KALYANI CHARITABLE TRUST'S
LATE G. N. SAPKAL COLLEGE OF ENGINEERING
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**Date: 11/05/ 2023**

# Industrial Visit Report

## TE-Civil

### A VISIT REPORT ON WASTE WATER ENGINEERING

## Department of Civil Engineering

**Late G. N. Sapkal College of Engineering, Nashik.**

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**Venue:** Tapovan Sewage Treatment Plant, Tapovan, link road, Nashik..

**Date:** 11/05/ 2023, Thursday at 10:00 am.

**Class:** TE

**Faculty coordinator:** Prof. Kiran Deore

**Number of Students:** 40

**No. of Teachers:** 02

**Mode of Transportation:** Bus

**Travelling Distance:** 25 km from college (One Side)

**Guided by: Mr. Matkale**
**Mr. Vispute**
**Capacity of plant:** 130 MLD (78 MLD+52 MLD)

**Visit Organized by:** Department of Civil Engineering, Late G. N. Sapkal College of Engineering, Nashik.

**Introduction:**

The Department of Civil Engineering of Late G. N. Sapkal College of Engineering, Nashik organized one day visit to Sewage Treatment Plant Tapovan, Nashik on 11th May 2023 for the third year student of Civil Engineering (BE) program.

The Visit was mandatory to fulfil the curriculum requirement of Savitribai Phule Pune University (SPPU) for TE Civil students under the subject of Waste Water Engineering. The visit was organized with the prior permission and guidance of Respected Principal Prof. Dr. S. B. Bagal and HOD of Civil Department Prof. Dr. C. K. Sridhar. Along with the staff members, students of BE. Prof. Kiran Deore have taken hard efforts and initiative for the visit and guided them throughout the visit.

**Objectives of the Sewage Treatment Plant Site Visit:**

1. To provide students with the practical knowledge of the various unit operations and unit Processes involved in treatment of sewage thereby leading to better understanding of the subject.
2. To learn about handling of sewage storage, capacity and processes.
3. To witness actual methods adopted by the plant at real time.
4. Our main purpose for this visit was to give the practical knowledge about water treatment plant process. By this visit students can be familiar with industrial environment and get knowledge of different units of waste water treatment plant.
5. Also in 6th semester subject like Waste Water Engineering requires knowledge about how components of sewage plant are constructed, so it is very much convenient to see all the practical and components in real time work environment.

**Sewage treatment plant:**

It is a type of wastewater treatment which aims to remove contaminants from sewage to produce an effluent that is suitable to discharge to the surrounding environment or an intended reuse application, thereby preventing water pollution from raw sewage discharges. Sewage contains wastewater from households and businesses and possibly pre-treated industrial wastewater.

Treated sewage water is purified and maintained as per the Maharashtra pollution control board norms (MPCB).

**Principle of STP:**

The basic principle of a biological treatment plant is decomposition of the raw sewage. This process is done by aerating the sewage chamber with fresh air.

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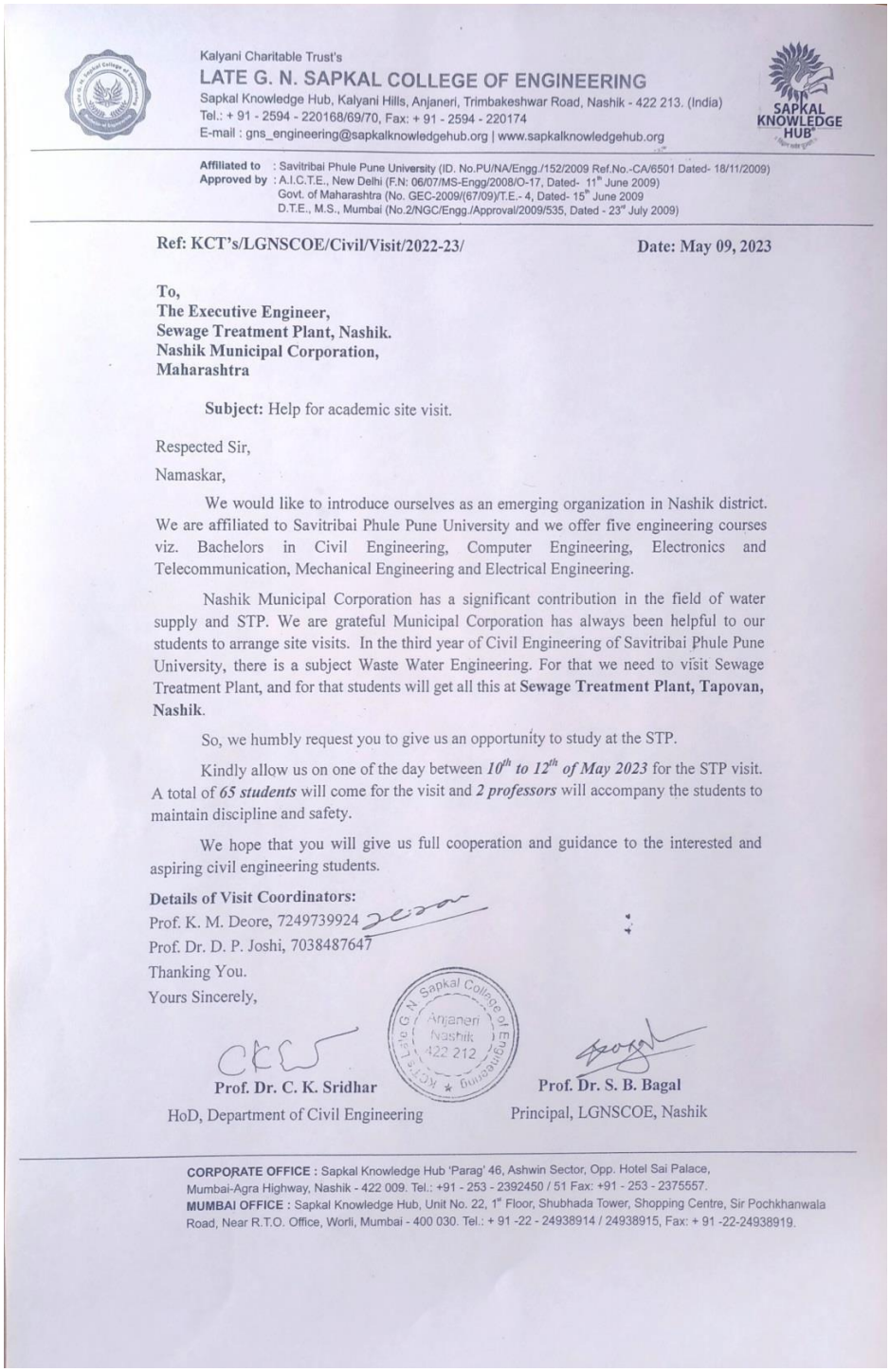
**Permission for the Visit:**

The college wrote a permission letter to The Executive Engineer of Water Supply and Sewage Department of Nashik Municipal Corporation to obtained permission. This process took about 4-5 days.



Kalyani Charitable Trust's
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SAPKAL KNOWLEDGE HUB

Affiliated to : Savitribai Phule Pune University (ID. No.PU/NA/Engg./152/2009 Ref.No.-CA/6501 Dated- 18/11/2009)
Approved by : A.I.C.T.E., New Delhi (F.N: 06/07/MS-Engg/2008/O-17, Dated- 11th June 2009)
Govt. of Maharashtra (No. GEC-2009/(67/09)/T.E.- 4, Dated- 15th June 2009
D.T.E., M.S., Mumbai (No.2/NGC/Engg./Approval/2009/535, Dated - 23rd July 2009)

**Ref: KCT's/LGNSCOE/Civil/Visit/2022-23/** **Date: May 09, 2023**

**To,**
**The Executive Engineer,**
**Sewage Treatment Plant, Nashik.**
**Nashik Municipal Corporation,**
**Maharashtra**

**Subject:** Help for academic site visit.

Respected Sir,

Namaskar,

We would like to introduce ourselves as an emerging organization in Nashik district. We are affiliated to Savitribai Phule Pune University and we offer five engineering courses viz. Bachelors in Civil Engineering, Computer Engineering, Electronics and Telecommunication, Mechanical Engineering and Electrical Engineering.

Nashik Municipal Corporation has a significant contribution in the field of water supply and STP. We are grateful Municipal Corporation has always been helpful to our students to arrange site visits. In the third year of Civil Engineering of Savitribai Phule Pune University, there is a subject Waste Water Engineering. For that we need to visit Sewage Treatment Plant, and for that students will get all this at **Sewage Treatment Plant, Tapovan, Nashik**.

So, we humbly request you to give us an opportunity to study at the STP.

Kindly allow us on one of the day between ***10th to 12th of May 2023*** for the STP visit. A total of ***65 students*** will come for the visit and ***2 professors*** will accompany the students to maintain discipline and safety.

We hope that you will give us full cooperation and guidance to the interested and aspiring civil engineering students.

**Details of Visit Coordinators:**
Prof. K. M. Deore, 7249739924
Prof. Dr. D. P. Joshi, 7038487647

Thanking You.
Yours Sincerely,

G. N. Sapkal College of Engineering Anjaneri Nashik 422 212

**Prof. Dr. C. K. Sridhar**
HoD, Department of Civil Engineering

**Prof. Dr. S. B. Bagal**
Principal, LGNSCOE, Nashik

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**Purpose of visit:**

Sewage treatment is the process of removing contaminants from municipal wastewater, containing mainly household sewage plus some industrial wastewater. Physical, chemical, and biological processes are used to remove contaminants and produce treated wastewater that is safe enough for release into the environment. A by-product of sewage treatment is a semi-solid waste or slurry, called sewage sludge. The sludge has to undergo further treatment before being suitable for disposal or application to land. Sewage treatment generally involves three stages, called primary, secondary and tertiary treatment.

- Primary Treatment consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment. Some sewage treatment plants that are connected to a combined sewer system have a bypass arrangement after the primary treatment unit. This means that during very heavy rainfall events, the secondary and tertiary treatment systems can be bypassed to protect them from hydraulic over loading and the mixture of sewage and storm water only receives primary treatment.
- Secondary Treatment removes dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.
- Tertiary Treatment is sometimes defined as anything more than primary and secondary treatment in order to allow ejection into a highly sensitive or fragile ecosystem (estuaries, low-flow Rivers, coral reefs...). Treated water is sometimes disinfected chemically or physically (for example, by lagoons and microfiltration) prior to discharge into a stream, river, bay, lagoon or wetland, or it can be used for the irrigation of a golf course, greenway or park. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purposes.

**Screening:**

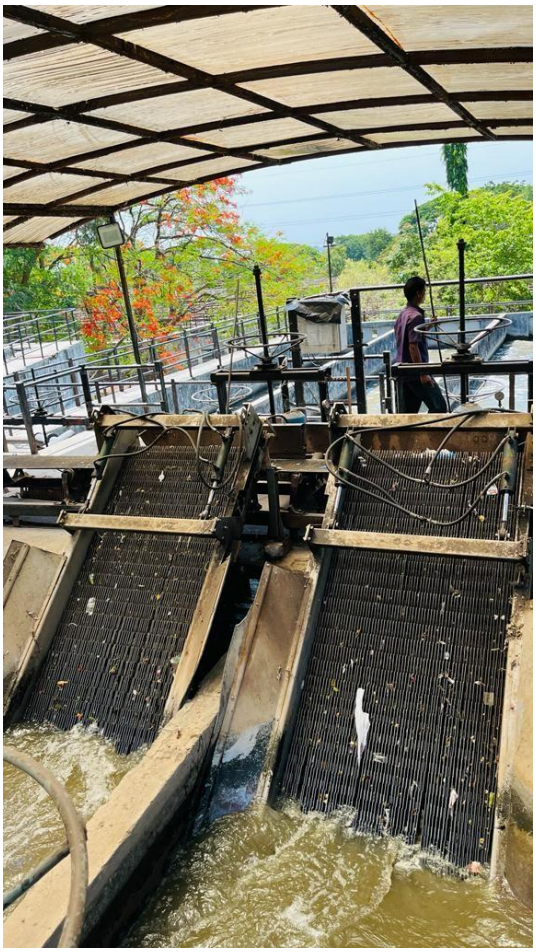
First unit of water treatment plant is screening, this is first step in wastewater treatment process. Screening involves the removal of large objects for example cotton buds, plastics, diapers, rags, sanitary items, face wipes, broken bottles or bottle tops that in one way or another may damage the equipment.

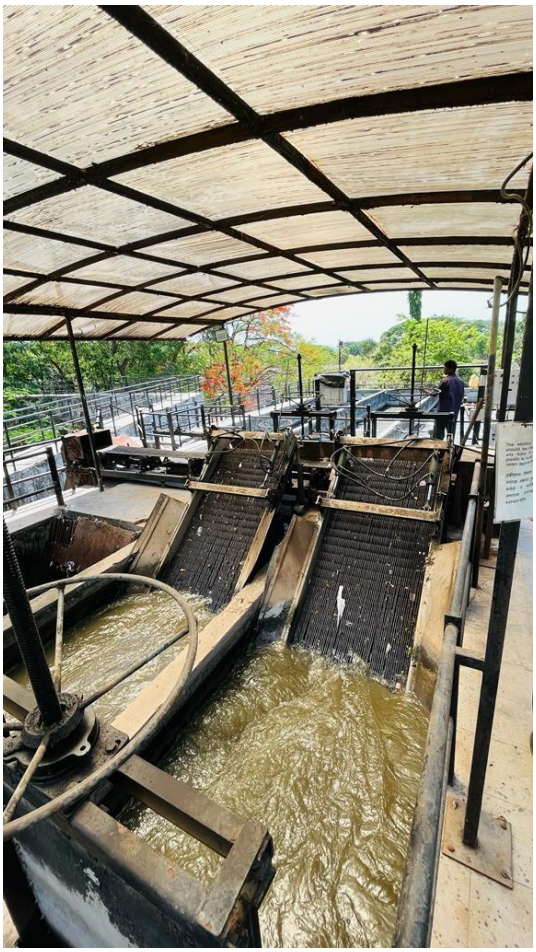
The incoming wastewater passes through screening equipment where objects such as rags, wood fragments, plastics, and grease are removed. The material removed is washed and pressed and disposed of in a landfill. The screened wastewater is then pumped to the next step: grit removal.

Types of screens:

1. Coarse screens

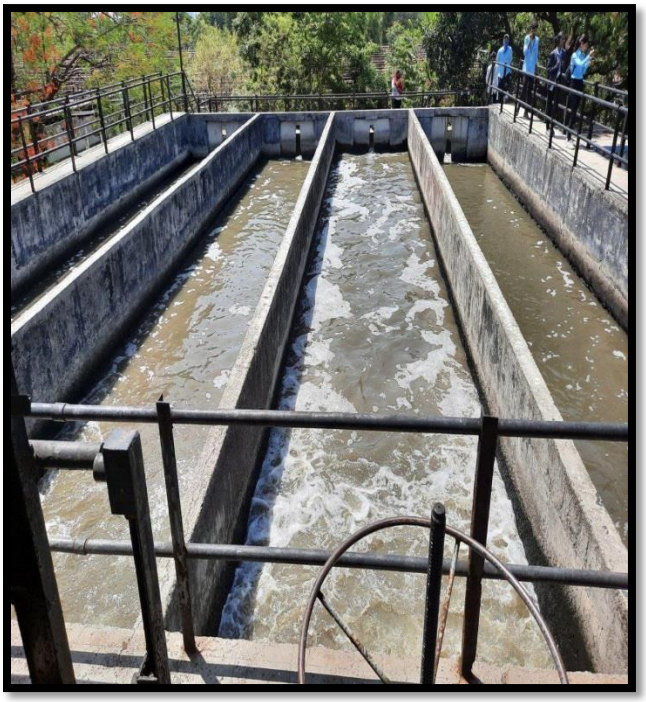
2. Fine screens

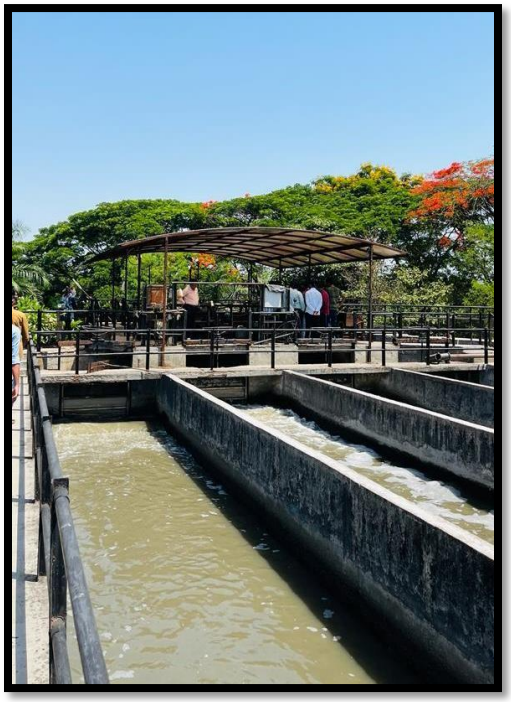




**Grit chamber:**

**Grit chambers** are long narrow tanks that are designed to slow down the flow so that solids such as sand, coffee grounds, and eggshells will settle out of the water. Grit causes excessive wear and tear on pumps and other plant equipment. Its removal is particularly important in cities with combined sewer systems, which carry a good deal of silt, sand, and gravel that wash off streets or land during a storm. Material is also disposed of in a landfill.





**Primary Treatment:**

This process involves the separation of macrobiotic solid matter from the wastewater. Primary treatment is done by pouring the wastewater into big tanks for the solid matter to settle at the surface of the tanks which is removed by large scrappers at the center of the cylindrical tanks. The remaining water is then pumped for secondary treatment.

**UASB reactor**:

**UASB** expands to **Up Flow-Anaerobic Sludge Blanket** technology. **Anaerobic treatment** means that it uses no air or oxygen in its process.

It aims to remove organic pollutants from the wastewater, slurries, and sludge. The microorganisms convert the organic pollutants into biogas that contains methane and carbon dioxide. UASB is efficient and able to remove the BOD, COD, and TSS but it is minimal for nutrients in wastewater. It is also able to treat black water and grey water, industry effluent, and agriculture wastewater.

For 78 MLD STP – 6 numbers of reactors are used.

For 52 MLD STP – 4 numbers of reactors are used.


Vivo V20 - PRACHI

After the reactor process, the water is sent to next process of aeration, and the remaining sludge is sent to sludge drying beds of zones which is then used for agricultural purposes.

**Secondary Treatment:**

The next step of the treatment process is secondary clarifier. The water from the primary tank is transported to the secondary clarifier for adding chemicals such as lime and alum to reduce the PH of water.


**Aeration Tank:**

The settled wastewater enters aeration tanks where air is blown into the liquid to provide oxygen for mixing and to promote the growth of micro-organisms. Some of this sludge is recycled to the inlet of the aeration tank to maintain the biomass, hence the name for the process activated sludge. The remainder is pumped to anaerobic digester for further treatment.

The technique of adding air to **wastewater** to allow aerobic **bio-degradation** of harmful components is known as **aeration.** Biological treatment stabilise toxins in the wastewater stream, using microorganisms that naturally reside in wastewater to decompose wastewater contaminants. Air is combined with, or dissolved in a liquid or substance during aeration. Pumping air into a tank, which promotes microbial growth in the wastewater, is the basis of aeration in an activated sludge process. The microorganisms feed on the organic material and create flocks that are easy to separate. The bacteria that produce the "active sludge" flocks are continually recirculated back to the aeration basin after settling in a separate settling tank to speed up decomposition.

In Tapovan STP, the depth of aeration tank is 50ft. and total 10 HP motors are used in 4 numbers. Detention period is 18 hours with 12 aerators and new processed water is settled down in polishing pond for 6 hours (without aerators).

**Secondary Clarifiers:**

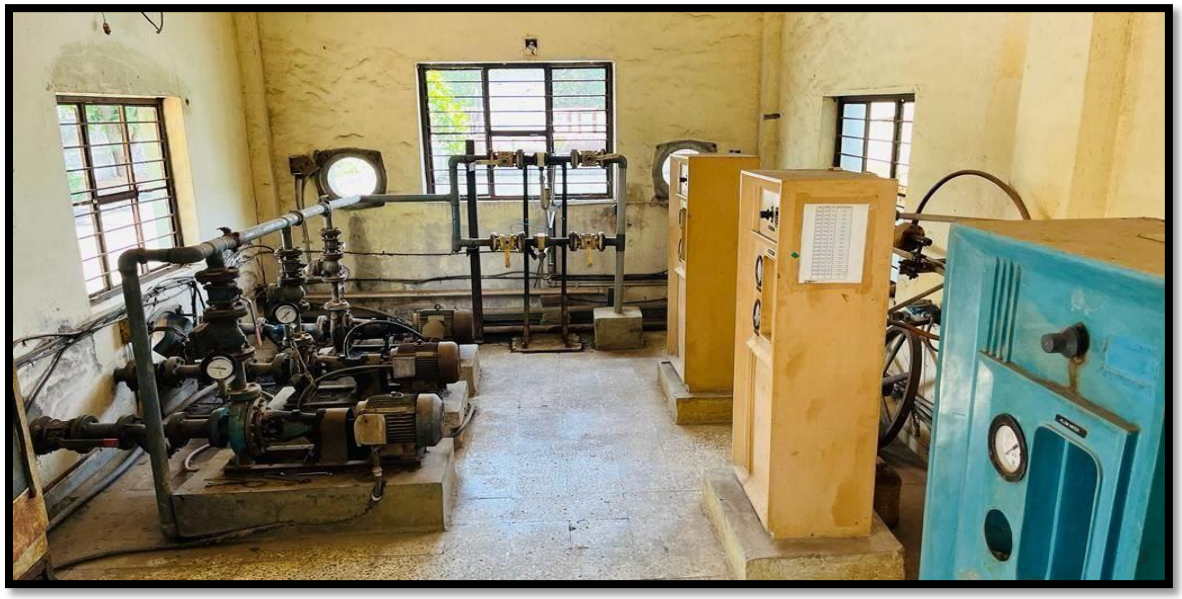
During the secondary clarification process the biomass from microorganisms settles to the bottom in the form of activated sludge. After settling over a period of time, the biomass of microorganisms is returned to the aeration tank with the cycle repeating until the effluent is clean before sent for filtration and/or disinfection. Waste sludge is removed and thickened prior to the digestion process.

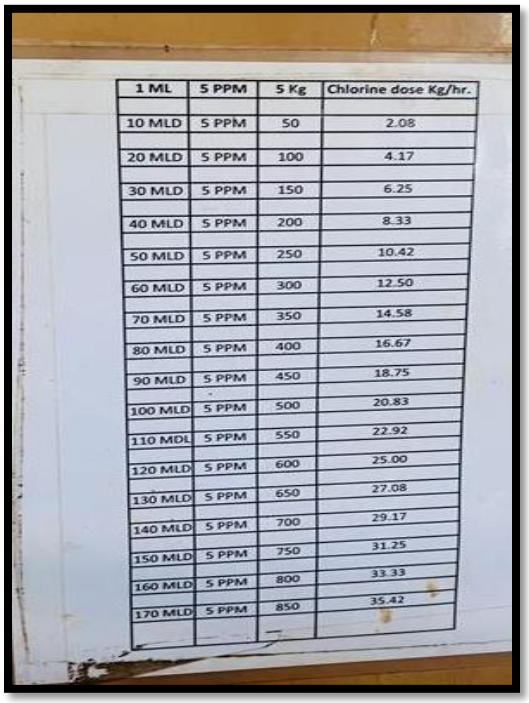
**Disinfection unit**

The next steps for wastewater treatment plants use disinfection for treatment to reduce pathogens, which are micro-organisms which can pose a risk to human health.

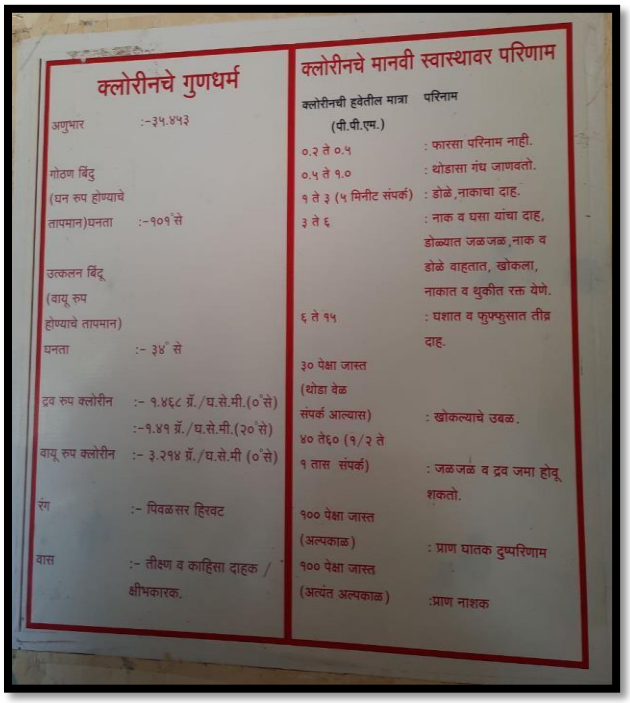

## Chlorination:

Chlorination is a **disinfection** method which helps in the destruction of microorganisms from the running wastewater. Microorganisms can be pathogenic or non-pathogenic. Wastewater contains pathogenic enteric microorganisms that impose severe health problems like Typhoid, cholera, dysentery etc., The chlorination method uses different forms of **chlorine** to disinfect the treated wastewater. It is largely responsible for reducing the incidences of waterborne diseases. Considering human health, the destruction of pathogens is necessary to make wastewater reusable.





| 1 ML | 5 PPM | 5 Kg | Chlorine dose Kg/hr. |
|---|---|---|---|
| 10 MLD | 5 PPM | 50 | 2.08 |
| 20 MLD | 5 PPM | 100 | 4.17 |
| 30 MLD | 5 PPM | 150 | 6.25 |
| 40 MLD | 5 PPM | 200 | 8.33 |
| 50 MLD | 5 PPM | 250 | 10.42 |
| 60 MLD | 5 PPM | 300 | 12.50 |
| 70 MLD | 5 PPM | 350 | 14.58 |
| 80 MLD | 5 PPM | 400 | 16.67 |
| 90 MLD | 5 PPM | 450 | 18.75 |
| 100 MLD | 5 PPM | 500 | 20.83 |
| 110 MDL | 5 PPM | 550 | 22.92 |
| 120 MLD | 5 PPM | 600 | 25.00 |
| 130 MLD | 5 PPM | 650 | 27.08 |
| 140 MLD | 5 PPM | 700 | 29.17 |
| 150 MLD | 5 PPM | 750 | 31.25 |
| 160 MLD | 5 PPM | 800 | 33.33 |
| 170 MLD | 5 PPM | 850 | 35.42 |



क्लोरीनचे गुणधर्म

अणुभार :-३५.४५३

गोठण बिंदु (घन रुप होण्याचे तापमान)घनता :-१०१°से

उत्कलन बिंदू (वायू रुप होण्याचे तापमान) घनता :- ३४° से

द्रव रुप क्लोरीन :- १.४६८ ग्रॅ./घ.से.मी.(०°से) :-१.४१ ग्रॅ./घ.से.मी.(२०°से)

वायू रुप क्लोरीन :- ३.२१४ ग्रॅ./घ.से.मी (०°से)

रंग :- पिवळसर हिरवट

वास :- तीक्ष्ण व काहिसा दाहक / क्षीभकारक.

क्लोरीनचे मानवी स्वास्थावर परिणाम

| क्लोरीनची हवेतील मात्रा (पी.पी.एम.) | परिनाम |
|---|---|
| ०.२ ते ०.५ | : फारसा परिनाम नाही. |
| ०.५ ते १.० | : थोडासा गंध जाणवतो. |
| १ ते ३ (५ मिनीट संपर्क) | : डोळे,नाकाचा दाह. |
| ३ ते ६ | : नाक व घसा यांचा दाह, डोळ्यात जळजळ,नाक व डोळे वाहतात, खोकला, नाकात व थुकीत रक्त येणे. |
| ६ ते १५ | : घशात व फुफ्फुसात तीव्र दाह. |
| ३० पेक्षा जास्त (थोडा वेळ संपर्क आल्यास) | : खोकल्याचे उबळ. |
| ४० ते६० (१/२ ते १ तास संपर्क) | : जळजळ व द्रव जमा होवू शकतो. |
| १०० पेक्षा जास्त (अल्पकाळ) | : प्राण घातक दुष्परिणाम |
| १०० पेक्षा जास्त (अत्यंत अल्पकाळ) | :प्राण नाशक |

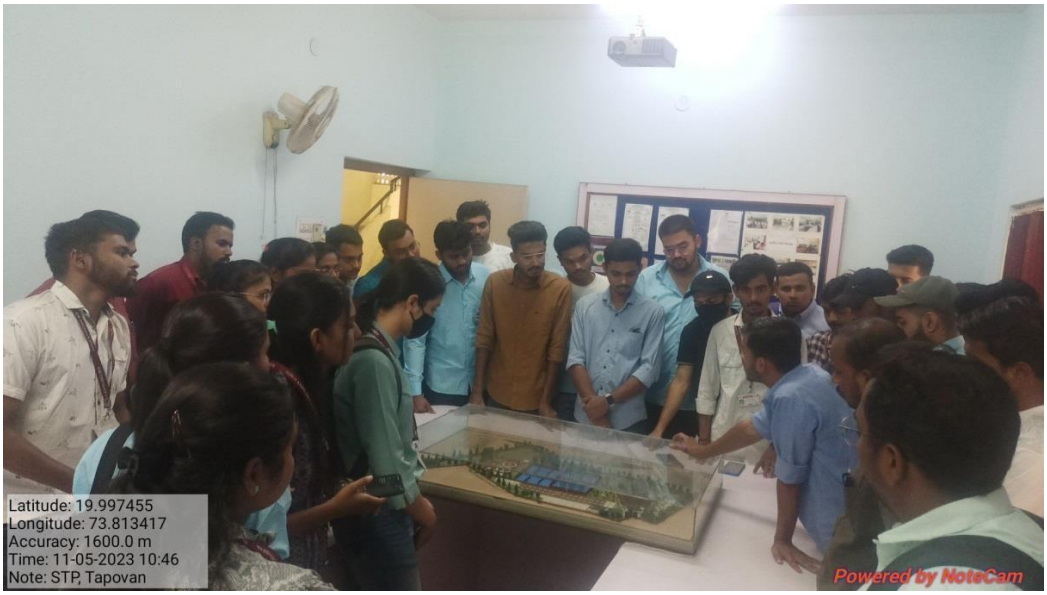
**Sludge Digestion**

Now again to remove the sludge particles the water is passed through the belt filter press. The purified water is obtained by chemically treating the water coming out of the belt filter press. In which Chlorine is usually dosed into the treated wastewater stream for disinfection.

**Outlet chamber:**

At the end of all the treatment processes, the treated waste water is discharged in the natural stream (Godavari river) through outlet chamber.

**National River Action Plan:**




78 MLD UASB Sewage Treatment Plant under Godavari Action Plan at Tapovan for Nashik Municipal Corporation, Nashik.

**Conclusion**

From this visit, we get the information and practical knowledge about the treatment of waste water and components used in treatment plant. Students got the knowledge about detailed process of sewage treatment.

The visit was a great opportunity for us to learn about the treatment process and see it in action. During the visit, we were able to observe the different stages of the treatment process, from preliminary treatment to final disinfection. We learned about the important role each stage plays in removing impurities from the sewage water and ensuring that it is safe to be discharged into the environment.