INDUSTRIAL WASTEWATER: VALUED RESOURCE

By SPML Infra Limited

India is ranked 120th among 122 countries surveyed on the safe water index. This is not an ideal scenario for such a large country aspiring to become the leading economic power in the world.

Water is a universal solvent and practically all substances in certain levels can be dissolved in it. With this nature, water can be easily contaminated by other compounds.

India is reaching towards the tally of 1.4 billion people and experiencing severe water scarcity. The issue further compounded by the fact that around 80% of India's water sources is severely polluted due to dumping of sewage, silt, garbage, industrial effluent, chemicals etc. into the country's rivers and lakes. This has led to water being undrinkable and the large population having to rely on unclean and contaminated water.

Activated Carbon Filter at CETP Naraina, Delhi

The World Bank has estimated that almost 21% of communicable diseases in India are water related. Of these diseases, each year more than 1.5 million children die from diarrhea alone. The highest mortality from diarrhea in children under the age of five highlights the urgent need of wastewater treatment to prevent diarrheal disease in this age group as well as keeping our water sources clean and free from contamination. The health and economic impact of poor water quality are enormous and experts predict that 40% of people may not have a clean water source by the year 2030.

Globally, India is ranked 120th among 122 countries surveyed on the safe water index.This is not an ideal scenario for such a large country aspiring to become the leading economic power in the world. The vast population in rural India is mainly dependent on the groundwater sources for their drinking water purposes. With wide spread water contamination, it is estimated that groundwater in one third of India's 739 districts is not fit for drinking as the concentration of fluoride, iron, salinity and arsenic exceeds the standard prescribed levels.

Consequences of Water Pollution

India is presently producing about 71 billion litres of wastewater per day that includes both municipal and industrial wastewater. With fast urbanization and economic and industrial developments, the figure is continuously growing. But the treatment facilities for both sewage and effluent is not matching with the demand and almost 70% of wastewater goes untreated and flows directly into India's ponds, lakes, rivers and other water sources. Eventually, contaminated water also enters the groundwater sources thus polluting the saved and sacred resource as well apart from the surface waters. Because of the poor infrastructure and absence of wastewater treatment, almost 38 million Indians suffer from waterborne diseases like typhoid, cholera and hepatitis every year. Over the last decade, the frequency of these illnesses has in fact increased.

Water pollution in India not only harms people's health and food security, but it also contributes to the decrease in India's GDP and economic growth. The water pollution leads to the degradation of environment including loss of thousands of crores in production and agriculture losses leave alone the increased cost of healthcare.

CETP at Naraina, Delhi

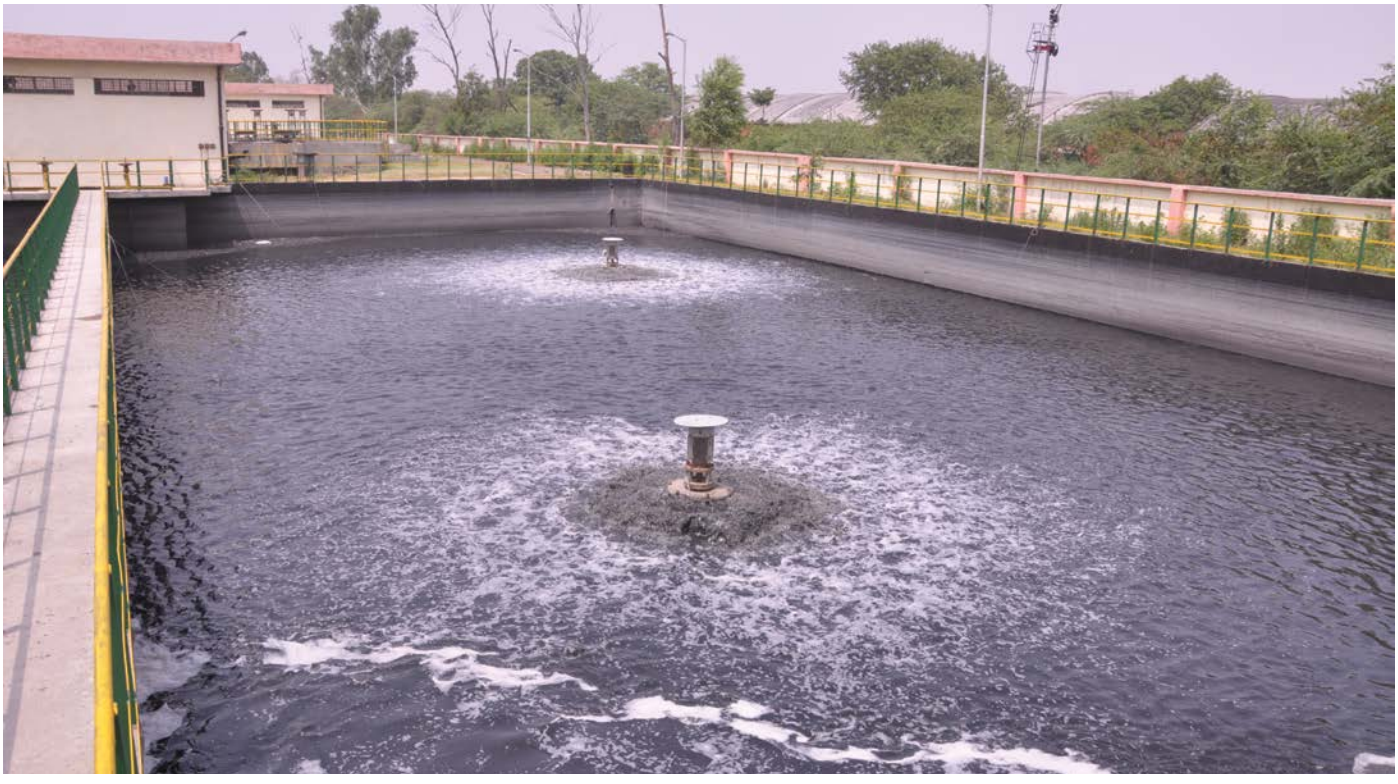
Presently, the industries in India generate around 14000 MLD of industrial wastewater every day of which about 60% is treated mainly by the large industries. This necessitates that government should take initiatives and encourage MSME industries to set up their own treatment plants to reduce the wastewater by reusing treated water for industrial purposes. Common effluent treatment plants (CETPs) were perceived to be a feasible solution for abatement of industrial wastewater pollution. However complexities involved with practical application and logistics proved not to be as appealing as the concept. The treatment of collected wastewater should be determined by the purpose for which it is recycled. It can either be discharged in water bodies or reused for other purposes such as agriculture, gardening or industrial depending on the quality produced. It should be treated up to certain levels in order to free the water of harmful contaminants that pollute the receiving environment.

SPML Infra Limited has been promoting sustainable water management – a task that is increasingly becoming essential as the natural supplies reduces and demand rises. SPML Infra makes an important contribution towards conserving the precious resources across the nation by reducing wastage, losses and pilferage of the drinking water and treatment of used water. It has designed and constructed a number of common effluent treatment plants in Delhi and other cities. The Naraina Common effluent treatment plant in Delhi is developed for the Naraina Industrial Area with the capacity to treat 21.6 million litres of effluents daily.

Case Study: Naraina Common Effluent Treatment Plant

Following the Supreme Court's order to shift all industrial units functioning in non–conforming or residential areas in Delhi to the industrial area specially created for them, the Government of Delhi has taken proper action and shifted them to different industrial areas of Delhi.

To accommodate these units, the Delhi State Industrial and Infrastructure Development Corporation (DSIIDC) developed the Naraina Industrial Area that has around 1,000 functioning industries. The types of industries in the industrial area include high tech industries such as electronics, instrumentation & process control equipment, machine tools, hand tools & tooling, light engineering, refrigeration & air conditioning, electrical and house–hold equipment, plastic goods, medical and pharmaceuticals, food processing, leather goods, textiles and sport goods, packaging, scientific and laboratory equipment etc.



Naraina CETP–2

These industries generate large quantities of effluents. To treat these industrial wastewater discharged by the industrial units and utilize the same for other useful purposes, a common effluent treatment plant (CETP) was constructed and operationalized.

The CETP at Naraina was constructed by SPML Infra Limited on an engineering, procurement and construction (EPC) basis for Delhi State Industrial and Infrastructure Development Corporation Ltd. (DSIIDC) on abuilt–up capacity of 21.6 MLD at an investment of Rs. 140.8 million. Post the commissioning of the plant; SPML Infra has maintained it with for a period of three years.

The plant has a three–tier treatment system comprising primary, secondary and tertiary treatment. It is equipped with treatment facilities which can remove suspended solids, biological oxygen demand (BOD), chemical oxygen demand (COD) and other pollutants in the effluent. The main units of the CETP are screen chambers, oil and grease (O&G) removal tank, grit chamber, equalization tank, chemical treatment, clarifiers, aeration tanks, tube settlers, rapid sand gravity filter and centrifuge. Wastewater generated by industries in Naraina is transported to the CETP by pumping of effluent from raw effluent pumping stations through rising mains.

The effluent through raw water pumping stations initially reaches a stilling/inlet chamber, after which it flows into the O&G chamber for removing O&G in the wastewater, using a skimming mechanism. During this process, air and chlorine are injected into the chamber and the separated O&G is then disposed of. Wastewater moves from the O&G chamber to be collected in the screen chamber for the removal of floating materials in the effluent. Apart from floating materials and O&G, the effluent also contains solid particles like grit and sand. This is removed in the grit chamber before undergoing biochemical treatment. After passing through these chambers, the effluent is collected in the wastewater equalization tank before undergoing primary treatment. From the equalization tank, the effluent flows into the flashed mixers. Since the raw wastewater contains substantial amounts of suspended solids, which cannot be removed by bar screens and the grit chamber, it is mixed with chemicals like alum or lime or polymer in the flash mixers to separate solids through chemical coagulation and sedimentation. The effluents discharged from the flash mixers flow into the primary settling tank via a distribution box for the gravitational separation of flocs resulting from the coagulation/flocculation process.

The primary treatment process results in the formation of sludge, which is collected in sludge pit at the bottom of the primary settling tank. Then, the effluent undergoes secondary treatment. From the primary settling tank, the effluent flows into the aeration tank for biodegradation of organic matter in the presence of oxygen supplied by the aerators. The biologically degraded effluent is discharged into the secondary settling tank and the settled sludge is collected in sludge pits at the bottom of the tank.

The secondary treated effluent flows into the secondary effluent sump and pumping station for further removal of pollutants with the help of chemicals like alum or lime or polymer. The effluent mixed with chemicals is discharged into the coagulation/flocculation chambers resulting in floc formation. The colloidal flocs formed settle at the bottom of the tube settler attached to the flocculation chamber. From the tube settler, the clarified or

The Naraina CETP is an important industrial wastewater project executed by the company. SPML Infra is putting best efforts in creating wastewater treatment and reuse facilities while contributing towards environmental sustainability by managing wastewater effectively and not allowing it to harm our ecosystem.

treated effluent flows into the rapid gravity sand filter for the final stage of tertiary treatment.

In the rapid gravity sand filter, the remaining suspended solids and other pollutants in the treated effluent are removed using the filtration process. The filtered effluent is collected in the final effluent storage tank. Finally, chlorine is injected into the tank to further reduce the level of pollutants in the treated effluents. The rapid gravity sand filter is connected through water channels to the final effluent storage tank and the reject water pump house. A backwash pump house is attached to the final effluent storage tank to store water for filters. The wastewater collected in the reject water pump house is pumped to the primary sludge pump house from where it flows into the sludge thickener. The thickened sludge is discharged into the thickened sludge pump house from where it flows into the centrifuge house. Finally, the sludge extracted from the centrifuge house is collected in the trolley for disposal.

Scope and project component

Design, engineering, construction, supply, erection, testing & commissioning on Design, Build and Operate basis of:

- 21.6 MLD Effluent Treatment Plant
- Pumping Stations
- Rising Main with 600 mm dia DI Pipeline
- Circular Raw Water Pump House
- Equalization Tank, Holding Tank, Grit and Screen Channel, Flash Mixer, Tube Settler, Flocculation Tank and Sludge Thickener
- Process/technology based on activated sludge process with Gas Mixing Technology
- Gasholder and Compressor
- Supply & erection of electrical and mechanical including instrumentation
- HT, LT Panels, Transformers, Pressure Gauges and Flow Meter
- Operation & Maintenance for 3 year

The Impact

The aim of the project is to reduce the impact of water contamination in the area by treating the generated industrial wastewater as per the standard and guideline of pollution control. With the advent of technology and the situation of water crisis in the country, we need to understand that the treatment of industrial wastewater that leads to reuse of it for specific purposes are becoming important.

About SPML Infra Ltd.:

SPML Infra is a leading infrastructure development company in India with about four decades of experience, it has executed more than 600 projects and created significant value for the country that has touched the lives of millions of people; be it provision of drinking water, improved sewerage facilities, better municipal waste management, and lighting up homes. SPML Infra provides drinking water facilities to more than 50 million Indian populations through various projects. It features amongst the World's Top 50 Private Water Companies as per Global Water Intelligence, London.

To know more about the contributor of this case study, you can write to us. Your feedback is welcome and should be sent at: deepak.chaudhary@eawater.com.