Narasaraopet 15.55 MLD - A2O based STP Case Study

Plant Location

15.55 MLD A2O treatment plant is situated in Narasaraopet Mandal of Guntur District. The nearest railway station is located at Narasaraopet.

Name of Work

Narasaraopet under Ground Drainage Scheme - Designing, Construction, Erection, Testing, Trail Run, Commissioning of 15.55 MLD (Avg) STP with Proven, Existing & Verifiable Technology in India with PLC/SCADA conforming to CPCB/ CPHEEO Norms:BOD<10, COD<50, TSS<10,TN<10, TP<2, pH:6.5-9.0 & FC<100, Allied Sewerage works, Sewerage HSCs (19,000 #)and Performance based O&M of STP for 7 years.

Tender Notice No: 1674/NRT/UGD/STP/JTO1/2016 dt.13-04-2016

Client : Public Health and Municipal Engineering Department Andhra Pradesh

Contractor : M/S Ankita Constructions, Ahmedabad

Technology Provider : M/s Eurotek Environmental private Limited

Vetting Of Design and Process : IIT - Indian Institute of Technology Madras

Overview

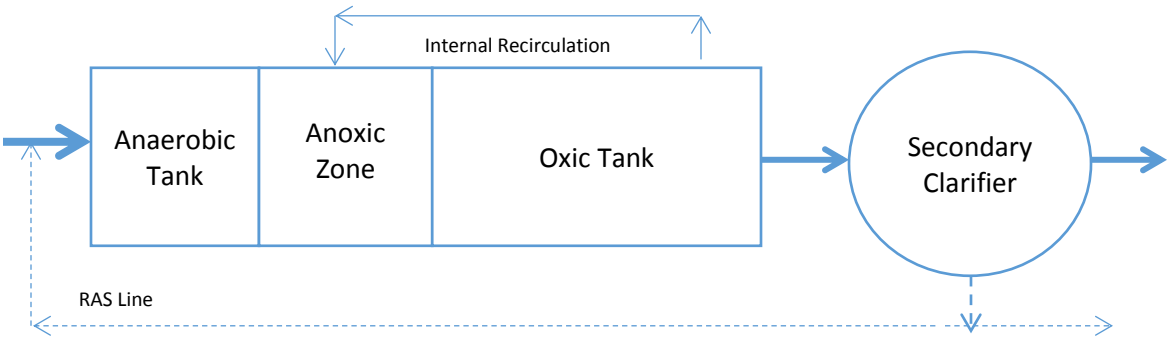
Indian Institute of Technology Madras is one among the foremost institutes of national importance in higher technological education, basic and applied research. The Environment and Water Resources Division of Department of Civil Engineering were approached by Government of Andhra Pradesh, Public Health and Municipal Engineering Department with the following scope of work. The scope of the work is to undertake the performance study after completion and commissioning the 15.55 MLD STP at Narasaraopet, Guntur as executed by M/S Ankita Constructions, Ahmedabad and to evaluate the treated water for accepted norms. The Technology provider for this STP plant was M/S Eurotek Environmental Pvt Ltd, Vadodara, Gujarat.

Challenges

Major issues and concerns related to the sequencing batch reactor (SBR) operation raised by plant operators are concerning PLC operation, decanting mechanisms, skimming, floatable materials, and dissolved oxygen (DO) monitoring. The SBR system operation varies depending on continuous feed or batch feed with or without influent equalization. These variations in SBR systems cannot to be considered when comparing the issues and concerns with other plants requirements.

Solution

In order to address these issues and provide the best solution to the plant we have introduced **A_2O Process (Anaerobic+ Anoxic+ Aerobic) - ADVANCED ACTIVATED SLUDGE PROCESS.** A2O process is a three stage biological process designed to remove BOD, Nitrogen and Phosphorus together. The process is called A2O since it consists of Anaerobic-Anoxic-Oxic (aerobic) tanks in series also called as combined removal of Nitrogen and Phosphorus by biological process. The A2O process is capable of producing an effluent phosphorus concentration of 2 mg/L without tertiary filtration and less than 1.5 mg/L with tertiary filtration.



The Influent first enters Anaerobic Tank where phosphorus-accumulating bacteria release stored phosphorus to the wastewater. Ammonia passes through the anaerobic stage untreated. The underflow from secondary clarifier is recirculated to anaerobic tank to get mixed with fresh sewage by enhancing anaerobic conditions leading to removal of phosphorus biologically in absence of Oxygen.

Then the flow enters to Anoxic zone where denitrification occurs. The wastewater from the end of aeration stage is internally recycled to Anoxic zone at a rate of 100-400 percent of influent. This stage is anoxic because it has no free oxygen and the only form of oxygen supplied is from the nitrates/nitrites present in the internal recirculation stream from the next stage. Denitrifying bacteria metabolize the nitrate and covert it to nitrogen gas as they consume the organic matter in the wastewater. Ammonia passes through this stage untreated. The phosphorus released anaerobic tank also passes through this stage. Nitrogen removal is limited by the IR flow and this is achieved by means of IR gates contrary to the pumping which consumes high amount of power

The wastewater from Anoxic Zone enter Oxic (Aerobic) Tank where carbonaceous material is oxidized, Ammonia is oxidized into Nitrates, Nitrites and N.

Biological nutrient removal processes are controlled by maintaining process control parameters, such as mean cell residence time (MCRT) (4-27 days), return activated sludge (RAS) recycle rate (20-50%), mixed-liquor suspended solids (MLSS)(3000-5000 mg/lt) concentration and IR rate (100-400 %) , and the food-to-microorganism (F/M) ratio (0.15-0.25/day) along with other parameters that are important in the control of biological nutrient removal processes are dissolved oxygen (DO), alkalinity and pH.

Features of (A2O) Process

- Incorporation of High Efficiency Triton Type Aerators which have deeper mixing capability upto 10m.
- Deeper Tanks so lower foot print area
- Inter Re-circulation by means of gates inbuilt in the design in contrast to the heavy submersible IR pumps. Which proved to be energy efficient.
- Able to avoid the usage of chemicals for Phosphorus removal.
- Complete BNR removal without use of any Chemicals unlike other Traditional Ditch & SBR system wherein chemical dosage is necessary.
- BOD Removal Efficiency 95-98%
- Lower HRTs compared to conventional process.
- Low Operation & maintenance cost
- Ease of Installation & Commissioning
- Customized Tank Designs based on the Effluent characteristics catering both domestic/municipal/industrial effluents.

Why Eurotek for A2O Process????

EUROTEK has gained its expertise in construction of A2O process more efficient

(i) by giving aeration through **Triton Type Aerators** (subsurface aerators) which are effective in O2 transfer with 1.83kg O2/kWh having deeper mixing capability with lower power consumption,

(ii) **Deeper tank depths** aiming to have less foot print,

(iii) Internal recirculation through inbuilt auto **IR gate** by avoiding heavy pumping

(iv) Special kind of orientation of Anoxic-Oxic tank allowing wastewater for wider travel to achieve more solids retention time for efficient removal pollutants.

(v) Stamford baffle is provided in Secondary clarifier to avoid sludge rise in secondary clarifier, specially designed.

How the Triton Type Aerator Make the A2O Advanced

A – Stands for Anaerobic (Mixing)

A – Stands for Anoxic (Mixing)

O – Oxic (Aeration – Oxygen required in quantity as per process calculations)

Triton aerator work at 750 rpm with propeller Saturn rings. In this system, the air jet is directly mounted at an adjustable angle with the motor portion and air intake above the surface, and the propeller portion below the surface. The motor rotates and turns the hollow shaft along with the propeller, the drives water at a high speed near the propeller blades. Air above the water level is drawn via the air intake port and going into the hollow shaft. Turbulent flow created by the propeller, breaks up the air into small bubbles along the water streamline, mixes in the basin and disperses oxygen. Such system provides total oxygen dispersion and therefore, whole basin

circulation prevents short-circuiting. The aeration system with the air aspirator-mixer is highly efficient in oxygen transfer of 1.83kg O2/kWhr, easy to maintain and versatile to use, as it is located outside aeration tanks. The sound levels are less than 60dB. Horizontal mixing and high oxygen transfer efficiency is the important feature of the system and below is the standard feature of the aspirator aerators. Fine bubble aeration of 2.2 mm and less, Dependable, extended service life Minimal maintenance Superior winter performance and Environment friendly.

Result & Impact

The A2O process adopted is working efficiently with 100% satisfaction and peace of mind along with huge amount of confidence in the biological removal of organics and nutrients. The characteristics of the treated wastewater and its compliance with various standards is presented in Table 2. The treated water is complying with the norms laid by EPC agreement (Fecal coliforms and total nitrogen would be analyzed during the next sampling). Also, it is complying with the CPCB discharge standards and can be safely discharged into inland surface water or public sewers or on land for irrigation. However, the COD in the anaerobic, anoxic and aerobic tanks were exceptionally high and might be because of the contamination in return activated sludge

Appropriate process control is the heart of the A2O process as it important in ensuring removal of the target contaminants from the wastewater.

Table 2 Treated water quality and its compliance with standards

S.NO	Parameters	Unit	IIT Test results	Prescribed standards as per EPC agreement	CPCB Discharge standards		
					Inland surface water	Public sewers	Land for irrigation
1	Temperature	°C	33.1	-	shall not exceed 5°C above the receiving water temperature	-	-
2	pH	-	8.0	6.5-9.0	5.5-9.0	5.5-9.0	5.5-9.0
3	Dissolved Oxygen	mg/L	5.7	-	-	-	-
4	Electrical Conductivity	µS/cm	1546	-	-	-	-
5	Total Dissolved Solids	mg/L	771	-	2100	2100	2100
6	Total Suspended Solids	mg/L	10	<10	100	600	200
7	BOD	mg/L	6	<10	30	350	100
8	COD	mg/L	19	<50	250	-	-
9	Ammoniacal Nitrogen	mg/L	0	-	50	50	-
10	Total Phosphorous	mg/L	1.96	2	-	-	-
11	Dissolved Phosphates	mg/L	4.7	-	<5	-	-
12	Nitrate Nitrogen	mg/L	<1	-	<10	-	-
13	Residual Chlorine	mg/L	<1	-	<1	-	-

Solution Providers

Questions on how we can help and solve the challenges you're facing with your Sewage Treatment Plants? Contact us at 040 – 48577301 or write us on info@eurotekindia.com for more information. Together we can create most innovative solutions for your wastewater challenges.