

1. PROJECT DESIGN CHARACTERISTICS

The 300 m³/day wastewater treatment plant consists of Biological Package Treatment Plant and auxiliaries in order to treat the influent wastewater to the level of discharge standards. The influent and effluent characteristics could be seen in Tables 1 and 2 respectively.

Table 1: Influent
Characteristic

PARAMETRE	AMOUNT	UNIT
Daily Flow	300	m ³ /day
BOD conc.	1160	mg/l
COD conc.	2250	mg/l
TSS	1100	mg/l
Oil and Grease	200	mg/l
PH	5.0 – 9.0	

Table 2: Discharge
Standards

PARAMETRE	AMOUNT	UNIT
BOD ₅ concentration	<50	mg/l
COD concentration	<150	mg/l
TSS concentration	<100	mg/l
Oil and Grease	<8	mg/l
PH	6.5 – 9.0	

1.1. Wastewater Treatment Plant Description

The 300 CMD wastewater treatment plant, is a Modified Extended Aeration Process with the moving bed consisting of PE filling bodies with high surface area, in order to develop an increased concentration of aerobic biological mass, thus decreasing the necessary oxidation tank volume. MBBR systems are designed by taking into consideration both suspended growth and attached growth bacteria, i.e. the process offered is combination of the activated sludge process and biofilm process like SAF.

The system includes the following treatment steps:

1. Pre-treatment using screening
2. Biological treatment using modified extended aeration basin and secondary clarifier
3. Tertiary treatment with dosing chlorine as disinfectant and filtration with a multimedia filter
4. Excess sludge dewatering with filter press
All the tanks are made of carbon steel St 37 two layers of epoxy paint applied on top of both in and outside of the tank. (Thickness of tank wall 5mm and Thickness of tank base 6mm.
5. The raw wastewater will first pass through the screen channel T-100 where the coarse screen (S-100) and then fine screen (S-101) are located, to prevent possible damage that the coarse materials will cause to mechanical equipment and lower the TSS amount on the following units. Wastewater free from the large objects will be transferred to the pretreatment basin the remaining TSS would settle whereas the excess oil and grease would float. With sludge pump P-100 the settled solids would be transferred to the sludge collection basin (T-600) as the oil pump P-101 would pump the oil skimmed from the top of the pretreatment basin T-101.
6. The water leaving the pretreatment basin (T-101) will enter into the equalization basin (T-102) that will also serve as a lift station for the biological treatment units. There would be 3 flowmeters (FM-100/A-B-C) (FM-100A will be fixed on the main sewer line after the main manhole before tank T100. FM-100 B&C will be fixed on the entrance of anoxic tank after the equalization basin). The water would be pumped to the anoxic tanks (T- 200/A-B) for denitrification with feed pumps P-102/A-B.
7. The anoxic tanks will constantly be stirred with the submersible mixers M-200/A-B so as to not to allow any dead zones in the tank. As the bacteria will use the nitrate in the water as an electron acceptor and release the nitrogen in the gas form. After denitrification process the water will enter into the oxidation tanks (T-300/A-B) for further removal of organic carbon along with BOD and COD.
8. The oxidation tanks (T-300/A-B) are designed with MBBR technology, consisting of a moving bed of polypropylene filling bodies having high surface area, in order to develop an increased concentration of aerobic biological mass, thus decreasing the necessary oxidation volume. The suspended bed biofilm process combines the technologies of activated sludge processes and biofilm processes.
9. The suspended bed biofilm process is used especially when the area accommodating the treatment plant is problematic. High-rate biofilm systems are highly efficient in removing the soluble organic and nitrogen load. They are based on the use of plastic carrier media, which are kept in suspension and easily moving in the treatment reactor. Excess biomass sloughs from the media and is carried out of the system with the effluent.

10. The core of the process consists of the biofilm carrier elements on which attached growth of microorganisms takes place. The elements are made from HDPE with a density slightly lower than water. The biofilm carrier elements are kept suspended in the water by air from the diffusers in aerobic reactors. The carrier elements are retained in the oxidation tank by means of suitably sized sieves or perforated pipes. A screen or sieve assembly with 5 mm slot openings is used to retain the carrier elements in the reactor. The effective open area of the screen is sized to provide minimum head loss. However, the process does not require periodic backwashing of the retention screens which retain the carriers.
11. The blowers B-300/A –B will continuously work to ensure that the dissolved oxygen inside the tanks will be kept around 2 mg/L.
12. As the nitrification along with the carbon removal are occurring together in the oxidation basins the water has to be recycled back to the pre-anoxic basin so as to remove the nitrate. The internal recycle pumps P- 300/A-B will be pumping the activated sludge from the oxidation tank back to the anoxic basins T-200/A- B.
13. The water leaving the oxidation tanks T-300/A-B would enter into the settling tank with lamella T-400/A-
B. As the microorganisms settle at the bottom, a portion of the sludge would be recycled back to the oxidation tank T-300/A-B whereas the rest would be wasted as the excess sludge to the T-600 sludge collection tank. The flowrates of each sludge line could be controlled with the help of the manual valve situated on the line of airlift pump P-400/A-B.
14. The wastewater will enter the clean water tank T-500 after subjected to biological treatment in the MBBR unit, where chlorine will be dosed for disinfection purposes. With the filter feed pump P-501 with a high pressure the water will be passed through the multimedia filter F-500. The backwash pump P-502 will start only when the differential pressure transmitters located at the entrance and effluent line of the multimedia filter F-500 exceeds the set value (3 bars). When the value exceeds 3 bars, it would indicate that the filter is clogged so that the backwash with clean water is necessary. The backwash pump P-502 would work when the pressure level exceeds 3 bars and draw water from T-500 and pump it backwards to the F-500 multimedia filter with a high pressure.
15. After passed through the filter media F-500 the water is stored in the T-700 basin for discharge. (Recycle tank).
16. The sludge collected from the oxidation basins T-300/A-B and pretreatment basin T-101 should be subject to dewatering. Therefore, the sludge is first thickened in T-600 and then sent to the decanter centrifuges CD-600/A-B with the feed pumps P-600/A-B, for dewatering the sludge from 5% solids concentration to 22% solids concentration. The dewatered sludge cake should be disposed according to the subjected regulations.