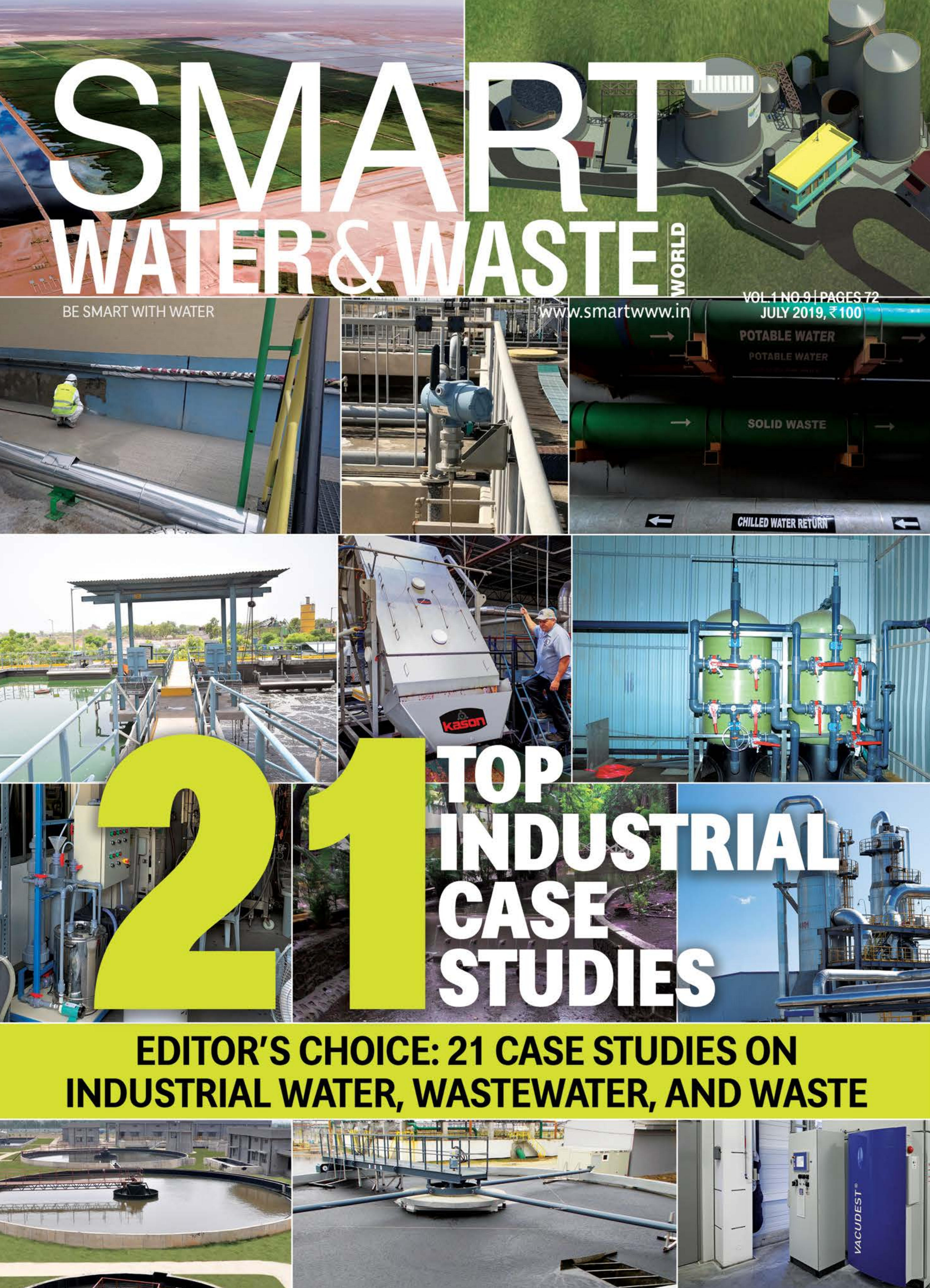

SMART WATER & WASTE WORLD

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21 TOP INDUSTRIAL CASE STUDIES

EDITOR'S CHOICE: 21 CASE STUDIES ON INDUSTRIAL WATER, WASTEWATER, AND WASTE

BAWANA CETP (COMMON EFFLUENT TREATMENT PLANT) PROJECT IN NEW DELHI

The Bawana CETP was constructed by SPML Infra Ltd on an EPC basis. Built at an investment of Rs. 537.4 million, the plant is spread over 53,000 square meters. Post the commissioning of the plant, SPML has maintained it with O&M responsibility for 3 years.

By Subhash Sethi

35 MLD Bawana CETP, Delhi

MORE THAN 50 percent of the world's population lives in cities and the trends of urbanization will continue to rise into the next century. By 2030, it is expected that nearly 5 billion (61%) of the world's 8.1 billion people will be living in cities. The movement of people towards cities has accelerated in the past 40 years due to economic activity and employment opportunities, particularly in the less-developed regions. This stemmed the global population living in urban areas to increase from one third in 1960 to over 50 percent currently. It is estimated that the world's urban population is growing by 60 million persons per year, about three times the increase in the rural population.

Cities across the world are facing a lot of water stress, availability is being seriously assessed and reviewed by the governments. As population and energy demand increases, efficient water supply, wastewater treatment, and sludge treatment continues to pose a significant challenge. The environmental regulations are constantly getting strong, placing new pressure on the cities and industries to treat and conserve water resources as a rapidly urbanizing world demands extreme wastewater treatment capabilities.

Worldwide the trend of water reuse is becoming mandatory considering the scarcity is real and looming large on cities. Singapore is a good example as they are being able to treat 2.4 million cubic meters of wastewater every day. There is a visible shift in the way large industrial water users are managing water resources with resilient technology to make the plant zero liquid discharge and generated effluents are being recycled and reused.

Indian Wastewater Scenario

The world's fastest-growing economy is habitat to 18 percent of the world population with just 4 percent of freshwater sources. Even this meager availability is reducing and the demand continues to escalate projected to overtake the availability very soon. With the rapidly changing urban face of India and increasing demand for more quality water and better sanitation services, the most important issue we are facing is to deal effectively with our wastewater.

Wastewater is an economic resource and good use of treated water on a sustainable basis to reduce our dependence on freshwater sources is the need of time. But, reuse of wastewater is still at the emerging stage in India as compared to other countries. Globally, many countries are using the treated water for potable and non-potable purposes. It is the main source of potable water in Namibia. China has developed a wastewater reuse network across Beijing and almost 22 percent of total water being supplied in the city is reclaimed water.

The major challenge urban India is facing is that an estimated 80 percent of the water supplied is coming back as wastewater. Only a fraction of it is treated due to insufficient treatment facilities and not being reused due to lack of infrastructure support. This leaves a big gap of generated wastewater is not being treated and sewage and effluent are released to water bodies further contaminating the already polluted surface and groundwater sources. From the public health perspective, the impact of water-borne diseases in the country affects almost 40 million people annually including the death of 1.5 million children from Diarrhea alone. Wastewater quantity is increasing significantly and due to lack of proper treatment and

PROJECT FILE
Industry: Various Industries (CETP)
Customer: Delhi State Industrial and Infrastructure Development Corporation (DSIIDC)
Plant Location: CETP, Bawana Industrial Area, New Delhi, India
Plant Capacity (CETP): 35 MLD
Plant Area: 53,000 Square Meters
Investment: Rs. 537.4 Million

management, the freshwater sources are being polluted deeply.

Industrial Wastewater

The pace of industrialization in India that was quite slow till 1980, and then paced faster post-liberalization. India went through rapid industrialization and urbanization and the amount of wastewater generated by industries has increased many folds. It is projected that industrial water consumption will multiply to reach 18 percent of total annual water consumption by 2025, up from just 6 percent in 2000.

Presently, the industries in India generate around 13,468 MLD of industrial wastewater every day of which about 60 percent is treated and mainly by the large scale industries. This necessitates that the 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 minimum 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 and complex as the natural supplies deplete and demand rises. SPML 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 several common effluent treatment plants in Delhi and other cities. The Bawana CETP in Delhi is the largest effluent treatment plant in Delhi developed for the Bawana Industrial Area with the capacity to treat 35 million liters of effluents daily.

Case Study: Bawana CETP

The industrial units functioning in non-conforming or residential areas in Delhi were closed in 1996 following the Supreme Court's order to that effect. To accommodate these units, the Delhi State Industrial and Infrastructure Development Corporation (DSIIDC) developed the Bawana Industrial Area. Spread over 1,922.94 acres, the industrial area has around 20,000 industrial plots. 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 household equipment, plastic goods, medical and pharmaceuticals, food processing, leather goods, textiles abd sport goods, packaging, scientific and laboratory equipment, etc.

These industries generate large quantities of wastewater. To treat the wastewater discharged by these industrial units and utilize the same for horticulture and gardening purposes, a Common Effluent Treatment Plant (CETP) was constructed and operationalized.

The CETP at Bawana was constructed by SPML Infra Limited on an Engineering, Procurement and Construction (EPC) basis for DSIIDC. It has a capacity of 35 MLD. Built at an investment of Rs. 537.4 million, the plant is spread over 53,000 square meters. Post the commissioning of the plant, SPML Infra has maintained it with O&M responsibility for 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 Bawana is transported to the CETP by pumping of effluent from three 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 a 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 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.

The Bawana CETP is a testimony of our capabilities in executing large water and wastewater projects. Through our efforts in wastewater treatment, we are contributing to environmental sustainability by managing wastewater and not allowing it to harm our ecosystem. Recycling wastewater further enhances reuse and social responsibility conforming pollution control norms. We have proven domain expertise of about four decades in water and wastewater management and SPML is a preferred partner for such projects.- Subhash Sethi

As against the standard stipulated for BOD at 30 mg per liter and COD at 80-120 mg per liter under the Environment (Protection) Act, 1986; the BOD and COD content of the treated effluents discharged by the plant ranges from 18 mg per liter to 26 mg per liter and 80 mg per liter to 120 mg per liter respectively.

Way Forward

As India continues with industrialization and urbanization, the amount of wastewater generated by industries will increase in the future. This necessitates that authorities should aggressively take up treatment and reuses initiatives and encourages industries to set up CETPs to reduce the wastewater generated at the source. Certain practices, if implemented efficiently, can surely make a difference. Although planning is the first step, it can facilitate the effective treatment only when there is easy access to the required resources and ability to manage them.

Some of the other factors, that are equally important for success, are:

- Availability of efficient technology that is cost-effective,
- Technical ability to manufacture, install and operate treatment systems, and
- Social acceptance and awareness, etc.

In a developing country like India, pushing for greater efficiency, effective control, management and reduction of wastes can be achieved only through a comprehensive strategy. It involves precautions and changes at every stage of the production cycle, starting from the use of the right raw materials to the safe disposal of unwanted materials. CETPs are just one of the stepping-stones towards achieving pollution-free production from the industries of India.

At the current rate of water consumption in India, we will only have half the water we require by the year 2030. Therefore, it is crucial that we must work to be the solution to the pollution, doing whatever we can with the time, talent, technology and persistence that we have.

Parameter	Influent	Treated Discharge	EPA Standards of Treated Effluent
pH	7-7.5	7-7.5	5.5-9
TSS, mg/l	1150-1750	38-70	100
COD, mg/l	700-900	80-120	250

Table 1: Ensuring Discharge Quality

About the Author

__Subhash Sethi__ is the Chairman of SPML Infra Ltd, a listed infrastructure development company in India. In the past three decades, he has worked relentlessly with his mission to create enduring value and wealth for the country and organization. Under his leadership, SPML Infra went on to establish itself as a leading engineering and infrastructure development organization in India with over 600 completed projects in the domains of water, power, sanitation, environment, and civil Infrastructure.