



ALMIGHTY EFFLUENT TREATMENT MACHINE

Fully Automated, Sustainable Patented Technology

ALMIGHTY ENGINEERING

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MSME Reg. No. UDYAM-TN-12-0001085

Office Cum Factory

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About Almighty Engineering

Almighty Engineering group mainly focuses on automated, off-ground, and sustainable effluent and wastewater treatment plants; and green laundry/garment-dyeing machineries for small, medium, and large-scale applications. Our team comprises professional experts, inventors and scientists, who are actively involved in developing green and sustainable technologies in this domain. Mr. Y. Jahir Hussain, the Founder & Chairman of Almighty Engineering, has invented an effluent treatment technology entitled "Automated Garment Dyeing & Chemical washing, Effluent Treatment Wet Process Machine", which was patented under breakthrough invention category by Government of India (Patent No. 274877; Application: 581/ CHE/2010; Date: 05-03-2010). This technology was approved and recommended by the Department of Science and Technology, Ministry of Environment & Forest, and Central as well as Tamil Nadu State pollution control authorities for commercialization and adoption in effluent-generating industries. Our second prestigious invention is a process-automated sustainable laundry machine integrated with drying, ironing, and wastewater recycling units. Our research & development unit is fully committed to delivering new products that contribute to achieving the national and global sustainable development goals.

Our Vision

To be a leading manufacturer of automated and sustainable effluent treatment plants and wet-processing machineries.

Our Mission

Our mission is to explore, design, and manufacture automated, off ground, and sustainable effluent/sewage treatment plants, and laundry machineries according to the end-user requirements. We also offer consultancy and laboratory services for all kinds of effluent/sewage treatment plants.

Our Values

Quality
Affordability
Integrity
User-friendliness



Almighty Automatic Effluent Treatment Machine (AETM)

Developed by the support of



**Department of Scientific &
Industrial Research**
Ministry of Science and Technology
Government of India.



Patented by Government of India.

Patent No. 274877
Application:
581/ CHE/2010
Date: 05-03-2010

Recognized and Recommended for Commercial Use by



**Ministry of Environment,
Forest and Climate
Change,**
Government of India



**Central Silk Technological
Research Institute,**
Bangalore,
Government of India.



**The South India
Textile Research
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Tamil Nadu State



**Tamil Nadu Handloom &
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Background of the Invention

The environmental pollution created by industrial effluent and municipal sewage has been a serious concern in the past few decades. Most industries discharge their huge volume of effluent to the environment without following the stipulated norms and standards. The growing urbanization and increased living standards of people cause huge generation of municipal sewage, which poses detrimental impact on the environment. On the other hand, the world is facing severe water crisis both in domestic and agricultural sectors. These issues are being put under top priority in the global sustainable development goals. A viable solution to this crisis is to adopt efficient and sustainable methods of wastewater treatment and recycling. In the conventional wastewater treatment method, the effluent is exposed to open air for a long period of time in large on-ground pits constructed over a large area. This system is highly expensive, time-consuming, and environmentally unfriendly; it also requires continuous monitoring throughout the process.

This situation calls for off-ground, compact, efficient, rapid, affordable, user-friendly, and sustainable effluent/sewage treatment technologies. By addressing this challenge, the Almighty Engineering team has developed our ground-breaking off-ground technology named **Almighty Effluent Treatment Machine (AETM)** with the above features.

Why AETM Technology?

Various industries produce effluents that cause land and air pollution. To save water resources and control land pollution, Government has setup some rules for the safe effluent discharge to land and other water resources. While most large-scale industries have their own treatment plants, the small and medium scale industries find it unaffordable. Consequently, the Government has come up with the solution of Common Effluent Treatment Plant (CETP). Accordingly, a minimum of 10 small and medium scale industries are combined to set up CETPs in government-approved areas. The treated effluent can be either disposed of or reused. However, CETP has the following drawbacks:



- Requires large space.
- Treats only large quantities.
- Requires skilled labor.
- Requires high initial and operation & maintenance costs.
- Requires high electric power.

To overcome these drawbacks, AETM has been developed by applying 4R's (Reduce, Reuse, Recycle and Recover), and it offers the following advantages over the existing on-ground technologies:

- Fully automatic: the primary, secondary, and tertiary treatment stages are integrated into a single automatic unit that is operated through an electronic control system.
- Off-the-ground: large pits on the ground in the conventional plants are fully eliminated.
- Works in both batch and continuous modes
- Portable, plug-n-play type
- Can be customized for any effluent-generating equipment.
- Can be customized to treat any type of wastewater (domestic, municipal, industrial, or petroleum refinery)
- 60% space-saving
- Ensures up to 90% reusability of the treated effluent, particularly in the effluent-generating equipment in various industries.
- The system can be designed to deliver clean water for agriculture or drinking.
- Fully sustainable
- Rapid and user-friendly
- No skilled workers are needed for operation and maintenance.
- Suitable for small, medium, and large-scale industries
- Full compliance with the national global regulations and standards.
- Extremely affordable cost compared to the existing practices.

Salient Features of AETM

User-friendliness

Till today, effluent treatment processes need skilled labours to operate the treatment plants. However, our AETM makes the entire operation simpler, which helps even a non-technical person can operate it easily with the help of inbuilt water parameter sensors, controllers, and pre-programmed chemical dosage and processing commands based on the effluent characteristics.

Automation

Fully automatic water treatment machineries are available in the market: for example, auto electro oxidation machine, auto UV disinfection unit, and auto reverse osmosis and membrane process units. Our AETM integrates all the four (preliminary, primary, secondary, and tertiary) stages of treatment processes under a single auto control unit and perform the treatment either in batch-wise or continuous mode as per the customer requirement.



Quantity

The conventional effluent treatment plants (ETPs) are generally designed to handle large quantities of effluent. For instance, a minimum of 4 to 5 MLD (million litres per day) is common in India. On the other hand, the effluent discharge from small and medium scale industries ranges from 100KLD to 2MLD, so ETPs are not economic for them. As already mentioned, this problem is currently solved by CETP connected to several industries. The main drawback of CETP is the need for shutting down of all the connected industries in case of a maintenance/shutdown of CETP. However, our AETM can effectively solve this problem as it can be designed to handle small quantities ranging from 1 KLD (kilo litres per day). Consequently, each industry can independently operate our AETM according to their necessity.

Ease of Maintenance

Most CETPs are not efficient for continuous operation and become non-functional after some period of operation, which causes shutdown of the plant for maintenance. This affects the functioning of all the connected industries as there is no substitute plant available for them.

This problem is effectively solved in our AETM by giving importance to the maintenance and service of the machinery. After each treatment process, AETM automatically cleans the tanks and alerts periodically about the required maintenance. We can design single AETM up to 50 KL per Unit. For 1MLD effluent treatment, we will increase the number of AETM Units and performs the treatment separately. Hence, failure of one unit does not affect operation of the other units.

Cost Reduction

AETM consumes lower space, power, and chemicals for the treatment processes, which reduces the financial burden of the end users and ensures eco-friendly plant operation. **The total cost of installation, operation, and maintenance of AETM is almost 50% less than that of a comparable CETP.**

Process Upgradation

A particular CETP is designed and operated for common effluent characteristics and for a fixed range of quantity. The plant gives its best performance only when it operates with the designed effluent characteristics and quantity. However, the effluent characteristics and quantity can vary according to the changes in manufacturing processes and production rate in the industry. Unfortunately, upgradation of CETPs according to such changes in the industry is almost impossible.

This challenge has been addressed in our AETM by allowing easy upgradation of the process and capacity. If the quality of the effluent water varies due to the new toxic chemicals, we can recheck the quality and re-design AETM with minimal modifications for better efficiency, which is not possible with CETPs.

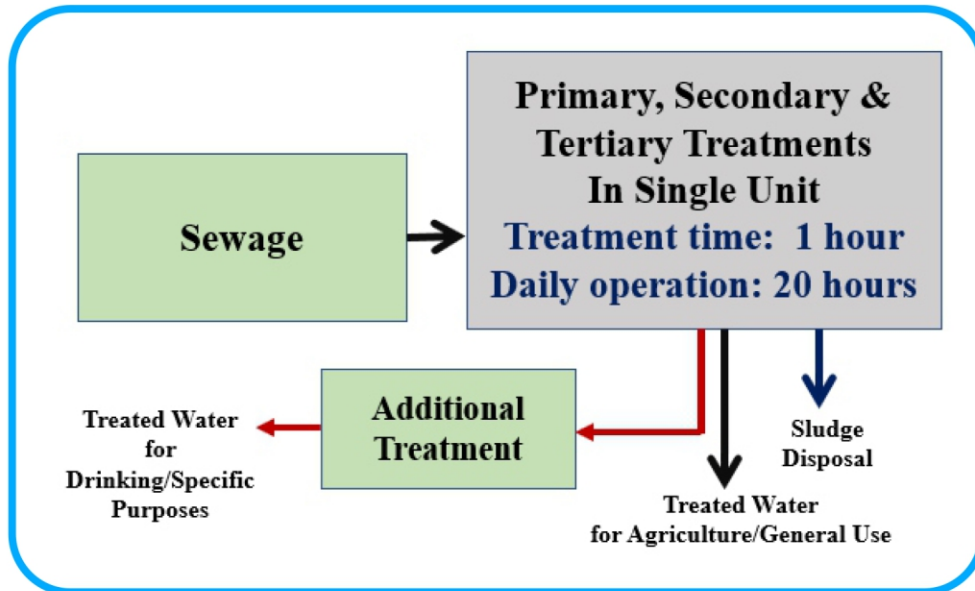


Direct Contribution of AETM to UN SDGs

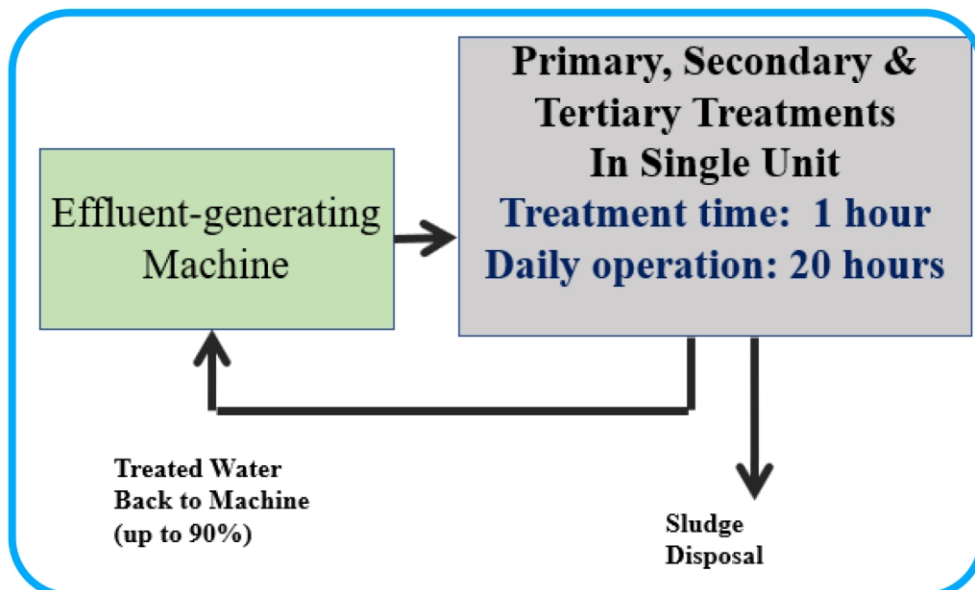




AETM Municipal Sewage Treatment

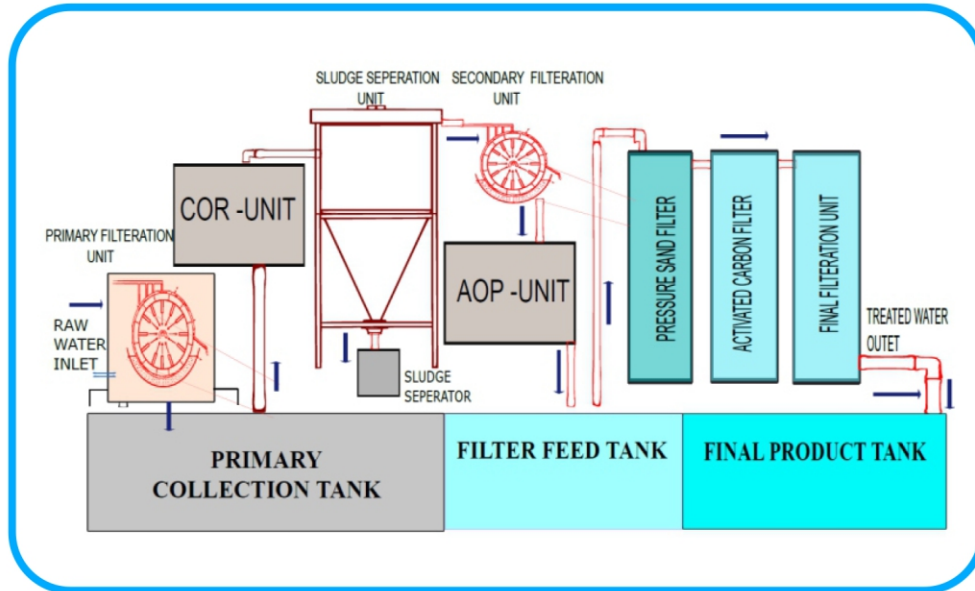


AETM Industrial & Oil Refinery Effluent Treatment

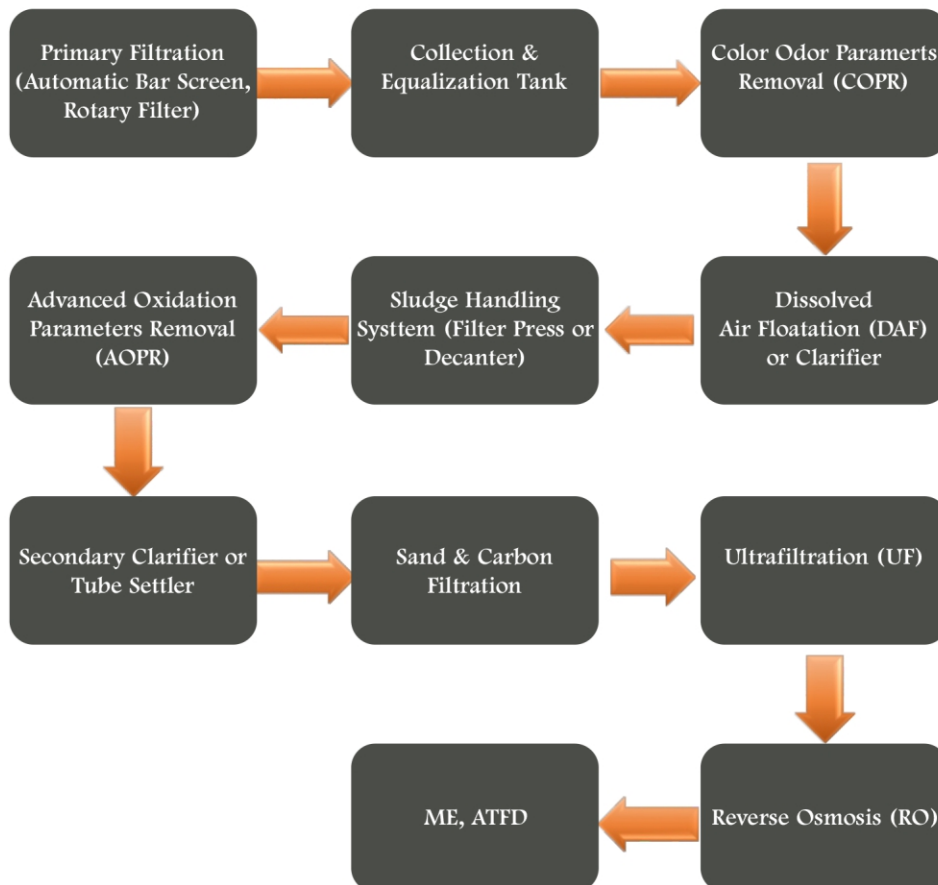




AETM Basic Layout



AETM Zero Liquid Discharge (ZLD) Process





AETM Design Considerations

Quality: The treatment processes are designed after testing the effluent/sewage sample characteristics. The treatment processes include the following four stages:

1. **Preliminary Treatment:** Physical separation of large-size impurities like cloth, plastics, wood logs, paper, etc. using screening, sedimentation and clarification processes.
2. **Primary Treatment:** Removal or reduction of the concentration of organic and inorganic compounds using color odor parameters removal (COPR) process.
3. **Secondary Treatment:** Removal of floating and settleable materials such as suspended solids and organic matter. Advanced oxidation parameters removal (AOPR) method is used in this treatment level.
4. **Tertiary or Advanced Treatment:** Final cleaning process that improves wastewater quality before it is reused, recycled or discharged to the environment. This treatment removes remaining inorganic compounds, and substances such as nitrogen and phosphorus. Bacteria, viruses and parasites, which are harmful to public health are also removed at this stage.

Quantity: The industrial effluent generated per day (or flow rate) helps to determine the size of the AETM for achieving the required quantity of treated water.

Cost: Since the costs of fabrication, installation, operation and maintenance are drastically reduced, our AETM technology can save about 50% compared to the conventional on-ground treatment method.

Steps in AETM Design & Delivery

- Collecting sample effluent
- Testing the effluent characteristics
- Selecting the appropriate treatment processes
- Designing AETM
- Fabricating AETM
- Demonstrating AETM operation
- Testing the output characteristics
- Delivering AETM to the end user



AETM Treatment Scope (before RO)

(Additional parameters will be considered depending on the effluent characteristics and client requirements)

Parameter	Input	Output
pH	Up to 10-12	6.5 - 7.5
COD	Up to 50000 mg/l	Less than 250 mg/l
BOD	Up to 7500 mg/l	Less than 30 mg/l
TDS	Up to 20000	As per raw effluent TDS
TSS	Up to 1200 mg/l	Less than 30 mg/l
Total Hardness	Up to 1500 mg /l	80-90% Removed

AETM Case Study 1: Textile & Dyeing Effluents

Our AETM technology has unique features that provide compact effluent treatment solutions to all kinds of effluents. Though the nature of effluents from different industries varies depending on the processes and chemicals used, the effluent has few common characteristics. For instance, the textile and dyeing units' effluent has a characteristic color along with high chemical oxygen demand. AETM provides a technologically sound, and economically viable automated smart solution for treating the textile and dyeing industry effluents and offers the following solutions:

- Removal of color and odor
- Removal of hardness and chemical oxygen demand (COD)
- Minimal sludge volume
- Optimal chemical usage
- 90% water reuse
- AETM uses the following treatment methodologies for textile and dyeing effluents:
 1. Preliminary treatment: Screening
 2. Primary treatment: COPR process
 3. Secondary treatment: AOPR method
 4. Tertiary treatment: Final filtrations & reverse osmosis (RO) membrane process



Textile and dyeing raw and treated effluent characteristics.

Parameter	Characteristics		Permissible Limit as per Govt. Norms
	Effluent	Treated Water	
pH	9.71	6.6-7.5	6 – 8
COD mg/l	3200	100	250
BOD	600	20	50
TSS	350	15	100
Total hardness (ppm)	300	40	60
TDS	7800	100	2100
Color	640	5	15

The pH value is an indicator of acidity/alkalinity/neutrality. If pH lies in the range of 6.5 to 7.5, it is considered neutral. The input of the raw effluent was alkaline (pH>7), and upon treatment, the effluent has been neutralized with a pH of 7. The COD value has shown tremendous decrease from 3200 mg/l to 100 mg/l, while hardness has decreased from 300 ppm to 40 ppm. The results in Table 1 show the effectiveness of the AETM in treating the dyeing effluents. Our AETM technology can treat 25,000 liters - 2,00,000 liters of effluent per day.

AETM Case Study 2: Municipal Sewage Treatment

The municipal sewage has a characteristic color, along with high chemical oxygen demand. AETM provides technologically sound, economic, and sustainable smart solution for treating the municipal sewage and offer the following solutions:

- Removal of the color and odors from the municipal sewage
- 90% water reuse

AETM uses following treatment methodologies for the municipal sewage:

- 1.Preliminary treatment: Screening
- 2.Primary treatment: COPR process
- 3.Secondary treatment: AOPR method
- 4.Tertiary treatment: Final filtrations& reverse osmosis (RO) membrane (if needed)process



Raw and treated sewage characteristics.

Parameter	Characteristics		Permissible Limit as per Govt. Norms
	Effluent	Treated Water	
pH	9.71	6.6-7.5	6 – 8
COD mg/l	3200	100	250
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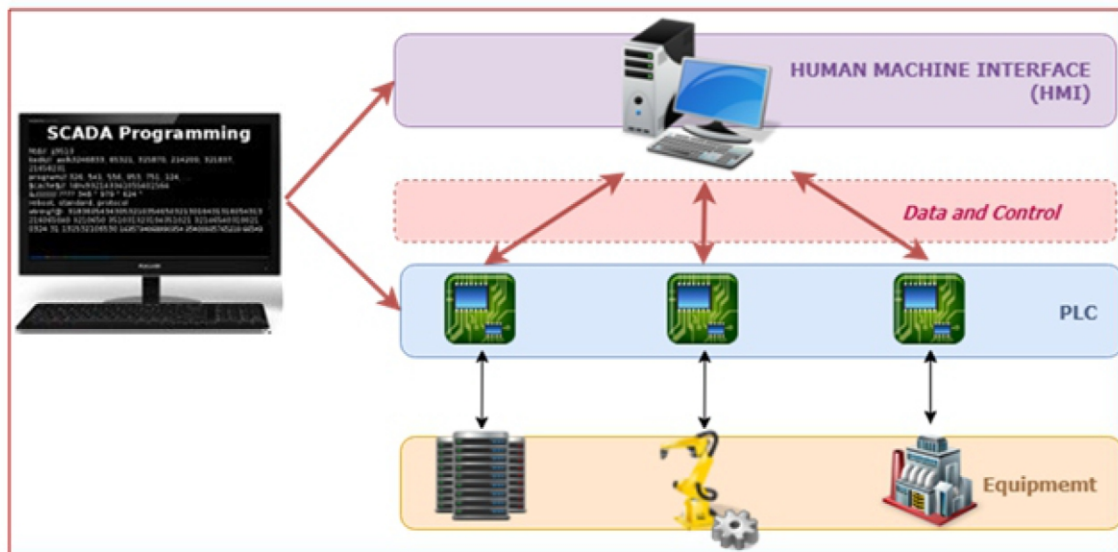
AETM Mobile Demo Unit

By considering the customers' concern to see a demonstration of our treatment technology before placing an order, we have developed a 6KLD mobile demo unit that can travel to the customers' location and facilitate an on-site demonstration. Our demo unit has successfully completed its first demo for a CETP at Erode, Tamil Nadu.





AETM Automation by SCADA





Comparison of Conventional & AETM Test Results

Conventional ETP Results



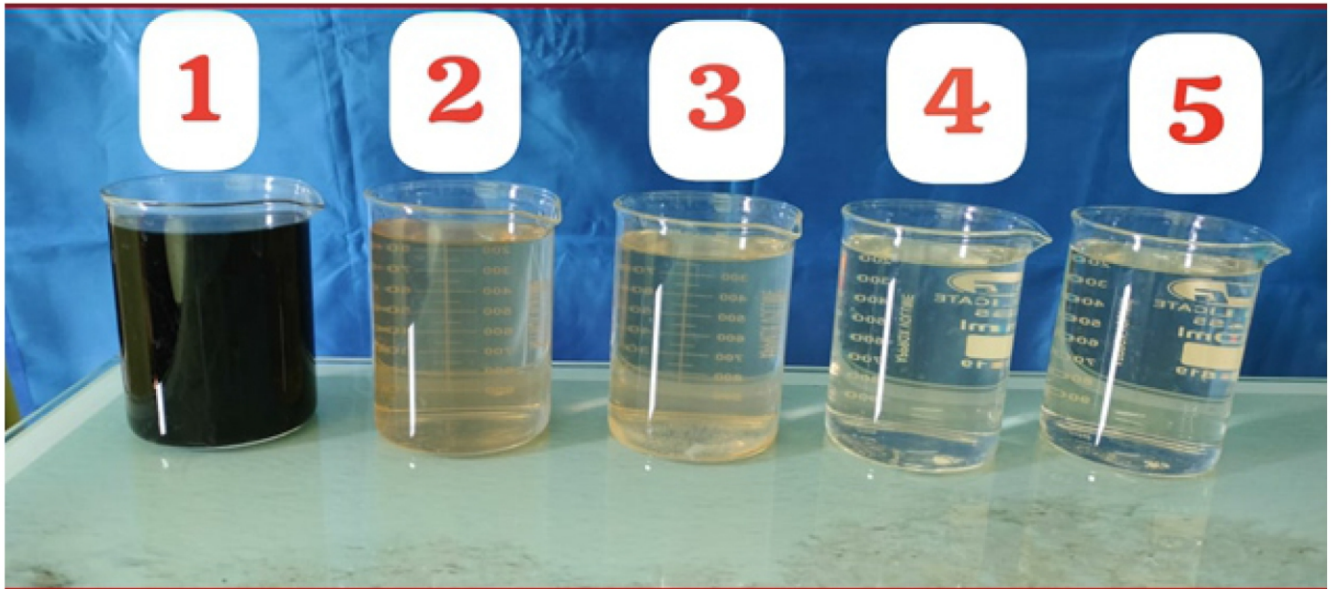
1. Raw dyeing effluent.
2. Primary Clarifier Output: Chemical Coagulation (Lime, Ferrous, A. Poly, HCl).
3. Secondary Clarifier Output: Aeration-Biological Method.
4. After Sand, Carbon, and Ultra filtration (UF) (before RO).

Main Problem:

Since the treated quality is very poor, using it as the first feed for the RO unit requires daily cleaning and creates membrane chocking problem, leading to frequent membrane replacement.



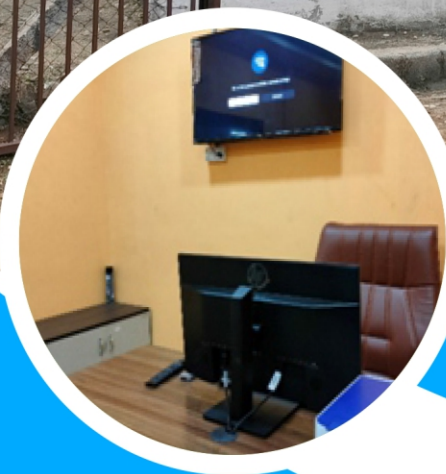
AETM Results



1. Raw dyeing Effluent.
2. COPR output: only 2 chemicals used (A.Poly & HCl)
3. AOPR output
4. Sand and carbon filtration output
5. Ultrafiltration (UF) output (before RO).

Main Problem:

Since the output quality is highly improved, there is no need for daily cleaning of the RO unit, and hence the issues of membrane choking and frequent replacement are solved.



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