional concrete. Compressive strength of concrete made with ceramic waste aggregate is studied with replacement of natural coarse aggregate by ceramic waste aggregate at 0, 10, 20, 30 and 40%.

MD074

Analysis of Green Building Certification Attainment through LEED System for SDC Block at KLEF, India

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Abstract

LEED (leadership in energy & environmental design) Certification of a project brings credibility to its safety & environmental charge. The green building labeling scheme is widely accepted by public and personal house owners. Contractors and property developers have shown a belief in adding to the success of the project in achieving sustainability goals through an appreciation of the LEED process. The credential system is focused on award points for excellence in areas such as sustainable site development, electricity and climate, water usage, indoor environmental quality, materials and resources, national significance and architecture creativity. Furthermore, the research focused on the idea of green building in order to reduce the environmental impact of growth. The outcome of this research is the appraisal of the green building model for the University Skills Development Center (SDC) in terms of water, power, air usage, etc. The plans aim to improve the LEED score system for the university building.

MD075

Analysis of Green Building Certification Attainment through GRIHA System for R & D Block at KLEF, India

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Abstract

GRIHA is known as green rating for integrated habitat assessment. The National Scoring System would periodically research the environmental efficiency of a building in its full life cycle; it will provide a clear benchmark for what makes a green building. Both national and international definitions are focused on the development and implementation of all emerging technologies that have an excellent balance on the energy and environmental values of the scoring system. The aim is to create a score system that can assess the building in order to satisfy different criteria. The Green Building Rating System is a method that tests the environmental efficiency of a building through its life cycle. The whole and fitting Indian atmosphere and structures, the GRIHA National Scoreboard Project, was established by MNRE, funded by the initial work carried out by the TERI Energy and Resources Institute. My paper describes the process for achieving the GRIHA ranking by evaluating many criteria such as site conditions, resource and activity, social aspects, energy optimisation, waste management, human health and the security of the inhabitants in the recycling and reuse of products, lightning control, and water management for the academic building in Andhra Pradesh.

MD076

A solution approach for a fully fuzzy assignment problem

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Abstract

The main idea of this paper is to solve a fully fuzzy assignment problem where the costs are triangular fuzzy numbers. The fuzzy assignment problem has gained its importance in the recent years. We have obtained the solution by taking all the triangular fuzzy numbers in their parametric form and then solved it through one's assignment method. To the best of our knowledge, several authors had acquired the solution for a fuzzy assignment problem by converting the given problem to its crisp form. In this paper, we have proposed an algorithm where we have used our ranking method and arithmetic operations to obtain a desirable solution. The solution we acquired is represented in terms of location index and fuzziness index functions. It is solved by giving preference to the choice of the decision maker. A numerical example is illustrated.

MD077

An alternate method for finding optimal solution to solid transportation problem under fuzzy environment

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Abstract

In this paper, we propose a new algorithm for the initial fuzzy basic feasible solution to a solid transportation problem with imprecise parameters. All the decision variables are assumed to be triangular fuzzy numbers. Using parametric form of triangular fuzzy numbers such as left fuzziness index, right fuzziness index, modal value and by using proposed algorithm we obtained the initial basic fuzzy feasible solution to the problem without changing to its crisp equivalent form. We further discuss the optimality by applying the modified distribution method .A numerical example is solved to show the effectiveness of the proposed algorithm.

MD078

A comparative solution of fuzzy unconstrained optimization problems with triangular fuzzy numbers

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Abstract

In this paper, we consider an unconstrained optimization problem with fuzzy valued functions. Here we obtain an optimal solution of fuzzy optimization problems by using well-known Newton's method and we compare this fuzzy optimal solution with our existing methods. Solving fuzzy unconstrained optimization problems by using Newton method needs hessian matrix, which consume more number of iterations where as the proposed method requires less number of iterations. For this purpose, the fuzzy generalized Hukuhara differentiability of fuzzy functions is discussed. A few numerical examples are provided to show the efficiency of the proposed method.

MD079

Performance Measurement of Schedule and Cost Analysis by Using Earned Value Management or a Residential Building

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Abstract

In the construction industry, conflicts intensify. First of all these confrontations are very important for improving the implementations of the project in terms of cost and schedule for overcoming these confrontations. For this, one of the tools is to obtain a methodology for analyzing and measuring the effectiveness of construction projects. Earned Value Management (EVM) is one of the best ways to track the progress in construction project. It considers time and cost factors to evaluate effectiveness and estimate completion time and costs. The main aim of paper is analyzing the cost and schedule for a residential building by using earned value management. For this project a case study is taken to known the performance and progress of the project in construction with respect to time, cost, and resources of the project. By using this technique we can able to find and control the delays and serious issues regarding time and cost. Comparing to manual calculation, Primavera is effective way to calculate Earned Value Analysis for the projects. It certifies whether our project is on schedule and on time, on budget.

MD080

Feasability Study and Implementation of BIM in Small Scale Projects

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Abstract

This paper explores about practical issues in project cost management professionals in the execution and utilization of software, tools and technologies by using building information model for small scale projects. In any construction project quality, time, and cost are very important elements. Mostly building information model is used for large scale projects .The purpose of paper explores about the conflicts and how to overcome in small scale projects. In construction industry building information model plays a major role from starting stage to final construction. By using traditional software's or methods in construction time consumption will be more and error prone are also more. The architectural engineering and construction industry building information model plays a major role in construction industry practices. The main aim of the study is to show benefits, challenges and factors in small scale projects. In building information and model reduces time of the project by 80% for the same project and cost decreases by 20-30%when comparing with traditional technique.

MD081

Performance and Cost Analysis of Modified Bitumen Binder for Flexible Pavement

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Abstract

Quality analyses of bitumen, including cost analysis. The best suitable modified bitumen is used for the formation of pavements. It also helps in reducing the amount of wastes that cannot be reduced. As development is a significant part of what Roadways are considered to be one of the most important infrastructure modules and play a significant role in our daily lives. Asphalt has been used as the basic material for pavement infrastructure, surplus products that are readily available on the market for bitumen alteration. In the present study, a transition in bitumen of different amounts has been made. Crumb rubber is a by-product of waste tires India's recycled tires account for about 6-7 per cent of the world's number. As the surrounding tire industry grows at 12 per cent per year, squandering amounts are growing. India has been reusing discarded tires for four decades, although it is claimed that 60 per cent of the tires are disposed of by illegal dumping. The system used to reclaim these recycled items addresses the littering issue and can guarantee a lower level of pollutants in the area. The bituminous binder acts as a flexible, thermoplastic adhesive.

MD082

A Taguchi approach for optimization of mechanical and fracture parameters in the high strength concrete

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Abstract

This study presents to determine the optimum values of the design parameters in high performance concrete. Four design parameters considered for this study, such as Binder/aggregate, Super plasticizers, W/B Ratio, CA/FA. An orthogonal array was formed with the help of design parameters; optimization was done using Taguchi method. The mechanical properties were studied in different specimens with different fiber ratios. When the HPC has very high in compressive strength, at the same time brittleness of the concrete also high. There is a need to improve the ductile of the high-performance concrete. Due to the addition of fibers to the mix, enhances the strength of the concrete. Fibers are used in concrete to control the concreting, better toughness.Fiber pull out and fiber deboning are two toughening mechanisms provided by the fibres in concrete. the study was conducted in a notched flexural beam, notched cylinder (Shear cylinder). The fracture energy of edge notched beam was determined in three point bending test. In this study 3 mm thickness of notch was developed for fracture toughness test specimens. Morphological Study was conducted by using SEM images, it gives the interaction between the materials in concrete. The experimental and analytical models were compared in this study, which includes the fracture toughness and fracture energy of M80 concrete

MD083

Optimization of High performance Concrete with Silica Fume and Alccofine Using Taguchi Method

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Abstract

In construction industry, while manufacturing of higher grades of concrete such as M100, there is possibility of more material wastage due to number of trails carried out to achieve desired strength. High performance concrete has been emerging as a promising alternative for conventional cement concrete. Generally, High performance concrete composes of alternative binding material to cement which has similar properties and the proportions were decided to provide strength, durability and workability required for being sound in structural and environmental aspects. This study was conducted on investigation of optimizations the mix design for high performance concrete with silica fume and alccofine as mineral admixtures in various ratios 5% &10%, 10% & 5%, and 7.5% & 7.5% for M100 grade of concrete and superplasticizer as water reducing chemical admixture. The mix design for M100 was obtained using American concrete institute code provisions with compressive strength as the parameter. Optimizing the mix design using Taguchi's method with four variables taken into consideration mineral admixture, water binder ratio, superplasticizer, and curing system on an orthogonal array. A comparative study on compressive strength of all the trails and optimum result are taken. It was found that 7.5% silica fume and 7.5% alccofine replacement in binder content has shown optimum results in compressive strength aspects.

MD084

Isometric Path Partition Number of Butterfly Network and *X* – Trees

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Abstract

A set S of isometric paths that partition the vertex set of G is called an *isometric path partition* of G. The *isometric path partition number* of G is the minimum cardinality of such a set S in G. It is denoted by $\mathrm{ip}p(G)$. The *isometric path partition problem* is to find a minimum isometric path partition. The isometric path partition problem has wide applications in the designing of an efficient algorithm in many architecture. Isometric path partition is NP – complete and so it is interesting to compute the exact value of isometric path partition of different networks. In this paper, we study the isometric path partition problem on butterfly network and X – trees and also compute the exact isometric path partition number of butterfly network and X – trees.

MD085

A Single Server non-Markovian queue with *K* Phase of Vacation, Two Types of Services and an Optional Service

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Abstract

A single server queue with two types of services and with vacation has been considered. The type 1 service is a phase type service with two service phases. Both the service time distributions are generally distributed. The type 2 service has only one phase of service. In addition the server also provides an optional service. This service time distribution is also general. At each time the system becomes empty, the server takes K phases of vacation and the vacation time distribution of each phase is general. For this model the probability generating function for the number of customers in the queue at different server's state are obtained using the supplementary variable technique. Some performance measures and particular model are calculated and numerical results are presented.

MD086

Conceptual Model Analysis on Effects of Delay in Construction Industry by Identifying Various Causes - A Case Study

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Abstract

In construction, delay could be described as the time extended further than the date of completion stated in a document, or beyond the time decided on by the participants for the completion of a task. This research thus seeks to define the main causes and effects of delay in construction projects. Mind razing was taken into account which identified a variety of delay factors in construction projects. In total, forty-six (46) variables were shortlisted to form part of the survey questionnaire and classified and categorized into nine (9) major categories. Descriptive, ranking and simple percentages were used to analyze the data. According to the case study results, the most contributing factors are Contractor related factors (Poor communication and coordination between owner and contractor 86.6% in Kabul and 73.3 % in Chennai); Consultant related factors (Poor site management &poor financial control on site 84.1% in Kabul and 80.0 % in Chennai); Owner related factors (Selecting inappropriate contractors 76.8 % in Kabul and 57.8% in Chennai) and some recommendations were made in order to minimize and control delays in construction projects.

MD087

Characterization of Zeolite Influence to Improve the Performance of Concrete

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Abstract

The main feature of the study is to provide sustainable concrete by reducing cement quantity by using modified pozzolanic materials, such as fly ash and zeolite, because of its low cost, technical features and its durability. Concrete is the primary material used for building where as there are several drawbacks and adverse impacts on the environment. Reducing the cement content in concrete preparation is therefore an effective way of reducing carbon footprint / global warming. The approach pursued here in this paper is greater replacement of cement with fly ash and zeolite and its concrete efficiencies in terms of workability, strength and durability. This material has a major impact on the building materials industry. In this paper concrete grade M40 is adopted and adjusted concrete with fly ash replacement was done for four levels (15 percent, 30 percent, 45 percent and 60 percent) and the optimum levels were carried and further zeolite replacement was done in four levels (5 percent, 10 percent, 15 percent and 20 percent) with cement. According to test results of 7 days, 14 days and 28 days, the maximum replacement amount reached was 30 percent with ultrafine fly ash and 10 percent with zeolite.

MD088

Experimental Investigation on Impact of Labours Sleep Deprivation in Pramuk Meridian Project Using Application Method- A Case Study

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Abstract

Sleep deprivation leads to stress and under-performance in work, which leads to labor's well-being and performance of work in construction. The sleep deprivation study was done on construction labourers on a huge construction sector in Bengaluru, Karnataka. The paper shows sleep and rest time for labours by installing application app on mobile to track the pattern of sleep. Hence results shows that quality of sleep and labour productivity by relating with the concentration level at work. The inadequate sleep was increased due to risk consideration. The labor's recommended sleep is 7.5-h per night as the guidelines of doctors and researchers. The time of sleep lesser than the recommended would lead to high risk of work accident which is of 12%. The findings in this study of labor's in the sector of construction would lead to decrease in productivity and performance of labor. The risk of accidents at home and work entirely depends on lack of sleep.

MD089

Analysis the Effect of Chromosome and Generation Count on Genetic Algorithm In Construction Projects: A Case Study

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Abstract

Resource leveling is utilized to minimize the project duration with a uniform distribution of available resources. The main objective of this study is to measure the effect of using different number of chromosomes and generations on resource utilization histograms. A good selection of the internal parameters of a genetic algorithm provides rapid and accurate results. We studied the effects of change in a key parameter, namely number of chromosomes and number of generations, on the optimization speed and reliability. We found that changing one parameter can be compensated for changing another. For this purpose, different combinations of chromosome count and generation count were used to optimize via a genetic algorithm-based model. The model was developed using sample data from a construction project. It was found that each of these combinations generates different resource utilization histograms. In order to determine the improvement levels achieved by resource leveling using an objective function, the improvement percentage in each parameter and the average improvement percentage for each variation in generation count and chromosome count were calculated. By using a meta-GA, we found the possible change in attaining optimum results using different chromosome count and generation count.

MD090

Application of BIM in Sustainable Infrastructure Development

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Abstract

The importance of sustainability has become one of the major priorities in the field of construction. The pollution and the exploitation of natural resources for the production, transportation and erection of buildings consume around 40% of total energy worldwide while account for 25% of carbon dioxide emissions. The implementation of sustainability helps in reducing the above said values by developing green and energy efficient materials for construction. This research aims in identification of such materials in the field and its properties. BIM tools and energy analysis software such as Autodesk Revit and IES is employed to model existing buildings with all its material properties and to replace them with the green materials. Further simulation and analysis is performed to identify the difference in energy consumption, effect on the building's occupants as well as the overall environmental impact. The results are utilized to illustrate the importance of the incorporation of sustainable materials in construction and its positive effects on the people as well as the environment.

MD091

Experimental Studies on Replacement of Steel Stirrups by Sisal Fiber Reinforced Polymer Stirrups

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Abstract

Growing awareness about natural resources the environmental regulations are encouraged researchers to use it for structural applications. Natural fibers such as sisal fiber are abundantly available and they are less in cost compared with steel reinforcement. Sisal fiber is one of the most promising reinforcements in fiber-reinforced polymer composites because of its higher tensile strength. Traditionally sisal fibers were used to make ropes, due to these high tensile properties in the sisal fiber it can be moulded into the form of a stirrup by using Pultrusion process and hand layup method. which leads to the replacement of steel stirrups. The beams were casted with steel stirrups and sisal fiber stirrups and tested. On comparision of the results sisal fiber stirrups showed slightly increase in flexural strength but crack width is more compared to beams with steel stirrups. Due to their superior corrosion resistance of SIFRP (Sisal fiber reinforced polymer), it increases the durability. But the brittleness of SIFRP and their inferior bonding performance with concrete needs to be addressed.

MD092

Experimental Investigation on Concrete Using Treated Recycled Aggregate

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Abstract

It has been observed that huge quantity of demolition waste which is generated in various sectors are simply dumped in low lying area and used in highways for pavement works. Subsequently the usage of natural resources for new constructions has increased in recent and it leads to depletion and affecting sustainable development. In this study, the demolition waste is utilized in construction activities as a recycling and reusing material in concrete based upon the basic properties like specific gravity, crushing strength, impact value, water absorption and abrasion which produces optimal result in using recycled aggregates in concrete. The properties pertaining to mechanical behavior of recycled aggregate is carried out with different replacement ratios namely 25%,50%,75% and100% and the experimental values shows that the implication of recycled aggregate is effective and it can be further used by adopting suitable methods. Hence treated recycled aggregate was found to be effective in usage in concrete.

MD093

Study on Ultimate Strength and Buckling Modes of Cold Formed Steel Structures

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Abstract

Stronger construction material is category from one of the steel structure are attain higher strength with stand the resistance of steel by natural as well as it could made in different shapes. The exact shape of steel structure and its profile are precisely designed from cross section to ensure Indian Standard along with mechanical and chemical characteristics. All over the country's most of the industrialization is precise on sizes, shapes; strengths, storage practices and its composition of steel structure are used as per standards. cold-formed steel is effect with rolling of thin gauge steel sheet increasing the yield strength whose products are widely used in construction industries, as well as structure like columns, beams, joists, studs, floor decking, built-up section, telecommunication towers, electricity transmission steel tower, multi-storied steel structures, etc., due to its stronger and reduction in dead weight cold-formed steel is used. The dies are series of making various section of cold-formed steel structural member with different section and shapes by cold roll forming the steel to attain the preferred shape. As per the standard, nominal minimum yield strength of sheet steel rolled in cold-formed section is 250 N/mm^2. However, user trend use of greater strength, but it could be lesser as 230 N/mm^2.

MD094

Study on lightweight coconut shell aggregate concrete columns under monotonic load

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Abstract

This study reported on lightweight coconut shell aggregate concrete columns under monotonic in comparison with the conventional concrete columns. Both long column and short columns concepts were considered and totally sixteen specimen were tested. Study includes general observations, load capacity, lateral deflection (bulging) behavior, and lateral surface strains. Traditional failure like crushing failure in case of short column and buckling failure in case of long column were perceived from the coconut shell aggregate column specimen. For coconut shell aggregate column columns, IS 456:2000standardsbe used to obtain a conservative estimate of the ultimate load capacity. Coconut shell aggregate concrete is able to achieve its strain capacity under monotonic loading and it is comparable to conventional concrete. Over all, the behavior of coconut shell aggregate concrete column is similar to that of conventional concrete columns. This study also proves that the coconut shell is a potential sustainable alternate aggregate for conventional coarse aggregate.

MD095

Study of Piled and Disconnected Piled Raft System with Raft Foundation in Cohesionless Soil

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Abstract

Foundation is the vital component of the structure which enables the transfer of loads from the superstructure to the soil to impart greater strength and provide support to the structure. In order to deal with the geotechnical problems and with reference to the structural point of view, there arises a concept of combination of shallow and deep foundation i.e. combination of raft footing (shallow) and pile foundation (deep) where the piles could be both connected and disconnected from the raft and are to be classified as piled raft foundation (PRF) and disconnected piled raft foundation (DPRF). In this experimental study, analysis were done on unpiled raft, piled raft and the disconnected piled raft foundation under vertical loading by varying the compactness of cohesionless soil as loose and medium density and the thickness of cushion. The geotechnical parameters such as the bearing capacity and the settlements in the foundation were analysed and it was observed as the density increase, the bearing capacity increases and settlement decreases. The bearing capacity in DPRF was increased 86% and 7.5% when compared to unpiled and piled raft respectively; settlements were also reduced to 50% in DPRF in loose compactness of soil. The maximum bearing capacity was 2.496kN and maximum settlement was 10.01mm for raft size 150x150 mm with pile length of 20cm in loose condition. Thus, to meet the stability requirements of high rise buildings, structures to be built in weak soils and to resist the horizontal loading, the disconnected piled raft system which is effective and economical can be employed.

MD096

Investigation on Industrial Waste Material for Stabilizing the Expansive Soil

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Abstract

The increasing demand of fertilizer for agricultural field to make the farmable land results in the more generation of byproducts during the manufacturing stages. These byproducts can be utilized by various treatment techniques for the reduction of its contaminants due to its disposal for long time. In this study, the strength characteristics of two expansive clayey soils were studied and it was observed an enhancement in strength by the addition of an industrial waste product, Phosphogypsum as a stabilizing agent at various percentages of 2, 4, 6 and 8 by weight of soil. The attainment in strength characteristics of soil due to the mixing of additive has studied by conducting Unconfined Compressive strength tests at the various time periods of 14, 28 and 60 days. UCS results showed that soil solidification process by the additive exhibited the maximum compressive strength of 50% when the addition of Phosphogypsum reached by 6% at the curing period of 28 days. The improvement in soil characteristics were analysed chemically and it was also studied under microstructural analysis such as Scanning Electron Microscopy and X- Ray Diffraction methods. Microstuctural studies reported a remarkable change in the mineralogy of the treated soil, with the fine phases formed due to the pozzalonic reactions which are responsible for the strength development. The durability studies were also conducted as per the freeze and thaw method to know the effect phosphogypsum in soil. Thus the use of Phosphogypsum waste in the clay as a soil stabilizer suggests a most economical material for the remarkable improvement in the properties of soil and it will be the best options to manage this waste as sustainable material towards the green environment.

MD097

Micro-silica and metakaolin as a partial replacement for cement in m60 grade concrete

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Abstract

The concrete is most widely used in construction industries. Now a day the construction works are increased for development. At the same time need of cement also increased and it leads to develop the environmental problems. In this study, to reduces the consumptions of cement in the way of partial replacement of cement by micro-silica and metakaolin in M60 grade concrete. The mechanical properties of concrete with metakaolin and micro-silica were cement was replaced in 5%,10%,15% and20%.As per IS 456:2000 the tests were carried out on 3rd,7th and 28th days after curing condition. This study proves that the possible replacement of cement by metakaolin is 15% and for micro silica is 10%. While using these materials in the production of concrete it helps to reduce the use of cement and environmental problem also.

MD098

Effect of Pyrophyllite on Behavioural Strength of Clayey Soil

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Abstract

The clay soil consists of minerals like montmorillonite which shrink and swell when the moisture content is altered because of which the bearing capacity of soil get decreased, which causes differential shrinkage of soil can leads to failure of super-structure. These weak soils can be stabilized by adding chemical minerals to improve its properties. The probability of stabilizing the clay soil using pyrophyllite in different proportions like 5%, 10%, 15% and 20%. Initially the compaction characteristic on adding pyrophyllite was done by standard proctor compaction test and the strength character were done based on unconfined compression test at various curing periods such as 0, 3, 7, 14 and 28th days and California bearing ratio test done on 4 and 7thdays. Compaction character test shows that on addition of pyrophyllite content, OMC increase whereas MDD decreased. UCC strength was noted after a curing period of 28 days the strength gain was maximum, the rate of development in the strength however decreased in 20% of pyrophyllite content with the soil showed the maximum strength when compared to the other percentages. Also, on adding admixture the CBR value increases, but not beyond 15% for soil sample 1 whereas CBR value increased till 20% for soil sample 2. From the results, the admixture of 15% can be selected as a nominal percentage which can be used in soil to enhance the soil character. In addition to strength parameter, these admixtures are also an eco-friendly and economical additive in soil stabilization process.

MD099

Different Type of Nasties Using in Linear Programming Problem

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Abstract

An innovative procedure for identifying a nasty numbers with the help of twin nasties using Big-M method in linear programing problem is existing in this paper. Linear programming is a way for defining an optimum schedule of interdependent events in observation of the existing resources. A definition of twin nasties and the interesting properties of nasty number is summarized. A new method of relating Big-M method with twin nasties using maximization procedure to get optimal solution which is a nasty number is shown in a clean way.

MD100

Minimizing the Cost Using an Inventive Proposal in Transportation Problems

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Abstract

In linear programming problem, transportation problem is a particular approach to achieve the cost. An innovative hypothesis is discussed for getting optimal cost in transportation problem in this paper and also Vogel's Approximation Method (VAM) and MODI method are compared with the projected method. This work is verified by various transportation problems.

MD101

Different Control Strategies for Ball and Beam

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Abstract

The Ball and Beam system is abundantly used in the aeronautical industries for the stabilization of the aircraft during the landing and take-off. It is evaluated using two degree of freedom. The ball rolls back and forth and is made to balance on the beam and the system comes into action. Also, the simulations are carried out for the Conventional PID Controller, Model Predictive Controller (MPC), LQR (Linear Quadratic Regulator) and the Fractional Order PID Controller (FOPID). The results are being compared to find out the controller best suited for the real time purpose. The software simulations are being done in MATLAB for the above controllers and then implemented in the real time hardware using the QUARC toolbox interfaced with MATLAB to achieve the desired output Response. The physical parameters are taken into account and they are modified according to the values for the mathematical modelling to be done to achieve the desired output.

MD102

Visual Flow on Eye-Activity and Application of Learning Techniques for Visual Fatigue Analysis

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Abstract

Smart phones have become a necessity rather than a utility. Not a single person can deny that our mobile phones go wherever we go. Whenever people use the smart phone, their eyes are glued to the device. The purpose of this study is to understand the connection between the flow level and the activity of the eyes. Also, how the visual activity parameters are calculated will be discussed in this study. A clear understanding of this connection could prove to be very useful information in the computer vision field. Additionally, this can also help a lot to understand about Visual Fatigue caused by Digital Medium. In addition, the application of learning algorithms including machine learning/deep learning are massive with regards to analysing visual fatigue. The purpose of this study also going to discuss about the application of both machine learning and deep learning on analysing visual fatigue caused by Digital Medium.

MD103

Gender Egalitarianism in Work Place

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Abstract

The fast growing development in almost all sectors has increased the amount of output from labors and workforce. This in turn has also aroused the need in more number of workers, yet by having cultural or structural barriers in gender preferences. Egalitarianism stands for the gender equity at ach job provided at its maximum efficiency when assigned to the appropriate individual. This study is regarding the same, in identifying the varied methodology adopted too find the factors affecting. And there by providing recommendations to overcome the restrictions faced by all gender in their workplace.

MD104

A Study on Mechanical and Durability Properties of Coconut Shell Concrete Using Coconut Fiber and Sawdust

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Abstract

Sawdust was used as a partial replacement material for sand in coconut shell concrete (CSC), coconut fiber also added with concrete to enhance the properties of concrete. The mechanical and durability properties were studied and some of the mechanical and durability properties are compressive strength test, split tensile test, flexural test, impact test and water absorption, volume of permeable pore voids, rapid chloride penetration test, sorptivity respectively. From the test conducted, the properties of coconut shell concrete with coconut fiber and sawdust (CSCF-SD) gave a better result.

MD105

Assessing the spatial impact of urbanization on surface water bodies using Remote sensing and GIS

Sridhar M.B[1], Sathyanathan R[2]

[1] Assistant Professor, Department of Civil Engineering
[2] Associate Professor, Department of Civil Engineering

Abstract

Indian cities are expanding exponentially due to rapid and unplanned urbanization. The unprecedented speed of expansion is a major challenge for surface water management. The shrinkage of surface water bodies is important criteria to be considered by urban planners and policymakers. This research utilizes remote sensing data to address this problems for the suburbs of Chennai. The extent of urbanization is carried out through remote sensing data obtained from satellite imagery at 30 m resolution for the 2019 and land use land cover classification is carried out to determine the urban built up. The surface water bodies surface area was determined using the topographical maps. This results reveals the urban expansion has had a significant impact on the surface water bodies. The water bodies have significantly undergone reduction and disappearance due to urban expansion. A proactive land use planning system and action is essential to safeguard the ecological value of water bodies.

MD106

Urban Sprawl Analysis Using Remote Sensing Data: Case Study of Surat, India.

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Abstract

Urbanization is the process in which population shifts from rural to cities or urban centres for improved standard of living due to economic growth and development. As migration rate increases, urban cities suffer major changes in land use and land cover which triggered several negative impacts such as slums by overcrowding, air pollution, water scarcity, loss of forest cover and productive agricultural lands over the decades. Remote sensing and Geographical Information System (GIS) is used for monitoring the developing urbanization of the cities using satellite images. In the present work, urban sprawl of the Surat city (situated in Gujarat State of India) has been studied for over a period of 26 years (1993-2019), to extract the information related to sprawl, area of impervious surfaces and their spatial and temporal variability. Statistical classification algorithm approaches have been used for the classification of the remotely sensed images obtained from various sensors viz. Landsat MSS, TM, ETM+ and IRS LISS-III. Urban sprawl and its spatial and temporal characteristics have been derived from the classified satellite images. The change detection matrix have been computed in terms of spatial phenomenon, in order to quantify the expanding urbanization. The results showed that the urban built-up area in the city has been increased to about 175.2% over the years.

MD107

Precipitation Analysis for the Four Major Districts of Sikkim, India

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Sangay Yangzom Bhutia, Jewel T.R****

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Abstract

This study emphasises the rainfall analysis in the state of Sikkim located in the north east region of India, which covers up an area of 7097 km^2. The rainfall analysis of all four districts namely north, east, west and south for a period of 118 years (1901-2018) are computed. Various tests depicting the trends, homogeneity, slope and statistical data reveals the monthly, seasonally and annual rainfall pattern in all four districts of Sikkim. For the annual rainfall, the coefficient of variance varies from 13% to 19% whereas the coefficient of variance for seasonal rainfall varies from 14% to 81% which indicates that seasonal variability is more than the annual variability. Southwest monsoon contributes 79% to the annual rainfall followed by pre-monsoon which contributes 14% to the annual rainfall. The trend analysis shows an insignificant increasing trend annually but a significantly decreasing trend for the south west monsoon with a negative slope justifying the downward trend. The homogeneity test points out the specific year the trend of the rainfall begins which was found to be in the year 1995.

MD108

Spatial and Temporal Structure of Urban Heat Island in Ludhiana City

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[2] Associate Professor, Department of Civil Engineering
[3] Student, Department of Civil Engineering

Abstract

Urbanization being one of the major causes of global warming has obtained more attention as the global mean surface temperature has been increasing since the late 19th century. Given the fact of the heavy migration of people from rural to urban, uncontrollable growth takes place to accommodate this population. This is considered to be a major problem in developing countries. Ludhiana a city in the state of Punjab, India is considered for the study. In this study, LANDSAT 8 (year 2019) and LANDSAT 5 (year 2000 and 2009) were taken from USGS to retrieve Land Surface Temperature (LST) and Land Use Land Cover (LULC). The rapid urbanization resulted in formation of Urban Heat Island (UHI). The UHI had a mixed pattern of temperature variation for barren, urban, water and vegetation lands. The results of the land covers were computed as normalized indices. The relationship between the temperature and indices were determined. Normalized difference built-up index (NDBI), and Normalized Difference Barren Index (NDBaI) produced an increase in LST as the range of NDBI and NDBaI increased.

MD109

Hydration Effect of Boric Acid and Strength Properties on High-Performance Concrete

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Abstract

Boron compounds are commonly used as a cementations composite material in concrete for the gamma and neutron attenuation. Boron compounds play a major role in the concrete for radiation shielding properties. Addition of boric acid (H3BO3) into the concrete will drastically decrease the hardening of the concrete and strength properties. Generally, high purity concrete is commonly used for shielding purposes. However, incorporation of Boron based materials proposed to have in shielding high thermal neutrons. In this study, different percentages of boric acid like 1, 2, 3, 4 & 5% were added into the high-performance concrete (HPC) and the effects on hydration process and strength properties were determined. Boron compounds will modify the active sites in the cement material and increase the setting time. The hydration of cement in addition to boric acid in the high-performance concrete has been studied using, X-ray diffraction, Fourier Transfer Infrared Spectrometry (FT-IR) and Scanning Electron Microscopy (SEM). The addition of different percentages of boric acid on compressive strength were be calculated for 7, 14, 21, 28, 60, 90, 120 and 150 days.

MD110

Fabrication of three dimension chitosan scaffold loaded with kaemferol nanoparticles for the regeneration of chondrocytes

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Abstract

Chitosan based porous scaffold are biocompatible, biodegradable, and function as a extracellular matrices of tissues it helps in the 3d culture of chondrocytes. Chondrocytes are avascular a neural tissue. The porus chitosan allow the chondrocytes infiltration, attachment and proliferation in its niche. It is hydrophilic in nature and attract cells. Freeze gelation of chitosan at 2% and 3% chitosan varies the pore diameter and proliferation of the chondrocytes. Porous chitosan acts as a engineering construct to support chondrocyte regeneration.

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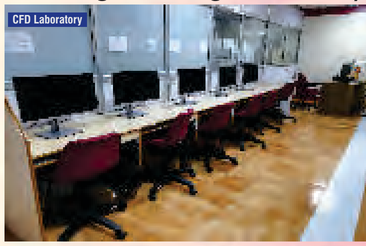

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- UV-Visible Spectrophotometer
- FTIR (Powders, pellet, thin films)

Patents Awarded / Filed

1. Chandrasekaran P, Cheralathan M, Velraj R., 'Spherical capsule for the PCM container in cool thermal energy storage using water as PCM for Vapor Compression Refrigeration (VCR) / Vapor Absorption Refrigeration (VAR) based cooling applications', 1447/2017-CHE

2. Chandrasekaran P, Cheralathan M, Velraj R., 'Water based PCM in spherical capsules stacked in packed bed Latent Cool Thermal Energy Storage System', 1446/2017-CHE

3. Chandrasekaran P, Cheralathan M, Velraj R., 'Material of PCM container on Energy efficiency for a cool thermal energy storage using water as PCM for Vapor Compression Refrigeration (VCR) / Vapor Absorption Refrigeration (VAR) based cooling applications', 1445/2017-CHE

4. A thermoelectric cooling device encapsulating a phase change material, S Manikandan, C Selvam, P S Praful, IN Patent App. 201841028136-A. (Indian Patent)

5. A Multifunctional Power bank , Abhinav Srivastava, Priyansh Tripathi, S Manikandan, IN Patent App. 201841033382. (Indian Patent).

6. Abhinav Srivastava, Priyansh tripathi and Dr.S.Manikandan filed patent titled on "A multifunctional power bank" published on 14.9.18. Application No.201841033382 A.

7. Mr.V.Thirunavukarasu, Dr.M.Cheralathan, "An Evacuated solar cavity receiver", Application no: 201841007044A, published on 25.1.19.

8. R. Senthil Kumar and Ashwin Mahendra [Passed out B.Tech. Mechanical], "Geometric Optimization of Electronic Component for Effective Heat Transfer" Application No.201941042257 A. Published on 1/11/2019.

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10. R. Senthil Kumar and Mridul Ranjan Upadhyay [Final year B.Tech. Mechanical], Nishchay Sachdeva [Final year B.Tech. Mechanical], "Thermal management system for Li-Ion battery pack at different climatic conditions", Application no.201941047243 A. Published on 6/12/2019.

11. G.Balaji and M.Cheralathan, Biodiesel based fuel composition that produces lower NOx and hydrocarbon emissions on combustion. Application Number: TEMP/E-1/46879/2018-CHE, Filed date: 15.11.2018.

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TE001

Transient Thermal Behaviour of a Novel Annular Thermoelectric Power Generator System

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Abstract

In this paper the transient thermal behaviour of a novel annular thermoelectric generator (ATEG) has been studied on the basis of one dimensional (1-D) unsteady state heat transfer analysis. Unlike the flat geometry of the thermo element, which has equal heat transfer area at its hot and cold side, the annular thermo element has higher heat transfer area at its cold side than its hot side. The transient temperature variation at the hot and cold side of the annular thermoelectric generator has been predicted for different operating conditions such as, variable heat input, operating current, and with variable heat transfer coefficient at its cold side. Finally, the transient thermal behaviour of the annular thermoelectric generator has been compared with the flat plate thermoelectric generator (FTEG). The results show that for a typical operating conditions with heat input of 2W and operating current of 2.75A, the power output and energy efficiency of annular thermoelectric generator are 0.94% and 1.12% higher than the flat thermoelectric generator. This study will be helpful in design of power generation systems from waste (reject) heat and solar energy using annular thermoelectric generator.

TE002

How to Burn? Straight Vs Horizontal Vs Upended

Rakshantha M, Yeleti Bunny Venkat, Gousik R and Kannan B T*

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Abstract

Burning is an inevitable process that happens in nature and has a massive impact on life. Technically, burning or combustion emphasises on the reaction process that consumes oxidiser and fuel to deliver heat and burnt products. Based on the direction of reaction propagation and fuel orientation, burning or combustion is classified in to forward or reverse combustion. Forward combustion is a process which comprises of movement of air and the propagation of ignition zone in the same direction while in reverse combustion, air moves opposite to the direction of the propagation of the ignition zone. Forward combustion escalates rapidly in solid fuels when compared to reverse combustion. The conductivity of the burning solid fuel, convection due to the atmospheric air around and buoyancy effects which takes place due to the difference in air densities plays a major role in the forward combustion process. In this work, thin uniform cross-sectioned solid materials such as matchsticks, candles and incense sticks have been considered as fuel to investigate forward flaming and smoldering. The experiments were carried out in ambient atmospheric conditions. The results based on visualizations suggest that the orientation of the fuel has a greater impact on burning rates and provides us the information on how to burn it in a beneficial way.

TE003

Visualization of Incompressible Jet flow issuing form a Cruciform Orifice

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Abstract

Smoke flow visualization is employed to investigate the behavior of a jet flow issuing from a cruciform orifice. Turbulent jet facility built using low cost devices was used to generate the flow field. Smoke generator was used for the seeding particle towards scattering of light for facilitating flow visualization. A CMOS camera was employed to capture the dynamics of flow via video recording. The snapshots will provide instantaneous behavior and the average behavior was obtained by averaging of all the snapshots. The visualizations were performed transverse to the flow field and along the field on a vertical plane. The results show the structure of potential core and jet boundaries along with the entrained flow in the downstream distances. The vertical structures are also visualized and the dynamics are explored in detail.

TE004

Smoldering Combustion of Hexagonal Incense Material in a Forced Air Flow

Yeleti Bunny Venkat[1], Rakshantha M[1], Sanjana S, Sri Vijay Prabhu R and Kannan B T[1]

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Abstract

Most of the forest fires and building fires are occurring due to the low temperature flame-less phenomenon called as smoldering combustion. The present study is carried for the understanding of fluid flow pattern over the fuel and also fuel under smoldering combustion. The fuel equipped here is a hexagon since most of the modern architectural shapes for buildings, parking lots, hexagon shaped houses, honeycomb patterned facades etc. Regression rates are calculated for the fuel under smoldering. For experimentation a table top wind tunnel is fabricated, and axial fan is fixed with speed regulator to investigate the smoldering combustion under the flow and behavior of fluid flow. The results suggest that the smoldering phenomenon is significantly dependent on the orientation, flow speed and the direction of smoldering with respect to the flow.

TE005

Design and Development of Impinging Jet Facility for Flow Visualization Studies

Abdul Hamid Rather and Kannan B T*

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Abstract

Smoke flow visualization is employed to investigate the behavior of a round jet issuing from a straight tube and impinging on a flat plate or bodies mounted on a support. Smoke jet impingement facility is a tool used in aerodynamic research to provide information about the behavior of round jet of smoke impinging on a model. The smoke impingement jet facility utilizes smoke as seeding for scattering towards visualization. In this study, an impingement jet facility is designed and fabricated that ought to be of low price and straightforward to use. The aim of this project is to offer educators and students an economical means to demonstrate flow impingement over completely different objects employing an easy variety of construction. This work utilizes a smoke generator that can produce good quality smoke and have sufficient density to be visible. The application of this smoke jet impingement jet facility over several test visualization techniques is that it produces high quality visualizations. The facility has proven to be an economic addition in supporting other research projects and is anticipated to be a valuable 'hands on' addition to existing aerospace laboratory teaching.

TE006

Numerical Investigation Of The Effect Of Turbulence Flow On Auv Hull For Various Angles Of Attack At Different Aspect Ratio

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Abstract

Autonomous Underwater Vehicle (AUV) is a self-operated, untethered, unmanned vehicle having the ability to perform the activities without human interaction. Recent studies present an increase in the current demand for Autonomous Underwater vehicles (AUV) in subsea exploration and marine research. The geometry structure plays a significant role in the efficient maneuverability of AUV and also makes it energy efficient. Therefore, this paper presents a numerical investigation of the effect of turbulence flow for various angles of attack for the different aspect ratios. Two different aspect ratio of the hull at a different angle of attack is considered for the investigation. The simulations are performed with commercial CFD software Ansys 19.2. The structured meshing is done with the fine at the boundary layer and coarse at the center. The Navier-strokes equation along with the two turbulence models (i.e. k-epsilon and k-omega) is used to compute the flowfield. The implicit time integration is used to obtain a steady-state solution with a density-based solver. The second-order method is employed to obtain an accurate solution. The numerical solution will be validated from the experiment data of whose design is chosen for investigation. Drag, lift, pressure moment and other parameters will be studied and results will be compared with the non-turbulence model. The most favorable hull length for a suitable angle of attack will be found with consideration of less turbulence. This paper will present the transparent concept about the effect of turbulence on angle of attack. Finally, relationships will be shown between the angle of attack and aspect ratio with different forces acting on the AUV hull.

TE007

Heat Transfer Enhancement Prediction of Automobile Radiator with Addition of Nano-Fluids through CFD

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Abstract

Recent years, researches are more focused on various enhancement methods for compact heat exchangers without altering the surface area of the heat exchangers. The advancements in the area of Nano fluids with better thermal properties have helped in development of light-weight, highly efficient automobile radiators. The main objective of this project is to increase the thermal performance of the radiator and thereby reducing the size of the radiator. In this project a numerical model with porous medium approach is developed and validated. Nano fluids (Aluminium oxide, Copper oxide, Graphite) of different volumes (ranging from 1%-13% in an interval of 2) are used along with water and it is observed that the heat transfer rate of the radiator is increased by 4.49% and the volume of the radiator is reduced by 5.4% for the addition of 5% of Aluminium oxide in water. Similarly, for 5% of Copper oxide the heat transfer rate is increased by 4.53% and the volume of the radiator is reduced by 5.6%, and for 5% of graphite the heat transfer rate is increased by 4.36% and the volume of radiator is reduced by 5.4%. From the results, it is concluded that the addition of the Nano fluids helps to achieve the same heat transfer rate with small frontal area of the radiator.

TE008

Effect of Wall Proximity on Bubble Enhanced Heat Transfer from a Vertical Heated Surface

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Abstract

The influence of rising bubble on the heat transfer enhancement from vertical heated surface immersed in water has been investigated. The family of Navier-Stokes equations and energy equation are solved on a fixed grid using the Finite Volume formulation of SIMPLE algorithm and VOF Method with Piecewise Linear Interface Construction (PLIC) algorithm is used to track the position of interface between two-fluids with different fluid properties. The Computations are performed for two bubble injection distances (6mm and 12mm) from the heated vertical surface. It has been found that the distance from the bubble path to the heated surface has a significant effect on the heat transfer enhancement from the surface. The heat transfer enhancement is more when the bubble is closer to the heated surface and decreases as the horizontal distance between the bubble injection point and the heated surface increases.

TE009

Thermal Stress Analysis of Thermoelectric Cooler

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Abstract

Thermoelectric cooler (TEC) is a solid state device, which can provide cooling without the use of refrigerants. TECs can be an alternate solution for the conventional vapour compression refrigeration systems. Though TECs have advantages such as it can be operated with solar energy and there are no moving parts, but due to their lower efficiencies, TECs are not widely used. Studies reported that the shape of the thermoelectric legs have impact on their thermal performance. The TECs are being studied in cuboidal, annular, pin and trapezoidal geometries. However, the thermal stress of the thermoelectric cooler for different geometry of thermoelectric legs are not been studied properly. Therefore, in this study the thermal stress of different thermoelectric cooler geometries have been evaluated and compared for improved cooling power output and thermal efficiency conditions. The results of this study will help in designing of thermoelectric modules.

TE010

Experimental investigation of HC and CO emission reduction from diesel engine powered by plastic oil blend using fly ash as catalyst

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Abstract

Catalytic Converter is an after treatment technique used to control emissions in internal combustion engines. Fly ash produced in the thermal power plant causes huge environmental problems. In this study, waste fly ash is used as catalytic material in the catalytic converter to reduce HC and CO emissions from the diesel engine powered with plastic oil blend. Fly ash was moulded into solid for the catalytic converter by treating the fly ash with diluted sulphuric acid (H2SO4). Experimental investigation was done with and without the prepared catalytic converter system at the exhaust with various engine loads (0, 4, 8, 12 and 16 kg). HC and CO emissions were reduced by 12.9% and 25% respectively at the full load conditions by using the fly ash based catalytic convertor. Hence the waste fly ash can be converted and used as catalyst in the catalytic converter for IC engines. Here both the fuel used and catalytic material were produced from waste products and is very cost effective leading to sustainable approach.

TE011

A Review on Thermoelectric Cooling Technology and Its Applications

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Abstract

Thermal control is a serious concern to enhance the life of energy conversion equipment and modern electronic automation like computer processors, LED and electric battery. Thermoelectric Cooling Technology (TCT) is one of the best methodhaving highest reliability and low energy usage for electronic cooling, which is working on the method of Peltier effect. TCT have feature such as compact in size, light in weight, no mechanical moving part, no noise, environment friendly and no working fluid. This paper presents a comprehensive review of TCT to understand the state of art in the cooling techniques and its applications on heat pipe cooling, sensible air cool warm fan and solar still productivity enhancements. The challenges and opportunities for future research are also highlighted.

TE012

Impact Of Oxygen Enriched Combustion On Specific Fuel Consumption Of A Single Cylinder Diesel Engine

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Abstract

In the present experiment, a computerized single cylinder diesel engine with a data acquisition system was used to study the effects of oxygen enriched combustion technology (OECT) on specific fuel consumption. The use of different levels of oxygen-enriched air was compared with respect to percentage load. Increasing the oxygen content in the air leads to faster burn rates and leads to less specific fuel consumption. Engine tests were conducted in the above said engine for different loads and with vary levels of oxygen enrichments and Nozzle pressure. The objective of this paper is to address, the key technical issues associated with fuel consumption by applying OECT to

TE013

Experimental Analysis of the impact of Magnetic Field Conditioning on the attributes and stability of Combustion in Automotive Engines

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Abstract

The conditioning of hydrocarbon fuels with the application of strong uniform and gradient magnetic fields has been under investigation for the last three decades across the globe. The impending depletion of conventional fuel sources and the challenges in a complete shift towards electrification of vehicles have forced the engine research community to focus on extracting the maximum energy from the available fossil fuel resources. Magnetic fuel conditioning is such a technology in which the combustion properties of hydrocarbons are modified by a physical and reversible process of ionization. The present study investigates the impact produced on the attributes and stability of combustion inside a port fuel injected automotive engine by applied magnetic fields of varying intensities. The applied magnetic field radicalizes the hydrocarbon molecules by increasing the transition probability of bond electrons to excited levels and enhances the splitting of C=C bonds there by accelerating the oxidation of hydrocarbon rings. The obtained results showed an increase in combustion efficiency with a noticeable reduction in emissions of the engine. The consumption of fuel reduced up to 13.8% at a magnetic intensity of 6400 Gauss. It was also observed that the percentages of exhaust components like carbon monoxide and UBHC showed a reduction up to 23.9% and 13.1% respectively. The statistical analysis of combustion parameters concludes a reduction in cycle to cycle variations which is an indication of stabilization of combustion.

TE014

The Numerical Investigation of Combustion Performance of Scramjet Combustor with Variation in Angle Of Attack

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Abstract

Numerical analysis has been performed to get improved performance of scramjet combustion by means of wall fuel injection system. Strut based combustor is used to validate the reacting flow characteristics and similar geometry has been chosen to perform the further investigation. Pressure at the wall of the combustor has been analysed with experimental data it is observed that the analysis is found to be in good agreement with open acess literature data. Steady state, two dimensional, scramjet combustor model has been chosen to complete the numerical convergence through ANSYS Fluent code. ICEM CFD is utilized to accomplish the desired meshing. Grid independence analysis has been done by comparing three different element sizes. Reynolds Averaged Navier Stokes (RANS) equation-two equation k-epsilon has been utilized to reach the convergence at lower computational cost. Finite rate eddy-dissipation based Species transport model has been choosen to solve the chemical kinetics of hydrogen and air. Hydrogen as fuel has been injected to conduct the simulation at sonic speed with same pressure as inlet with 250K temperature. Incoming boundary condition of free-stream air has been optimized to get the high percentage of combustion efficiency. Further enhancement of combustion performance, angle variation of the incoming air has been estimated. To change the angle of attack of incoming air, Modified isolator is added ahead of the combustor with constant length. It is observed that behaviour of shock waves and flow properties are dependent on the angle of attack. Ignition delay can also be observed at the downstream. Constant area fuel injector at the wall is selected for fuel injection. Comparative observation has been analysed with monitoring combustion efficiency graph.

TE015

A Detailed Review on Electric Vehicles Battery Thermal Management

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Abstract

Conventional vehicles with internal combustion engines are the major sources of greenhouse gases (GHG) emissions. Hybrid Electric Vehicles/ Electric Vehicles (HEV / EV) offer an environmentally friendly alternative emerging power sources, and the replacements for traditional automobile vehicles to reduce GHG emissions with an assistance of charging the battery from the renewable energy conversion routes. The recent electric vehicle, lithium-ion battery is used for energy storage and there are many thermal challenges have been studied by many researchers, the poor performance at low and high temperature, degradation of electrodes at high temperature and safety accidents resulting from thermal runaway associated with lithium–ion batteries would have direct influence on performance, cost, reliability, and safety of HEVs and EVs. Overheating caused by chemical reaction during the charging and discharging process under high temperature conditions leading to a catastrophic destruction of the batteries. Hence better efficient battery thermal management system is in the need of hour. In this review paper, various types of state of art techniques in battery thermal management system along with opportunities for advancement are highlighted. It is concluded that there are scope on battery thermal management system of electric vehicles for future research.

TE016

Effect of Internal Heat Generation on Solidification of Droplets during Molten Fuel Coolant Interaction in a Nuclear Reactor

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Abstract

One of the important issues in safety analysis of severe accidents in fast reactors is Molten Fuel Coolant Interaction (MFCI). MFCI is the phenomenon in which fragmentation of the molten fuel takes place when it comes in direct contact with liquid sodium coolant. For complete understanding of MFCI, we need to study the solidification of the molten fuel happening along with fragmentation. Solidification / melting of any material initially held at its melting temperature is the classic Stefan's problem. In the case of a severe reactor accident the molten fuel might have a significant amount of decay heat, even though nuclear fission reactions have been stopped by reactor shut down systems. The presence of decay heat in this case, makes the transient Stefan problem more difficult to solve analytically. Here, an investigation of this special case of Stefan's problem with internal heat generation in nuclear materials has been carried out considering a typical droplet size of 4 mm diameter. The numerical heat transfer analysis has been carried out using the commercial software Fluent. The validation of the problem is done with the steady state analytical solution available for the position of phase change front. Parametric studies have been carried out by varying internal heat generation rates and convective heat transfer coefficient at the surface of the droplet. Temperature profiles and liquid fraction are obtained at different instants. Solidification time and final equilibrium temperature are estimated from the results. It is observed that there is significant increase in drop solidification time for heat generation rates (q) greater than 1 MW/m^3 for the drop size of 4 mm. The maximum q which is tolerated by the droplet without reaching its boiling point is about 6 GW/m^3 when the heat transfer coefficient from its surface is fixed at h=56000W/m^{2}K.

TE017

Computational Studies on Performance of Thermoelectric Cooling System with Phase Change Materials

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Abstract

The current vapour compression refrigeration (VCR) cycle has considerably higher efficiency compared to existing thermoelectric cooling system. The VCR cycles employ refrigerants, which poses threat to the environment and climate cycles. Efforts are being made to make cooling process less toxic and to make the thermoelectric system more energy efficient. In this study, a technique to minimize the temperature on the hot side of the thermoelectric cooler (TEC) has been proposed. Computational studies were conducted by introducing PCM to a custom designed heat sink to analyze the effect of PCM on the heat dissipation through the heat sink using COMSOL Multiphysics software. The hot side temperature of TEC is considerably reduced with the PCM as compared to the case of without PCM. The same analysis was carried out with different quantities of PCM in the heat sink and with different film coefficient conditions. The results from the studies were compared a conclusive result was obtained. Results show a significant improvement in the heat dissipation level, thus, justifying the potential of the PCM for the thermal management problems.

TE018

Effect of Nozzle Hole Number On Diesel Engine Using Diesel And Biodiesel Blends

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Abstract

In this work the experiment was carried out to investigate the performance, combustion and emissions by changing the number of nozzle holes of the injector such as 3 hole, 4 hole and 5 hole by maintaining the hole diameter as 0.25mm. The experiments are executed on Kirloskar 4-stroke computerized single cylinder air cooled and electrical dynamometer coupled DI diesel engine with diesel, Rubber seed methyl ester and B20 Blend as fuels at 1500 rpm, with the injection timing of 23.4°BTDC with an injection pressure of 240 bar maintained constant throughout the experiment. It is found that 4 hole nozzle gives higher brake thermal efficiency, lower specific fuel consumption, CO, HC, for Diesel, Bio-Diesel and B20 Blend compared with other two nozzle holes. However the NO_X got increased which is the major drawback.

TE019

Comparison of a Thermal Barrier Coated Engine Using Eucalyptus Oil Methyl Esters and Azadirachta Indica Methyl Esters

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Abstract

Key features of a diesel engine such as the engine effectiveness, release of toxic gas and ignition are examined while using two methyl esters. One of the methyl ester is got from Eucalyptus and the other from Azadirachta Indica. A trans-esterification process is applied on both of these oils by utilizing methanol and alkaline catalyst to generate the Eucalyptus methyl ester (EUME) and Azadirachta Indica methyl ester (AIME). These are green fuel, used as substitutes in Thermal barrier coating engine (TBC). The temperature of combustion chamber is raised by applying thermal barrier coating on piston face. Experiments are done with EUME and AIME in a single cylinder, four stroke, and direct injection TBC engine. It has been discovered that, at peak load the brake thermal efficiency is reduced to the extent of 5.82% and 6.97% and an increase in BSFC to the extent of 11.68% and 12.61% using EUME and AIME in TBC engine in contrast to ordinary diesel propellant used in uncoated engine. It has also been observed that the release of NO_X increases in TBC engine also higher level release of CO, smoke and HC. The ignition features it has been discovered that the cylinder pressure of EUME and AIME in TBC engine are similar to that of diesel propellant in uncoated engine.

TE020

A Review Study of Nanostructured Thermal Barrier Coatings

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Abstract

IC Engines find their applications in various sectors like Transportation, Agriculture, Sports etc. This attracts a great attention by the Researchers for Enhancing the Efficiency and Performance of these Engines. More than 3 Decades intense Research work has been carried out on Thermal Barrier Coatings. TBC are used to improve Reliability and Durability of hot section metal components and Enhance Engine performance and Thermal Efficiency. Application of TBC will not only Increases the Efficiency but also reduces the requirements of the cooling systems. Usually TBC system has 4 layered Structure: The Ceramic Thermal Barrier Layer, The Metallic Bond Coat Layer, a Thermally Grown Oxide Layer[TGO] between the Topcoat, Bond Coat and Substrate. The different materials used for TBC coatings are 7-8% Yatria Stabilized Zirconia[YSZ], Mullite, Aluminium Oxide, Aluminium Silicon[AlSi], NiCrAl [Nickel Chromium Aluminium], Spinel, Forsterite, Cordierite etc. There are different methods of Depositing TBC but among them EBPVD plays a very important role because it Exhibits Columnar microstructure that provides outstanding Resistance against Thermal shocks and Mechanical Strains. By producing TBC's on Engine fuel consumption can be reduced by 2 to 12%. It is also observed that by coating of TBC<1mm makes to Extract Maximum Benefits. The coating thickness is usually measured with the help of Fischer MP-20 Dual Scope. The word NANO means "Dwarf" in Greek Language. Nano Coatings encompass numerous advantages over other conventional coatings, due to unique properties that are Small size, Control the Structure and Composition on the Nanometer(nm) scale in order to control the properties. The thermal cycling life of Nano Lanthanum Zirconate is 6 times more than that of Micro Lanthanum Zirconate. Nano structured TBC's often Exhibit excellence performance compared with Conventional TBC's such as Adhesive Strength, Thermal Shock Resistance, Thermal Insulation, Corrosion Resistance and so on. Based on the Comparision conducted using several nanostructured Ceramic Coating, Carbon Stabilized and Yatria Stabilized Zirconia was proven better in providing increased thermal cycling Life span. The Difference in the values of co-efficient of Thermal Expansion for two different materials i.e Substrate material and Coating material induces thermal stresses in Coating. By using TBC on IC engines it improved Combustion Efficiency by 0.1% to 0.4%, Carbon Monoxide emissions decreased between 4.3% to 8.8%. Nano Ceramics in Combustion Engines are listless, only a Handful of researchers have been carried out so far and there is a need for Rapid Experiments in the Sector of Nano Ceramic Coating.

TE021

Review of the Effect of Enhanced Surfaces in Pool Boiling Heat Transfer with HFO Refrigerants

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Abstract

This paper describes the current investigations on hydrofluoroolefin (HFO) refrigerants with enhanced surfaces in pool boiling heat transfer. Heat enhancement rate of the heating surface depends on the surface design, surface geometry, surface material and surface finish condition, etc. Heat transfer enhancement improves the system performance of thermal system and reduces the size of HVAC&R applications parts. In recent years, refrigerant emissions have become a serious concern as it is responsible to deplete the ozone layer. Under this circumstance, HFO refrigerants are considered as an alternative of chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). Hydrofluoroolefin (HFO) refrigerants have some excellent properties such as zero ozone depletion potential (ODP), low global warming potentials (GWP), low toxicity, mild flammability (manageable) and same system performance as HFCs for any surface tested. Based on the literature review, this paper proposed a brief future study to identify existing shortcomings.

TE022

Reliability analysis of solar air heater with thermal storage using hourly mean solar radiation data

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Abstract

This paper presents the hourly mean solar radiation and standard deviation as inputs to simulate the solar radiation over a year. Monte Carlo simulation (MCS) technique is applied and MATLAB program is developed for reliability analysis of solar air heater using thermal storage system. This paper is distributed in two parts. Firstly various solar radiation prediction methods along with hourly mean solar radiation (HMSR) method are compared. The comparison is carried on the basis of predicted hot air generation by solar air heater. Estimation of heated air using HMSR method is close to the actual heated air generated by solar air heater. The deviation in monsoon months is due to the cloud cover. In later part of the paper various reliability indices are obtained by HMSR method using MCS technique. Reliability indices, additional load hours (ALH) and additional power (AP) reduce exponentially with increase in load indicates that a solar air heater with thermal storage system, source will offset maximum fuel when all of its generated energy is utilized. Fuel saving calculation is also investigated. Case studies are presented for ACS College of Engineering in Bengaluru, Karnataka State, India.

TE023

Evolution of Air Conditioners and Constructal Progress of Air Conditioner for Better Performance

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Abstract

Evolution of air conditioners does not happen in one day and progressed slowly over a period of time since the development of first ever air conditioner. Need for air conditioning has a strong background and the heating, ventilation air conditioning professionals had taken a continuous development in the design and performance of air conditioners. The fundamental structure of the universe is one of conservation, not innovation. However, evolutionists, adopts that the course of evolution takes place within the structure of energy conservation. A common argument in contradiction of evolution is that the theory contradicts the Second Law of Thermodynamics which claims disorder, or entropy, permanently proliferations or stays. Entropy says the universe is breaking down. Evolution says the universe is getting better! The philosophy of evolution does not challenge any recognized laws of physics. This paper converses about the evolution of air conditioners and Constructal development of an air conditioner for better performance and minimized disorders. This paper also argues on the second law of thermodynamics, entropy and Constructal thermodynamics and their contributions in system design modifications in air conditioning systems in order to minimize the disorders.

TE024

Statistical tool analysis of parameter optimization in single cylinder Four stroke diesel engine

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Abstract

Energy is the main source for driving vehicles. Fossil fuels are the major source of energy. When the supply of energy is affected, transportation comes to a standstill. The energy produced in the prime mover is also called an internal combustion engine. Even though electric vehicles are come in near future the usage of internal combustion engine still exists. The utilization of fossil fuels leads to pollution so it is necessary to curb the emissions by employing advanced technologies. This research work focus the optimized working condition of the engine, because engine optimization alone reduce the emissions and improve the fuel economy. To achieve this engine testing has been done in different types of combustion chamber with various alternate fuels (Bio diesel) also employing multiple fuel injection conditions by varying the Injection parameters fitted with different types of nozzles. In order to simplify and find the best operating conditions (better performance and lower emissions) and reduce the time, it is decided to incorporate multiobjective optimisation techniques by implementing the grade analysis and the analysis of variance (ANOVA). The optimized working condition was found also the confirmation experiment was done for the proposed research work.

TE025

Exergy Analysis On Compression Ignition (Ci) Engine Fuelled With Lemon Grass Biodiesel, Mahua Biodiesel, Karanja Biodiesel And Lemon Grass-Mahua Oil Blend

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Abstract

An experimental investigation was carried out to evaluate the Performance characteristics, Emission characteristics, Combustion characteristics and Exergy Analysis of lemongrass Bio-diesel, Mahua Biodiesel, Karanja Biodiesel and Lemongrass oil-Mahua oil blend fuel in single cylinder compression ignition diesel engine. The tests were conducted to measure Fuel consumption, indicated power, Brake thermal efficiency & Combustion characteristics and Exhaust gas emissions and compared with standard diesel fuel operation. The results indicated various trends in specific fuel consumption, brake thermal efficiency, brake specific fuel consumption which are nearly equal to diesel fuel. CO, CO_2, HC and smoke emissions also gives a variety of results hence lead to further investigation over emission and other characteristics.

TE026

Extraction of Water from Atmospheric Air Using Desiccant Material with Solar Concentrator

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Abstract

Most countries in the world are facing an adverse situation due to lack of water, a water crisis mayhem. Due to pure water scarcity in many regions worldwide, atmospheric water generation looks to be one of the most promising methods for generating pure water. In this paper, an alternate method to extract large quantites of fresh water from atmospheric air by using desiccant materials has been presented. The experimentation on the production of water has been carried out in S.R.M. Institute of Science and Technology Kattankulathur, Tamil Nadu, India [12.8193° N, 80.0393° E]. Desiccant material absorbs moisture from the air during night time and then on regeneration during the day using a heat source (solar energy), it releases water in the form of water vapours which it had adsorbed earlier. This water is then collected separately in a container. A Scheffler type solar concentrator has been utilised for regeneration, as it is a renewable energy source. The experiment was performed successfully using transformer silica gel as the desiccant material. Transformer silica gel produces large quantities of water upon regeneration. The required data regarding radiation intensity, ambient temperature, wind speed, flow rate and relative humidity were also obtained. The approximate amount of water collected ranges in between 160ml to 200ml for 2 hours of sunshine period. Along with collecting water from desiccant material, an economic analysis of the system was also performed and proved to be economical and commercially viable.

TE027

Experimental investigation of performance, combustion and emission characteristics of CI engine fuelled with pine oil and mahua oil

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Abstract

Increase in energy demand, stringent emission norms and depletion of oil resources led to find alternative fuels for internal combustion engines. In this report we study the performance and emission characteristics of CI engine fuelled with pine oil and mahua oil blended in the blending ratio 70:30, 50:50 and 30:70 respectively. The experiment was carried out in four stroke single cylinder diesel engine by varying the load from 0% to 80%. The result shows the blend of pine oil and mahua oil used as a fuel has increased the brake thermal efficiency with reduction in specific fuel consumption and exhaust gas temperature. Blend with higher composition of pine oil shows better performance results while the blend with higher mahua oil composition shows better emission results. Use of blend also reduces the emission parameter such as CO, CO_2, NO_X and O_2 with an increase in HC emission, yields satisfactory result on the combustion characteristics at lower load which gets better on increasing the load.

TE028

Performance, Combustion and Emission Characteristics of CI Engine Fueled With Pine Oil And Karanja Oil

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Abstract

Increase in energy demand, stringent emission norms and depletion of oil resources led to find alternative fuels for internal combustion engines. In this report we study the performance and emission characteristics of CI engine fueled with karanja and pine oil blended in the blending ratio 70:30, 50:50 and 30:70 respectively. The experiment was carried out in four stroke single cylinder diesel engine by varying the load from 0% to 100%. The result shows the blend of karanja oil and pine oil used as a fuel has increased the brake thermal efficiency with reduction in specific fuel consumption and exhaust gas temperature. Use of blend also reduces the emission parameter such as CO, CO_2, NOX and O_2 with an increase in HC emission, yields satisfactory result on the combustion characteristics at lower load which gets better on increasing the load.

TE029

Solar Powered Waste Removal and Segregation System

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Abstract

The system consists of metal teeth based jaws that wait at the bottom of the mechanism. It is mounted in a frame to hold the system upright in the gutter. The vertical frame bed is used to let liquid flow but catch all solid waste. The mechanism consists of a filter basket on top of it. After particular time intervals the jaw lifts up using a motorized shaft which is connected using a chain to the jaws. It reaches the top and turns upside down to dump the solid waste. After dumping the waste, the motor rotates again to bring the jaw again to the bottom position to collect more waste. The system is a very efficient way to clean gutters & drains and also requires very low power since it will only rotate once or twice a day to dump the solid waste. Since the system doesn't need as much power and would be much more efficient if a reusable source of energy is used, we use solar panels and a lead acid battery. The objectives of this project are provide a fully automated drain gutter cleaning mechanism to tackle modern day gutter jamming issues and to power the system using solar energy to overcome fossil fuel crisis.

TE030

Heat Transfer Analysis of DOT4 Brake Fluid Using Concentric Tubes Heat Exchanger

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Abstract

Enhancing the heat transfer rate is an important factor in a heat exchanger. Various heat losses are accounting to convection, conduction and radiation from the fluid via atmosphere or the construction material reducing the performance of a heat exchanger. This project focuses on developing a concentric tube type model focussing on the parallel flow of fluid for analysis of DOT4 brake fluid accounting the various energy losses based on experimental results. The effect of variation on the overall heat transfer rate is studied. Based on the results obtained from the model developed parameters are optimized in comparison with a pre-studied literature survey for better performance which has been taken into consideration for doing theoretical calculations. This project aims at studying and analysing the various attributes of the brake fluid both experimentally and theoretically through rigorous study, by fabrication of the heat exchanger using mild steel and copper and henceforth conducting the experiment to obtain the analysis of the fluid.

TE031

Use of Phase Change Materials for Thermal Management of Batteries in Electric Vehicles

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Abstract

The electric batteries convert stored chemical energy into electrical energy. Batteries are used as the power sources in electric vehicles. The batteries used in electric vehicle should have high power density and fast charging characteristics. During the charging and discharging cycles, batteries will release some amount of heat, and if the heat is not removed, the battery temperature will increase and it will lead to decrease in its stored energy. To maintain constant temperature in the batteries, air, liquid, thermoelectric and phase change material based cooling techniques are employed. In this paper, we studied the effect of phase change material for the thermal management of electric batteries for different geometrical configurations and with different phase change materials. The 2D thermal model of the thermal management system was developed and analysed using ANSYS Fluent. The results are then compared for improved thermal management characteristics.

TE032

Exergy Analysis on Compression Ignition (Ci) Engine Fuelled With Pine Oil and Linseed Oil Blend

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Abstract

Increase in energy demand, stringent emission norms and depletion of oil resources led to find alternative fuels for internal combustion engines. In this report we study the performance and emission characteristics of CI engine fuelled with Linseed and pine oil blended in the blending ratio 70:30, 50:50 and 30:70 respectively. The experiment was carried out in four stroke single cylinder diesel engine by varying the load from 0% to 100%. The result shows the blend of Linseed oil and pine oil used as a fuel has increased the brake thermal efficiency with reduction in specific fuel consumption and exhaust gas temperature. Use of blend also reduces the emission parameter such as CO, CO2, NOX and O2 with an increase in HC emission, yields satisfactory result on the combustion characteristics at lower load which gets better on increasing the load.

TE033

Evaluation of Shape Factor for Simple Geometry Using COMSOL

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Abstract

Shape factor is an important parameter for calculating radiation incident in various devices like solar panels and tubes. Using COMSOL for evaluating shape factor of any geometry is very useful and convenient. Evaluation of shape factors for simple geometries like Concentric Sphere, Cylinders and Parallel, Perpendicular and Inclined Plates have been done in COMSOL and the result has been compared to conventional data using standard equations and has been found to be the same. Hence by using COMSOL, evaluation of shape factor for complex geometries which otherwise is very difficult to evaluate using conventional formulas can be done. The satisfactory results by using COMSOL for shape factor evaluation are useful in determining the actual radiation incident on complex geometries for example in bifacial solar panels.

TE034

Study of Solidification Characteristics of PCM in A Spherical Capsule Using Rectangular Fins

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Abstract

This study investigates the solidification characteristics of deionised water in a stainless steel spherical capsule fitted with rectangular fins immersed in a constant temperature bath. Experiments are carried at three different bath temperatures (-6°C -9°C and -12°C). Four rectangular fins of size 20.6mm length, width 10.6 mm and 1mm thick made of copper are fixed on the inner surface of the spherical capsule. Experiment results indicated that fin had a significant reduction in total solidification time. A maximum reduction of 51% in freezing duration was observed for 50% of total PCM mass at a bath temperature of -6^{o}C. Similarly a reduction of 35%,26% and 21% in freezing duration was observed for 75%,90% and 100% of total PCM mass was observed at a bath temperature of -6^{o}C. The above results indicate that fins can be employed in spherical encapsulation at lower bath temperature to achieve maximum energy savings Increased heat transfer rate due to fins allows the chiller to be operated at lower temperature difference.

TE035

Effect of phase change behavior of paraffin wax with modifications in heat transfer fluid tube directions

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Abstract

Solar thermal energy is the utilization of energy obtained from shortwave solar irradiance, transferred to a heat carrier medium. Due to drawbacks like discontinuous energy supply by the sun it demands a storage system. PCM thermal storage systems are preferred over sensible heat storage systems as significantly lesser volumes of storage medium is required and have high energy density of storage. The water temperature at inlet is 65-70 degrees Celsius for all three coils types with a water flow rate of 1.395 l/min. Linear heat transfer tube, one dimensional curved and two-dimensional curved tubes are investigated with the similar flow rates and inlet temperature of heating fluid. The operational duration and the percentage of melting are used to determine the type of coil producing the effective melting. Two-dimensional heat transfer fluid tube was observed with a faster melting rate of 20% more than the one-dimensional curved tube and 30% more than the linear two turn heat transfer fluid tube.

TE036

Performance and Emission Investigations on Diesel Engine Using Oxygenated Jatropha Biodiesel with Exhaust Gas Recirculation

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Abstract

In our study, Jatropha oil was taken for the biodiesel production and it was blended with diesel in four volumetric ratios namely JB5 (5% jatropha biodiesel, 95% diesel), JB10 (10% jatropha biodiesel, 90% diesel), JB15 (15% jatropha biodiesel, 90% diesel) and JB20 (20% jatropha biodiesel, 80% diesel). It has been calculated that the emissions like HC,CO and smoke emissions of JB blends were less than that of the diesel, but the NO_X emissions were more than that of the diesel. Also the performance characters like Brake thermal efficiency (BTE) of JB blended fuel is reduced and Specific fuel combustion (SFC) of JB blends were increased with the concentration of the jatropha biodiesel in the diesel. Exhaust Gas Recirculation (EGR) is a well-known technique to reduce the NO_X emissions and an oxygenated additive (Di-tetra-butyl-peroxide) can increase the brake thermal efficiency. To get the better combustion and emission characteristics both EGR and the additive should act at the same time. So, the best jatropha biodiesel blend based on the obtained results of performance and emissions (JB20) was taken for the testing of combined technique. The obtained results show that the combined technique gave the best results in terms of all the aspects.

TE037

Experimental Analysis of Methyl esters of Rubber seed oil fueled on VCR engine using Taguchi Design

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Abstract

In this work, methyl esters of rubber seed oil were tested in variable compression ratio stationary small duty, agricultural multi-fuel engine. The engine optimum operating parameters were analyzed using Taguchi design. Experiments were carried out with biodiesel blends 20, 40 and 60% biodiesel with diesel (volume basis) by varying compression ratio from (18:1 to 22:1), load (0-8kg) and fuel injection pressure (150-170 bar). The biodiesel blends up to 40% gives better results in terms of performance and combustion characteristics at increased compression ratio and fuel injection pressure. There was a reduction CO and NOx emissions obtained with slight increase in HC emission. The engine performance such as brake thermal efficiency and combustion pressure were improved with reduction in specific fuel consumption of lower blends of biodiesel compared with diesel.

TE038

Investigation of Cu-ZSM5 catalyst for the Emission Reduction in ethanol-gasoline blends using ISO-butanol as an additive in SI engine

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Abstract

In this research, experiments were conducted in a gasoline engine to find out the effects of Cu-ZSM5 zeolite coated catalytic convertor on the emission characteristics of iso-butanol additive in ethanol-gasoline blends. The engine tests were carried out at half wide open throttle in three engine speeds of 2000rpm, 3000rpm and 4000rpm. The volumetric proportion of the fuel samples taken for testing were gasoline (pure gasoline), E10 (90% gasoline, 10%ethanol), IB5 (95% E10, 5% Iso-butanol) and IB10 (90% E10, 10% Iso-butanol). The physiochemical properties of the fuels like heating value, kinematic viscosity and density were analyzed for these samples as these values influences the emission formation characteristics. The heating value of the samples were decreased with the gasoline concentration in the fuel samples. E10, IB5 and IB10 produced the heating values of 2.34%, 3.13% and 5.05% respectively less than that of the gasoline. However the density and kinematic viscosity were increased with the alcohol concentration in the samples. From the performance results, the Brake specific fuel consumption decreased for E10, IB5 and IB10 of about 3.57%, 5.14% and 7.13% respectively when compared gasoline. Brake thermal efficiency of the fuel increased to a noticeable level with the increase in the alcohol concentration in the fuel samples. Initially, the engine was fitted with the commercially purchased catalytic convertor and the emissions values were measured with the help of AVL 444 gas analyzer. Carbon Monoxide and Hydrocarbon were reduced but the Nitrogen Oxides increased with the increase of alcohol concentration in the fuel samples. Then the engine was fitted with the Cu-ZSM5 coated in-house fabricated catalytic convertor and the emission values were measured. From the results obtained, It is clear that the zeolite based catalytic convertor reduces engine emissions better than the commercial catalytic convertor for all the engine speeds.

TE039

Mathematical modeling and analysis of solar water collector with flat and v-groove absorber plate with helical water flow path tubes

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Abstract

A mathematical model has been developed for Solar Flat Plate Collector (SFPC) to compare the thermal performance between different geometrical profiles of the collector like Flat plate, V Grooved flat plate and Helical strip inserted in the absorber tube. Water, used as working fluid, is passed through the tubes to analyze the thermal performance. Different geometry of the absorber plate and tube are used to increase the heat transfer coefficient. The inlet and outlet temperatures are measured and analysis of heat gain, collector recovery factor, losses like edge loss, bottom loss and collector efficiency has been done. The comparative study on the thermal performance shows a 4% higher collector efficiency for Helical strip absorber tube than the other geometric profiles. Also, the results of mathematical analysis closely agree with the experimental results.

TE040

Energy and exergy analysis of three major recirculating multi-stage flashing Desalination plants in Kuwait

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Abstract

The objective of this study is to compare the thermal performance of three Multi-Stage Flashing (MSF) desalination plants that were built at different times over 40 years. The plants considered in this study are Al-Doha East, Al-Zour, and Al-Sobia, which were built in 1978, 2001, and 2007, respectively. Analyses based on the first and second laws of thermodynamics were performed to model the three MSF desalination plants using actual operational data. The thermal performance comparisons were in terms of energy consumption, exergy consumption, second law efficiency, and exergy destruction in different components. The results showed that Al-Sobia plant yielded 17% lower energy consumption, and 21% lower exergy consumption compared to Al-Doha East and Al-Zour plants. The results also showed that Al-Sobia plant had the highest second law efficiency of 6.9 %, compared to 5.4 % and 5.5% for Al-Doha East and Al-Zour plants. The fact that Al-Sobia desalination plant had less thermal and electrical energy consumption can be explained by the high-performance ratio, high heat exchanger effectiveness, high recovery ratio, and high top-brine temperature (TBT) compared with Al-Doha East and Al-Zour desalination plants. The low exergy consumption of Al-Sobia desalination plant, on the other hand, can be explained by the low exergy destruction in the desuperheater device and ejectors. The low exergy destruction of Al-Sobia desuperheater was due to low steam extraction and high exit flow exergy caused by the high TBT and pressure compared with Al-Doha East and Al-Zour plants.

TE041

Efficiency Improvement in Thermal Power Plants Using Waste Heat Recovery of Flue Gas – Simulation Study

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Abstract

In this paper an Organic Rankine cycle is used as waste heat recovery cycle for a 250 x 2 MW thermal power plant. The exhaust flue gas (80 to 130°C) in the thermal power plant is often released into the atmosphere as waste heat. This waste heat can be utilized as a form of heat source for the Organic Rankine Cycle. The treated flue gas form the Flue Gas Desulphurization plant will be fed to the heat exchanger where the heat transfer between the flue gas and the working fluid (e.g.: Ammonia, R245A) will take place. The working fluid will be fed to the (low pressure) turbine where the work done can obtained. After the expansion of the working fluid in the turbine, the working fluid is cooled in the condenser using water. Then this fluid is again sent to the heat exchanger using pump. The flue gas from the heat exchanger after the heat transfer will be then supplied to the stack. The cooling of the condenser water can be done using a cooling tower. As the load varies for the thermal power plant the temperature of the flue gas also changes and hence the turbine shaft output also changes this may result in tripping of the generator. In order to avoid this, a turbine governing system is designed with a step-up gear box and a torque converter. This governing system will keep the generating shaft in motion at constant speed even during low loads and high loads. This cycle will help the thermal power plants to obtain extra power output and will increase the efficiency of the plants.

TE042

Thermal Management of CPV Cells Using Nano Enhanced Phase Change Material

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Abstract

With the rising need for solar cells in the market there is a need to increase the efficiency and life of the Concentrating Photovoltaics(CPV). But when the temperature of CPV increases beyond a threshold temperature its efficiency starts to drop. To control this drop in efficiency we need to remove heat from the system. This can be done by active cooling or by passive methods. In this project we aimed to simulate the cooling done by Phase Change Materials (PCM) and compare it to cooling done by natural convection. For this we designed various heat sinks and compared their simulation for heat dissipation when PCM was present. Our aim was also to select a suitable PCM and prepare its nano PCM. The PCM selected was OM 35 and it was initially mixed with surfactant Sodium Deoxy cholate to improve its solubility. Further in the mixture we added Graphene based nano particles to create a nano PCM.

TE043

Non-Conventional Energy Extraction (Vibration Energy Extraction)

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Abstract

Utilization of alternative sources of energy can be very useful as conventional energy resources are depleting rapidly and has a negative impact towards earth. As we know playing any sport requires a lot of energy. All that energy that players utilize in a game, is usually is exerted in the form of vibration and sound, we can effectively tap this and convert it to electrical energy. We will be generating electrical energy from the vibrations produced on the turf during any sports like Basketball, Tennis, Badminton, Kabbadi etc. The idea is to convert the vibrations on the floor into useful electrical energy through piezoelectric transducers placed on the turf. These vibrations will be used to deform the piezoelectric material that will generate a potential difference that can be stored.

TE044

Studies on the performance of 150W solar photovoltaic module with evaporative cooling

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Abstract

The increase in surface temperature of solar photovoltaic module due to incident solar radiation has an adverse impact on its performance, reducing its electrical output power and efficiency. Proper cooling can improve the electrical efficiency, and decrease the rate of cell degradation with time, resulting in maximization of life span of photovoltaic modules. Various methods like active cooling, passive cooling and heat pipe cooling are employed to cool the module. In the present work, water passive cooling technique has been used since this method is preferred for small modules and is more efficient because of higher thermal capacity of water. Evaporative cooling is one such technique. Numerical and experimental investigations have been carried out to study the effect of evaporative cooling on the performance of solar photovoltaic module. A two dimensional, steady state, cross flow, heat and mass transfer model has been developed and temperature distribution of air and water across a cooling pad has been studied. An evaporative cooling pad is incorporated at the bottom surface of solar photovoltaic module. Experiments are conducted to evaluate the performance of solar PV module and the results are compared with that of numerical simulation.

TE045

Heat and mass transfer studies in a finned tube heat exchanger employed with evaporative cooling technique

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Abstract

Fin and tube heat exchangers are air cooled, cross flow heat exchangers. The obvious advantage is that they do not require water. They find usage in refrigeration, air conditioning, power plants, steam generators, chemical plants and vehicles, etc. They have shown broad prospects in places where there is lack of water resources. Research is focused on improving the heat rejection capacity of these exchangers and various enhancement techniques have been studied. Evaporative cooling is one of the techniques employed to improve the performance. It is a prospective cooling technique as it involves the latent heat of evaporation. It cools the air entering the heat exchanger by evaporation of water. A mixture of air and water is used as the cooling medium. Air cooled heat exchangers with evaporative cooling techniques perform better compared to conventional fin and tube heat exchangers. In the present work, a numerical simulation has been developed to investigate heat transfer enhancement in a fin and tube heat exchanger incorporated with evaporative cooling technique. An experimental setup has been built to test the modified heat exchanger and to validate the numerical results. Experimental values of heat transfer rate and outlet temperatures of hot water and air are compared with those of numerical simulation and the agreement is generally good.

TE046

Effect of micro-arc oxidation coating on engine component to study the flame features and emission characteristics of Spark Ignition Engine

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Abstract

This research article was the outcome of the experiment performed to analyse the result of piston crown coated using Micro-Arc Oxidation (MAO) on the flame and emission attributes of the Spark Ignition engine fueled by gasoline. The micro-arc oxidation (MAO) coating is a technique to form a ceramic oxide layer on the reactive metal substrate by electro chemical and thermal oxidation in an alkaline electrolytic solution. This oxide layer creates an adiabatic effect to minimize the heat rejection from engine in-cylinder parts. Combustion flames were captured by combustion endoscopic window to study the flame characteristics. By observing combustion flame images, it was found that flame propagation was faster in MAO coated piston engine than the standard piston engine. This was owing to the enhanced air-fuel reactivity which was favoured by high in-cylinder local temperature. The low thermal conductivity nature of MAO oxide layer reduced the heat rejection and increased the in-cylinder temperature. The MAO coated piston engine reduced Carbon monoxide (CO) and Unburned Hydrocarbon (UHC) emissions by 6.46% and 4.6% at maximum load condition respectively compared to uncoated piston engine. The reasons for decreased emissions were better fuel vaporization and mixing of air fuel vapors.

TE047

Elementary Characterization of Smoke Tunnel using Flow over a Circular Cylinder

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Abstract

The utilization of smoke tunnel for flow visualization of aerodynamics studies needs calibration of the tunnel. This paper aims to describe the characterization of the smoke tunnel using smoke injection technique. The main phenomenon considered is the wake behavior occurring at the downstream side of the cylinder. The experiment is conducted by injecting the smoke perpendicular to a circular cylinder placed in the tunnel. The visualized smoke flow lines resembles the streamline patterns which will reveal the wake behavior. The procedure of smoke based visualization will be carried out for various Reynolds numbers and the corresponding physics is described with the limitations of the tunnel.

TE048

Numerical Analysis of Multi-point Laser Induced Spark Ignition of Hydrogen-air and Methane-air Mixture

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Abstract

Lean burn combustion with high spark energy is an advanced combustion approach which improves the combustion characteristics. The limitation of conventional electric discharge system i.e. electrode erosion, electrode quenching and requirement of number of electrodes for igniting lean mixtures is overcome by multi-point laser induced spark ignition (LISI). A laser is high energy electrode less ignition source with easy possibility of multi-location ignitions. A number of investigations have been carried out on single-point laser ignition of fuels but the work on multi-point laser ignition of fuels is indeed very limited. Therefore, in the present work a multi-dimensional CFD modeling using ANSYS Fluent was developed for constant volume combustion chamber (CVCC) to characterize multi-point laser induced spark ignition combustion phenomenon from start of plasma formation to end of combustion. The combustion and emission characteristics of methane-air and hydrogen-air mixtures ignited by multi-point laser induced spark were studied using numerical simulation. The standard k-ε model was used to simulate the flow with turbulent conditions and required input conditions for simulation were taken from the literature. It was predicted from results obtained from numerical solution that, peak pressure goes on increasing with increase in equivalence ratio from 0.77 to 1.29 and 0.36 to 1.0 for methane-air and hydrogen-air mixture respectively. The simulated model is validated for peak pressure and combustion duration against experimental results. The maximum error for peak pressure of 6.45% and 11.71% was observed for methane-air and hydrogen-air mixture respectively. However maximum error for combustion duration of 8.02% and 9.52% was observed for methane-air and hydrogen-air mixture respectively. The simulated results shows good agreement with experimental results which shows the model is valid for the combustion process. The reaction progress for hydrogen-air mixture was found faster and more turbulent compared to methane-air mixture. The trends of the NO_x, CO and CO_2 emissions were analyzed using a numerical model.

TE049

Reduction of Particulate Matter Emission in an CI Engine fuelled with ISO-Butanol-Diesel Blends

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Abstract

Diesel Engines are preferred for the long distance drive as well as heavy load operation. It is necessary to reduce the dependence upon the depleting diesel products with some kind of an alternate fuel, but it should be acceptable in the diesel engine in all the aspects like modification required, emission norms etc. Many researches were focused on using the alcohol based products in the diesel as well as petrol engines. In this research, Deposition formation in the injector hole and the particulate emission formed from a stationary diesel engine fueled with pure diesel and IBD10(Iso-butanol10%,Diesel90%) was studied. The deposition on the fuel injector of the engine running with diesel and IBD10 was evaluated by using Scanning Electron microscope. From the results it has been observed that the injector running with IBD having only 1.5% deposition more than that of the initial injector hole diameter, but the diesel fuel have 4.5% more than the initial hole diameter. Also the formation of the particulate emission from IBD fuel and form pure diesel fuel was measured with help of the Bosch smoke meter. The particulate emission formed when the engine was fueled with diesel was more than that of the IBD10 fuel, because of the more carbon content. It has been observed from the results that the engine running with the diesel fuel have an average smoke emission of about 17.4% more than that of the IBD fuel.

TE050

Endoscopic visualization of combustion flame and evaluation of engine characteristics of spark ignition engine fuelled by Benzyl alcohol blended gasoline

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Abstract

This paper endeavors to investigate the characteristics of the twin-cylinder spark-ignition engine with a port fuel injection (PFI) system fuelled by gasoline fuel blended with benzyl alcohol (BZ) in the ratio of 1.5%, 3% and 5% by volume. The fuel blends were tested at constant engine speed of 2500 rpm at different loads (20%, 40%, 60%, 80% & 100%). In this study, the endoscopic visualization technique is adapted to visualize and capture the spark, flame propagation and start of combustion (SoC) for all the test blends using the charge-coupled device camera. From the captured combustion images, flame characteristics like are covered by flame at different crank angles, flame speed, and flame luminosity were determined using MATLAB image processing technique. Combustion image showed an advance in SoC for BZ blends. The addition of BZ with gasoline increased the flame speed due to the presence of aromatic ring which results in faster hydrogen abstraction rate and promoted more premixed combustion which can be inferred from the reduced luminous flame area in the combustion flame images. The in-cylinder pressure and heat release rate (HRR) was measured using Visio-spark plug and recorded using AVL-Indicom software. The oxygen molecule in the OH atom of BZ improves the heat release rate and results in the increased in-cylinder pressure for BZ blends. At full load, the brake thermal efficiency of BZ1.5, BZ3, and BZ5 was increased by 1.2%, 2.9% & 4.4% respectively when compared to gasoline. All the exhaust gas emissions were decreased with the addition of BZ in gasoline especially NOx and CO2 emission. From the result, it can be concluded that the blending of BZ with gasoline improves the performance and reduce the engine emission.

TE051

An analysis of real-time building with exfoliated vermiculite materials incorporated on the energy efficiency roof material for Indian climatic conditions

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Abstract

Presently the essential research trend for sustainable buildings is to use the renewable energy sources and the development of new techniques of energy storage materials. The energy consumption of the buildings cannot be reduced effectively by the cool roof materials which is used in building constructions but which improves indoor thermal comfort and diminish the urban heat island (UHI) condition. In this paper an energy efficiency residential building roof is coupled with Exfoliated Vermiculite (EV) materials has been analyzed and compared with conventional building in Indian climatic zones by using EnergyPlus software. The thermal performance of heat fluxes, roof surface temperature, net site energy, annual energy demand, annual energy use intensity (EUI) and annual electricity have been studied for three different climatic conditions such as hot and dry, warm and humid and moderate climatic conditions in India. The results indicated that, peak temperature and heat flux of the energy efficiency roof has decreased, since the effect of the outdoor condition on indoor environment has been weakened. This is due to lower heat transmittance properties and higher thermal resistance of EV material. In conclusion, it has been proved that the energy efficiency roof has good thermal insulation effect and energy efficiency potential which is more suitable for utility in building applications for providing better indoor thermal comfort.

TE052

Modeling and simulation of an active solar water heating system for Maiduguri, Borno State, Nigeria

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Abstract

The recent interests in renewable energy has created a need for research in the area of solar technology, particularly solar water heating system. In this study, a model of an active solar water heating system was developed to produce hot water with the temperature of 90^{o}C using TMY solar weather data of Maiduguri. The numerical experiment was used for simulation and hourly thermal performance of the system was determined using TRNSYS 16 software. The main component of the TRNSYS deck file constructed for this purpose is Type 109, accompanied by other components require for the model. Typical meteorogical year (TMY) weather data of Maiduguri was processed to obtain the monthly average daily hot water for Maiduguri, and the recommended average day of each months were also used. The weather condition of the month of August was considered for the design. The result of simulation shows that an active solar system collector area of 2.04m^{2} with inlet flow rate of 120kg/hour for hot water application, tilted at an angle of 12^{o} to the horizontal would be capable of producing daily domestic hot water of 0.1m^{3} volume to the desired temperature of 90^{o} C. The validation computed by using statistical tool of Nash-Sutcliffe Coefficient Efficiency (NSE) and Root Mean Square Error (RMSE) reveal the system ambient temperature and storage tank temperature of 1.6^{0}C,0.82 and 3.6^{0}C,0.96 respectively. For the experiment conducted, the model has capacity of predicting the performance of system with 82% and 96% degree of accuracy for that the experiment conducted. The early hours of each months as compared by the collectors showed that the serpentine solar collector has higher thermal performance than the riser-header flat plate collector but after 15:00 hours, Riser-header solar collector performance is better. This means that that riser-header solar collector has higher performance better than serpentine solar collector.

TE053

On the effect of repulsive magnetic field on partially premixed flames

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Abstract

The premixed flame represents the premixing of fuel and oxidizer at the ignition front and are important with wide range of applications from burners, gas turbine combustor, mixing studies to practical, functional, engineering and scientific research applications. One of the interesting cases of premixed flames is partially premixed flames which has redirected the attention of the scientific community. The partially premixed flames are primarily investigated as peculiar case of feedback mechanism and instability. This represents incomplete burning, safety hazards and heterogeneous heat and mass transfer. The flame stability of premixed flames comprises an integral role in most of the propulsion applications. For efficient combustion operations and applications, flame stability is mandatory and different method and approaches have been tried. However, the complexity of the problem has prevented a thorough understanding. One aspect of transitional energy interaction which is yet to be tried is the interaction of magnetic energy with the thermal energy in partially premixed flames. The energy interactions are likely to alter the high energy field supporting flame stabilization and control. Present work is motivated by the need to enhance fundamentally understanding of the partially premixed flame behaviour and stabilization utilizing an alternate energy source. The specific objective of the work is to explore the effect of the combustion process in presence of repulsive magnetic field and to investigate the role of key controlling parameters. The major application includes, enhancement of fundamental understanding and optimization of potential gas turbine combustors, spacecrafts and magnetic nozzles etc. A simple experimental setup was upraised comprising of Bunsen burner and designated magnets. The investigation was carried out for varying number of external energy sources viz., 2, 3 and 4 magnets, continual variation in interspace distances, and different configurations in repulsion fields. The magnetic effect on the flames is characterized in terms of geometric flame classification viz., Blue flame length, Yellow flame length and Gross flame length along with the visible structural changes in the flames. The phenomenon was systematically video-graphed and the percentage variation for different cases was calculated and tabulated with respect to the initial condition without magnet as the base case. Results clearly state that presence of magnetic energy in the immediate vicinity significantly affect the flame behaviour. With systematic reduction in the separation distance, a non-monotonous drop in the BFL is observed for the cases of 2,3,4 magnet configuration(s) with reduction in the interspace distance.

TE054

Combust-O-Acoustics: Energy Transition and Implications

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Abstract

Acoustics is an integral constituent of most of combustion processes. While combustion advancements have revolutionized human life, acoustics induced combustion also represents a dominant form of instability. Thermo-acoustics, as an intense area of scientific research, covers a wide range of applications viz., industrial (electricity generation), transportation (jet and space propulsion), engineering (system efficiency and operations) and scientific research. The presence of such inept working systems with instability is likely to result in significant loss of resources, infrastructure, property, mankind, nature, with huge amount of money being spent on research activities. Appreciable work has been done before however; the heterogeneous nature of the problem has prevented comprehensive understanding. Thus, the need to investigate and characterize the acoustics imbibed combustion processes to suggest better combustion alternatives/ enhance effectiveness and to minimize the resultant hazards. Present work, attempts to resolve the low effectiveness of combustion systems by classification of thermal acoustics and related major hazards.

TE055

Experimental Investigation of Light Weight Cementitious Material for Thermal Insulation

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Abstract

Light weight – thermal insulation concrete has a growing demand in energy efficient building. It can be used in places where there is a requirement for thermal insulation in the form of tiles and weathering coarse for roof as well as in places where there is a need for thermal lining. For the preparation of light weight – thermal insulation concrete, a cement replacement mix consisting of Silica fume, Metakaolin, Egg shell powder, Allcofine were used along with different particle sizes of Cenospheres as a fine aggregate replacement. The test concrete samples made of cubes and cylinders were tested for their physical and mechanical parameters such as compressive strength, tensile strength and its thermal conductivity were investigated. The light weight – thermal insulation concrete has a reliable compressive strength and a satisfactory thermal insulation property.

TE056

Combustion and propulsive characteristics of potential hybrid rocket propellant

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Abstract

Presently, the advancements in the field of rockets and rocket propulsion has been done to such an extent where the mission success rate is surely more than its failure. This has also led to a need for much better efficient materials (propellants) that form a major part of the rockets. The project deals with the combustion and the propulsion characteristics of the rockets. In combustion part, the experiments are conducted on normal paraffin wax candle, coated with different energetic materials in order to calculate the burn rate with the help of videography. This addition of energetic materials enhances the regression rate of candle. The propulsive characteristics, like the specific impulse and characteristic velocity, are studied through simulations carried on the NASA-CEA software in which a base composite propellant (AP/HTPB/Al) is present along with highly energetic materials. The energetic materials considered here are either fuel, binder or oxidiser which helps us to study the variance in the specific impulse and the characteristic velocity. The key parameters here are pressure, temperature, the oxidiser to fuel ratio and the composition of the material. One of the novelties of this study is to create a relation between the combustive and propulsive characteristics as there is not existing correlation between them. Other importance of this study is the concept of Hybridisation put forth to simplify the addition of material in the propellant. This concept has been studied extensively come up with a better hybrid propellant that can be used to improve the efficiency of the rocket.

TE057

Self-Inducing Fires: The Heat Source Effect

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Abstract

Scholars and scientists have been trying to find ways to control and alleviate the consequences of concurrent fires such as forest fires, building fires and various space fires but no compelling solutions have been concluded from their studies so far. The basic cause of these kind of fires concerns with the unstable nature of the flames and marked unpredictability associated with it. For example, the breakout of one of the deadliest wildfires in California in 2018 and the Amazon fire of 2019 shows us the gravity of the situation and also the immediate requirement to control such mishaps to save lives and properties valuable to us. This led us to make an attempt to study the behavior of such flames – an experimental setup with rather ideal conditions was devised and a thorough home-scale study was carried out. This present study mainly concerns with the study of fire propagation phenomena and the vitality of fire control in our daily life. This study involves the review of the varying regression rates and fire spread rates of flames as observed in matchsticks when spaced in both linear and non-linear orientation for different configurations. The behavioral instability of the flames will give us an insight into the heterogeneous fire propagation phenomenon and its control. An insight into the heterogeneous fire propagation is expected for essential fire safety and, on its basis, an algorithm for the same is to be formulated. With this knowledge along with the existing information, it might help us quantify the extent of fire propagation by means of a non-dimensional entity which might as well give us some possible solution to the reduction of such kind of fires in forests, buildings, large scale fires in industries, space propulsion systems.

TE058

Analysis of transmission oil condition for Nissan Serena S-Hybrid after 3 years operation

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Abstract

Transmission or gearbox is machine components which functioning as converter from rotating power source to speed and torque. Lubricant plays a significant role in a tribology system in order to enhance the reliability and service life of friction units. Not only expected to perform as anti-friction media, it also should be able to facilitate smooth operations, reduce wear and heat loss from moving contact surfaces, prevent rust and reduces oxidation as well as act as seal against dirt, dust and water. Condition monitoring techniques have been deployed in the past two decades in order to predict and overcome the wear related damage progression in gear transmission systems. Ferrographic Technique (FT) is a microscopic analysis to identify the presence of material composition by characterizing particles concentration, type, size, distribution, and morphology. Spectrometer analysis can shared the types of element available in oil contaminants. This technique is part of a Predictive Maintenance (PdM) program to avoid a major failure in machine systems. In the present study, analysis of wear characterization from Nissan Serena S-Hybrid transmission oil by Ferrographic Technique and Spectrometer analysis was conducted. Transmission fluid samples were collected from 3 years unchanged fluid and analysed using Ferrogram Maker (FM-III). Optical microscopy and Predict Chart were used to characterize and identify sample in which groups. Elemental analysis was carried out using Spectroil Q100 an atomic emission spectrometer to analyse the elements content on the specified lubricant. Total of 33 metal and non-metal elements can be detected by the equipment in part per millions range. The EP test was conducted in accordance with with ASTM D2783 standard using four-ball friction and wear tester produced by Koehler Instrument Company, Inc. Initially, 24 kg of load was applied, and the load was gradually increased for about every 10s until the balls were welded. It was observed that the corrosive and black oxide wear type were major findings in sample tested. Spectroil analysis show the high amount of Natrium and Carbon which believe come from oil additive and oxidation of oil.

TE059

CFD Studies of Rocket Nozzle Flows with Supersonic Film Cooling

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Abstract

The divergent portion of a rocket nozzle is subjected to very high thermal loads due to expansion of high temperature gases. To keep the temperature of nozzle material within the safe limits, a cooling system needs to design. Supersonic film cooling method is most preferred method due to its flexibility and higher effectiveness. The objective of the present work is to predict the effectiveness of a supersonic film cooling and performing parametric sensitivity studies. The nozzle conditions are: Stagnation pressure and temperature are 58 bar and 3700 K respectively. These conditions correspond to actual flight conditions of a typical launch vehicle systems. Hydrogen is used as nozzle fluid. Nitrogen is used as coolant, and it is injected at a Mach number of 2 and temperature of 100 K. Cold flow CFD simulations are performed with commercial CFD software ANSYS-Fluent. The diffusion of coolant into the nozzle flow field is modelled by solving species transport equations for nozzle fluid and coolant fluid. The gas is treated as mixture of two non-reacting species, and mixture properties are computed using ideal gas mixing laws. The predicted cooling efficiency will be validated with the experimental data available in literature. Subsequently, simulations are performed by changing the coolant Mach number and temperature. Solutions obtained from different inlet conditions of coolant are analyzed to understand the coolant flow pattern, mixing layer between nozzle fluid and coolant.

TE060

Numerical investigation of flow around four in-line circular cylinders

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Abstract

The flow around four in-line circular cylinders has been studied numerically for 0.1< s/D< 10 and Re= 100, 150 and 200, where 's' is the distance between two cylinders, 'D' is the diameter of the cylinder and 'Re' is the Reynolds number. The effect of spacing between the cylinders on the flow regimes is initially studied numerically at Re = 100 and the predicted lift and drag coefficients are validated against published data. The present study is undertaken with a focus on identifying the flow patterns that the flow can exhibit for multiple inline cylinders. A flow regime map is proposed as a function of spacing and Reynolds number. The appearance of flow regimes is opposite to that for a row of cylinders. The Strouhal number for vortex shedding is measured for all the cylinders, especially for end cylinder. It was observed that the mean drag (C_{Dmean}) experienced by the cylinders is less than that for an isolated cylinder. Interestingly, the fluctuating lift force can be larger than the fluctuating drag force on the cylinders. These results should help to improve the understanding of flow around multiple bluff bodies.

TE061

Effect of Preheating on Azadirachta indica biofuel and their performance analysis in a CI engine

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Abstract

This paper deals with evaluation of engine performance using preheated biofuel utilizing the waste heat generated from exhaust gases. The performance characteristics and emission parameters are compared with the trans-esterified biodiesel. It is understood that the preheated biofuel run in the engine was capable of producing appreciable brake thermal efficiency as that of biodiesel run CI engine. This effort simultaneously reduced the heat loss to the environment, thereby improving the exergy of the system. The neem biofuel was heated to 70°C and 80°C before injection by the exhaust gases. HC and CO emissions were reduced by 22.3% and 19.01% respectively. NOx emissions suffered an increase of 18.6%. The improvement in BTE was 5.5% compared to non- heated biofuel.

TE062

Experimental Analysis of Aerodynamic Performance on asymmetric NACA 23018 Aerofoil incorporating a Leading Edge Rotating Cylinder

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Abstract

The effects of Momentum injection can play a vital role in increasing the efficiency of an aerofoil by increasing its lift and delaying the stall angle. Most of the studies regarding this concept analyzed the effects of momentum injection for higher velocity ratios (cylinder tangential velocity to free stream velocity) only. Almost no or less studies analyzed this effect for lower velocity ratios which created a research gap in this field. In this paper, a rotating cylinder is placed at the leading edge of an asymmetric aerofoil NACA 23018 and the aerodynamic performance with and without a rotating cylinder was studied for lower velocity ratios (<0.2). The experimental analysis was carried out for two Reynolds numbers (Re): 2×10^5 and 2.5×10^5 corresponding to two free stream velocities: 20 m/s and 25 m/s, respectively, for six different angles of attack (−5°, 0°, 5°, 10°, 15° and 20°). The experimental analysis showed that incorporating a leading-edge rotating cylinder increased the maximum lift coefficient by around 24% and delayed the stall angle by around 20%.

TE063

Exploration of Zeolite 5A as catalyst in the after treatment system for a CI engine powered by plastic oil blend

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Abstract

Catalytic converters are commonly used for the automotive engines to reduce the regulatory emissions. Catalysts used in the commercial converters are costly and works in certain temperature ranges. To overcome those problems, Zeolite 5A powder is chosen and used as catalytic material in the catalytic converter to reduce the emissions from diesel engine. Zeolite 5A was moulded into solid by adding distilled water and carboxymethyl cellulose as binder material. Prepared mould was put in the furnace for 3 hrs at 450°C to make it into harder. Hardened solid mould was used as catalytic material in the exhaust gas after treatment system. Waste plastics were pyrolysed into oil and blended with diesel in the 50:50 ratio for the study. Performance and emission readings were taken by varying the engine loads (0, 4, 8, 12 and 16 kg) in the single cylinder 5.2 kW CI engine. NOx and HC emission were reduced by 37% and 33% respectively at the full load condition.

TE064

1-D mathematical modeling of a diesel oxidation catalyst for transient hot start drive cycle

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Abstract

The need to obey with increasingly stringent emission regulations has amplified the importance of after treatment devices, and therefore, reliable tools need to be developed for the evolution of better after treatment devices. Even though the upcoming regulations paved the way for improved combustion engines, their high carbon monoxide and hydrocarbon emissions increased the load on catalytic converters. Numerical modeling is one such tool which is extremely useful in providing the basic information which helps in designing the reactor, understanding its operation, and predicting the performance. In this context, the utmost aim of the numerical modeling is to simulate the driving cycle where inlet conditions to the catalytic converter vary with respect to time. Such a simulation must include the calculations of transient temperature-field of the monolith substrate and converter-out mass emissions. In this paper, a one-dimensional mathematical modeling of an oxidation catalyst has been implemented to simulate a hot start New European Drive Cycle (NEDC). The transient engine data was taken from the literature, and the measured instantaneous traces at the outlet of the catalyst were compared with the model predictions. This model has been developed to investigate the CO conversion performance of the catalyst. The comparison between model predictions and experiments has shown a satisfactory agreement in terms of both substrate temperature and CO emission at the catalyst outlet, confirming the effectiveness of the methodology applied. The reliability of the 1-D model was also proved with the probability density function of the conversion efficiency.

TE065

A Numerical Approach to Study the Steady State Heat Transfer Characteristics of an Annular Porous Heat Exchanger

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Abstract

Heat exchangers are one of the most heavily studied devices and extensive work has been performed over the years to increase their effectiveness. The present work investigates the heat transfer characteristics of an APHE (annular porous heat exchanger) in terms of different parameters. A modified design for the APHE is proposed, which resembles a conventional double pipe heat exchanger, with the annular portion of the outer pipe filled with a specific type of porous medium in order to intensify the heat transfer process. Commercial CFD package ANSYS Fluent has been utilized to investigate the performance of the proposed design numerically. Introduction of porous medium induces an increase in pressure loss which is undesirable; hence, a trade-off is present between hydrodynamic and thermodynamic performance. In the present work different inlet parameters have been modified such as different values of porosity (70% to 90%), different inlet velocities of hot fluid (1 m/s to 9 m/s), different inlet velocities of cold fluid (5 mm/s to 25 mm/s), and different inlet temperature of hot fluid (400 K to 480K), and their effects on the outlet parameters have been studied. The change in heat transfer has been presented quantitatively along with other significant parameters such as mass flow rate, pressure drop and hot gas outlet temperature. These results have been compared with the values for conventional heat exchangers in order to establish the effectiveness of APHE.

TE066

A Computational Study and Experiments to Investigate the Combustion and Emission Characteristics of a Small Naturally Aspirated Diesel Engine through Changes in Combustion Chamber Geometry, Injection Parameters and EGR

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Abstract

Investigation of the combustion process in engines for improved fuel economy and emissions is best done by combining experiments and simulations. In the present work both experiments and simulations are conducted considering a naturally aspirated common-rail direct-injection (CRDI) diesel engine. The CFD model is developed based on experiments conducted at two operating points, representing to a 0.9 l, two-cylinder, and diesel engine. The developed CFD model is then used to study the effects of different in-cylinder strategies attempted at reducing emissions, without compromising on performance. It is worth notifying that previous researches conducted on CFD simulations are generally based on large-bore large-capacity single cylinder engines, and mostly investigated a single operating point. Also, literature discusses more about studies conducted on a single in-cylinder strategy, and rarely on a combination of different strategies. Therefore, present study investigates the effects of combustion chamber geometry, injection timing, multiple injections as well as EGR, individually as well as a combination, on NOx and soot emissions, at two different operating points.

TE067

COMPARISON BETWEEN 6063 AL ALLOY AND COPPER THERMOSYPHON PERFORMANCE WITH Fe_3O_4 WATER BASED NANOFLUID

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Abstract

Materials emphasize the performance of the thermosyphon. The thermosyphon is the passive heat transfer device. In this study the performance of 6063 AL alloy and copper made thermosyphon with water based Fe_3O_4 nanofluid are compared. The experiments conducted on the different heat input, angle of inclination and flow rate by using box-behnken design method (BBD). The output responses are thermal resistance (R_{th}) and efficiency. The Fe_3O_4 water based nanofluid with particle size 30 nm uses in the concentration of 80mg/lit. Both the thermosyphon materials have been analyzed with the Fe_3O_4 water based nanofluid. The result show that the Fe_3O_4 water based nanofluid suits for 6063 AL alloy made thermosyphon than the copper made thermosyphon.

TE068

Development of a CFD Model and Validation with PIV-data to Study the Fluid Motion in a Small PFI SI Engine

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Abstract

In-cylinder fluid motion has a substantial impact on air-fuel mixture formation, combustion process and emission formation. In the present paper, a simulation study of the in-cylinder fluid flow is performed using a computational fluid dynamic (CFD) model of a port-fuel-injection (PFI) engine (volume: 110 cc). First, a 1-D model is developed, and validated with the cylinder pressure traces acquired in an optical engine experimentally. The model provided the boundary conditions for multi-dimensional numerical simulations. The predicted velocity fields from CFD are then compared with the measured data obtained using particle image velocimetry (PIV) at various crank angle positions with low throttle opening condition. A good relevance is observed on comparing numerically estimated results with experimental results.

TE069

Flow Separation Control and Enhanced Expansion of Sern Nozzle Flows Using Dielectric Barrier Discharge

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Abstract

Dielectric Barrier Discharge (DBD) is extensively studied by researchers as a means of active flow control technique for airplane and wind turbine aerodynamics. A DBD actuator is a mechanical component with no moving parts and has a sandwiched dielectric between two electrodes which are connected with high voltage AC current obtained from a transformer. Present work has two phases of investigation, first dealing with the study of a Single Expansion Ramp Nozzle (SERN) to identify the separation region on the ramp through CFD simulations. These studies are conducted for various nozzle pressure ratios (NPR) and for selected ramp angles in order to identify the separation region over the ramp surface for various angles at each NPR. Further the second phase of study include an experimental investigation with a Dielectric Barrier Discharge actuator over the ramp region to minimize or avoid the adverse effects of flow separation. A low-cost DBD from a fly-back transformer and a driver circuit is indigenously developed. This DBD combines the advantages of non-equilibrium plasma properties with the ease of operation at atmospheric pressure. The results of combining DBD with SERN will be proved as an effective means of increased expansion which otherwise is not possible with the conventional SERN nozzles.

TE070

Development of thermal conductive paste for enhancing the heat transfer rate in electrical and electronic devices

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Abstract

The growth in modern micro or nano electronic chips and electrical devices in the market, with the aim of developing a highly efficient electrical processing machine. However, heat dissipation is a critical problem for these electrical and electronic devices. The heat extraction from these devices can be enhanced by adding thermal conductive epoxy paste over the surface. The conductive epoxy polymer use has been increasing widely in the electrical and electronic application due to its lightweight, exceptional insulating, adhesives nature and low corrosion rate. In the present work, an initial attempt is made to utilize the waste metal swarf which will help to minimize the cost, energy and environmental damage. Each year a large amount of metal swarf are produced from the machine shop and various other manufacturing industries. The micro-sized conductive metal swarf and -Nano-conductive filler with varied weight percentage is used for developing a thermal conductive paste. After solidification of these conductive epoxy paste, its thermal conductive behavior is examined using third-generation advance modified transient plane source technique. To investigate the formation of the conductive path in the epoxy polymer scanning electron microscope. Corrosion analyzer is used to determine the reduction in the corrosion rate and universal testing machine is used for determining mechanical strength.

TE071

Investigation of mode II delamination resistance of composite laminates with acoustic emission monitoring

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Abstract

This research work focuses to investigate the mode II delamination resistance of composite laminates with online Acoustic Emission monitoring. The effect of the fiber material on the interlaminar fracture toughness and delamination behaviour was investigated. Unidirectional glass fiber and carbon fiber with areal weight of 200gsm were used for fabricating the laminates. Mode II fracture toughness test was performed on End Notch Flexure (ENF) specimens in a three point bending fixture. The mode II (G_{IIC}) critical strain energy release was calculated using the Direct Beam Theory. The evolution of damage during crack propagation was monitored, and their successive damage mechanisms were characterized with Acoustic Emission Technique. The interlaminar shear strength and G_{IIC} fracture toughness of carbon/epoxy laminates were improved by 64% and 125% than glass/epoxy laminates. The fracture surfaces revealed tortuous/undulating crack path in the interlaminar region attributing to the enhanced interfacial adhesion of carbon fiber with epoxy matrix. The results showed that the AE Sentry function can be an effective and reliable tool for monitoring the damage growth behaviour in composite laminates.

TE072

Computational Study of Flow over NACA 23012 Aerofoil to Determine Flow Separation Region for Dielectric Barrier Discharge Actuation

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Abstract

Flow separation region over the wing of an aircraft considered to be a serious issue as it leads to decrease in lift, eventually stall. Dielectric Barrier Discharge (DBD) can prevent the flow from separating. Locating the flow separation region will help to use the Dielectric Barrier Discharge to maximum advantage. We narrowed our study over NACA-23012 aerofoil as it is one of the more promising recently developed aerofoil with high maximum lift and a low profile drag. To identify the flow separation region over the aerofoil we adapted the Computational Fluid Dynamics simulations. In this study we conducted a series of CFD simulations to capture the flow features over the selected aerofoil at all operational angles of attack. With the flow separation identified, we intend to proceed further to investigate the enhanced operational range of the airfoil with the inclusion of DBD. This DBD charge actuator arrangement will be placed over the region of flow separation. The Dielectric Barrier Discharge set up is developed by the help of a line output transformer (LOT) and a fly-back circuit. Further we are trying to simulate the Dielectric Barrier Discharge in computational study to clearly understand the effect of DBD over the flow.

TE073

Experimental Investigation of Performance and Emission Characteristics of CI Engine Fuelled With Linseed Oil with Methanol Additives

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Abstract

The use of Biodiesel is increasing all around the world which makes it an alternate substitute for Diesel In the current study Linseed oil is used as the alternative for Biodiesel with methanol additives. The Blending ratios used were B20, B40 ,B60 ,B80 ,B100 ,B20+5% ,B40+5% ,B60+5% ,B80+5% B100+5% ,B20+10% ,B40+10% ,B60+10 ,B80+10% ,B100+10%. The experiment was carried out on a 4 stroke diesel engine which runs at a maximum speed of 1500 rpm with maximum rated power of 5.2kW. The experiments results indicates that B20+5% shows better performance characteristics and B40 + 5% shows good performance characteristics. The emission tests showed that CO2 emissions of the B20+5% were lower than that of diesel. Though lower than diesel, the performance characteristics of B40+5% were better than the other blends.

TE074

Aerodynamic Characteristics of Flow over Two Unsymmetrical Tandemly Arranged Airfoils – Numerical Simulation

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Abstract

There have been many insects having a tandem wing configuration that gives them a major advantage for maneuvering with various desirable speed, such as dragonflies and butterflies, but subsequently have been used for a wider range of applications. So, it is well known that the tandem airfoil arrangement will have better aerodynamic characteristics than those of the single airfoil arrangement. The present work aims at numerically predicting the aerodynamic characteristics of the single airfoil and tandem airfoil arrangements of the Wortmann FX 63-137 airfoil profile at a Reynolds number of 0.5×10^6. The numerical simulations are performed using commercial CFD software, ANSYS-Fluent. Turbulent flows are modeled using the k-ω RANS model with a second-order upwind scheme. The pressure- velocity coupling is done through the SIMPLE algorithm. In the tandem arrangement, airfoils are positively staggered in the flow direction with variable gaps ranging from 0.1m to 0.7m with an increment of 0.2m and the perpendicular distance between the leading edges of two airfoils is fixed at 0.3 m and simulations are performed for a various angle of attacks with a range of 0 to $\pm 14^0$. The aerodynamic characteristics of the single and tandem arrangements of the same airfoil are compared and the effect of wake from the primary airfoil on a secondary airfoil at different angles of attack is also studied for the same conditions.

TE075

Design, Fabrication and Performance Test of a Turbine having NACA 2415 Blades and Feasibility Study of its Application in Cooling Tower

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Abstract

The production of energy is a problem with many human and economic ramifications. Among others, solar and wind energies are very popular but have their own problems, primarily cost. The Physics and Media Group at MIT Media Laboratory is experimenting with cheap alternative energy sources. A recent study has found that wind energy is more efficient than solar energy. Calculations showed that for a wind of 36 km per hour with a 3 square meter turbine of total efficiency 30% we can obtain about 300 watt. The main contents of this paper include the design, construction and calculating the performance of aerofoil shaped turbine blade. To construct the aerofoil shaped turbine three blades of wood, a hub of wood are used. A metallic shaft of 5 cm diameter is fitted with hub its other end which is supported with a metallic gear. There is also gearing system to increase the speed of output shaft. A 24 volt generator is connected to the output shaft. The primary output was 6 watt & can apply this output power in various purposes like to run energy saving lamp, to charge mobile battery & other charge storage battery. A model has been used for simulation since the site of the actual turbine was not feasible for collecting effective data. The model was tested at different wind speeds and rpm of the rotor with respect to the amount of electricity produced.

TE076

Preparation and characterization of green synthesized cerium oxide nano particle doped with biodiesel blends

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Abstract

The present work focuses on the green synthesis of nanoparticles by using bael leaves. It is a naturally occurring material for synthesizing nano additives. Characterization studies such as particle size analyzer and UV spectroscopy have been used to examine the inherent properties of bale leaf to be used as a nano material. The particle size study confirms that the produced nanoparticle has an average particle size of 50 nm with 200 nm diameter. The study by UV spectroscopy confirms that the nano crystal has a BCC structure with a peak absorption of 9.82 a.u. On the other hand, the physical and chemical properties of nano particle doped with B20 such as kinematic viscosity, calorific value, density and flash point are measured and compared with ASTM standards are presented in this paper.

Keywords: Bael leaf extract, Green Synthesis, Nanoparticle, Biodiesel.

TE077

Analysis of Concentrated Solar Powered Reactor

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Abstract

Nowadays there is an increased in usage of non-renewable products to produce energy required to sustain in day to day life, results in generation of harmful emissions. So using renewable energy for the thermal input saves the environment for the further damage and also free of cost. Using concentrated solar energy gives promising results in so many fields, thus creating much more interest in researchers to establish and enhance the performance of solar energy coupled reactor. In this present work, solar concentrated power is used as an input fuel supply to the reactor process. The parabolic dish type concentrator used of diameter 1.4m and has a focal length of 0.28m which is focused towards the preferred conical shape reactor, because of the effective flux distribution inside the reactor than the other shapes. The reactor volume of $13.9m^3$ is fixed at the focal distance where the receiver absorbs more amount of radiation from the concentrator, leads to increase the temperature inside the reactor. Condensing of the gases formed by the specimen inside the reactor due to chemical reactions will get flammable pyrolysis oil.

TE078

Development and test of a new carbon capture system using Zeolite with addition of Activated carbon and Monoethanolamine for IC engines

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Abstract

Global warming has been a major concern in the modern era, which is caused by greenhouse gases like CO_2 , CH_4 , NO_x, , SF_6, etc which leads to greenhouse effect. Past survey shows climate change is mostly due to atmospheric CO_2 level, which is released due to burning of fossil fuels as well as incomplete combustion in IC engines. One of the ways to prevent this is to capture carbon emissions at the source, which is attained by post combustion. This paper deals with reduction of CO_2 employing the combination of Zeolite, Activated carbon and Monoethanolamine (MEA) with the help of Aluminium fine wire mesh. The properties of Zeolite 5A has been adapted in capturing the CO_2 due to their high micro porous structure also MEA has high CO_2 absorbing characteristics. A slurry is prepared and the aluminium wire mesh is dipped and dried which is later kept in the exhaust pipe for the results. A comparison of both with mesh and also without mesh is tabulated and presented with discussions.

TE079

Effect of tilt on heat transfer performance and pressure drop of water/brine based natural circulation loop: An experimental study

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Abstract

Natural circulation loop is widely used where simple and safe heat transfer system is needed, but it has some disadvantage, instability is one of the major drawbacks caused by a regular change in fluid flow path. One of the elegant solutions to overcome such problem is tilting the entire loop by some angle, which may cause some penalty in terms of heat transfer and pressure drop. In the present study, experiments have been carried out on water/brine based natural circulation loop (NCL) with heat exchangers and loop tilting. Pressure drop and heat transfer performance of water/brine based NCL for various tilt angles (0, 30°, 45°) in XY and YZ planes, have been investigated. Results are obtained for different temperatures (-18 to 70°C) at 1 atmospheric operating pressures. Results show that the loop tilting is not effecting the heat transfer performance, pressure drop of water/brine based system. Hence, loop tilting could be a solution to the instability problem associated with NCL without compromising the performance of the loop.

TE080

Experimental investigation of performance and emission characteristics of CI engine fuelled with pine oil and cotton seed oil

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Abstract

Increase in energy demand, stringent emission norms and depletion of oil resources led to find alternative fuels for internal combustion engines. In this paper we study the performance and emission characteristics of CI engine fuelled with cotton oil and pine oil blended in the blending ratio 70:30, 50:50 and 30:70 respectively. The experiment was carried out in four stroke single cylinder diesel engine by varying the load from 0% to 80%. It is evident from the results that the performance of engine with blends of cottonseed oil and pine oil behaves almost similar to diesel, without any engine modification. The result shows the blend of cotton oil and pine oil used as a fuel has increased the brake thermal efficiency with reduction in specific fuel consumption and exhaust gas temperature. Use of blend also reduces the emission parameter such as CO, CO_2, NO_x and O_2 with an increase in HC emission, yields satisfactory result on the combustion characteristics at lower load which gets better on increasing the load.

TE081

Study of expansion ratio on dual bell nozzle of LOX-RP1 engine for replacing the existing bell nozzle to dual bell nozzle

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Abstract

Numerical study was conducted on the LOX-RP1 engine bell nozzle to replace the dual bell nozzle for determining the optimum expansion ratio and greater thrust at sea level. Here base nozzle is a conventional Rao's TIC nozzle, where throat radius, exit radius, inflection angle and exit angles are 138mm, 826mm, 33° and 8° respectively. The total length of dual bell nozzle and existing bell nozzle are kept same. Numerical analyses was carried out in ANSYS FLUENT software on different dual bell nozzle geometry to evaluate the thrust and expansion ratio. Numerical analysis is performed by two dimensional, axi-symmetric, steady state, pressure based solver with SST k-ω turbulence model at different ambient pressures to recreate the patterns of flow in the nozzle at different nozzle pressure ratio (NPR) and expansion ratio. The profile has made by commercial software SOLID WORKS^{TM}. Numerical simulations and flow separation locations are validated with the experimental data published by S.B. Verma, et al. [28]. It is observed that with area ratio 150 and inflection angle 15° the thrust has increased by 5.46% at sea level and around 10.5% in vacuum, where the increase in exit radius and mass is only 96 mm and 6 kg respectively.

TE082

Experimental study on MWCNT Based Nanofluid Phase Change Material for cooling application

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Abstract

The current study aims to analyze the solidification and melting characteristics of nanofluid phase change material (NFPCM) for building cooling applications. The NFPCM were prepared by using Multi-walled carbon nanotubes (MWCNTs) in different concentrations (0.2, 0.4 & 0.6 wt. %) and DI water as base PCM. The NFPCM was prepared using two step method and stability of the NFPCM was analyzed using visual sedimentation method. The experimentation was conducted in -12 °C and -9 °C surrounding bath temperatures. The experimental results showed that the 8.9 % reduction in solidification time was observed in 0.6 wt. % MWCNT in base PCM for -12 ^{O}C surrounding bath temp. Also, the DSC analysis was conducted to find the variation of enthalpy during heating and cooling and the appreciable change in the enthalpies was noticed in 1K/min and 5K/min. Also, the Sub-cooling was eliminated completely for the addition of SDBS and MWCNT in maximum concentration. It is observed that the reduction of overall solidification time of the NFPCM will have the predominant effect in the chiller operation time.

TE083

Study of Health Monitoring of Li-Ion Battery under Vibrations Using Neural Network

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Abstract

Over the last few decades, lithium-ion (Li-ion) batteries have attracted significant attention due to their high energy density, low maintenance, and the variety of shapes, chemistries and performances available. Batteries are increasingly used in electronic devices, toys, electrical vehicles (EV), Hybrid Electrical vehicles (HEV) like applications where mechanical vibrations and shocks are a constant companion. The state of charge (SoC) and state of discharge (SoD) of the battery affects the mechanical properties of anode and cathode due to intercalation and de-intercalation which affects performance and life of battery. If excessive warranty claims on these batteries are to be avoided, it is necessity to develop the health monitoring algorithm of the battery. The mathematical modelling is done using neural network method.

TE084

Analysis and Performance improvements of Photovoltaic system by using fins for heat reduction by CFD

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Abstract

The efficiency and power output of the solar PV panel decreases with an increase in temperature. The efficiency of a photovoltaic panel decreases around 0.3% for every degree rise in temperature after 30°C. By using different techniques we can reduce temperature. A heat sink made up of aluminum plate with aluminum fins attached to the PV panel which enhances heat rejection. The analysis of the system was done in computational fluid dynamics (CFD). The static and transient analysis was done and an optimal heat sink is designed for the PV panel from the analysis. It was found that the optimal fins of heat sink have 1.5mm thickness and each of 40mm height and 30mm spacing between the fins. There is a reduction in temperature of panel by 4°C in static conditions by natural convection.

TE085

Fresnel lens technology for Distillation of water with LDR sensor based tracking mechanism

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Abstract

Fresnel lens reduces the amount of material required compared to a conventional lenses. By employing this technology to two of the ubiquitous resources available almost everywhere – sunlight and brine water - we produce steam which is condensed to distilled water. Focusing sunlight by tracking mechanisms was used to boil water from a copper tube boiler while a spiral piping is used as a condenser. With LDR sensors and a high torque servo motor, the solar irradiance was maximised. This has been made possible using ‘Adruino Uno’ micro controller coded to use real time data obtained from the LDR sensors. The solar tracking coding developed has many applications for similar technologies. A prototype model was created in solidworks software and the system developed was tested on sunny, partially cloudy and cloudy days. The solar irradiance were highest, mediocre and lowest respectively with corresponding efficiencies of water collected. Though black paint on copper duct helped increase water productivity, loss in heat from the system was evident. An average of 1.5 litres of water was produced per day from a 0.12 m^2 fresnel lens with a boiler capacity of 3.18 litres. Heat loss from system may be further controlled by larger aperture lens and also selective insulation of copper duct at focal point of the lens may be used for increased production. Also baffles for heating and fins at condensation may increase heat transfer rate.

TE086

Investigation on NOx Control in SI engine assisted with Hot and Cold EGR with regular fuel and fuel blends

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Abstract

NO_x is produced from the reaction of nitrogen and oxygen gases in the air during combustion, especially at high temperatures. The major causes of the NO_x emission in the engine are because of the presence of nitrogen in air and high combustion temperature in combustion chamber. The ill-effects of NO_x emission in the atmosphere causes acid rain, respiratory problems and increase in response to allergens. One of the ways to reduce the NO_x emission from exhaust gases is by using the technique of exhaust gas recirculation (EGR). The engine used for this study is 2.2 kW with electrical loading. In this study, the EGR technique is incorporated in two ways, namely Hot EGR and Cold EGR using regular fuel and fuel blends. The emission and performance characteristics of this engine are compared, tabulated and presented with discussion. The result of the implementation of EGR resulted in significant reduction of NO_x emission.

TE087

Numerical study of thermal and hydraulic performance for fin and tube heat exchanger with elliptical tube and upward rectangular winglet vortex

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Abstract

A three dimensional computational study of the thermal and hydraulic characteristic of the fin and tube heat exchanger with the upward rectangular winglet vortex and the elliptical tube of various elliptical ratio are analysed in the study. The ratios are b/a=1.0, b/a=0.333 and b/a=0.307. The numerical studies is performed with the Reynolds no ($R_{e,)}$ within the range of 500-3000. The performance is evaluated by the non-dimensional parameters such as colburn factor (j), friction factor (F) and efficiency index (jF). The temperature contour and streamline patterns were presented to explain the reason for the pressure drop and heat transfer and to analyse the flow in different arrangement. It is demonstrated that the upward rectangular winglet vortex and the elliptical tube design in case of lesser pressure loss and less separate flow which is preferred in the heat exchanger application in order to save energy.

TE088

A REVIEW ON SOLAR TRACKING METHODS

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Abstract

In the World, perhaps the greatest issue as far as people understood, non-renewable sources would be extinguished. Apart from that non-renewable energy sources are one of the key factors for pollution, global warming. So as to address such issues it is vital to shift to sustainable power sources, for example - sunlight, wind, etc. are essential in the present century. To examine the available solar tracking methods and algorithm, this has better accuracy and high output power efficiency. Multiple databases were searched for English literature and limiting to last ten years. The keywords selected for the search were a combination of the solar tracking algorithm, image processing, maximum power point tracking system, and solar tracking. The search results suggested that research on solar tracking is required to increase generation of pollution free energy. Many International research institutions conducted research related to solar tracking systems and tracking algorithms. The solar tracking is done, by utilizing mechanical sensors to maintain the PV module perpendicular to the sun's irradiation. Proficient solar tracking methods are investigated by directing various analyses. The usage of renewable energy sources is lacking. Also, by designing optimized solar tracking system generation of better output power is recommended.

TE089

Drop-wise Condensation Studies on Different Solid Surfaces

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Abstract

Dew extraction from thin air using solid surfaces is a passive green technology for water pooling. This paper attempts to analyse drop-wise condensation characteristics of three different solid surfaces namely rexine, steel and glass. Nucleation, growth and mobility of droplets are examined for its sustainability on all three surfaces under same environmental conditions. An initial brief study of water-loving nature (Hydrophilic or Hydrophobic) of all three solid surfaces is performed. Basic thermodynamics and classical theories of droplet distribution are used to understand the energy levels of different interfaces involved in the study. The effect of surface roughness on contact angles and influence of contact angle hysteresis are analysed. Connectivity of intrinsic material wettability with surface geometry, liquid adhesion and apparent wettability are discussed. All three solid surfaces (rexine, steel and glass) are noticed to sustain stable drop-wise condensation with varied contact angle hysteresis. Synchronized minimization of contact angle and hysteresis for low surface tension condensates was found difficult for all three surfaces considered. Surface roughness was found to have a strong effect on the contact angle and wettability of surfaces used in the study.

TE090

Design and Analysis of SCR with mixer and urea injection for NOx emission reduction

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Abstract

As part of India's commitment towards cleaner fuel, 17 cities have to switch from BS IV to BS VI directly by 2020. These stringent emission transition leads to the use of effective nitrogen oxide (NOx) after treatment devices for passenger vehicle. Selective catalytic reduction (SCR) based on aqueous Urea Water Solution (UWS), is an effective technique to reduce NOx more than 98% from diesel engines. This paper discusses the development of a static mixer and SCR reactor compatible for passenger vehicle. Proposed mixing pipe is short (~300 mm) and straight which is a challenge in terms of complete urea conversion and flow mixing. Current serial SCR reactor has long distance (~700 mm) from injection point to SCR reactor to ensure sufficient mixing and complete vaporization of urea droplet into ammonia (NH_3) gas. A 3D numerical model of injection of UWS and their interaction with exhaust gas is explained using CFD simulations. The mixing pipe is complemented with two static swirl mixers to create turbulence which favors flow mixing. Selection of optimum mixer design is based on interaction between spray, the flow field and mixer elements. The performances of static swirl mixer have been predicted through the outcome of CFD simulations and tested the same with SCR reactor using AVL DI Gas Analyzer. Optimization of distance (60,70,80mm) and angle(15°,0°,25°) of urea injection, maximum NOx conversion efficiency of 90% was able to achieve at SCR reactor with minimal back pressure.

TE091

Enhancement of thermal properties of mineral engine oil using nickel oxide nanoparticles as additives

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Abstract

In today's world over 90% of the vehicles are powered by crude oil derivatives. These vehicles have got an efficiency of 35 to 45 per cent. A major part of over 30% of the energy is lost in exhaust of gases after combustion and about 25% of the energy lost is due to the piston and piston rings friction with cylinder, crankshaft bearings transmission. About 30-35% of the energy lost is due to friction. The purpose of this project is to enhance the lubricating property of engine oil SAE20W50 using nickel oxide nanoparticles with the average size of 13.64 nm as additives and thereby reduce the loss of power due to friction and to increase the engine's efficiency.The tribological properties such as flash point and fire point were analyzed under different loads and concentrations of nanoparticles added engine oil. The morphology and structure of NiO nanoparticles were studied through scanning electron microscopy (SEM), Fourier transform infrared spectra (FTIR) and X-ray powder diffraction pattern (XRD).

TE092

Performance, combustion and emission characteristics of compression ignition engine using hydrogen, Simarouba oil, and massive EGR

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Abstract

Biofuel is a sustainable, clean and safe and alternative fuel for CI engine. In this study straight, Simarouba oil is taken which as high viscosity and high density. High viscosity and high density have reduced by blending technique which has proved my many current researchers. The result indicates that the BTE efficiency is decreased compared to base fuel. Hydrogen fuel has taken as a secondary fuel to improve brake thermal efficiency. Again many types of research are currently working on hydrogen fuel for implement in CI engine. The dual technique has implemented which hydrogen is inducted separately as secondary fuel, and pilot fuel is Simarouba oil. The main advantage of hydrogen fuel has a higher heating value. The main concern is on safety for the handling of hydrogen fuel in a diesel engine. The result indicates that the oxide of nitrogen is increasing more the 18.13% for B20H30 compare to base fuel. To overcome this problem, another one more technique, namely EGR (Exhaust Gas Recirculation) system, is implemented. A cold EGR system has fixed in the current CI engine, which has used to control the temperature of the exhaust gas around 25^0C. Due to inert gas present in the exhaust gas, which reduces in-cylinder temperature has reduced NOx emission. Although pure hydrogen enrichment improves the performance, combustion, and emission in a diesel engine.

TE093

Influence of geometric and operating parameters on the flow behavior of the helical capillary tube for the R744 refrigerant

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Abstract

This paper reveals the numerical study on an adiabatic helical capillary tube. The study is carried out for the R744 refrigerant with homogenous and unchoked flow conditions. The basic principles of conservation of mass, momentum, and energy are used to develop the mathematical model. The results of the present helical capillary tube model are validated with previously published test results. Thermodynamic and transport properties of R744 refrigerant are obtained from property code CO2PROP, which is developed by employing an iterative procedure of derivatives of Helmholtz free energy function. The influence of various geometric parameters like tube diameter, roughness, and coil diameter on the mass flow rate of the capillary tube has been evaluated. The consequence of the tube diameter on the mass flow rate is larger than other geometric parameters. As the tube diameter increase by 18%, the mass flow rate increase by nearly 55%. Similarly, as the coil diameter increase by 10%, the mass flow rate increase by 5%. The negligible change in mass is observed owing to the change in surface roughness. While the surface roughness increases by 18%, the mass increases by 1%. Moreover, the influence of various operating factors is evaluated. A significant change in the mass is seen due to the change in gas cooler temperature. As the gas cooler temperature increases by 5%, the mass flow rate decrease by18%. Comparatively, less effect is recorded due to an evaporator temperature. As the evaporator temperature increases by 15%, the mass flow decrease by nearly 11%. The considerable impact is perceived owing to the change in gas cooler pressure. As the gas cooler pressure increases by 4%, the mass flow rate increases by nearly 7%. Similarly, the influence of operating and geometric parameters on the cooling capacity and coefficient of performance of the transcritical R744 system is evaluated. For optimum performance of the R744 cycle, the selection of proper gas cooler temperature and gas cooler pressure is a key factor. This study may be useful for the design of a helical capillary tube for R744.

TE094

Numerical Simulation of Flow fields over Slender Bodies at Transonic Mach number and Low Angle of Attacks

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Abstract

The transonic flow field over a launch vehicle is complicated due to presence of standing normal shock wave on the heat shield. To predict the aerodynamic loads, the shock wave position needs to be predicted accurately. The present work aims at predicting the flow field over a typical launch vehicle at angle of attack (AOA), and analyzing the effect of AOA on flow field, shock wave position and aerodynamic and moment coefficients. The launch vehicle considered here is long slender body with spherical nose followed by a conical, cylindrical and boat-tail portions. A long cylindrical portion follows the boat-tail part. Simulations are performed at Mach number of 0.95. And AOA of 0, 2 and 4. Commercial CFD package ANSYS –Fluent is used for simulations. κ-ω SST turbulence model is used to close the turbulent stresses terms. The numerical method is based on finite volume methods and density based algorithm is used to obtain the steady state solutions with explicit time stepping. The surface pressure distribution in axial and circumferential distributions are analyzed to understand the effect of AOA on the aerodynamic and moment coefficients. It is observed that as AOA is increased, the normal shock wave moves towards nose. The drag coefficient and pitching moment coefficients found to increase with increase in AOA.

TE095

Performance analysis of solar conventrator dish by various reflector and absorbent

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Abstract

Recent days the availability of a conventional source of energies are limited due to overexploitation of resources. This can be prevented by replacing the conventional source of energy to renewable energy which is believed to be the future. In renewable energy, there are a lot of types among which solar energy is the best and most effective as it is abundant, freely available, and it has a lot of versatile applications. The solar concentration is a technology that enables the concentration of solar energy in a focus, which allows a significant increase in energy intensity. This paper presents the different parameters which are affecting the performance of the solar concentrator dish based on which a thorough investigation is performed on the reflective material of collector and enhancement of absorbing capacity of the receiver. Considerable enhancement in the performance of the solar dish collector was observed by altering various reflectors of the collector.

TE096

Comparison of the effect of 1st order and 2nd order fluctuating temperature field on convective heat transfer coefficient in an unsteady laminar bounding layer

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Abstract

An unsteady thermal boundary layer analysis over a heat source (flat plate) has revealed that first order temperature change in source and core flow temperatures affects the time average or RMS value of h'_S. It also emphasize that 1st order changes are important. Analysis also indicates that a phase difference between pressure and temperature exists at the source in order to increase the RMS value of h'_S. Value of h'_S is directly proportional to the tan/sine of the above phase difference, This implies that entropy oscillations must exist at the heat source. The purpose of this paper is to compare the result of 2nd order analysis previously done, with the 1st order study carried out in this paper. In second order analysis time average of h'_S depends upon 2nd order change due to 1st order effects. Finally, existence of phase difference between pressure and temperature, thus having entropy oscillations are evident, comparison implies although there is similarity between 1st order and 2nd order results but first order effects are more important than 2nd order effects.

TE097

Experimental examination on physicochemical properties of the Tamarind seed biodiesel in comparison with petroleum diesel fuel

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Abstract

The present escalating demand of the hydrocarbon fuel and its lack of availability, moves the automotive industries and the oil companies to urge the search for the alternative resources and feedstocks to emerge a fuel for transportation to keep going. This paper deals with examination of properties of the Tamarind seed Biodiesel and the petroleum diesel fuel with biodiesel oils of significant feedstocks. The raw oil extracted from Tamarind Seed was trans esterified with methanol in the presence of potassium hydroxide to obtain the biodiesel. The oil yield was 35%. The study was to figure out the variation in the physicochemical properties of the biodiesel for their progressive blend percentages with the petroleum diesel. The blends investigated were B20, B40, B60 and B80. The vital physicochemical properties of the biodiesel evaluated were a flashpoint, fire point, kinematic viscosity, and the calorific value. Importantly, the calorific value of B100 is 45.83 MJ/Kg and diesel is 45.49 MJ/Kg. The increasing biodiesel concentrations show, the kinematic viscosity of the blended fuel decreases to 2.4 cSt at B80 from 2.63 cSt for Diesel, which is 13%. The flash and fire point value of the diesel fuel which is 37.4 and 56.7^{o}C, was incremented with the higher concentrations of biodiesel as 41.2^{o}C and 57.7^{o}C at B80.

TE098

Design, analysis and fabrication of Lanthanum Strontium Manganite Catalytic Converter

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Abstract

With the ever increasing pollution rate, we have considered the need to control automobile emissions which are responsible for global warming. In this paper, we aim to propose a cost effective and sustainable design prototype of a catalytic converter. Design was done by considering some of the problems in existing catalytic converter like back pressure, cold start emissions and cost. The new design of the Catalytic converter includes a new catalyst i.e. Lanthanum Strontium Manganite (LSM) with a piecewise placement approach and a hexagonal random cell shape which is in contrast with the existing platinum-palladium catalyst and honeycomb structure. Analysis of the design of Catalytic converter was done which included the ANSYS CFD and mode shape analysis. The cold start emissions were reduced by using a method to pre - heat the air at the input of the converter shell using Arduino controlled heat plug. The testing of the converter assembly was done on a single cylinder Briggs & Stratton Engine and results were taken using Exhaust Gas Analyzer which gave us the emission outputs with and without catalytic converter at idling and full rpm of the engine.

TE099

Numerical investigation of flow field over four Cylinders in square arrangement for different spacing ratios

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Abstract

The ever increasing demand of consumption of electrical energy had made researchers to find for the cheaper alternatives of the production of energy, of which Vortex induced vibration (VIV) has been an potential alternative method in recent past because of low cost of production of electrical energy with a compromise on the wattage of electrical power generated.(Usually in mille and micro watt) which can be used to run small electronic devices which require lower power for operation. There are many factors that affect the vortex development out of which we have considered the ratio of L/D (L is spacing and D is diameter of cylinder) between the bluff bodies (an array of 4 fixed cylinders) which has a significant effect on the vortex's development in the flow field. In this paper 2D CFD simulations are done in Fluent with k-omega SST turbulence modeling with different L/D ratios (L/D of 1.5,2, 2.5) to demonstrate the types of vortices developed and at a fixed Reynolds number (Re = 200) and reduced velocity (Vr) at 15.At smaller L/D ratio of 1.5 it is observed that the array behaves as a single cylinder that is the boundary layer/ vortex sheet which gets separated by the leading cylinder will engulf the rows behind. At L/D ratio of 2.0 it is observed that the boundary layer or vortex sheet has a strong interaction of vortices through gap. At L/D ratio of 2.5 and greater it is observed that vortex sheet from leading cylinders will shed the vortices before reaching the rows behind, this behavior will lead to different vortices to be formed and vibration of bluff body at different amplitudes.

TE100

Design of Integrated Single Stage Photovoltaic Solar Inverter (Stand-alone)

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Abstract

The extremely high demand for energy and increased demand for fossil fuels has led us to shift our concentration towards new and renewable sources of energy, which are seemingly unlimited sources. They are zero-carbon emitting, thus eco-friendly for the environment. Several issues have been addressed before regarding different topologies for standalone and grid connected inverters with and without microcontroller circuits. Some of them have addressed the introduction of multilevel inverter input using buck boost converters for improving the efficiencies of the output circuit. This paper enlightens the design of single stage photovoltaic inverter which is needed to run AC appliances as loads, which are mostly used as consumable purposes. The design implements MOSFETs as switching devices, which have considerably high switching frequency of 40 KHz, power diodes, inductors, capacitors, solar panel and a battery. The proposed inverter converts the DC output of the PV module into AC directly while maintaining the stability in the output voltage. PSIM software has been used for inverter design. The improved efficiency resulting in 75-90% is due to the minimized voltage drop over the inductor. High frequency operation of the MOSFET switch enables minimized switching losses.

TE101

Design and Analysis of Scrubber for emission reduction

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Abstract

The reduction of contaminants that contribute to environmental pollution is a worldwide goal that has seen an increased focus in recent years. Also to meet the stringent emission control norms after treatment devices are predominantly used in the exhaust system to effectively reduce the air pollutant. Scrubbing system is an effective technique used to reduce the pollutants from the exhaust of marine and various industries. Wet scrubbing system consists of nozzles used to spray the sorbent over the flue gas to remove the NOx, HC and CO from emission. This research discusses the development of a wet scrubber system compatible for IC Engines by using the computational fluid dynamics to optimize the performance. The simulation results were also validated against actual measurement data. As a part of the CFD simulation, nozzle parameters was modelled for tracking the particles in the analysis, nozzle characteristic and position were optimized. Also different sorbent were used in the simulation and identified the effective one. Distance between nozzle (15mm,20mm and 25mm) and number of nozzle (3 to 5) for spraying the sorbent was studied and optimized.

TE102

DEVELOPMENT AND INTEGRATION OF OXYGEN GENERATOR FOR HOME AIR CONDITIONER

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Abstract

Oxygen is very essential for Human survival. Lack of sufficient intake of Oxygen has adverse effects on one's health like Neuropsychological, Cardiopulmonary and Hemodynamics. As per Occupational Safety & Home Administration (OSHA), 19.5% to 23.5% are the safest levels of Oxygen percentages to breathe. But the people with Medical conditions like Chronic Obstructive Pulmonary Disease (COPD) it's hard to breathe at normal and low levels of Oxygen. We have developed a laboratory system that follows Skarstrom cycle with single bed adsorption molecular sieve inside which Zeolite is filled up with, to study Oxygen separation. A pressurized air stream is given as an input to the Molecular sieve where Pressure Adsorption takes place which allows Nitrogen to be captured by micro pores of the Zeolite, and allows Oxygen and rest of the air constituents to fly out. In order to observe Oxygen levels we have conducted a Fire Test with match stick at the outlet of the Molecular Sieve. We have clearly observed the difference of fire intensity and how fast the match stick burns at the outlet and at atmospheric air. There is a clear observation made that outlet is having oxygen enriched air than that of atmospheric air.

TE103

Study on thermal transport properties of nanofluid phase change material for space cooling in sustainable buildings

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Abstract

This paper investigates the thermal energy storage deportments of the Nano fluid phase change materials (NFPCMs) for building space cooling application. The NFPCMs have been prepared using Deionized (DI) water as base PCM and MWCNT and GNP as a nanomaterial with mass fractions (0.15, 0.3 and 0.45 wt. %) independently. For clinching the better stability of the additive materials in the base PCM, sodium dodecyl-benzene sulfonate (SDBS) has been chosen as the capping element. The surface construction of the nanoparticles has been studied by SEM (scanning electron microscope). The freezing and melting temperatures and enthalpy of fusion of the composite PCMs have been assessed by DSC (differential scanning calorimetry) measurements. The escalation in thermal conductivity for NFPCMs with mass fraction of 0.45 wt. % GNP nanoparticles has been estimated as 15 % while comparing to the base PCM. The study results have proved that the reduction of total freezing and melting time for both nanomaterial's in maximum concentrations. The environmental pollution remediation can be achieved through the reduction of energy input to the chiller by minimizing the total time taken for charging and discharging of the PCM.

TE104

Investigation on reduction of charging time of waster based NFPCM for cooling application

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Abstract

This study aims to investigate the solidification characteristics of water based nanofluid NFPCM (Nanofluid phase change material) with an aim to form an efficient CTES (Cool Thermal Energy Storage) system. Here we have taken base PCM as deionized water and Graphene is taken as nanoparticle because of its property of high thermal conductivity. The PCM was prepared by adding surfactant (0.2wt%) which is used to reduce the surface tension of the solution and then various concentration of graphene nanoparticle are added i.e. 0.2wt% and 0.4wt%, and the effect in solidification time and reduction of sub cooling is seen and studied. The enhanced heat transfer rate of NFPCM without sub cooling is advantageous for many CTES applications. So, finally it is constructed from experimental results that by embedding this technology with chiller systems which is used to cool large spaces can help us to conquer our motive to save energy and provide effective and efficient cooling.

TE105

Design and analysis of shell and tube heat exchanger for low temperature applications using CFD

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Abstract

A shell and tube device is deployed for the applications such as oil refinery processes, chemical processes and high pressure technologies. The hot fluid flows to the tubes in the heat exchanger, and the cool fluid moves through the shell section. Hence, heat is transferred from the tube section to the shell section of the heat exchanger. This article is deals with the modelling and analysis of mini shell and tube heat exchanger (MSTHE) for low temperature applications which is less than 250°C. The design of the heat exchanger is made with nine tubes which is of 6 mm diameter and shell of 41 mm diameter. As conventional design does not result in the internal heat transfer, computational fluid dynamics scheme is adopted to design the modified heat exchanger by adopting the conditions such as velocity of tube fluid and pressure drop. The modelling of MSTHE is done by Pro/E whereas CFD analysis is done with ANSYS. The contour obtained from the analysis proves that the MSTHE is applicable for the temperature less than 250°C and have the potential to transfer heat effectively.

TE106

Preliminary Studies on Compressible Jet Flow from a Pipe with Hexagonal Cross-section

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Abstract

The present study is an experimental investigation of compressible jet flow from a pipe with hexagonal cross-section. The pipe is fixed to a settling chamber which is supplied with compressed air by a storage tank via a pressure regulator. The experimental methodology includes the measurement of centerline variation of stagnation pressure and the visualization of shock structures. The results from the present pipe shape considered for the present study will be compared with the results of jet flow experiments from circular pipe. The diameter of the circular pipe is taken as 15mm and the same is fixed for the hexagonal pipe. The L/D ratio of the pipe is chosen as 5. The nozzle pressure ratio will be varied according to the source available and the measurements will be taken via a Pitot tube connected to a Pressure Scanner. The positioning is controlled by a traverse mechanism which can move in axial and transverse directions. The results obtained will be discussed in details with the help of relevant literature.

TE107

Preliminary Studies on Compressible Jet Flow from a Pipe with Square Cross-section

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Abstract

Jet flow through pipes/nozzles have been successfully applied in various fields and has a further wide scope in fields of Flow Control and Acoustic Suppression. In the past few decades, jet flow through pipes and nozzles have been widely exploited, researchers found that non-Circular Pipes possess some unique properties, with which the need for research in this field increased. This work presents the properties of jet flow from a Square Pipe (L/D=5) over the Circular ones. Experiments are done in Compressible flow conditions using 3-D fabricated Pipes of Circular and Square cross sections. The cross sectional area of the pipe exit are maintained same for both the Pipes to facilitate comparison of results. This study highlights the advantages of Square Pipes over the conventional ones via pressure measurements and visualizations.

TE108

Design and Development of a Modular Atmospheric Boundary Layer Tunnel

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Abstract

Aerodynamics studies are carried out experimentally by using wind tunnels and computationally by using simulation software packages or codes. The normal wind tunnels used to study aerodynamics provide uniform velocity profile and they are used for aviation aerodynamics. To study about the industrial aerodynamics, the wind tunnel must be modified to achieve the velocity profile required by the problem considered. With increase in population, the requirement of housing also increases in an equal phase which leads to congested buildings. To study the aerodynamics around buildings, atmospheric boundary layer wind tunnels are required. Standard ABL Tunnels are long and heavy that cannot be moved in a constrained environment like colleges. Hence, the present work is about design and fabrication of a modular wind tunnel that can be used inside a laboratory and can be dismantled for usage of space for other purposes when the wind tunnel is not operating.

TE109

Assessment of Turbulence Models on a Backward Facing Step Flow Using Open FOAM®

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Abstract

Studies on turbulent inlet flows have a wide variety of applications, Backward Facing Step (BFS) facilitates this study. The phenomena of flow separation occur due to an abrupt change in geometry, causing the creation of a re-circulation zone and a flow re-attachment point. The present numerical study focuses on the assessment of different turbulence models. The flow velocity is in the turbulent region characterized by the Re=7000. Steady State Reynolds Averaged Navier Stokes equations are solved along with various turbulence models using OpenFOAM® which is an open-source Computational Continuum Mechanics toolbox for conducting numerical simulations. The simulated data is processed using Paraview and the assessment of the turbulence models is performed via quantitative (re-attachment length) and qualitative (visualizations) methods.

TE110

Experimental Investigation on Thermal Performance of A Cavity Receiver With Short Term Thermal Energy Storage For A Solar Parabolic Dish Concentrator

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Abstract

Solar parabolic dish collectors are widely used for the solar thermal energy conversion for various medium and high temperature applications. One of the problems being faced by the receivers of parabolic dish collectors is the short time non-availability of solar radiation due to sudden cloud cover. This affects the useful output and also results in sudden change in the receiver temperature, which induces thermal stress in it. Hence receiver with short term storage is attempted to tackle this issue. A hemispherical cavity receiver is developed with double layered wall and the space between the two layers are filled with a salt bath composed of eutectic mixture of NaNO3 and KNO3 as phase change material. Copper tubes are coiled in the gap between the two layers, through which the heat transfer fluid flows. The phase change material surrounds the copper tubes and act as a storage as well as heat transfer medium. Experimental tests were carried out with Scheffler-type reflector of 16 m^2 as the reflecting material. The test was carried out at both constant radiation condition and intermittent radiation condition and the results obtained are compared. The result shows that the short term storage has a good impact on the thermal output, even during irregular radiation input conditions.

TE111

Thermal property enhancement on di-water based PCM in spherical container for cold energy storage applications

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Abstract

The purpose of the present work is to study the solidification behaviour of a di-water based PCM for cold energy management applications. Nucleating agents such as gelatin, agar and corn-starch at various mass fractions of 0.5wt%, 1wt%, and 1.5wt% are used. The experiment is carried out in a low temperature bath of -7 degrees celsius inside which the PCM sample is kept spherically encapsulated for uniform distribution. The behaviour and effect of addition of the nucleating agents are compared. The analysis showed that the subcooling of di-water was substantially reduced and its crystallisation occurs at a faster rate. It is concluded that faster crystallisation and reduction in sub cooling can help increase the efficiency of a cool thermal energy system and can be applied to any commercial system in the society to help alleviate the electrical load.

TE112

Numerical Study of Thermal Performance with Nanoparticles and Grooves in Microchannel

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Abstract

The fluid flow and heat transfer characteristics for a laminar nanofluidic flow in a two-dimensional grooved microchannel are numerically studied. A constant temperature boundary condition has been used on the walls of the microchannel. A suitable range of parameters such as Reynolds numbers, volume fraction, and groove offset are studied. The characteristics are investigated for various offsets in the grooved microchannel. The results specify an increase in heat transfer performance with increase in volume fraction, Reynolds number, and offset between upper and lower grooves. The offset 1 (δ_x=1) is found to be the most efficient groove arrangement with a high Nusselt number maintaining the least pressure drop coefficient.

TE113

Experimental and Numerical Modeling of a Sensible Heat Thermal Energy Storage Using Local Thermal Non-Equilibrium Model

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Abstract

The charging performance of a sensible heat thermal energy storage (SHTES) has been compared by varying the size of the pebbles. The average diameter of the pebbles considered in this study are 30 mm and 40 mm with porosity of 15% and 30% respectively. The charging of the SHTES is carried out by flowing the hot air through it. Heating of the air is carried out by resistance heating method by wrapping nichrome wire around the pipe and flowing the ambient air through it. The variation in the temperature of the pebbles and stratification number profiles are evaluated for charging at various flow rate of the air from $5x10^{-2}$ l/s to $1x10^{-1}$ l/s and material of the SHTES. The results obtained from the experimental and numerical modeling shows that the charging time depends upon the volumetric flow rate of the heat transfer fluid (air) and material of the SHTES. It is observed that when the average diameter of the pebbles is 30 mm with lowest flow rate, better stratification is observed in the SHTES.

TE114

Effect on solidification characteristics of water based PCM and NPCM for Cool Thermal Energy Storage

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Abstract

Cold Thermal Energy Storage is an upcoming need for sustainable energy consumption and storage. It finds application in wide variety of energy need in the sub-zero temperature zone. This work aims to study the effect of various surfactants on solidification characteristics of spherically encapsulated DI water with graphene nanoparticles used as additive. A constant temperature bath at -7°C is used to charge spherical encapsulated samples using VCR system. Tween80, Gum Acacia and PVP K30 are selected as surfactants and samples are prepared at various concentrations using two step method. To check the feasibility of the sample for thermal energy storage application its thermal properties are determined. Zeta Potential test is employed to analyse stability while DSC calorimetry test is used to obtainT_m. Tween 80 and PVP at 0.5 wt% and 1.0 wt% dispersed graphene to form a stable solution and subsequent reduction in super cooling was observed in case of PVP. Tween 80, Gum Acacia are edible substance generally used in foods and cosmetics, they are nontoxic and easily available commercially. PVP is used in pharmaceutical industry mainly as lubricant in eye drops.

TE115

Experimental and Numerical investigation of flow boiling inside microchannel

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Abstract

The present work focuses on heat transfer and flow boiling phenomena in a horizontal tube of 0.9 mm diameter pipe. The experimental and numerical study analyzed the heat transfer, bubble diameter and pressure drop across microchannel. The ranges of mass flow rate is from (1.586×10^{-6} kg/s to 3.112×10^{-6} kg/s) at constant heat flux 500KW/m^2, inlet temperature of 30°C. The obtained experimental data is used to predict the best boiling model among present available models like Volume of Fluid model, Mixture model and Eulerian model in computational Fluid Dynamics (CFD) solver. The dynamics of boiling process, bubble characteristics, frequency of bubble formation inside channel. In modeling, it is observed that all model showed the vapour bubble elongation was increased with respect to mass flow rate. But mixture model over predicts vapour bubble elongation compared to rest.

TE116

Design of finned Spherical Enclosures and thermal performance evaluation under natural convection

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Abstract

Natural convection over spherical surfaces has been an important subject for numerical and experimental studies. Many applications like LED lights, optical systems etc. housed inside spherical enclosure, need fins on the spherical surfaces to cool the system naturally. This present study discusses the thermal behaviour of rectangular fins on spherical surfaces. Fins on spherical surface were simulated using computational fluid dynamics tool; the variation of Nusselt number with respect to Raleigh number for different fin configuration for Ra in the range of 1010 is studied. Simulation results were validated on a sector of a sphere with rectangular fins by measuring temperature of various fin configurations experimentally.

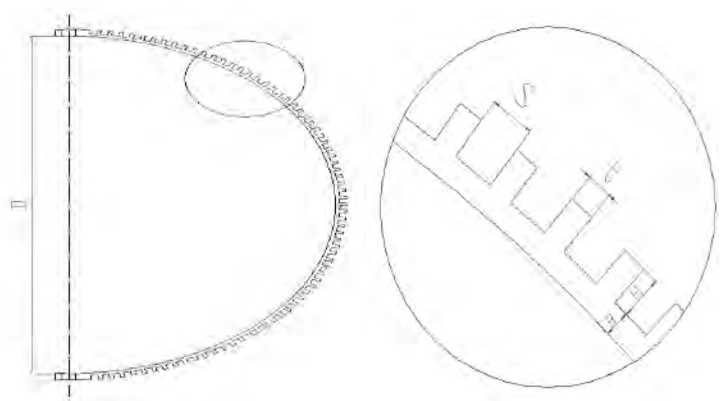

Fig. 2: Finned wall hollow spherical enclosure

TE117

Numerical study of natural convection around a square cylinder inside a square enclosure for different orientations

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Abstract

Natural convection heat transfer within the enclosure is a classic problem by highlighting real-world applications such as electronic packaging industry, DNA amplification PCR chips, energy-efficient building room architecture, nuclear reactor operation and protection, convective heat transfer inside boilers, furnaces and solar systems, and thermal energy storage. Due to increase in technology developments and miniaturization the heat dissipation from the components is very much essential for guaranteed performance of the components or life of the same. So, considering that the present study therefore examines numerically the flow and heat transfer characteristics within the square enclosure making the square cylindrical obstacle heated in the centre. Study was done to analyse the flow pattern and heat transfer rate for different orientation of square cylinder by varying the orientation of the square cylinder by its central axis of around 15^0.

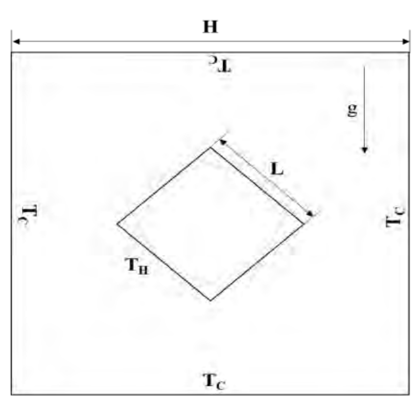

Fig.1 Schematic representation of the different orientation of the Square cylinder inside square enclosure.

TE118

Natural convection heat transfer enhancement of circular obstacle within square enclosure

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Abstract

The natural convection heat transfer within the enclosure is a classical problem by highlighting the real field applications such as Electronic packaging industry, PCR-chips for DNA amplification, Energy efficient design of buildings rooms, Operation and safety of nuclear reactors, Convective heat transfer within boilers, Furnaces and Solar systems and thermal energy storage. Hence the present study numerically investigates the flow and heat transfer characteristics within the square enclosure having the heated circular obstacle at the middle. The detailed hydrodynamic and thermal boundary conditions are shown in the Fig.1. The influence of circular obstacle, circular obstacle with winglet, surface modified obstacle and surface modified obstacle with winglet have been reported by comparing velocity and vorticity magnitude also estimating natural convection heat transfer from obstacles.

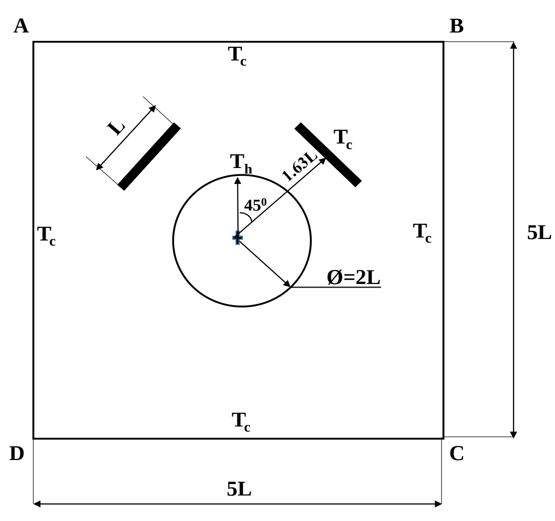

Fig. 1 Schematic diagram of square enclosure with circular obstacle and guiding winglets

TE119

Study on Performance of Nano (CNT) fluids for Heat Transfer by considering a Differentially Heated Square Enclosure

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Abstract

Analysis of convective heat transfer in an enclosure has received a considerable interest due to its wide range of applications such as electronic cooling, heat exchangers, refrigerator condensers, and energy storage devices as well as in nuclear reactor systems. High thermal load management has become crucial these days as the complexity of the systems has been steadily increasing while the size has been decreasing. This phenomenon has been quite prominent in the field of electronic cooling where the heat dissipation has a direct link to the performance and the only major concern being the size in which the heat transfer is to be achieved. Due to the low performance observed with heat transfer fluids such as air and water, nanofluid research is being carried out in order to improve the heat transfer rate. A square enclosure has been considered for the study which is experimentally and numerically probed. The top and bottom wall are considered to be at constant temperatures while rest of the walls are considered to be adiabatic in nature. The heat transfer fluids considered for the study were water, nanofluid with surfactant and nanofluid without surfactant. The study is concluded by later comparing the experimental results with the numerical results as well as detailed performance comparison between considered fluids.

TE120

Effect of confinement on flow around square cylinder with downstream control cylinders

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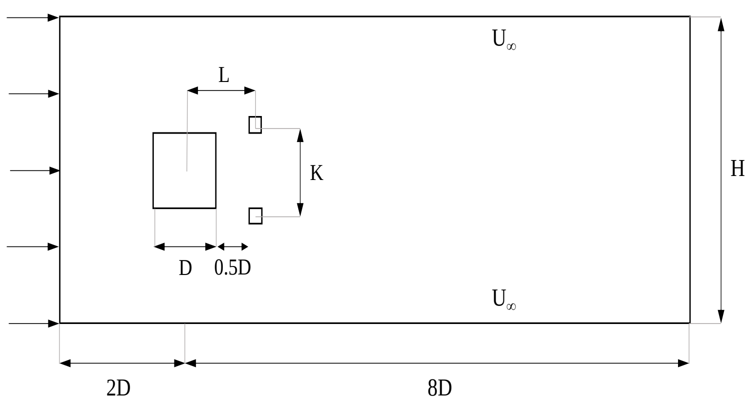
Abstract

A two-dimensional numerical investigation on flow past a heated square cylinder at different confinement has been carried out. Two control cylinders have been inserted on the rear side of the cylinder near the wake to control shedding phenomena. The confined flow has been simulated with a blockage ratio from 2 to 4 (i.e., ratio of the computational domain height to the diameter of sq). The effects of Reynolds number ranges 75 ≤ Re ≤ 200 on various flow and heat transfer characteristics are studied and analyzed in the form of streamline plots, variations of pressure and viscous drag coefficients, Strouhal number, total pressure drop and surface average Nusselt number.



TE121

Numerical study on the effect of extensions on lateral sides of square cylinder

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Abstract

The present study analyses the effect of triangular and arc extensions on lateral sides of square cylinder in a confined domain. Two-dimensional simulations have been carried out for laminar flow across a square cylinder along with triangular and arc extensions for Reynolds number range 75–200. The momentum and energy equations are solved numerically by applying suitable boundary conditions using Ansys Fluent 18. The fluid flow and heat transfer characteristics of the square cylinder with extensions have been analysed by estimating and comparing the total drag, Strouhal number, Nusselt number.

TE122

Mems Based Heavy Metal: Mercury and Cadmium Ion Detection in Laminar Flow of Water

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Abstract

Innumerable Nations are enduring biohazard complications because of potable Water contamination. Water contamination is due to the presence of heavy metals like Nickel, Lead, Mercury, copper, iron, manganese, Cadmium, and Zinc in ppb (parts per billion) level. The most effective MEMS-based cantilever design capable of detecting Mercury and Cadmium ionic pressures with better geometry is highly demanded. Heavy metal ion detection in the vapor phase at a particular temperature is highly recommended. The project primly proposes a comparative study of divergent MEMS-based micro-cantilever beam structures with an active layer coating for heavy-metal Mercury and Cadmium ion detection and the structures were appraised based on the mechanical displacement under the pressure influence of target ions. The project proposes a concernment study of the laminar flow of water (liquid) through divergent structural designs. The laminar flow characteristics of water are engaged to find the maximal and minimal velocity and pressure positions. On altering the Inlet flow rates; the outlet flow rate, maximal and minimal velocity and pressure positions vary. Laminar structures were appraised based on the variation of outlet flow rate and pressure with respect to inlet flow velocity. The MEMS-based micro-cantilever structure with superior mechanical displacement is lodged at a maximal pressure locus of laminar flow structures. The pressure quantification at the locus of the micro-cantilever structure is calibrated for Heavy metal: Mercury and Cadmium ions pressure concentration. The finite element analysis of heavy metal Mercury and Cadmium Ion detection is executed using COMSOL Multiphysics 5.4.

TE123

Numerical study on performance enhancement of a square enclosure with a circular cylinder of varying geometries

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Abstract

These days many sophisticated equipment like electronic chips, components inside laptops and phones, etc, produce a lot of heat while they are running and also decrease in the size of these equipment makes it difficult to dissipate heat using forced convection methods like using fan or blower. Thus, Natural convection is gaining more attention as it has become vital to remove unwanted heat from a component and also at the same time natural convection is economically suitable. This phenomena of using natural convection has proved to be quite beneficial in the field of electronic cooling. On the account of this, the present study on numerical investigation of the heat transfer and flow characteristics from the hot cylinder body which is in a square enclosure is carried out. After considering and reviewing several literatures, in this paper a geometric modification is made. There are 2 cases in which the geometric modification of the cylinder is done. In the 1st case the upper half of the cylinder is semi-circle in shape and the lower half is of varying arc lengths and in the 2nd case the upper half is of varying arc length and the lower half is a semi-circle. This change in the cylinder geometry will make an increase in the fluid movement between the cylinder and the square enclosure and therefore help in significant heat transfer from the cylinder body. These significant increases are studied briefly. The schematic representation of the problem statement in this study is shown Fig. 1.

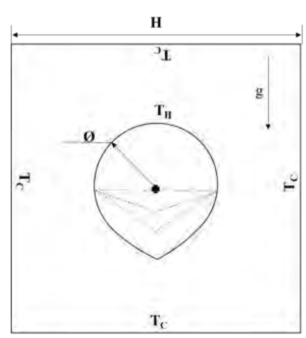

Fig.1 Domain considered for the study.

TE124

Numerical study on performance enhancement of a square enclosure with circular cylinder having confinement bodies nearer

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Abstract

Now a days most sophisticated equipment such as computer circuits, modules inside laptops and phones, etc. produce a lot of heat when operating and also decrease in the scale of these equipment makes it difficult to dissipate heat using forced convection techniques such as using fan or blower. Therefore, natural convection is gaining more attention as it has become crucial to remove unwanted heat from a product and is also economically viable for natural convection. In the field of electronic cooling this process of using natural convection has shown to be quite helpful. The present research on numerical analysis of the heat transfer and flow dynamics from the hot cylinder body that is in a square enclosure is carried out on this basis. Fig.1 shows the schematic representation of the problem considered for numerical analysis for natural convection induced by a temperature difference between a cold outer square enclosure and a hot inner cylinder for various Rayleigh numbers ranging (10^3 – 10^6). The study goes further to investigate the flow pattern and heat transfer which would effectively change by the introduction of another small cylinder inside the square enclosure, which is applicable to analyse and manufacture efficient electrical circuit boards used in appliances.

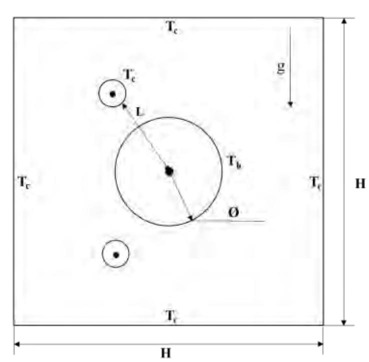

Fig.1 Physical Domain of the study

TE125

Numerical study on performance enhancement of a square enclosure with multiple hot circular obstacles

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Abstract

Heat dissipation from electronic components is critical for their endurance and efficiency. Through a geometry optimisation under natural convection we can obtain maximum heat dissipation in a cost effective manner. Hence the present study numerically investigates the flow and heat transfer characteristics from 2 hot bodies in a **2D** simulation. By considering and reviewing several literatures, a modification has been done, i.e. two cylinders are considered inside an enclosure with one of them at a fixed position and the other one at three different positions(considered as three different cases),so that the fluid movement around the body has been increased and helps in appreciable heat transfer from the body. Our primary concern is as to how the utilization of this geometry will impact the heat transfer rate which we have quantified in terms of Nusselt & Rayleigh Number. The schematic representation of the problem considered in this study is shown in Fig. 1.

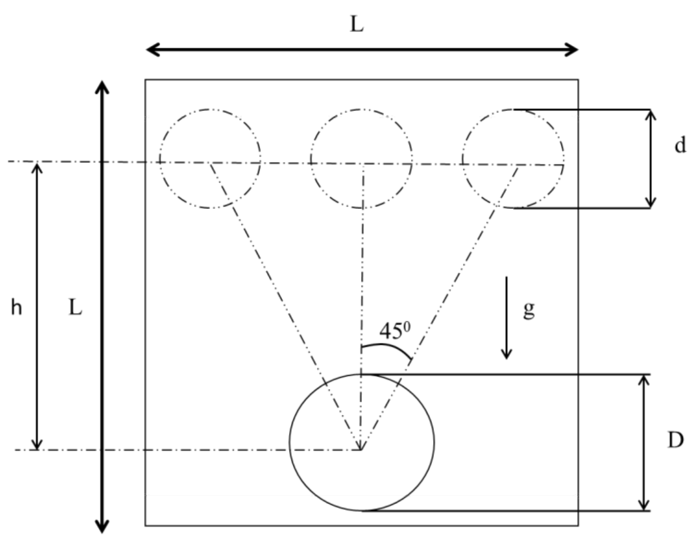

Fig.1 Domain considered for the study.

TE126

Impact of Nano Additives with Diesel on CI Engine Performance and Emissions - A Review

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Abstract

In this paper, we can see the different characteristics of a diesel engine using diesel fuel with Nano additives. The impact of various fuel added substances on execution and emanation normal for CI motor fuelled with a mix of nano additives and diesel fuel. Nanoparticles can usually and uniformly dispersed in the diesel fuel. The micro explosion can improve the fuel blend mix with air because of the high surface volume ratio and to the intensified for transmissibility of nanoparticles. As a result, by addition of additives to the diesel fuel rise to increasing within cylinder pressure compared with regular diesel fuel. The fuels show reduced ignition delay and high flame sustenance. The improvement in combustion rates raised exhaust gas temperature leading to increase in thermal brake efficiencies as compared to regular diesel fuel. The investigation depends on reports of analysts who distributed their inquiries about fuel. The metal-based added substances improve discharge and execution of a diesel fuel contingent on pace of added materials. Utilization of multifunction added materials for diesel will lead to higher fuel preservation, and discharge control happens. Motor execution esteems changes smidgen, yet the exhaust outflow profile was improved. The expansion nano additives, with altered biodiesel at various dosing sections of the added substances, demonstrated an increase in the proficiency of the motor. HC emanation and NOx outflow are decreasing with the utilization of fuel-based added materials.

TE127

Performance Evaluation of Bifacial and Monofacial modules using PVSyst

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Abstract

Producing power in Solar PV panel is simple as all the required data on the performance of various types of panel are available in the field scientific research but as we advance into the future newer and newer technologies are created and evolved according to the needs of the generation. Similarly, in the field of Solar Photovoltaics we have evolved the face of power production from one side to double side. Bi-facial panels are the latest trends which not only produces power on the side facing the sun but also the side facing away produces power. Experimenting on the Bi-Facial Panels by using PvSyst software to determine the performance, the orientation and placement for the highest LCOE. In this project we will be developing various Approach to acquire the data required for a Bi-Facial panel setup. We will also develop a prototype field panel setup to conform the new theory of approach.

TE128

Heat Transfer Enchancement Using Titanium Nitride Nanofluid In A Shell And Tube Heat Exchanger

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Abstract

The heat transfer enhancement in shell and tube heat exchanger can be done by adding Nano particles to the base fluid. The heat transfer rate of Titanium nitride (TiN) nanofluid increases with increase in the mass flow rate. Mass flow rate can be controlled and monitored with the help of valve fixed to the shell inlet. The heat transfer rate increases with the increase of the volume concentration of the TiN nanofluid. Increasing the volume concentration cause increase in the viscosity of the nanofluid leading to increase in friction factor. Increased mass flow rate and heat transfer helps to find efficiency. The result will shows the convective heat transfer rate of nano fluid is slightly higher than that of the base liquid at same mass flow rate and at same inlet temperature with water. The efficiency increase for about 7.47% for water to nanofluid. The effectiveness increase for about 36.6% for water to nanofluid. The LMTD decreases for about of 3.36ºC and heat transfer rate increases for about 0.4879 kW for three concentrations at one flow rate. Same as this way the heat transfer rate increases when mass flow rate increases.

TE129

Numerical analysis of circular cylinder at different aspect ratio for subcritical flow regime

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Abstract

This paper attempted to study the flow structures behind a circular cylinder in different shapes for the subcritical flow regime numerically. Aspect ratio variation like circular to elliptical has been obtained by changing its major to minor axis ratio for the wide range of Reynolds numbers (200, 4000, 5000 &6000). The numerical simulation has been carried out in CFD using commercial software Ansys-Fluent. Various flow parameters like pressure coefficient, drag coefficient, lift, and kinetic energy are analysed and validated against earlier published work. The initial results, which are validated against the published results, indicated that the flow structures are highly profound to different shapes of circular cylinders. Pressure fluctuations and turbulent kinetic energy for various aspect ratios are obtained and also the strong interactions between them are found out.

TE130

Analysis on Impact of Energy Efficient Techniques to Enhance The Building Performance

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Abstract

A substantial share of energy goes into building air-conditioning under harsh climatic conditions. The climate control load could be decreased by several means; the proper structure and choice of the building envelope and its components are noteworthy among them. Due to the growing global warming and energy crisis, energy analysis is becoming a major factor to be considered in the industry these days. During the design process, there is a growing need to forecast energy use and consider alternative energy conservation measures (ECM) and design considerations for a more energy-efficient construction. To minimize the annual energy use and annual cost, the study of the commercial school building has been done by employing various alternatives in the conventional school building model. The different parameters taken for the study are (heating load, cooling load, orientation, lighting, construction and type of material used in wall and roof). Analyzed the alternative scenarios, and the findings were collected. Each case comparison is based on energy use and the annual cost. The result shows that from the combined use of Autodesk Revit and the Green Building Studio, the integrated energy analysis and design alternatives can provide more energy-efficient buildings. The accuracy of the data can greatly affect the results obtained.

TE131

Comparison of Energy Analysis in Residential Building Using Building Information Modelling

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Abstract

In the early stage of building development and design, the buildings were not able to construct in a manner to provide proper ventilations and reduce energy usage. The focus was not given on the energy consumption during the construction stage or during its operational stage. In this generation it is becoming essential day by day to reduce the energy consumption as it is very essential for our future use. The ideal BIM software is able to representing the physical and essential properties as a model. BIM is a tool consists of various tool which are used for creating a model of a physical structure with similar properties for analysis. On successfully running the energy analysis the heating and cooling load values are obtained for each component as well as room for all the 3 locations and based on these values and the average temperature and humidity of selected locations the necessary changes are made such that a comfortable temperature can be maintained inside the room.

TE132

Experimental Investigation of Performance and Emission Characteristics of CI Engine Fuelled With Mahua Oil – Pine Oil Blend

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Abstract

Huge competition of the developing countries opens the challenge to create to new technique which make them as super powers. Most of the developing countries economics are mainly depends on the energy sectors which make them to seek alternate. Biofuel is best element which brings them to Independence on other countries. This study investigate the performance and emission characteristics of four stroke diesel engine fuel with mahua oil and Pine oil blend. The fuel was prepared in the volume ratio M30P70, M50P50 and M70P30 and compared with diesel fuel. The experiment was carried out by varying the loading conditions. The experimental results shows that increasing the pine oil in the blend fuel leads to higher brake thermal efficiency, lower BSFC because of the lower viscosity of the Pine oil. The emission results show that adding of pine oil in the blend leads to higher Nox emissions because of its lower cetane number of the Pine oil. Co and HC emissions shows reduction pattern because of the lower viscosity of pine oil.

TE133

Experimental Investigation of Performance and emissions of CI engine fuelled with Mahuaoil blended Camphor fuel

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Abstract

Rapid increment in the energy sector forcing all the developing countries to look forward to find the alternate solution for their improvements. Biofuel is best alternate or next level fuel which can be easily used in the CI engines. This paper deals with emissions and performance characteristics of CI engine fuelled with Mahua oil blended Camphor Biofuel blend (M70C30, M50C50 and M30C70). Blending of the Camphor oil with mahua oil increases the Brake thermal efficiency. BSFC for M70C30 was found higher for than other blended Fuel. Increasing the percentage of camphor oil in blended fuel increases the Nox emissions and reduces the CO, HC and Smoke emissions.M30C70 has higher Thermal efficiency and lower BSFC and which also supports for lowering the HC, CO and Smoke Emissions and higher Nox emissions.

TE134

Experimental investigation of Performance, combustion and Emission characteristics of CI engine Fuelled with Turpentine oil Diesel Blend,Camphor oil Diesel Blend, Lemongrass oil Diesel Blend, Mahua oil Diesel Blend, Karanja oil Diesel Blend

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Abstract

Economic and Environment constraint of the developing countries brings them in position to find the new substitute for Fuel which is more economic, ecofriendly, higher efficient and sustainable. Many research was carried in the field of high viscous Biofuel which has been changed into straight oil to Biodiesel to suit the Diesel engine. This project deals with CI engine fuelled with low viscous Biofuel and narrate the characteristics of performance and emissions. This paper deals with Mahua oil –Diesel blend (M50), karanja oil – Diesel blend (K50), Turpentine oil-Diesel Blend (T50), Lemon grass oil – Diesel Blend (L50) and Camphor Oil –Diesel Blend. Low Viscosity and high calorific value of T50 supports for higher thermal efficiency and Lower BSFC when Compare to Diesel, C50, L50, K50 and M50. The High Viscous Biofuels M50, K50 has the Higher CO emissions because of improper. Diesel has the lower HC emission than T50, C50, L50, K50 and M50. Low viscous Biofuel T50 and C50 has lower Smoke emissions and higher Nox emissions. The T50 and C50 has the higher heat release rate and higher peak pressure which supports for proper combustion and results in higher BTE, NOx emissions.

TE135

Experimental Investigation on Performance and Emission Characteristics of CI Engine Fuelled With Linseed Oil And Ethyl-Tert-Butyl-Ether As Additive

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Abstract

Increase in energy demand, stringent emission norms and depletion of oil resources led to find alternative fuels for internal combustion engines. In this paper we study the performance and emission characteristics of CI engine fuelled with linseed oil diesel Blended in the blending ratio B20, B40, B60, B80 with 10% ETBE. The Experiment was carried out in the four stroke, single cylinder diesel engine by varying the load from 20% to 80%. The result shows that addition of pine oil increases the Brake thermal efficiency with reduction in specific fuel consumption and exhaust gas temperature. Increasing amount of pine oil in the blends also reduces the emission parameter such as CO, CO_2, NOX and O_2 with an increase in the HC emission. The addition of ETBE blend diesel fuel has similar effect to that of addition of pure linseed oil in varying proportions, that increases the brake thermal efficiency with reduction in specific fuel consumption and exhaust gas temperature, the effect on the emission characteristics by addition of kerosene results in a lower CO, CO_2, NOX and O_2 with an increase in the HC emission. The effective mixing of linseed oil and diesel yield satisfactory result on the combustion characteristics at lower load which gets better on increasing the load.

TE136

Economic Evaluation of Grid connected & Standalone Photovoltaic systems Using PvSyst

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Abstract

Now a days the consumption of electricity per household has been increased as well as the cost per unit of energy too. Due to this the consumers are pushed in seeking an alternate source of energy such as renewable energy. Thus, Photovoltaic systems being small and economically viable comes into action. Even though designing a pv system is proven to be a tedious work, not due to the complexity but due to various options that are laid down. Basically, Pv systems are divided to Standalone, hybrid and Grid connected systems. In this paper we will be considering Solar PV panels as the only source in generating the electricity. Using the latest simulation software PvSyst, we will analyse the economic viability of a typical household backup system connected to grid and as a standalone system. We will be comparing the reliability, performance and financial values of both the systems.

TE137

A Review on Effective Use of Cooling System to Control Heat Generation and Drive Configuration

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Abstract

A hybrid electrical bus employs both a faster diesel engine and an electric powered motor to power the car in distinct pace-torque eventualities. The cooling system for this kind of automobile is particularly power costing because it wishes to burn up warmness from now not simplest the engine, but also the intercooler and the motor. An electronic manipulate unit (ECU) has been designed with a single chip laptop, temperature sensors, DC motor power circuit, and optimized control algorithm to manage the speeds of numerous enthusiasts for green cooling the usage of a nonlinear fan pace adjustment strategy. Experiments advised that the non-stop operating performance of the ECU is strong and capable of saving 15% of the whole strength comparing with ordinary fan speed control method. Hybrid electric vehicle cars provide propulsion whilst accelerating and fee the battery percent while braking or decelerating. Though electric automobiles have excessive working efficiency, big heat is generated primarily based on required operating torque and pace. Thus, an efficient motor cooling gadget is wanted to maintain the temperature inside a prescribed range. The conventional motor liquid cooling system is powerful but consumes electricity to run the coolant pump and radiator fan. This paper examines the overall performance of a hybrid cooling device, combining warmth pipes with conventional liquid cooling in a compact thermal cradle. This modern design permits heat removal via an incorporated thermal pathway by using regulating diverse actuators (e.G., centrifugal fanatics, radiator pump, and fan) to reduce strength consumption. A decreased order thermal version predicts the motor's inner temperatures. Cooling overall performance is evaluated based at the Urban Assault riding cycle for extraordinary situations. Numerical consequences show that the electrical motor temperature is maintained at about the goal cost of 70 °C. Additionally, as much as about 370 kJ of electricity is saved as compared to a conventional liquid cooling device for a specific 85 kW e-motor inside 1500 s run time.

TE138

Performance and Emission Characteristics Test on CI Engine Fuelled With Turpentine Oil-Diesel Blend with Dee as Additives

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Abstract

With modernization and increase in the number of automobiles worldwide, the consumption of diesels and gasoline has enormously increased. Biodiesel is an alternative to conventional diesel fuel made from renewable resources, such as non-edible vegetable oils. Increase in energy demand, stringent emission norms and reduction of oil resources led to find alternative fuels for internal combustion engines. In this paper we study the performance and emission characteristics of CI engine fuelled with turpentine oil. The addition of DEE has satisfactory effects on the performance characteristics of the fuel such as the increases in the amount of DEE increases the brake thermal efficiency of the fuel and thus having the rivers effect on the specific fuel consumption. The experiment was carried out in four strokes, single cylinder diesel engine by varying load. The addition of Turpentine in diesel increases its density viscosity and oxygen content but reduces its calorific value. The emission curves show the same effects as that of addition of Turpentine oil which is reduction in CO, CO2, NOX and O2 and an increase in the amount of HC.

TE139

Experimental Investigation of Performance and emissions of CI engine fuelled with Neem oil blended Turpentine fuel

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Abstract

Developing countries like India spending huge money in the energy sector and reliable on the other countries which act as the barrier for its own improvement. The developing countries has the constraint in either economic and environment impact because of the higher pollutant released the energy sector like Automobiles. This paper deals with fuel of neem oil and turpentine oil blend in the Proportional of N30T70(30% of Neem oil and 70% of Turpentine oil) N50T50 (50% of Neem oil and 50% of Turpentine oil) and N70T30 (70% of Neem oil and 30% of Turpentine oil). Experiment was conducted in four stroke diesel engine by varying load from 0% to 100%. The results shows that increasing the turpentine oil in the blended with neem oil reduces the viscosity, density and increase the Calorific value blended fuel supports for better combustion. Increase the turpentine oil in blended fuel increase the efficiency, decrease CO and increase the Nox emissions.

TE140

Experimental Investigation of CI Engine Fueled With Diesel Blended Neem Oil with Methanol as Additives

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Abstract

To select an alternative fuel suitable for running an IC Diesel engine for real world usage without any major modifications. The need to reduce the use of fossil fuels ignites interest in renewable fuels such as biodiesels. Preventing direct substitution of bio fuels is the higher viscosity of bio fuel over diesel. In this paper we study the performance and emission characteristics of CI engine fuelled with Neem oil Blended in the blending ratios of B10, B20 and B30 and also with M10% & M20% where methanol is used as the blending agent. The Experiment was carried out in the four stroke, single cylinder diesel engine by varying the load from 0% to 80%. emission.

TE141

Performance and Emission Characteristics of Turpentine Cottonseed Oil Blend, Varying Injection Pressure

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Abstract

In the current study an experimental investigation was carried out with Cotton Seed oil and Mineral Turpentine oil blend as a alternative fuel in a compression ignition engine. The problem associated with cotton seed oil are high viscosity , low volatility but at the same time their higher cetane number , lower sulphur content and higher oxygen concentration are the desirable properties to use as a fuel in CI engines , turpentine oil low viscosity and high volatility is used to enhance the fuel blend properties. The current paper reports a study carried out to investigate the combustion, performance and emission characteristics of cotton seed oil methyl ester with turpentine oil on a single cylinder, four-stroke , direct injection and water cooled diesel engine. This study gives the comparative measures of Brake specific fuel consumption, Brake thermal Efficiency, Total Fuel Consumption, CO , CO2 , NOx ,HC emissions , p-theta diagram . The Turpentine oil was first blended with 20% , 30%,40% ,50% of Cottonseed oil and it was found that at full load condition the T50 (Turpentine50 , Cottonseed50) blend has lowest CO , CO2 , and Nox emissions and meanwhile it has greater HC emissions than diesel. In combustion characteristics it has been observed ignition delay due to high cetane index of fuel blends leading to improper combustion and knocking. Then investigation of effect of changing injection pressure on blend T50 has been done.

TE142

Effect on solidification of Deionized water based PCM in a spherical encapsulation- An Experimental study

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Abstract

An aim of project work is to investigate the effect on solidification of phase change material as Deionized (DI) water in a spherical capsule for cool thermal storage application. A LDPE spherical capsule is used as an encapsulation material. It is filled with three different concentration of PCM with NaCl of 0.5wt.%, 1.0wt.%, 1.5 wt.% and the ratio levels are measured as 0.5g, 1.0g and 1.5g respectively. The capsules are filled with DI water upto 90% volume and immersed at a desired depth in a constant temperature bath of HTF. An experiments are conducted by immersing the spherical capsules in the constant temperature bath which is maintained at -7◦C temperature for all samples. The solidification time is observed in each capsule at various radial locations which correspond to 50%, 75%, and 100% of the mass solidified. The results obtained reveal that the PCM of Nacl has a great influence in reducing the solidification duration. Further, the capsule with 0.5wt.%, shows better results till the solidification of 75% mass than all the other capsules and slows down thereafter. Hence it is concluded that the consideration of DI water with 0.5wt.%, mass of NaCl in the spherical capsule for the design of the energy storage would increase energy efficiency of the system and reduce the energy consumption the chiller.

TE143

Comparison of Freezing Characteristic of PCM in Metallic and Ldpe Spherical Capsules

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Abstract

The present study aims to investigate the influence of the material of the spherical capsule on the solidification characteristics of deionized water as the PCM (phase change material) filled with 90% of its fill volume. The experiment was conducted with two same sized balls measuring 86mm diameter made of LDPE and Stainless Steel, maintained at −6°C, −9 °C and −12°C bath temperature. It was observed that the material of the spherical capsule had an influence on the solidification characteristics of the PCM. The Stainless Steel capsule froze significantly faster than the LDPE capsule for 50%, 75% and 90% mass fraction. This effect was prominent in the lower mass fractions and diminished at higher mass fractions. The freezing time for the centre of both the capsules (100% mass fraction) were roughly similar, thus producing insignificant effect of material at higher mass fractions. It was also inferred that the percentage by which the Stainless Steel capsule froze faster than the LDPE capsule escalated by 33%, 41% and 43% at higher potential temperatures for 50% mass fraction, While it was noteworthy for 75% and 90% mass fractions respectively and insignificant for 100% mass fraction.

TE144

Experimental Investigation of Performance and emissions of Crdi engine fueled with kapok ester oil blended with diesel

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Abstract

As the world oil reserves is going down rapidly and the world energy demand is going up, along with the increasing Greenhouse emission, we need to support the initiative to reduce the emission and increasing the efficiency. We need to grow awareness among people of the importance of Biofuels which will be one of the energy source in the near future .This paper deals with fuel of kapok-Ester oil and Diesel oil blend in the Proportional of (10% of kapok-ester oil and 90% of diesel oil) and B20 (20% of Kapok-ester oil and 80% of Diesel oil).The properties of the blended fuel as ASTM standards. The Experimental setup consists of single cylinder four stroke CRDI diesel engine with varying load at constant speed. The experiment results show that increasing the Kapok-ester oil proportion increases the brake thermal efficiency, decrease CO and increase the NOx emission.

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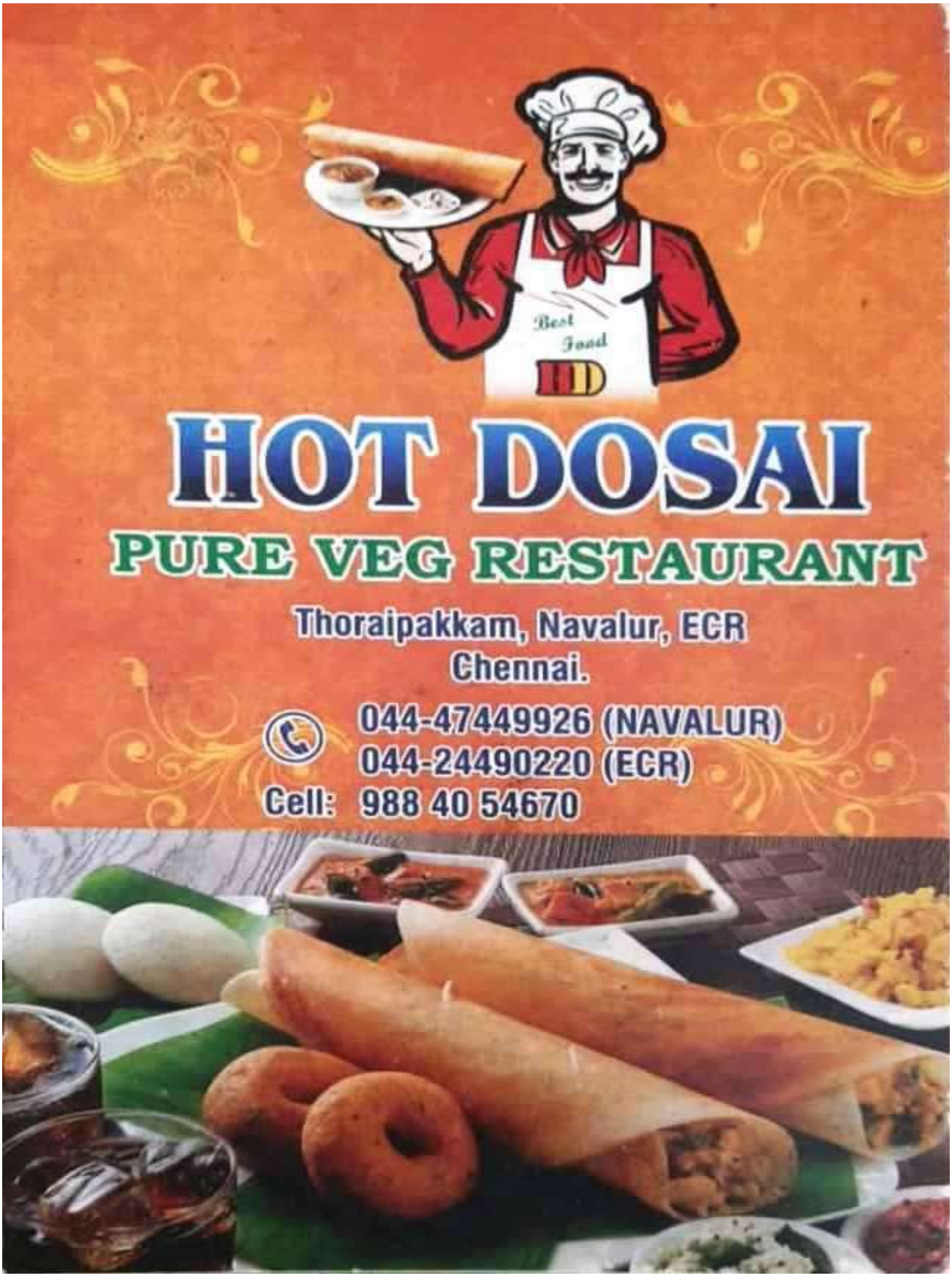
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