# Water Management


SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
*(Deemed to be* **University** *u/s 3 of UGC Act, 1956)*

How do we reduce and recycle our wastewater?

# WATER MANAGEMENT

SRM IST has a long-term commitment for conservation for water. The Institute of Science and Technology will regularly monitor the use of water with frequent meter readings to enable a rapid response to potential leaks in the system before damage, excessive use and expense occur. Overnight leak tests by taking meter readings before and after a period of no occupancy will identify any leaks and/or overflows in the building.

Water Management

The specification and design of all water systems to monitor remotely by the management staff. While the excellent design of water systems will reduce the amount of water used at SRM, the behavior of the students and faculty at the Institute of Science and Technology will carry the most influence. Therefore, occupant education is a crucial factor in the reduction of water use. Institute of Science and Technology has operated an irrigation monitoring program specifically designed to conserve water and reduce runoff from campus. The irrigation schedule is administered by an advanced automated central control system based upon historical irrigation practices.

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## WE AIM TO:

- Reduce water consumption by 15 % at the end of 2022;
- Maintain water-consuming equipment at its optimum efficiency in all buildings and facilities;
- Reduce consumption through tighter control and elimination of leakages;
- Avoid unnecessary expenditure on water consumption.

## OUR PERFORMANCE:

- **Our goal to reduce water consumption per student is near the target, with consumption per student currently at around 3.7m$^3$. Water use per user including staff is 3.3m$^3$.**

## HOW WE' RE RECYCLING WATER

Water Recycling

1. To reduce the unit cost of water.
2. To reduce the volume of mains water used.
3. Water Monitoring.
4. To investigate its own sources.

Reduce consumption by 15% by 2022

## SRMIST INITIATIVE FOR WASTER WATER TREATMENT

Water treatment describes industrial-scale processes used to make water more acceptable for the desired end use. The goal of all water treatment processes is to remove existing contaminants in the water or reduce the concentration of such contaminants, so the water becomes fit for its desired end use. The processes involved in treating water for drinking may be solids separation using physical processes such as settling and filtration, and chemical processes such as disinfection and coagulation. The quality of the water treatment process is maintained by certified operators monitoring results of the analytic test performed every four hours and aided by online recording monitors.

The average wastewater generated in the campus is 4600 $M^3$ (or) 46, 00,000 Lit. The average water treated in the 3 STPs is 4140 $M^3$ (or) 41, 40,000 Lit. The treated water is used for watering the gardens and lawns maintained in the campus. The sludge settled in the STPs are removed four times a month and composed as manure for the gardens. Thus, the entire wastewater generated in the campus is treated and used for zero discharge.

**We aim to reduce the average wastewater generation by 10% by 2020 and increase the quantity of water to 95 % before 2022 from 90 % in 2016.**

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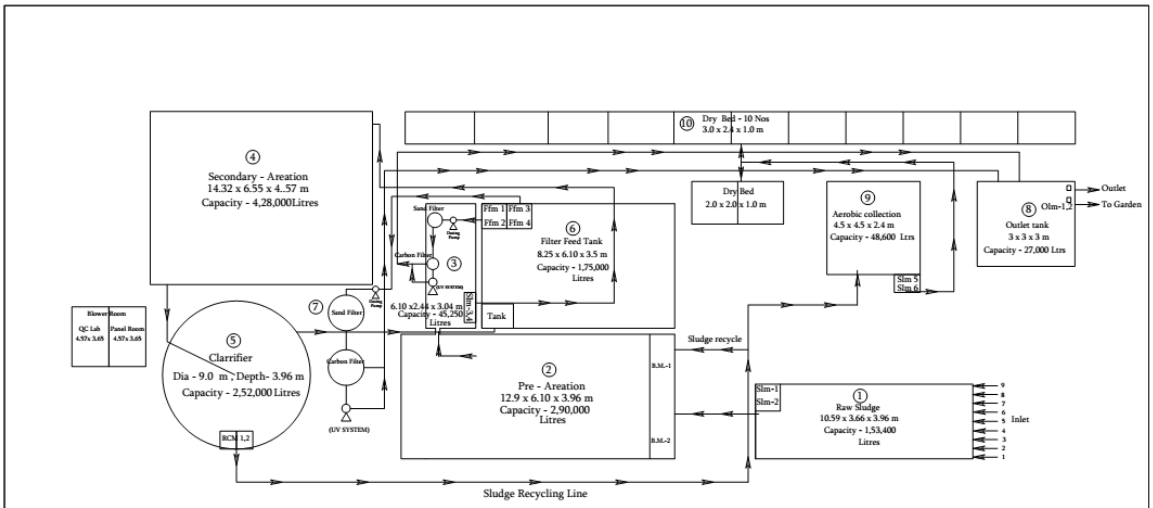
# WATER TREATMENT FACILITY AT SRM




| Sl.No | Description | Size in 'M' | Qty in Ltrs |
|---|---|---|---|
| 1 | Raw Sludge | 10.59x3.66x3.96 | 1,53,400 |
| 2 | Pre - Aeration | 12.9x6.1x3.96 | 2,90,000 |
| 3 | Aeration Tank | 6.1x2.44x3.04 | 45,250 |
| 4 | Secondary - Areation | 14.32x6.55x4.57 | 4,28,000 |
| 5 | Clarrifier | Dia-9.0 / D-3.96 | 2,52,000 |
| 6 | Filter Feed Tank | 8.25x6.1x3.5 | 1,75,000 |
| 7 | Pressure Sand Filter, Activated Carbon Filter | 2m(dia)x2.5m-h | |
| 8 | Outlet Tank | 3.0x3.0x3.0 | 27,000 |
| 9 | Aerobic Collection | 4.5x4.5x2.4 | 48,600 |
| 10 | Drying bed | 3.0x2.4x1.0=10Nos | |

| BUILDING WISE INLET LINE DETAILS | |
|---|---|
| Sl.No | Building Name |
| 1. | Hospital A , F Block |
| 2. | Hospital C , G Block |
| 3. | OP Canteen |
| 4. | Staff Quarters 'A' Block |
| 5. | Staff Quarters 'B' Block |
| 6. | Staff Quarters 'D' Block |
| 7. | Dean Quarters & M/c Ladies Hostel |
| 8. | Medical College A,B Block |
| 9. | Mortuary & Store Room |

Note:
Am - Aeration Motor
Bm - Blower Motor
Olm - Outlet Motor
Slm - Sludge Motor
Ffm - Filter Feed Motor

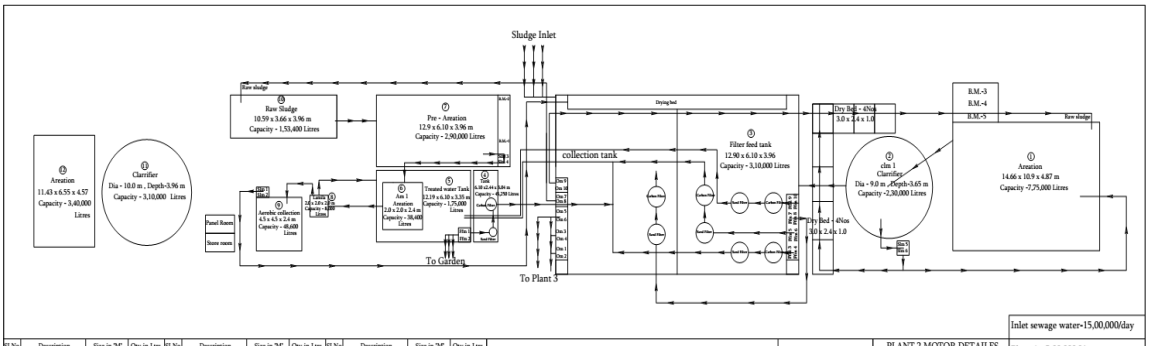
| PLANT 1 MOTOR DETAILES | |
|---|---|
| Am 1 | = 5hp -1no |
| Olm 1,2 | = 7.5hp -2no"s |
| Slm 1to Slm 4 | = 5hp -4no"s |
| Bm 1,2,3,4,5 | =10hp-3no"s&20hp-2no"s |
| RCM 1,2 | = 5 hp - 2no"s |
| Ffm 1,2,3,4 | = 7.5hp-4no"s |

PLANT 1TREATED CAPACITY

Plant A = 10,00,000 Litres

Inlet sewage water- 9,00,000/day

Figure 32 : layout of Waste Water Treatment Facility–1




| Sl.No | Description | Size in 'M' | Qty in Ltrs | Sl.No | Description | Size in 'M' | Qty in Ltrs | Sl.No | Description | Size in 'M' | Qty in Ltrs |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Areation | 14.66x10.9x4.87 | 7,75,000 | 7 | Pre - Areation | 12.9x6.1x3.96 | 2,90,000 | PROPOSED | | | |
| 2 | Clarrifier | Dia-9.0 / D-3.65 | 2,30,000 | 8 | Lamda | 2.0x2.0x2.0 | 8,000 | 11 | Clarrifier | Dia-10.0 / D-3.96 | 3,10,000 |
| 3 | Filter Feed Tank | 12.9x6.1x3.96 | 3,10,000 | 9 | Aerobic Collection | 4.5x4.5x2.4 | 48,600 | 12 | Areation | 11.43x6.55x4.57 | 3,40,000 |
| 4 | Tank | 6.1x2.44x3.04 | 45,250 | 10 | Raw Sludge | 10.59x3.66x3.96 | 1,53,400 | | TOTAL (B) | | 6,50,000 |
| 5 | Treated Water Tank | 12.19x6.1x3.35 | 1,75,000 | | TOTAL (A) | | 20,71,000 | | GRAND TOTAL (A+B) | | 27,21,000 |
| 6 | Areation | 2.0x2.0x2.4 | 38,400 | | | | | | | | |

Note:
Ffm - Filter Feed Motor
Slm - Sludge Motor
Olm - Outlet Motor
Bm - Blower Motor
Am - Aeration Motor

| PLANT 2 MOTOR DETAILES | |
|---|---|
| Ffm 1 to 10 | =7.5hp-10no"s |
| Cm 1 | =1hp -1no |
| Bm 3 to Bm 5 | =20hp-3no"s |
| Bm 1,2 | =10hp-2no"s |
| Slm 1to Slm 6 | = 5hp -6no"s |
| Am 1 | =5hp -1no |

Inlet sewage water-15,00,000/day

Plant A =5,00,000 Litres

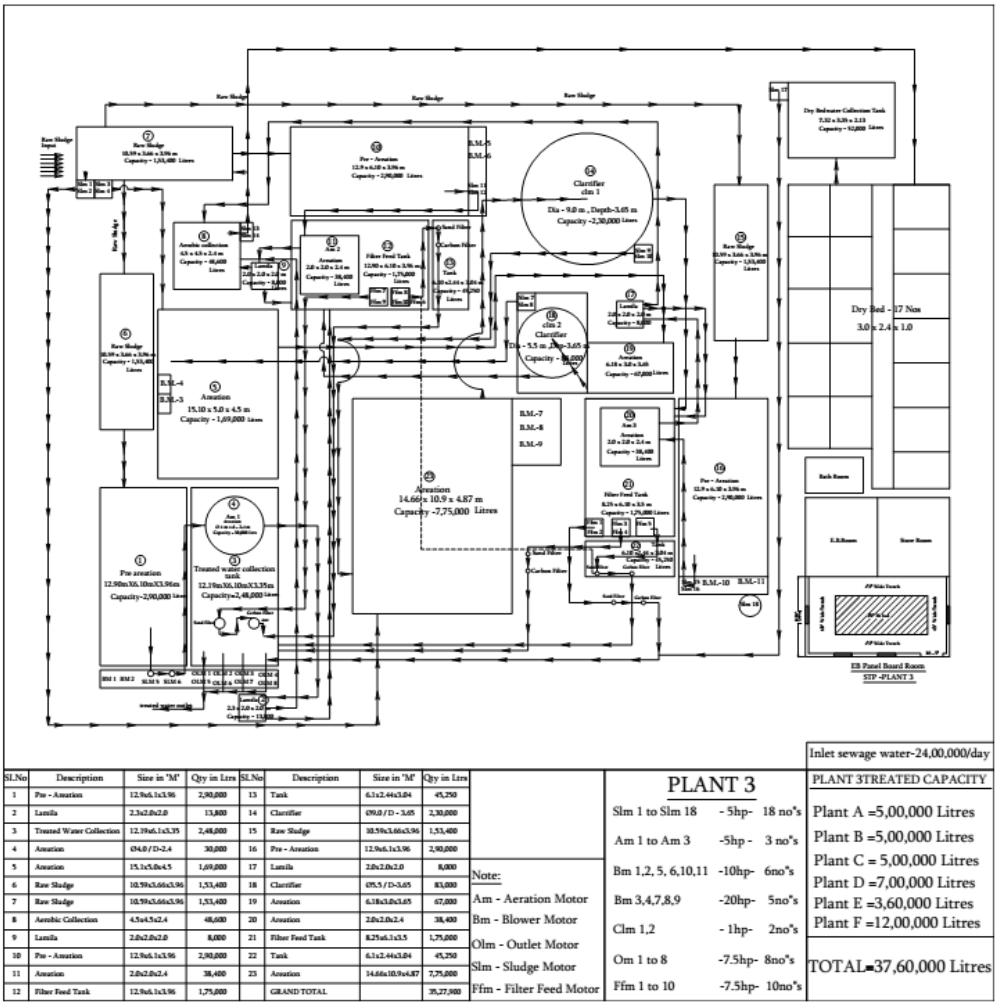
Plant B =5,00,000 Litres

Plant C = 7,00,000 Litres

TOTAL=17,00,000 Litres

PLANT 2 TREATED CAPACITY

Figure 33 : The layout of Waste Water Treatment Facility -2




Inlet sewage water-24,00,000/day

| SL.No | Description | Size in 'M' | Qty in Ltrs | SL.No | Description | Size in 'M' | Qty in Ltrs |
|---|---|---|---|---|---|---|---|
| 1 | Pre - Aeration | 12.9x6.1x3.96 | 2,90,000 | 13 | Tank | 6.1x2.44x3.04 | 45,250 |
| 2 | Lamila | 2.3x2.0x2.0 | 13,800 | 14 | Clarifier | Ø9.0 / D - 3.65 | 2,30,000 |
| 3 | Treated Water Collection | 12.19x6.1x3.35 | 2,48,000 | 15 | Raw Sludge | 10.59x3.66x3.96 | 1,53,400 |
| 4 | Aeration | Ø4.0 / D-2.4 | 30,000 | 16 | Pre - Aeration | 12.9x6.1x3.96 | 2,90,000 |
| 5 | Aeration | 15.1x5.0x4.5 | 1,69,000 | 17 | Lamila | 2.0x2.0x2.0 | 8,000 |
| 6 | Raw Sludge | 10.59x3.66x3.96 | 1,53,400 | 18 | Clarifier | Ø5.5 / D-3.65 | 83,000 |
| 7 | Raw Sludge | 10.59x3.66x3.96 | 1,53,400 | 19 | Aeration | 6.18x3.0x3.65 | 67,000 |
| 8 | Aerobic Collection | 4.5x4.5x2.4 | 48,600 | 20 | Aeration | 2.0x2.0x2.4 | 38,400 |
| 9 | Lamila | 2.0x2.0x2.0 | 8,000 | 21 | Filter Feed Tank | 8.25x6.1x3.5 | 1,75,000 |
| 10 | Pre - Aeration | 12.9x6.1x3.96 | 2,90,000 | 22 | Tank | 6.1x2.44x3.04 | 45,250 |
| 11 | Aeration | 2.0x2.0x2.4 | 38,400 | 23 | Aeration | 14.66x10.9x4.87 | 7,75,000 |
| 12 | Filter Feed Tank | 12.9x6.1x3.96 | 1,75,000 | | GRAND TOTAL | | 35,27,900 |

Note:
Am - Aeration Motor
Bm - Blower Motor
Olm - Outlet Motor
Slm - Sludge Motor
Ffm - Filter Feed Motor

PLANT 3

| | | |
|---|---|---|
| Slm 1 to Slm 18 | - 5hp- | 18 no"s |
| Am 1 to Am 3 | -5hp - | 3 no"s |
| Bm 1,2, 5, 6,10,11 | -10hp- | 6no"s |
| Bm 3,4,7,8,9 | -20hp- | 5no"s |
| Clm 1,2 | - 1hp- | 2no"s |
| Om 1 to 8 | -7.5hp- | 8no"s |
| Ffm 1 to 10 | -7.5hp- | 10no"s |

PLANT 3TREATED CAPACITY

Plant A =5,00,000 Litres
Plant B =5,00,000 Litres
Plant C = 5,00,000 Litres
Plant D =7,00,000 Litres
Plant E =3,60,000 Litres
Plant F =12,00,000 Litres

TOTAL=37,60,000 Litres

Figure 34 : layout of the Waste Water Treatment facility at SRMIST–Plant 3

## TABLE 14 : PERCENTAGE OF WASTE WATER RECYCLED

| Year | Total wastewater collected | Waste water recycled | R.O. Reject generated | % waste water recycled |
|---|---|---|---|---|
| 2013 | | | | |
| 2014 | | | | |
| 2015 | | | | |
| 2016 | | | | |
| 2015 | | | | |
| 2016 | | | | |
| 2017 | | | | |

Figure 35: Wastewater treatment plant at SRMIST

Figure 36 : Effluent Treatment plant at SRMIST

Figure 37: Clarifier tank in wastewater treatment process

## REVERSE OSMOSIS PLANTS (R.O. PLANTS)

Reverse osmosis (RO) is a membrane separation process, driven by a pressure gradient, in which the membrane separates the solvent (generally water) from other components of a solution. The membrane configuration is usually cross-flow. The Institute of Science and Technology has provided purified R.O. drinking water to all the students and staff residing in the campus by setting up the R.O plants in the hostels and academic buildings. In additional to drinking purpose, R.O water is provided to the hostel mess for cooking foods. The details of R.O. plants in the university are furnished below.

## TABLE 15 : RO PLANTS INSTALLED AT SRMIST

| S. No | Campus / Blocks | Total No of R.O Plants | Capacity | Number of Hours Run | Remark |
|---|---|---|---|---|---|
| Institution | | | | | |
| 1 | Main Campus | 2 No | 1000 L / Hour | 10 Hrs | |
| 2 | Annexure Campus | 7 No | 1000 L / Hour | 10 Hrs | |
| Hostels | | | | | |
| 3 | Green Pearl Apartment | 1 No | 1000 L / Hour | 10 Hrs | |
| 4 | Engineering Hostels | 13 No | 1000 L / Hour and 2000 L / Hour | 10 Hrs | 12 No = 1000 L<br>01 No = 2000 L |
| 5 | Medical College and Hospital | 7 No | 1000 L / Hour and 2000 L / Hour | 8 to 10 Hours | 06 No = 1000 L<br>01 No = 2000 L |


Figure 38: RO Plant installed at SRMIST

# RAINWATER HARVESTING

Capturing rainwater can be a valuable way to reduce and aim to eliminate a building's use of municipal potable water, without requiring reductions in water use by occupants. However, it is, of course, more effective in rainy climates than dry ones.

## ROOFTOP RAINWATER HARVESTING

SRM has initiated and executed the rooftop rainwater harvesting in all the buildings of the Institute of Science and Technology, including hostels, guesthouse and hospitals. The rainwater collected from building rooftops of buildings connected to a standard header and led to a trickling sand filter. The filtered water is used for domestic purposes after chlorination. Rainwater harvesting is also done by diverting stormwater drains and runoff from rooftops to bore wells for recharge. For this, a pit of size 2m x 2m x 2m is excavated around the dry bore well, and the casing pipe is fitted with a v-wire filter. Filter media is filled in the pit around the well. The stormwater drains and rooftop rainwater are diverted into this pit gets filtered into the borewell through the v-wire filter.

Rainwater is collected from the roof and stored in large tanks. The water is then used for the flushing of toilets and prevents the drinking water from the mains being used. There are many advantages to harvesting rainwater, mainly by providing an independent and local water supply, which is not impacted by regional water restrictions and which reduces the demand on local water infrastructure

## RAINWATER HARVESTING AT SRMIST

Total rooftop and surface area: square metres (sq m)

Average annual rainfall in Tamil Nadu: millimetres (mm)

Total volume of rainwater harvested: cubic meters ($m^3$) or litres.

This represents XX  per cent of total rainwater harvesting potential

## SURFACE RUNOFF HARVESTING

### TABLE 15 : RAINWATER HARVESTING PLANTS AT SRMIST

| S.No | Campus | Blocks | Number of Rainwater Harvesting | Quantity of Water Collected |
|---|---|---|---|---|
| 1 | Annexure Campus | Dental Ground | 3 | 15000 |
| 2 | Annexure Campus | SRM Hospital | 4 | 15000 |
| 3 | Annexure Campus | SRM Medical College | 2 | 15000 |
| 4 | Annexure Campus | SRM PC Roy Hostel | 1 | 15000 |

## TABLE 16 : QUANTITY OF RAINWATER HARVESTED

| Year | Quantity of rainwater harvested |
|---|---|
| 2012 | |
| 2013 | |
| 2014 | |
| 2015 | |
| 2016 | |
| 2017 | |
| 2018 | |

Figure 39: Rail water Harvesting Facility at SRMIST

At SRM we have harvested approximately 12,00,000 Liters of rainwater, our goal is to double the rate of rainwater harvesting by 2022.

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# WATER USE REDUCTION IN LABORATORIES & OFFICES

1. Recirculate water used for cooling
2. Ensure water-using equipment has as high loadings as possible
3. Use water efficiently for cleaning and rinsing
4. Efficient use of water baths and heating blocks
5. Efficient use of purified water
6. Raise awareness of the environmental impact of water usage