AMITY UNIVERSITY
UTTAR PRADESH

# REPORT

## THE VOLUME (IN m3) OF TREATED WATER (mains water or desalinated water) OR EXTRAXTED WATER (from rivers, lakes, aquifers) USED IN THE UNIVERSITY IN THE YEAR 2022.

18 number bores are being utilized for extracting water (ground water) for utilization in AUUP Campus. This water is stored in underground tanks at various locations near the hostel blocks & academic blocks from where it is pumped to overhead tanks for consumption.

## PROCESS TO TREAT WASTEWATER

There are four STP plants and seven ETP plants at various locations for treating sewage waste and laboratory / laundry waste. The process followed in the university is as below:.

GreenEnviroTech

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# Report on Sewage & Effluent treatment being carried out at Amity University, Sector 125 Noida

Amity University is situated in Sector 125 Noida, Uttar Pradesh and consists of classrooms, canteens, a laundry, laboratories and hostels. Being an environment friendly zero discharge University, the wastewater generated from all these sources needs to be and recycled within the premises. For this purpose four STP's and seven ETP's have been installed. All the STPs are interconnected and waste water is treated by these STPs as per the capacity of each.

The total number of users currently are as below:

1) Day scholars including visiting staff & Teachers - 41,100 nos
2) Hostel residents including on site staff etc. - 4,000 nos

The Waste water generated per type of user is :

| | | | | |
|---|---|---|---|---|
| 1) | Day Scholars etc. | 41,100 x 20 ltrs/hd/day | = | 8,22,000 |
| 2) | Hostellers etc. | 4,000 x 100 ltrs/hd/day | = | 4,00,000 |
| | | Total domestic sewage generated | = | 12,22,000 |

Apart from domestic sewage the other sources of waste water are:

| | | |
|---|---|---|
| Laundry | - | 40,000 ltr/day |
| Kitchen waste water | - | 1,20,000 ltr/day |
| Lab effluents | - | 2,500 ltr/day |
| RO Plant waste water | - | 70,000 ltr/day |
| Total | - | 2,32,500 ltr/day |

The total waste water generated by the University is approx. :

12,22,000 + 2,32,500 = **14,54,500** ltrs per day

**90% received back as sewage = 13,09,050 ltrs/day**

After treatment the waste water is recycled for various purposes detailed as below:

| | | | |
|---|---|---|---|
| 1) | Flushing | | |
| | a) Hostels 4,000 x 40 | - | 1,60,000 ltrs/day |
| | b) Day students 41,000 x 12 | - | 4,92,000 ltrs/day |
| 2) | Chiller Plant make up water | - | 2,50,000 ltrs/day |
| 3) | Gardening | - | 1,20,000 ltrs/day |
| | Total water recycled | - | 10,22,000 ltrs/day |

**Excess water being discharged into gardens = 2,87,050 ltrs per day**

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**STP 1 :** Maximum capacity of 600 Kld or 25 Kl/hour

Design characteristics:

| Parameters | Inlet Value | Unit | Outlet Value |
|---|---|---|---|
| $BOD_3$ | 200 | mgs./ltr | < 10 |
| COD | 400 | mgs./ltr | < 50 |
| Total suspended solids | 300 | mgs./ltr | < 10 |
| pH | 6 - 8 | | 6 - 8 |
| Oil & Grease | 5 | mgs./ltr | < 3 |

Design specifications:

| Module | Volume | Unit | Retention |
|---|---|---|---|
| Raw water sump | 75 | cum | 3 hour |
| Aeration tank 1 | 187 | cum | 7.5 hours |
| Primary settling Tank | 52 | cum | 2 hours |
| Aeration Tank 2 | 100 | cum | 4 hours |
| Secondary Settling Tank | 68 | cum | 2.72 hours |
| Air Blower 1 & 2 | 400 | cum/hr | |
| Air Blower 3 & 4 | 200 | cum/hr | |
| Air Blower 5 & 6 | 160 | cum/hr | |
| Filter | 2 | 1200 ltrs | $\leq 12\ m^3/m^2/hr$ |
| Treated Water Tank | 100 | cum | 4 hours |

**STP 3**: Maximum capacity of 300 cum/day or 12.5 Kl/hr

Design characteristics:

| Parameters | Inlet Value | Unit | Outlet Value |
|---|---|---|---|
| $BOD_3$ | 200 | mgs./ltr | < 10 |
| COD | 400 | mgs./ltr | < 50 |
| Total suspended solids | 300 | mgs./ltr | < 10 |
| pH | 6 - 8 | | 6 - 8 |
| Oil & Grease | 6 | mgs./ltr | < 3 |

Design specifications:

| Module | Volume | Unit | Retention |
|---|---|---|---|
| Raw water sump | 275 | cum | 22 hour |
| Aeration tank | 160 | cum | 12.8 hours |
| Settler | 43 | cum | 3.4 hours |
| Filter feed tank | 48 | cum | 3.8 hours |
| Air Blower 1, 2 & 3 | 300 | cum/hr | |
| Dual Media Filters | 2 | 1.0 mtr dia | $\leq 8\ m^3/m^2/hr$ |
| Treated Water tank | 90 | cum | 7.2 hours |

**STP 4:** Maximum capacity of 600 Kl/day or 25 Kl/hour

Design characteristics:

| Parameters | Inlet Value | Unit | Outlet Value |
|---|---|---|---|
| $BOD_3$ | 200 | mgs./ltr | < 20 |
| COD | 400 | mgs./ltr | < 150 |
| Total suspended solids | 300 | mgs./ltr | < 50 |
| pH | 6 - 8 | | 6 - 8 |
| Oil & Grease | 6 | mgs./ltr | < 2 |

Design specifications:

| Module | Volume | Unit | Retention |
|---|---|---|---|
| Raw water sump | 150 | cum | 5 hour |
| Aeration tank | 247 | cum | 10 hours |
| Settler | 54 | cum | 2.16 hours |
| Filter feed tank | 54 | cum | 2.16 hours |
| Air Blower 1 | 500 | cum/hr | |
| Air Blower 2 | 500 | cum/hr | |
| Filters | 2 | 1.00 dia | $\leq 9\ m^3/m^2/hr$ |
| Filters | 1 | 1.20 dia | $\leq 9\ m^3/m^2/hr$ |
| Treated water tank | 260 | cum | 10 hours |

**ETP's:** Apart from the domestic sewage generated, the university generates effluent from their kitchens, laboratories and the laundry. The break up of the effluent generated along with treatment parameters is detailed below:

**ETP 1** : ( L1 Block Labs) Capacity – 30 ltrs per day; Peak flow 300 ltrs per week

| S. No. | Parameters | Inlet | Outlet |
|---|---|---|---|
| 1 | BOD | 100 – 150 mg/l | < 10 |
| 2 | COD | 300 – 450 mg/l | < 150 |
| 3 | TSS | 100 – 200 mg/l | < 50 |
| 4 | pH | 6 – 7.5 | 6 – 8.5 |
| 5 | Oil & Grease | 10 – 12 mg/l | < 5 |

**ETP 2 :** ( L1 Block labs) Capacity – 30 ltrs per day; Peak flow 300 ltrs per week

| S. No. | Parameters | Inlet | Outlet |
|---|---|---|---|
| 1 | BOD | 100 – 150 mg/l | < 10 |
| 2 | COD | 300 – 450 mg/l | < 150 |
| 3 | TSS | 100 – 200 mg/l | < 50 |
| 4 | pH | 6 – 7.5 | 6 – 8.5 |
| 5 | Oil & Grease | 10 – 12 mg/l | < 5 |

**ETP 3**: (Laundry at D Block) Capacity – 4,000 ltrs per hour; Flow 40,000 ltrs per day

| S. No. | Parameters | Inlet | Outlet |
|---|---|---|---|
| 1 | BOD | 100 – 150 mg/l | < 10 |
| 2 | COD | 300 – 450 mg/l | < 150 |
| 3 | TSS | 100 – 200 mg/l | < 50 |
| 4 | pH | 6 – 7.5 | 6 – 8.5 |
| 5 | Oil & Grease | 10 – 12 mg/l | < 5 |

**ETP 4:** (For H Block Canteen kitchen) Capacity – 1,500 ltrs per hour; Flow 20,000 ltrs per day

| S. No. | Parameters | Inlet | Outlet |
|---|---|---|---|
| 1 | BOD | 900 mg/l | < 30 |
| 2 | COD | 1,600 mg/l | < 150 |
| 3 | TSS | 200 – 300 mg/l | < 50 |
| 4 | pH | 6 – 7.5 | 6 – 8.5 |
| 5 | Oil & Grease | 10 – 12 mg/l | < 10 |

**ETP 5:** (For E Block Labs) Capacity 30 ltrs per hour; Flow 2,000 ltrs per day

| S. No. | Parameters | Inlet | Outlet |
|---|---|---|---|
| 1 | BOD | 100 mg/l | < 20 |
| 2 | COD | 3,500 mg/l | < 150 |
| 3 | TSS | 200 – 300 mg/l | < 50 |
| 4 | pH | 2 - 9 | 6 – 8.5 |
| 5 | Oil & Grease | 20 – 45 mg/l | < 5 |

**ETP 6 :** ( E Block labs) Capacity – 30 ltrs per day; Peak flow 300 ltrs per week

| S. No. | Parameters | Inlet | Outlet |
|---|---|---|---|
| 1 | BOD | 100 – 150 mg/l | < 20 |
| 2 | COD | 300 – 450 mg/l | < 150 |
| 3 | TSS | 100 – 200 mg/l | < 50 |
| 4 | pH | 6 – 7.5 | 6 – 8.5 |
| 5 | Oil & Grease | 10 – 12 mg/l | < 5 |

**ETP 7 :** (For J Block Labs) Capacity 300 ltrs per hour; Flow 2,000 ltrs per day

| S. No. | Parameters | Inlet | Outlet |
|---|---|---|---|
| 1 | BOD | 100 mg/l | < 20 |
| 2 | COD | 3,500 mg/l | < 150 |
| 3 | TSS | 200 – 300 mg/l | < 50 |
| 4 | pH | 2 - 9 | 6 – 8.5 |
| 5 | Oil & Grease | 20 – 45 mg/l | < 5 |

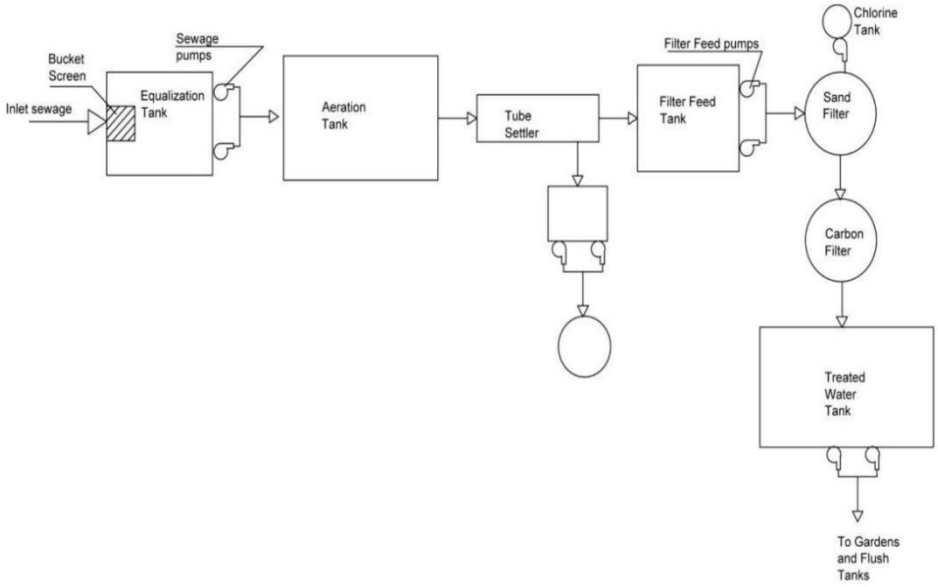
**All the treated water from the ETPs is pumped into the sewage line after preliminary treatment and undergoes final treatment along with the sewage water.**

## Total volume of Waste water generated in the University

Total flow per day : **13,09,050** ltrs. per day

Total Sludge generated = 13,09,050 ltrs @ 200 mgs/ltr = 262 Kg/day
Sludge recycled back in aeration tanks = @ 70% = 183 Kg per day.
Sludge dried and handed over to be used as compost = 262 – 183 = **79 kg/day**.

## Typical Flow Diagram of STP's




## Note on functioning of STP's

1. The raw sewage water from different buildings/blocks reaches the raw water sumps by gravity flow from the sewage pipelines. The BOD of the raw water is taken to be 200 mgs./ltr. ***Aer Bac*** bacterial solution is added in this tank at a ratio of 1:1000 to assist in break down of organic mass and autolysis.

2. From the raw water sump the sewage mixed with the bacteria is pumped into the aerobic reactor. The reactor is designed for BOD reduction of 95%. Air is pumped into the reactor to assist the bacteria in multiplication. ***Aer Bac*** microbes multiply rapidly and curb the generation of pathogens. The BOD is reduced to approx. 10 mg./ltr.

3. From the Aeration Tank the water flows into a settling tank where solids are allowed to settle. Since the water is rich in ***Aer Bac*** microbes approx 70% of the solids are pumped back to the aeration chamber where they react with the waste water. Some dead cells are consumed by the active microbes as nutrient and do not require removal due to the process of enhanced autolysis. The settled sludge is removed via a Drying Beds and handed over to the gardener to be used as compost.

4. The filters are backwashed on a daily basis and the backwashed water is returned into the aerobic reactor

5. The treated water from all the STPs is recycled back into the flushing tanks, Chiller Plants and the excess treated water is used for irrigation the lawns.

**Note on functioning of ETP's**

1. Effluent from the laboratories is collected in a equalization cum neutralizing tank. PH is checked and the water is neutralized. Lime and Ferric Alum are added one by one in the collection tank. Each chemical is allowed to react with the waste water for 20 minutes and the mixture is pumped into the mixing cum settling tank. After allowing the coagulation and separation process to take place Polyelectrolyte is added and mixture is allowed to settle. The settled and floating pollutants are removed into the sludge drying bed while the clear water is collected in a separate tank. From here the water is pumped through a filter into the nearest manhole. The sludge from the drying beds is collected after allowing drying time and stored for safe disposal as per CPCB guidelines.

2. Effluent from the laundry is collected into a sump from where it is pumped into the chemical reaction tank. Lime, Ferric alum and Polyelectrolyte are added in the CRTs for flocculation and coagulation. Floccs are developed in the flocculation tank and the water is allowed to flow to the settler where the floccs are settled and separated in the Sludge Drying Beds. The clear water is sent to the nearest manhole from where it reaches the STP. The Sludge is collected and stored in PVC bags and will be disposed as per CPCB guidelines.

3. Effluent form the Kitchens are collected in a sump and pumped into a grease trap. Grease and fats are removed physically and sent along with the other kitchen wastes for composting. The waste water then flows into the STPs. Here Air is pumped using appropriately sized Twin lobe roots type air blowers through fine bubble air diffusers. Aer Bac bacteria is also added. The Oxygen helps in providing energy to the microbes to multiply faster using the waste water as nutrient. The oxygen demand is reduced and the water gets stabilized. The Sludge is removed using sludge filters and the treated water is pumped into the adjoining garden for watering.

For Green Envirotech

Navin Chopra

## Water treatment and recycling -per month

| Block/ Area or total for campus | Total Water consumption (Lts) | STP input (Lts) per day | ETP input (Lts) per day | STP output (Lts) per month | ETP output (Lts) per month | Recycling of treated water to toilets (Lts) | Recycling of treated water to gardening (Lts) |
|---|---|---|---|---|---|---|---|
| STP1 | | 1,80,000 | | 54,00,000 | | 25,65,000 | 15,39,000 |
| STP2 | | 1,40,000 | | 42,00,000 | | 19,95,000 | 11,97,000 |
| STP3 | | 3,00,000 | | 90,00,000 | | 42,75,000 | 25,65,000 |
| STP4 | | 3,50,000 | | 1,05,00,000 | | 49,87,000 | 29,92,500 |
| Dell Building STP | | 30,000 | | 9,00,000 | | - | 8,55,000 |
| | | | | | | | |
| D- Block Laundry | | | 30,000 | | 9,00,000 | | |
| Mama-Mia Kitchen ETP | | | 25,000 | | 7,50,000 | | |
| E - 1 Block Lab ETP | | | 500 | | 15,000 | | |
| E - 3 Block Lab ETP | | | 200 | | 6,000 | | |
| J - 1 Block Lab ETP | | | 500 | | 15,000 | | |
| L - 1 Block Lab ETP | | | 200 | | 6,000 | | |
| L - 1 A Block Lab ETP | | | 200 | | 6,000 | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | 10,00,000 | 56,600 | 3,00,00,000 | 16,98,000 | 1,38,22,000.00 | 91,48,500 |

## RO water quality parameters -per month

| Block/ Area or total for campus | al Water consumption | Parameter | Standard | Finding |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |