KALYANI CHARITABLE TRUST'S
LATE G. N. SAPKAL COLLEGE OF ENGINEERING
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Date: 2nd Nov. 2023

Industrial Visit Report

TE-Civil

A VISIT REPORT ON WATER SUPPY ENGINEERING

Department of Civil Engineering

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

Venue: Nilgiri Baag Water Treatment Plant, Bidi Kamgar Colony Nashik: 422006

Date: 02/11/ 2023, Thursday at 10:00 am.

Class: TE

Faculty coordinator: Prof. Kiran Deore

Number of Students: 20

No. of Teachers: 02

Mode of Transportation: Bus

Travelling Distance: 25 km from college (One Side)

Guided by: Mr. Nikhil More (Chemist)

Mr. Rajesh Vavhale (Plant Incharge)

Capacity of plant: 50 MLD

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

Figure 1: Administrative office of WTP Nilgiri Baug, Nashik

Acknowledgement

On behalf of the third-year civil engineering students of Late G N Sapkal College of Engineering, Nashik, I would like to express our sincere gratitude to the Nashik Municipal Corporation, Nashik for arranging a site visit for our class.

We were particularly grateful for the guidance of Mr. Nikhil More (Chemist) and Mr. Rajesh Vavhale (Plant Incharge) they were very knowledgeable and helpful, and they took the time to answer all of our questions.

We also appreciated the opportunity to see the water treatment plant in operation and to learn about the different types of process and treatments that are done there.

We would like to thank Respected Chairman of Sapkal Knowledge Hub Dr. Ravindra Sapkal Sir for giving us opportunity to do learn new things and providing necessary facilities. We are also thankful to Respected Principal of Late G N Sapkal College of Engineering Nashik Prof. Dr. Sahebrao Bagal Sir for giving us permission for the visit.

We would also like to thank Head of the Department of Civil Engineering Prof. Dr. R. T. Pardeshi and Prof. Kiran Deore for coordinating the site visit.

Introduction:

The Department of Civil Engineering of Late G. N. Sapkal College of Engineering, Nashik organized one day visit to Nilgiri Baag Water Treatment Plant, Nashik on 2nd Nov. 2023 for the third year student of Civil Engineering (BE) program.

The Visit was mandatory to fulfill the curriculum requirement of Savitribai Phule Pune University (SPPU) for TE Civil students under the subject of Water Supply 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. R. T. Pardeshi. The faculty member Prof. Kiran Deore have taken hard efforts and initiative for the visit and guided them throughout the visit.

Objectives of a site visit to a water treatment plant:

- To learn about the different stages of water treatment.
- To see how water is treated to make it safe for drinking.
- To understand the importance of water treatment in protecting public health.
- To gain an appreciation for the complexity of water treatment systems.
- To learn about the different types of water treatment technologies available.
- To see how water treatment plants are operated and maintained.
- To understand the environmental impact of water treatment.

In addition to these general objectives, a site visit to a water treatment plant can also be used to meet specific learning objectives. For example, a student might visit a water treatment plant to learn about a specific treatment process, such as coagulation or disinfection. A student might also visit a water treatment plant to learn about a specific issue, such as the treatment of wastewater. No matter what the specific objectives are, a site visit to a water treatment plant can be a valuable learning experience for students of all ages. It can help them to understand the importance of water treatment in protecting public health and the environment.

Here are some of the benefits of a site visit to a water treatment plant:

- Students can learn about the different stages of water treatment in a hands-on way.
- Students can see how water is treated to make it safe for drinking.
- Students can gain an appreciation for the complexity of water treatment systems.
- Students can learn about the different types of water treatment technologies available.
- Students can see how water treatment plants are operated and maintained.
- Students can understand the environmental impact of water treatment.
- Students can ask questions and get answers from experts in the field of water treatment.
- Students can see the real-world applications of concepts they have learned in class.

Water treatment plant:

Water treatment plants are facilities that purify and treat raw water for human consumption. They are essential for ensuring that our drinking water is safe and free of contaminants. Here is an overview of the processes involved in water treatment.

Introduction to Nilgiri WTP:

Name: Nilgiri Baugh Water Treatment Plant

Owner: Nashik Municipal Corporation

Opening Year: March 2015

Purpose: Water Treatment Facility is to make water portable while also ensuring that there is a sufficient supply of a water to meet community need.

The Nilgiri Baag Water Treatment Plant is situated near amrutdham in nashik. It gets its water supply from gangapur dam.The water treatment plant is situated over an area 7.5 acres out of which 4.5 acres is under construction of the plant.

The total capacity of this water treatment plant is 50MLD and its daily generation is 45MLD. It generates 1900m3/hr. of clear water every hour.

Principle of WTP:

Water treatment plants employ a range of physical, chemical, and biological processes to purify raw water and make it safe for human consumption. These processes work together to remove impurities and contaminants that can pose health risks, ensuring that the water meets stringent drinking water quality standards.

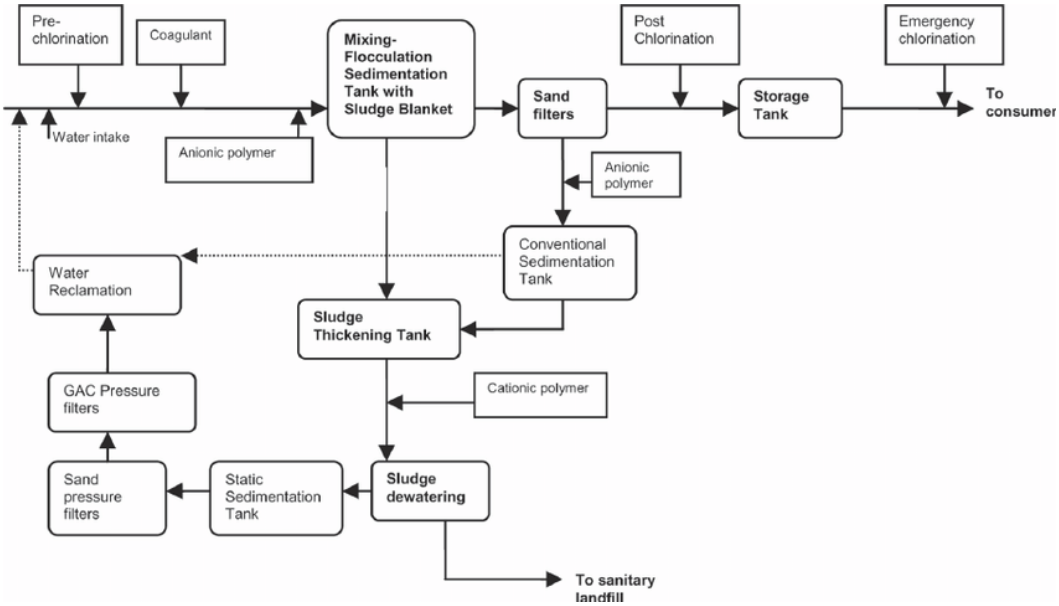


Figure 2: Flow chart of Water treatment process

The primary objectives of water treatment plants are to:

Remove impurities: This includes physical contaminants like sand, silt, and clay, as well as chemical contaminants like pesticides, heavy metals, and organic compounds.

Eliminate pathogens: These are microorganisms like bacteria, viruses, and parasites that can cause waterborne diseases. Disinfection processes, such as chlorination or ultraviolet radiation, are employed to kill these pathogens.

The principles of drinking water treatment are based on the fundamental understanding of physical, chemical, and biological processes.

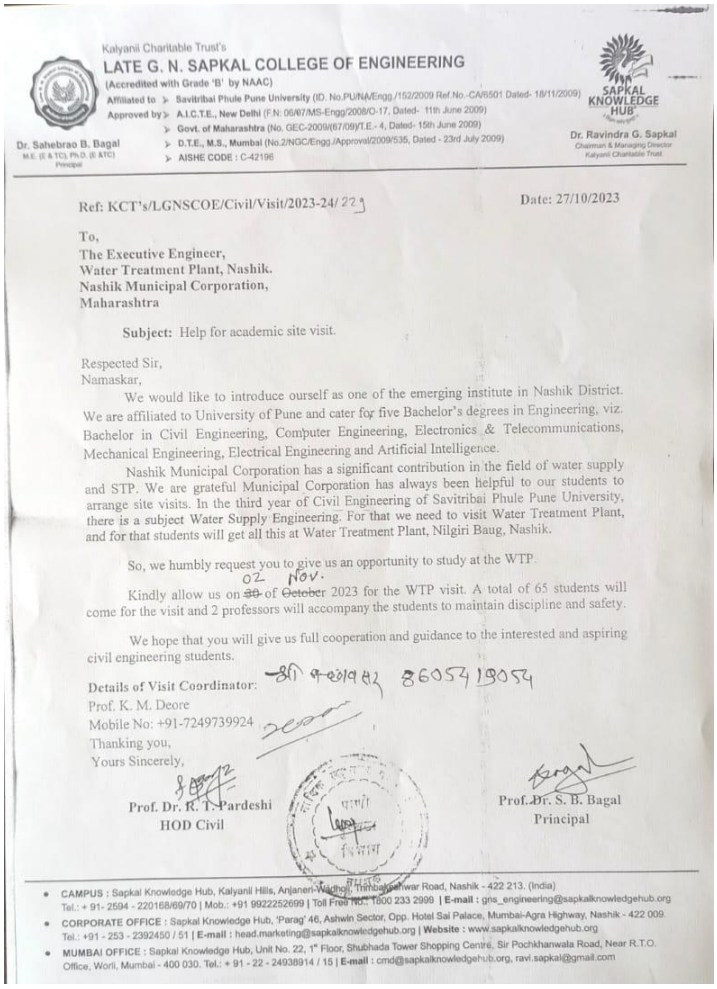
Physical processes: These processes involve the removal of impurities based on their physical properties, such as size, density, or solubility. Examples include screening, sedimentation, and filtration.

Chemical processes: These processes involve the use of chemicals to react with contaminants, either to remove them or to transform them into less harmful forms. Examples include coagulation, flocculation, and disinfection.

Biological processes: These processes utilize microorganisms or biological enzymes to remove or degrade contaminants. Examples include activated sludge treatment and slow sand filtration.

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.



Kalyanii Charitable Trust's
LATE G. N. SAPKAL COLLEGE OF ENGINEERING
(Accredited with Grade 'B' by NAAC)
Affiliated to Savitribai Phule Pune University (ID. No.PUNE/Engg./152/2009 Ref.No.-CA/6501 Dated- 18/11/2009)
Approved by A.I.C.T.E., New Delhi (F.N: 06/67/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)
AISHE CODE : C-42196
Dr. Sahebrao B. Bagal M.E. (E & TC), Ph.D. (E &TC) Principal
SAPKAL KNOWLEDGE HUB
Dr. Ravindra G. Sapkal Chairman & Managing Director Kalyanii Charitable Trust

Ref: KCT's/LGNSCOE/Civil/Visit/2023-24/229 Date: 27/10/2023

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

Subject: Help for academic site visit.

Respected Sir,
Namaskar,

We would like to introduce ourself as one of the emerging institute in Nashik District. We are affiliated to University of Pune and cater for five Bachelor's degrees in Engineering, viz. Bachelor in Civil Engineering, Computer Engineering, Electronics & Telecommunications, Mechanical Engineering, Electrical Engineering and Artificial Intelligence.

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 Water Supply Engineering. For that we need to visit Water Treatment Plant, and for that students will get all this at Water Treatment Plant, Nilgiri Baug, Nashik.

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

Kindly allow us on ~~30~~ 02 Nov. of ~~October~~ 2023 for the WTP 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 Coordinator:
Prof. K. M. Deore
Mobile No: +91-7249739924
Thanking you,
Yours Sincerely,

Prof. Dr. R. T. Pardeshi
HOD Civil

Prof. Dr. S. B. Bagal
Principal

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Figure 3: Site visit permission letter

Stages of water treatment:

The stages of water treatment in a water treatment plant are designed to purify raw water and make it safe for human consumption. These stages work together to remove impurities, contaminants, and pathogens that can pose health risks, ensuring that the water meets stringent drinking water quality standards.

Intake: Raw water is drawn from a source, such as a river, lake, or reservoir. This water may contain various impurities, contaminants, and pathogens that need to be removed.

Figure 4: Intake well at Gangapur Dam

Pretreatment: The raw water is then pretreated to adjust its physical and chemical properties, preparing it for the subsequent treatment stages. This may involve adjusting the pH and temperature of the water, adding chemicals to aid in coagulation and flocculation, or removing dissolved gases.

Aeration is the process of adding air into wastewater to allow aerobic biodegradation of the organic materials. The principal secondary techniques used are the trickling filter and the activated sludge process and are the activated sludge process and are often classified as fixed-film or suspended-growth system respectively

Purpose of cascade aerator:

- Retain the quality of water that has been infused with unwanted gases through the process of transfer of water from dam to water treatment plant.
- The area of cascade aerator 63sq.m and has 5 steps with 260mm ht. of each steps.
- The water brought to the cascade aerator through a 900mm pipe.

Figure 5: Cascade aerator

Parshall flume: Parshall flumes are a type of open channel flow measurement device that can be used in water treatment plants to mix coagulants. They are a popular choice for this application because they are relatively inexpensive and simple to install and maintain.

Figure 6: Parshall flumes

Coagulation and Flocculation: Coagulation and flocculation are processes that cause small particles in the water to clump together, forming larger particles called flocs. This is typically done by adding chemicals, such as alum or iron salts, to the water. The flocs are larger and heavier than the individual particles, making them easier to remove in subsequent stages.

Figure 7: Coagulation and flocculation process

Clariflocculator: Clariflocculator is a combination of flocculation and clarification in a single tank. It has two concentric tanks where inner tank serves as a flocculation basin and the outer tank serves as a clarifier.

Purpose of Clarifloccutor:

- To clarify the water and to remove the turbidity, suspended particles.

Purpose of Clarification Tank:

- Remixing of chemical dosage it helps in setting of very fine particles

Sedimentation: The flocs are allowed to settle to the bottom of the water treatment basin by gravity. This process is called sedimentation. The settled flocs form a layer of sludge at the bottom of the basin, which is periodically removed.

Figure 8: Clariflocculator

Filtration: The water is then passed through a series of filters to remove any remaining flocs and other contaminants. The type of filtration used depends on the specific contaminants present and the desired level of water quality. Common filtration methods include granular filtration, using sand or other granular media, and membrane filtration, using membranes with tiny pores to trap contaminants.

Water from the Clariflocculator is brought to the filtration tank and then is filtered by rapid sand filters in filter bed.

Purpose of Filtration:-

- Remove dissolved particles and germs such as dust, chemicals, Parasites, bacteria, and viruses etc.

Figure 9: Filtration tank

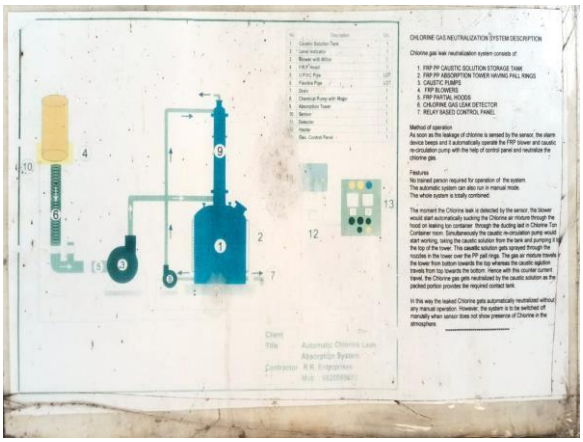
Backwashing: The back washing bed is used to filtrate the water at the end. The number of back washing bed at the plant is 6. Four are working and 2 for stand by each bed contain 8 walls 4 for outlet. In the bed there are two sides and that each side contain of sand gravel through which water is filtrate.

The backwashing process consists of;

- Cleaning/Brushing the drain area of filter beds.
- Compressed air is passed through the blowers for about 3 minutes.
- Wash water value is then opened to pass water at a pressure so that the filter beds overflow and sludge and debris is removed.

Figure 10: Back washing bed

Disinfection: Disinfection is a critical step in ensuring the safety of drinking water. It involves killing any harmful bacteria, viruses, or parasites that may be present in the water. Common disinfection methods include chlorination, ultraviolet radiation, and ozone treatment.



क्लोरीनचा सुरक्षित वापर - दक्षता सुचना :-

१) क्लोरीनची गळती अमोनिया टॉर्च ने शोधत रहावी.
२) क्लोरीनचा सिलेंडर टनर जोडतांना दोन्ही व्हॉल्व सरळ उब्या रेषेत ठेवून वरील व्हाल्वला क्लोरीनेटर ची नळी जोडावी.
३) व्हॉल्वला धरुन टाकी उचलू नये. व्हॉल्व उघडतांना व्हॉल्व चाबीचाच उपयोग करावा. पान्हा, हातोडी, वापरु नये. वापरात नसलेल्या टाकील्या सरंक्षक टोपी नेहमी लावून ठेवावी.
४) गळती तपासतांना व टाकी बदलतांना कॅनिस्टर मास्कचा वापर करावा. गळतीत काम करतांना हातमोजे व सरंक्षक ॲप्रॉन यांचा वापर करावा.
५) गळती आढळल्यास त्या ठिकाणी कोणत्याही परिस्थीतीत पाणी मारु नये.
६) अलकली द्रावणाची टाकी नेहमी तयार ठेवावी.
७) टाकीतील दाब ०.५ कि.ग्रॅ./चौ. से.मी. होताच टाकीचा व्हॉल्व बंद करावा.
८) क्लोरीनचा प्रवाह चालु करण्यापुर्वी पाण्याचा प्रवाह चालु करावा नंतर क्लोरीनेटर व्हॉल्व प्रथम बंद करावा. नंतर क्लोरीनेटरचा व्हॉल्व बंद करावा. पाण्याचा प्रवाह ५ मिनीटांनी बंद करावा.
९) क्लोरीनेटर अथवा तांब्याची जोड नळी काही कारणाणे काढल्यास मोकळी तोंडे निट बंद करुन ठेवावीत.
१०) क्लोरीन ची टाकी उन्हात ठेवू नये.
११) द्रव रुप क्लोरीन ची गळती झाल्यास द्रवावर भरपूर वाळू टाकून आच्छादन करावे.
१२) क्लोरीन सिलेंडर / टनर जोडतांना शिसाचा / टॅपलेनचा वॉशर वापरावा.

★★★★★

क्लोरीनचे गुणधर्म :-

अणूभार	:-	३५.४५३
गोठण बिंदू (घन रुप होन्याचे तापमान)	:-	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)
वासू रुप क्लोरीन	:-	३.२१४ ग्रॅ. / घंसे.मी (०°से)
रंग	:-	पिवळसर हिरवट

Figure 11: Chlorination unit

Storage: The treated water is stored in a reservoir before it is distributed to homes and businesses. This storage provides a buffer to ensure a consistent supply of water and allows for further testing and quality control measures.

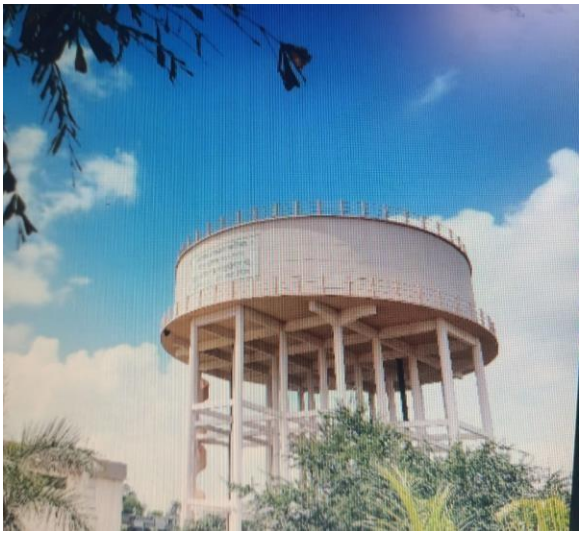


Figure 12: Overhead water storage tank at WTP

Distribution: The treated and stored water is then pumped through a network of pipes to homes, businesses, and other facilities. The distribution system is designed to maintain pressure and ensure that water is delivered to all users at a consistent flow rate.

Monitoring and Control: Throughout the treatment process, water quality is continuously monitored and controlled using various sensors, analytical instruments, and control systems. This ensures that the water meets all applicable drinking water quality standards and remains safe for consumption.

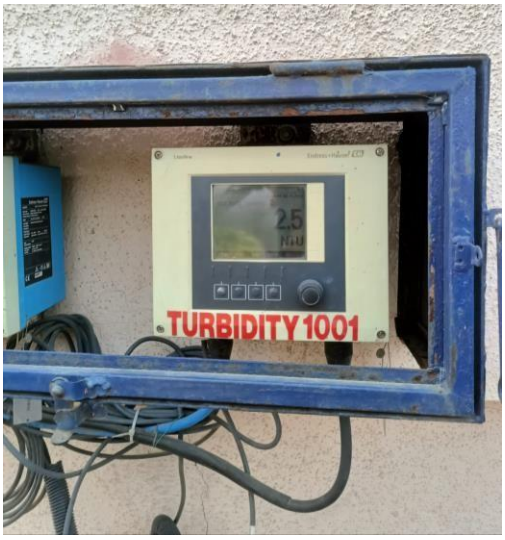


Figure 13: Quality of water is monitored and controlled by control systems

Recycling Unit: Water is brought to this unit where sludge is allowed to settle and the water is allowed to settle and then sludge free water is sent back to aerators for purification.

Purpose of recycling water:

- Agricultural and landscape, irrigation, industrial process, toilet, flushing, and replenishing a ground water basin (referred to as ground water recharge) Water recycling offers resource and financial savings.

Figure 14: Recycling Unit

Conclusion:

Water plays a very important role in our daily domestic life. The field visit at water treatment plant gave us the knowledge about the purification of water on very large scale and made us aware about the quality of water which we use and importance of water. I also get information of steps in water treatment plant such as aeration, sedimentation, filtration, chlorination, etc.

Also the visit made us realized that it's not easy to purify the raw water. So, thanks to the Prof. K.M. Deore , chemist at plant Nikhil More sir and plant in-charge Rajesh Vavhale sir.

The site visit to the water treatment plant was a valuable learning experience for the third year civil engineering students. They learned about the different stages of water treatment and how water is treated to make it safe for drinking. They also gained an appreciation for the complexity of water treatment systems and the importance of water treatment in protecting public health.

Here are some of the key takeaways from the site visit:

- The different stages of water treatment are intake, screening, pretreatment, coagulation and flocculation, sedimentation, filtration, disinfection, and storage.
- Each stage of water treatment removes different types of contaminants from the water.
- Water treatment plants are essential for protecting public health by removing harmful bacteria and viruses from the water.
- Water treatment plants are complex systems that require careful operation and maintenance.
- The students also had the opportunity to ask questions of the plant engineers and operators. This allowed them to gain a deeper understanding of the water treatment process and the challenges that water treatment plants face.
- Overall, the site visit was a positive experience for the students. They learned a lot about water treatment and the importance of protecting public health. They also gained an appreciation for the complexity of water treatment systems and the challenges that water treatment plants face.

Figure 15: Felicitation of the Plant in-charge by the students of LGNSCOE