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Performance evaluation of common effluent treatment plant (CETP) for heterogenous waste at Narela- Delhi (India)

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Abstract
CETPs of Delhiare listed as one of the potential causes of pollutants of the river Yamuna. The study to evaluate performance of Narela Common Effluent Treatment Plant treating the effluents being generated from a cluster of small-scale industries in Narela, Delhi. The task was undertaken for a period of four consecutive months i.e., January, February, March and April in the year 2019. The parameters which were monitored are pH, COD, BOD, TSS, TDS and the points of sampling are Outlet of Raw Effluent Power House, Outlet of Tube settler, Outlet of Secondary Clarifier and Final Treated Effluent Sample respectively. All the parameters considered for performance evaluation are examined. Also, the operational status of CETP is scrutinized. And, suggestions were made for proper functioning of CETP.

Keywords: Common Effluent Treatment Plant, Total Suspended Solids, Total Dissolved Solids

1. Introduction
The growing willingness amongst the human population to acquire various goods, commodities and facilities has resulted into increase in rate of industrialization, urbanization, rapid construction of infrastructures and skyscrapers, etc. As a result of it, the environment and the life forms it sustains, is at stake because of increasing pollution.
These days there is an increase in concern amongst population towards the issue of degradation of environment. Steps to prevent and control the environment from ill effects of our own progression is being enhanced. It is done in such a manner that there is no compromise in fulfilment of requirements of future generation and even our needs, not demands, gets fulfilled. This in other terms is referred to as the population is emphasizing on sustainable development.
Common effluent treatment plants (CETPs) have been installed and are in operation at numerous industrial clusters throughout India. (Padalkar *et al*., 2018) [2]. The Small-Scale Industries directly or indirectly drain their effluent in the river Yamuna. Toper form evaluation the CETPs is a step towards protecting the river from pollution, and hence, adds up to sustainable development measures.
CET Psserve to reduce effluent treatment cost, provide better collective treatment, and reduce land cost for small-scale industrial facilities that cannot afford individual treatment plants. Optimum working conditions for treatment of effluent to be at par with discharge standards is a major mandate for any CETP (Padalkar *et al*., 2018) [2].

2. CETP, Narela
The present study is about Narela Common Effluent Treatment Plant treating effluents from a cluster of small- scale industries in Narela, Delhi. The concept of Common Effluent Treatment Plant (CETP) can be recognized as one of the major steps taken in the field of sustainable development and towards benefits of society as well.
The CETP is taken care of Delhi State Industrial and Infrastructure Development Corporation. InDelhi, for the construction of Common Effluent Treatment Plant, a PIL filed by Dr M. C. Mehta against Govt. of India and Supreme Court of India showed concern on the matter.

On behalf of the Government of Delhi (GoI), Department of Environment (DoE) and Delhi Pollution Control Committee (DPCC) are responsible to implement the task.
As per convener of Yamuna Jiye Abhiyaan Mr. Manoj Misra, CETPs are required to treat toxic effluent from industries. Without treatment, this effluent, which contains even heavy metals, get mixed with the domestic waste and reach the Yamuna. If most of them are not working, it means industrial effluents and toxic metals are still reaching the river. (www.hindustantimes.com)

3. Earlier Work

Prime Tanning industry situated in Sembattu in Trichy was studied. The tannery has installed an Effluent Treatment Plant at the cost of 1.5 crores to treat the tannery waste water. This plant is designed to treat the effluent at the rate of 400 m^3/day. The improvement of the CETP mainly executes the reverse osmosis (RO) plant, which would optimize the level of TDS and applicable for the reuse of treated water for gardening.
Performance evaluation of common treatment plant for tanneries at Pammal- Pallavaram Tamil Nadu (India) was carried out. The CETP was designed to treat wastewater quantity of 3000m3/day. The data on flow, BOD, COD, TSS and TDS were calculated from CETP log book for the months of June'96 to November'96 and overall removal efficiency were summarized. The performance of individual units of CETP were analyzed by analyzing the influent and effluent samples of respective units for a period of 10 days in the month of October'96 and also removal efficiency was calculated. Also, recommendations were made for optimum performance of CETP. The parameters like BOD, COD, TSS in the treated effluent were found to be higher than those prescribed by TNPBC.

4. About Study Area

The CETP is in Narela which lies in North Delhi district of NCT of Delhi. Narela forms boundary with Haryana state. It has a design capacity of 22.5mldfor average flow and 45mld for peak flow. The CETP receives its effluents from small and medium scale member industries comprising mainly of plastic, rubber, electroplating, dyeing and manufacturing of engineering goods industries, etc.
The Narela CETP consists of receiving chamber, bar screens, grit chamber, oil and grease trap, equalization tank (retention time of 3.73 hrs), flash mixer, flocculators (retention time of 20 mins), tube settler, selector tank, aeration tank (detention time of 8.09 hours), secondary clarifier (detention time of 4.5 hrs), Dual Media Filter (20 in number), Activated Carbon Filter (14 in number), Chlorine Contact Tank(contact time of 20 minutes) and Final Treated Effluent Storage tank(detention time of 2.13 hrs). The sludge drying beds are provided separately for sludge generated from primary treatment (11 in number) and sludge thickener (5 in number) respectively. Figure No.- 1 depicts flow diagram of treatment system at Narela CETP.

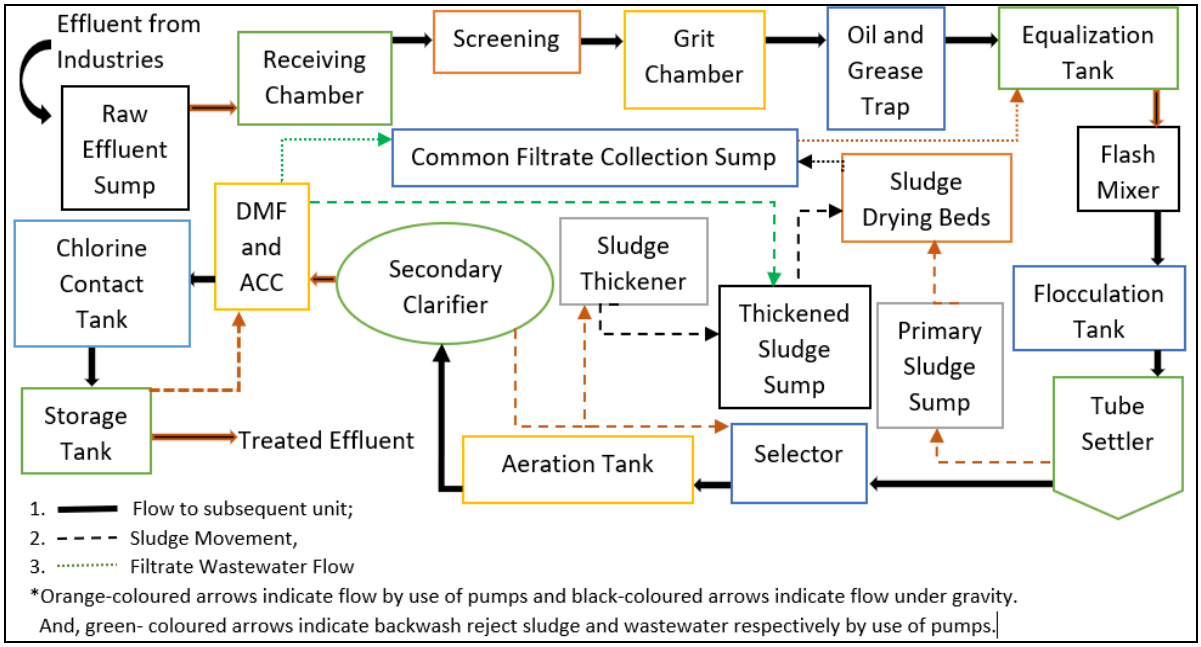

Fig 1: Flow diagram of treatment system at NarelaCETP

5. Materials and Method

The parameters which were monitored are pH, COD, BOD, TSS, TDS and the points of sampling are Outlet of Raw Effluent Power House, Outlet of Tube settler, Outlet of Secondary Clarifier and Final Treated Effluent Sample respectively. The task of collection of samples was undertaken for a period of four consecutive months i.e., January, February, March and April. Also, functioning of CETP, whether as per designed or not, was analysed. The flow of wastewater was also noted on a daily basis from flowmeter in MLD.
As per EPA standards, the inlet wastewater limits for effluent coming from industries for treatment at the common effluent treatment plants are 5.5-9.0, 250 for pH and TSS respectively. And, the constraints for treated effluent for pH, TDS, COD, BOD and TSS are 5.5- 9.0, 2100mg/l, 250mg/l, 30mg/l, and, 100mg/l respectively (www.dpcc.delhigovt.nic.in).
The standard methods are used for testing. The pH (in mg/l) and TDS (in mg/l) were tested using pH meter and TDS meter respectively. The quality of wastewater was assessed in terms of TSS (in mg/l; by gravimetric method), BOD (in mg/l; by Winkler's method) and COD (in mg/l; by titrimetric or acid digestion method, open reflux method).

6. Result and Discussion

The flow of wastewater in the plant was noted from flowmeter, average flow in each of four months being 5.7, 5.5, 6.5 and 7.3MLD respectively, that are much less than its design capacity of 22.5MLD. The average flow is 6.2 MLD

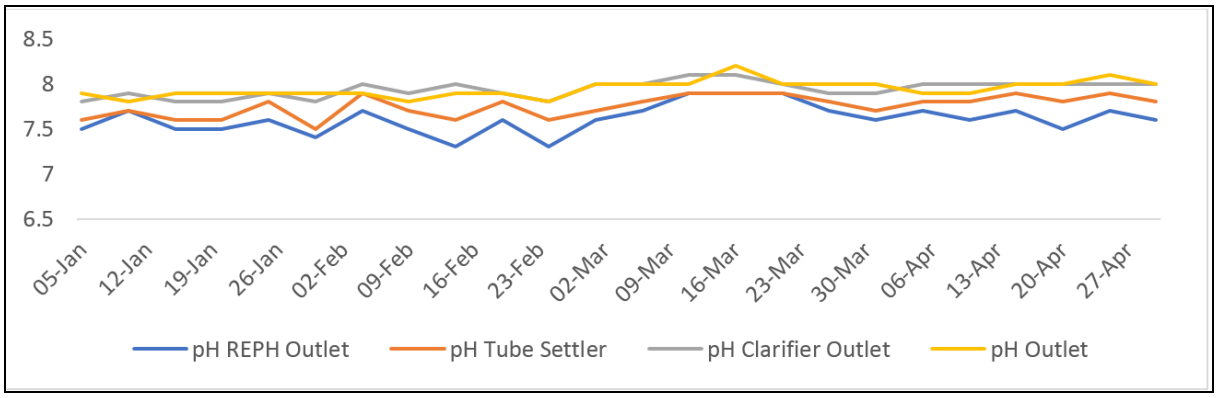

Fig 2: pH obtained at various units of Narela CETP

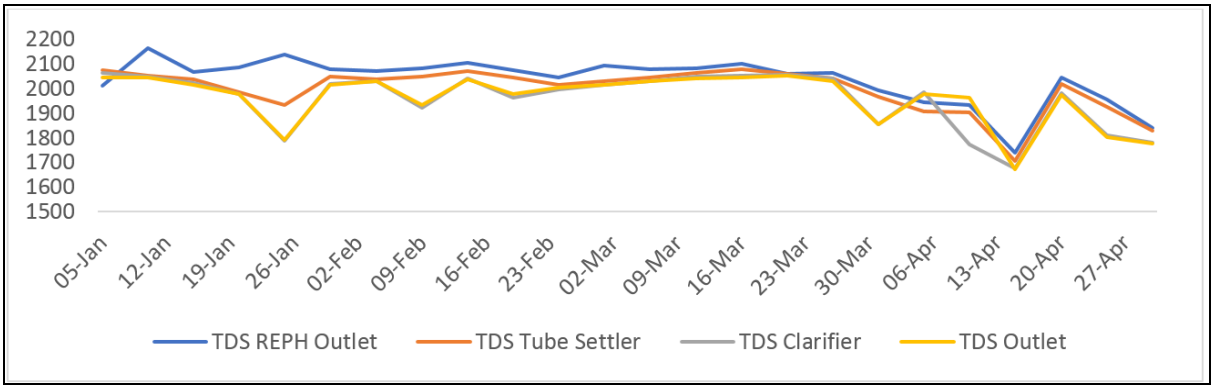

Fig 3: TDS (in mg/l) obtained at various units of Narela CETP

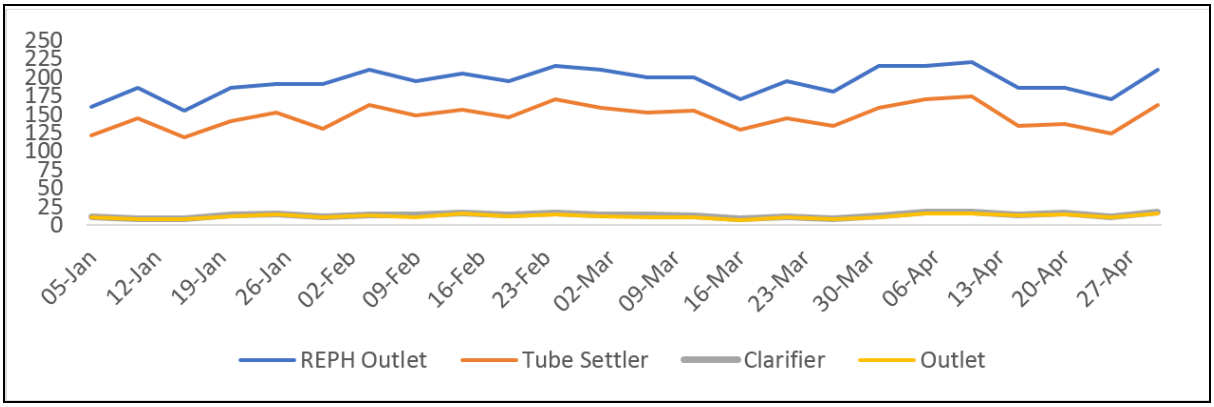

Fig 4: BOD (in mg/l) obtained at various units of Narela CETP

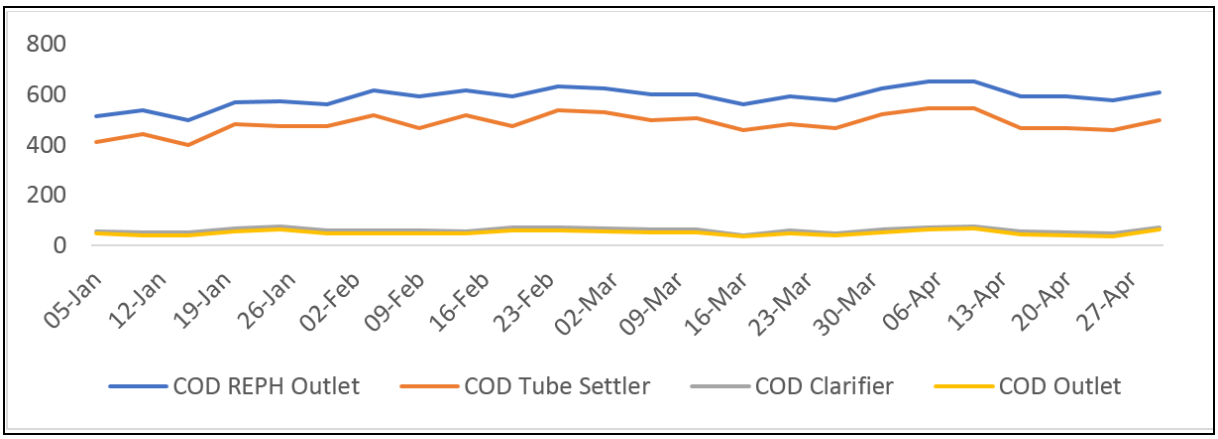

Fig 5: COD (in mg/l) obtained at various units of Narela CETP

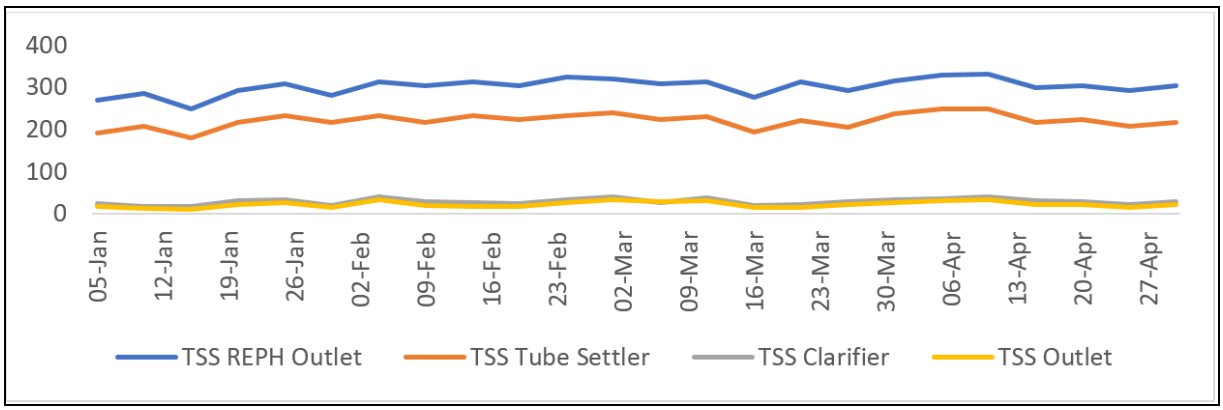

Fig 6: TSS (in mg/l) obtained at various units of Narela CETP

The values obtained from the tests performed during the course of four months i.e., January 1st 2019 to April 30th 2019 are depicted in figure no. 2, figure no. 3, figure no. 4, figure no. 5 and figure no. 6 respectively

The pH of was observed in the range of 7.2 to 7.8 and 7.9 to 8.2 for inlet and outlet respectively. TDS was 1710mg/l to 2207mg/l and 1610mg/l to 2116mg/l respectively.

The average of total of BOD, COD and TSS for four months was taken for each of REPH outlet, Tube Settler Outlet, Clarifier Outlet and Finally treated wastewater.

The average BOD for each of the units are 195ppm, 148ppm, 13ppm and 12ppm (mg/l) for REPH outlet, Tube Settler Outlet, Clarifier Outlet and Finally treated wastewater respectively. The average COD for each unit was 592mg/l, 488mg/l, 60mg/l, and 52mg/l respectively. And, the average TSS observed was 300mg/l, 220mg/l, 28mg/l, 22mg/l respectively for each of the units.

The average of BOD, COD and TSS from January'19 to April' 19 was calculated, which are given in table number-1.

As per the observation at Narela CETP, the Online Monitoring System (OLMS) was found to be installed and operating. Also, 20 Dual Media Filter and 14 Activated Carbon Columns have been installed and are operating.

Table 1: Average of BOD, COD and TSS from January'19 to April' 1

Parameters	REPH Outlet	Tube Settler Outlet	Clarifier Outlet	Outlet
Avg. BOD	195	148	13	12
Avg. COD	592	488	60	52
Avg. TSS	300	220	28	22

The aerators in aeration tank are working fine. Chlorination is not being carried out although facility for it is available. No dozing is being done in equalization tank. Floating pieces of plastics were found in post chlorination tank.

The floating particles in the chlorination tank gives rise to assumption that the filters are not operating correctly and TSS is not within desired range.

However, TSS has been decreased substantially, and is meeting standards at the outlet. However, in future when flow will increase, the problem will have to be tackled.

TSS in the inlet effluent was found to be exceeding standards whereas TSS at the outlet is meeting standards. The TDS is high in wastewater at outlet. No EPA standards is given for TDS at inlet.

The TDS exceeds the standard limit at outlet of the Common Effluent Treatment Plant. The BOD and COD was found to be at par with the standards.

7. Conclusion

TSS in the inlet effluent was found to be exceeding standards which indicates that either member industries are either sending the effluent without treatment to Effluent Treatment Plant (ETP) or, their ETP are not working correctly and should be checked.

No dozing is being done in equalization tank. The test results reveal that the pH of the effluent water at inlet is meeting standards, so, there is no requirement for dozing to be done in equalization tank as per the present scenario.

The problem of high TDS in both treated and untreated effluent can be tackled by installation of Reverse Osmosis unit.

Also, the blades, gear and flow meter stopped working which were repaired suddenly.

Due to lack of funds etc sometimes the repair of equipment, etc gets delayed.

The problems that exists with the CETP can be corrected by taking correct preventive measure by the CETP and more by efforts of participating industrial units from where effluent comes to CETP. Stringent adherence to limits and standards of CETP will help in upliftment of society and inachieving the goal of sustainable development in broader sense.

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