



One day site visit to Kotarpur Water Treatment Plant and Pirana Sewage Treatment Plant in Ahmedabad on 17th November 2018 for 3rd Year B. Tech Civil Engineering Students of IITRAM

One day site visit was conducted to Kotarpur Water Treatment Plant (WTP) and Pirana Sewage Treatment Plant (STP) in Ahmedabad on 17th November 2018 for 3rd Year B. Tech Civil Engineering students of IITRAM. The Kotarpur WTP was visited during morning session and the Pirana STP was visited during afternoon session.

Kotarpur Water Treatment Plant (WTP):

Kotarpur WTP is the largest water treatment plant in Ahmedabad. The total capacity of existing plant is 850 Million Litres per Day (MLD) with the new plant having capacity of 200 MLD and the old plant having capacity of 650 MLD. It takes raw water from Narmada Main canal and two intake wells (each of 2500 m³/hour capacity) drawing water from Sabarmati river. The inlet bay (about 4.75m depth) consists of two pipes of 2 m diameter and two pipes of 2.5 m diameter. Suction pump are also provided for drawing water from 2.5 m diameter pipes. The intake well-1 have 4 nos. of vertical turbines and intake well-2 has 7 nos. of vertical turbines for pumping water to the inlet bay. Hydraulic jump is provided at inlet bay for proper mixing of alum dosed to raw water to flocculate the particles present. The various processes of water treatment includes pre-chlorination (if required), alum dosing, clari-flocculation, filter bed treatment in filter house, post-chlorination, solid sludge removal and finally storing the treated water in clear water reservoirs. The plant has 12 nos. of Clari-flocculators for removing the suspended particles first by flocculation in flocculator and then allowing them to settle in clarifier. The diameter of clarifier is 50.1 m and diameter of flocculator is 18.25 m. The detention period of water in flocculator zone is 30 minutes and in clarifier is about 2.4 hours. The water depth in Clari-flocculator varies between 3.17 m to 5.09 m. The sludge settled at the bottom of the clarifier is collected in to sludge pit and sent to a separate sludge tank.

The water coming out of Clari-flocculator is sent to the filter house through water channels. In the filter house, further turbidity is reduced by passing water through filter beds each of 78.4 m² area. There are total 48 nos. of filter beds and the rate of filtration is about 2 mm/sec. The filter media is uniformly graded course silica sand of 750 mm depth. To clean the filter media, backwashing is done regularly at rate of 5 to 8 mm/sec. After filtration the treated water is pumped to the underground storage tank. The capacity of storage tank is about 80 MLD and depth about 5m. Post-treatment chlorination is done by injecting chlorine gas (stored in cylinders of 900 kg capacity) mixed with



appropriate proportion of water. Venting pipes are installed at regular intervals to remove any gases in stored treated water. The plant currently takes about 550 MLD of raw water and supplies more than 540 MLD of water to east and west zone of Ahmedabad with help of 5 pumps of 300 HP capacity each for each zone. The WTP is capable of treating raw water turbidity up to 3000 NTU. The turbidity of treated water is less than 1 NTU, pH in range of 7-8 and residual chloride about 0.6 mg/l. Water sampling is done regularly by the contractor to assess the quality of water and daily samples are sent to laboratory at Dudeshwar, Ahmedabad for water quality monitoring.

Pirana Sewage Treatment Plant (STP):

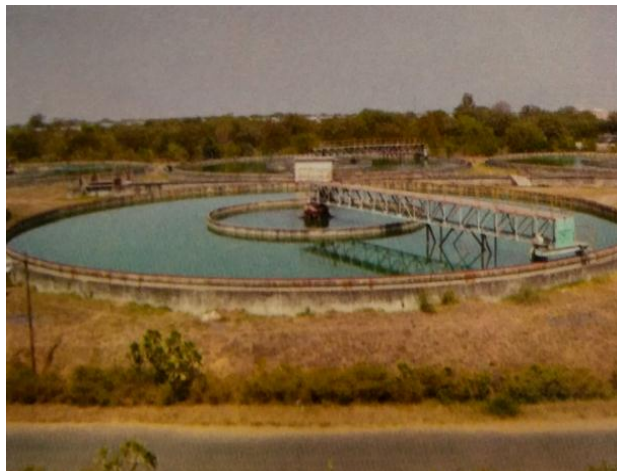
The Pirana STP has 180 MLD capacity (average flow) of treating wastewater collected from Ahmedabad city with peak flow of about 405 MLD. The plant works on the aerobic activated sludge process. The design parameters for treated wastewater is pH between 7-8.5, Biological oxygen demand (BOD) less than 20 mg/l, suspended solids less than 30 mg/l and chemical oxygen demand less than 100 mg/l.

The waste water entering the plant is divided into three streams by three inlet chambers of size 7.5 m x 5 m size and liquid depth of 2.5 m with a hydraulic retention time (HRT) of 60 seconds. Total six screen channels are provided (two in each stream) with step type fine screen. Total six grit chambers (two in each stream) each of size 10.2 m x 10.2 m and water depth of 1.0m are provided in each stream to remove gravel, sand and other settleable solids. One Parshall flume is provided in each stream to measure flow inlet to the Primary Clarifier. Six nos. of Primary Clarifier (two in each stream) are provided for reducing the concentration of suspended solids by up to 60% and BOD reduction up to 30% in the waste water. The diameter of Primary Clarifier is 39.5 m and depth of wastewater is about 3.2 m with hydraulic retention time (HRT) of 2.5 hours. The surface loading rate of wastewater is $30 \text{ m}^3 / \text{m}^2.\text{day}$.

The secondary treatment process (biological treatment) is done in aeration tank followed by secondary clarifier. Total six aeration tanks (two in each stream) are provided with 26.6 m length and 60 m width and liquid depth of 4.7 m. The hydraulic retention time is about 5 hours and about 1 kg of oxygen required per kg of BOD removal. The microbial culture in presence of oxygen decomposes the organic fraction in the wastewater inside the aeration tank. The wastewater from each aeration tank is sent to the corresponding secondary clarifier of 43 m diameter, 3.5 m liquid depth and the waste water has a hydraulic retention time of 2.5 hours in this tank with average surface loading rate of $25 \text{ m}^3 / \text{m}^2.\text{day}$. The activated sludge is separated from the wastewater in this tank and settles



down. The sludge from both the primary and secondary clarifiers are collected in respective sludge pits and pumped for sludge thickening and then further to sludge digestion tank for anaerobic digestion. Each stream has one sludge thickening unit (25 m diameter and liquid depth of 3.5 m) and two anaerobic digestion units (28 m diameter, 8 m liquid depth and retention time of 20 days). The digester produces biogas (methane) and residual sludge. The sludge is passed through filter press to remove moisture from sludge to increase the solids concentration to up to 25 %. The biogas is stored in gas holder unit and sent for purification and compression to cylinders for industrial utilization. The residual sludge is compacted into cake form and is used as manure. The treated waste water coming out of secondary clarifier is chlorinated for disinfection before final disposal.



Primary Clarifier at Kotarpur WTP
(Courtesy: Kotarpur WTP Brochure)



IITRAM Students at Kotarpur WTP site



Filter House at Kotarpur WTP
(Courtesy: Kotarpur WTP Brochure)



Pirana Sewage Treatment Plant
(Courtesy: Pirana STP Brochure)



Acknowledgement:

On behalf of IITRAM, I sincerely thank Shri N. H. Ninama (Additional Chief Engineer, Water Treatment Plant) and Shri N. K. Ninama (Additional Chief Engineering, Sewage Treatment Plant) from Ahmedabad Municipal Corporation for their support in facilitation of the site visits. Thanks are also extended to Viral madam, Pinakini madam, Mr. Abhinav and team at Kotarpour WTP for their time and support in conducting the site visit and explaining the technical details of the plant to our students. Thanks are also extended to Darshana Patel madam, Mr. Nikunj Patel, Mr. Shailesh Patel and Mr. Meet Patel for facilitating the site visit at Pirana STP and explaining the technical details of design, operation and maintenance of the plant. Thanks are also due to Dr. Mamta Sharma and Mr. Chintan Sorathia for joining the site visit and their support during the visit. Sincere gratitude is expressed to Prof. Shiva Prasad (Director General, IITRAM), Prof. A. U. Digraskar (Director, IITRAM), Dr. N. N. Bhuptani (Registrar, IITRAM) for their support and guidance for conducting the site visit. Special thanks to Mrs. Bharti, Mr. Harshad Patel and office team of IITRAM for facilitation of the site visit including bus facility and packed lunch. Special thanks to all students present for the site visit for their good conduct and active participation during the site visit.

Site Visit Coordinator and Report Preparation: Dr. Kannan Iyer (Assistant Professor, IITRAM)