WASTEWATER – THINK BEYOND

By Subhash Sethi

42 MLD Sewage Treatment Plant, Kanpur

Water is essential for the existence of humanity and all living organisms on the planet earth. But this valued resource is increasingly being threatened as human population is growing and demanding for more water for domestic and industrial purposes and for other economic activities. World Economic Forum has released the 2018 Global Risks Report in which water has been named one of the top five global risks in the world for the seventh consecutive year in a row. The United Nations has emphasized that "sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well–being, and socio–economic development, for ensuring protection against water–borne pollution and water–related disasters, and for preserving ecosystems in a climate of peace and political stability," is of prime importance.

The 21st century is undergoing a tipping point in the way water supplies are being managed and sustained. The powerful trends of rising human populations, faster urbanization and industrialization combined with climate change are colliding against outdated water management practices and insufficient, aging infrastructure. It is estimated that on an average, high income countries treat about 70 percent of the wastewater they generate, while that ratio drops to 38 percent in upper middle income countries and 28 percent

THE WASTEWATER SECTOR HAS BECOME A PRIORITY WITH GLOBAL MARKET FOR WASTEWATER RECYCLING AND REUSE REACHED NEARLY USD 12.2 BILLION IN 2016 AND IS ESTIMATED TO REACH USD 22.3 BILLION BY 2021.

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in lower middle income countries. In low income countries, only about 8 percent of industrial and municipal wastewater undergoes any kind of treatment. ☞ www.spml.co.in

Water Outlook

By 2050, India's total water demand will increase 32 percent from now. Industrial and domestic sectors will account for 85 percent of the additional demand. Over–exploitation of groundwater, failure to recharge aquifers, reduction in catchment capacities due to uncontrolled urbanization and no reuse facility for treated wastewater are all causes for the precarious tilt in the water balance. If the present rate of groundwater depletion persists, India will only have 22 percent of the present daily per capita water available in 2050, possibly forcing the country to import water.

India's Wastewater

India is having only 4 percent of world's water resources to feed 16 percent of the world population and 15 percent of livestock ranks 133rd out of 180 nations in terms of water availability and 120th out of 122 nations in terms of water quality. Almost 70 percent of sewage generated in urban India is not treated. As per estimate, around 62,000 million liters per day (MLD) sewage is generated by India's urban population alone, while the treatment capacity across India is only 23,277 MLD, or 37 percent of sewage generated. But the revealing fact is that of 816 municipal sewage treatment plants (STPs) listed across India, only 522 are in the working condition. So the fact is that we generate 62,000 MLD, the listed treatment capacity is 23,277 MLD but no more than 18,900 MLD of sewage is actually treated

11 MLD Decentralizsed Sewage Treatment Plant at Mira Bhayander

that is just 30% of the total sewage generated. The untreated municipal and industrial wastewater is mostly discharged directly into water bodies, polluting almost three–fourth of India's surface water resources and underground water. Estimate suggests that 75 percent to 80 percent of water pollution is from domestic sewage, discharged untreated into local water bodies.

It has been evaluated that 80 percent of India's surface water is polluted which results in India losing USD 6 billion every year due to water–related diseases. Challenges faced by the Indian water sector are due to increasing water consumption and wastage in urban areas, water–borne diseases, industrial growth, political and regulatory disputes, water cycle imbalances, increasing irrigation and agricultural demand, lack of technology, etc. According to estimates, India's water sector requires investment worth USD 13 billion to improve and sustain.

Wastewater–Renewable Resource

Wastewater is a renewable resource in its own right with thermal, chemical, and hydraulic energy embedded within it. It is estimated by the American Biogas Council that the wastewater sector consumes very large amount of electrical energy per annum. Wastewater sector has the potential to generate trillions of unit of energy each year enough for running the treatment plants and also to provide surplus energy to households. The sewage sludge can produce gas which can be converted directly via a generator into electricity or it can feed as bio–methane into the urban gas network.

Singapore is using all its wastewater to treat and turn it into drinking water. The Australian city, Perth is recycling about 10 percent of the city's 134 billion liters wastewater into drinking supplies via a landmark treatment plant at Beenyup in Craigie. Back home, the fine example is Chennai, where Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) have established water recycling through strong coordination and good governance. Chennai is the first metro city in India that has implemented 100 percent sewage collection and formulated a set of service standards for accelerated wastewater reuse and the "Zero Water Discharge in Chennai" program. In harmony with the CMWSSB water reuse plan, the Greater Chennai Corporation also introduced a by–law that sets the rules for mandatory wastewater recycling. Permits for all new developments will only be awarded with wastewater recycling planned into the design. The rules state that only water from toilets is to

13 MLD Sewage Treatment Plant in Zone 6 in Mira Bhayander

be connected to the sewerage network, the rest should be used for groundwater recharge after a simple organic filtration. All stakeholders in the city including government authorities, commercial establishments, private sector and citizens are mandated by a set of regulations and bylaws to ensure maximum reuse of water and wastewater. Chennai has achieved around 15 percent of the city's water demand through water recycling. Around 8 percent of the treated wastewater is sold to industries and up to 41 percent of domestic water needs in newly built houses are secured from wastewater reuse. The wastewater reuse in residential areas and rain water harvesting has reduced nearly 60% of water reaching the sewer system that has contributed to improved operation of sewer networks.

All Indian cities must follow the Chennai example by establishing ambitious target and introducing policies to support 'zero discharge' concepts. Partnering with industry, such as in Durban, where 98 percent of wastewater is treated and used by industry, can have a financial impact on reducing operational costs and also helps in addressing water scarcity, public health and socio–economic development.

A growing number of wastewater facilities around the world have taken steps to install novel wastewater to energy technology; with some even achieving complete energy self–sufficiency. SPML Infra has developed energy recovery system by adopting a number of innovative measures in its sewage treatment projects at Kanpur and Nashik with increased biogas production and energy generation to support the functioning of the plants.

SPML Infra Contribution

SPML Infra has contributed immensely and established a leading position in the treatment of wastewater from design to application of technology, construction to management and operation of sewage treatment plants, common effluent treatment plants, tertiary and water reuse treatment plants, sludge treatment, bio–gas & power generation. It has the capabilities to provide reuse with recovery of resources from waste as well as solutions for proper treatment and disposal of wastewater with specific processes. SPML Infra has built plants which are fully equipped with PLC and SCADA system with reliable treatment technology for efficient operation and maintenance.

Kanpur, the heavily industrialized city of Uttar Pradesh is having tanneries and other polluting industries poses the biggest challenge of the gigantic task of clean Ganga mission. The main drain of the city discharges the highest amount of untreated sewage @138 MLD into the river and passes through deeply populated and congested areas. The strategy document of the National Mission for Clean Ganga identifies the Kanpur–Varanasi leg as the "most critical stretch" having engineering complexities. Kanpur Sewerage System is strategically planned and executed to treat the sewage and effluent of the current population of more than 3 million people and numerous industries with inbuilt capacity to handle the future demands for next 30 years. The project involved design and construction of 130 kilometer sewerage network and 42 MLD sewage treatment plant with facility of bio–gas generation from sludge treatment that will be utilized by 3 biogas engines to generate 1140 KW power to fulfill the partial power requirement of the plant. The treatment plant is designed to treat the sewage to meet the prescribed standards and to make treated water suitable for discharging into disposal point.

SPML Infra has designed and constructed the 240 MLD sewage treatment plant in Ahmedabad, Gujarat to provide treatment and safe disposal system for wastewater produced. The sewage treatment plant is built in 4 modules of 60 MLD with each module having its own primary & secondary treatment. Common facilities exist for disinfection of biologically treated water, biogas collection & flaring, collection of digested sludge and dewatering system along with common chemical preparation and dosing facilities. The project has ensured the desired level of treatment as per the GPCB standards. The sewage collection and treatment has improved to 100 percent and the bio–gas is being used for power generation. Revenue generation from sludge and energy is making the operation of the plant self–sustainable.

Another important project executed by SPML Infra is the Integrated Sewerage Systems in Mira Bhayander, a satellite city of Mumbai, designed completely as decentralized system having separate collection and treatment facilities in 10 zones across the city. This is one of India's largest and first comprehensive underground sewerage system with 113 kilometers of sewer lines, 10 pumping stations, 10 sewage treatment

plants of various capacities ranging from 7 MLD to 17 MLD with total capacity of 115 MLD having advanced MBBR treatment technology with high level of treatment efficiency. This integrated sewerage system is fully automated with zero manual intervention and can be easily expanded, retrofitted for capacity enhancement. This system implies closure of existing septic tanks and drainage through storm water drains thus improving overall hygiene and living standards of more than 1.2 million people.

Future Trends

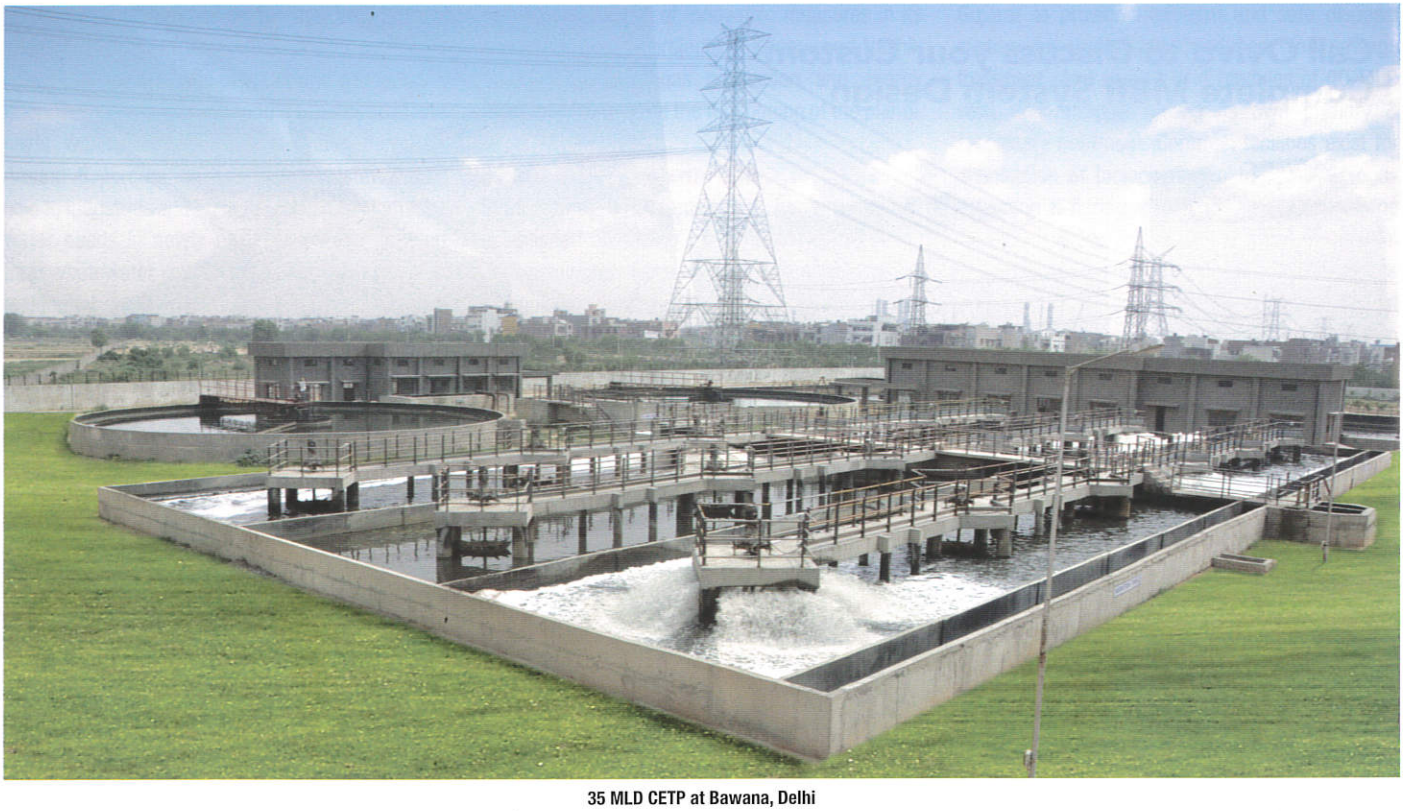
The importance of water security has become a top priority as we move into the future. Understanding the importance, governments across the globe are racing against time to provide credible solutions to the water scarcity and water pollution. A World Bank report examines how these trends are already impacting global economic growth and prosperity, and proposes solutions to help the world avoid a thirsty and uncertain future. All major cities around the world are being tasked to lead a "reuse revolution" to considerably help increase wastewater treatment, recycling and reuse. With almost 80 percent of all wastewater being discharged untreated into water bodies, it is leading to health and environmental hazards, while contributing to greenhouse gas emissions leading to volatile climatic conditions of frequent draught, typhoon and unusual rains. The wastewater sector has become a priority with global market for wastewater recycling and reuse reached nearly USD 12.2 billion in 2016 and is estimated to reach USD 22.3 billion by 2021.

Singapore's Public Utilities Board has recognized the need to ensure water security and sustainability under the theme, "our water, our future" with sustainable and resilient practices by managing water demand through several measures including wastewater recycling and reuse policy. The fact that Singapore has become a global hub for water solutions is remarkable, considering the nation's early years were filled with environmental challenges such as flooding as well as sanitation and pollution issues. Israel is another good example where they have proven that engineering capability and meticulous planning can build an integrated robust water supply and wastewater treatment and reclamation system to cater to their water supply needs for a relatively longer period.

Among various environmental challenges India is facing, fresh water scarcity and wastewater treatment ranks very high. We need to replicate examples from Singapore and Israel in a planned manner with dedicated resources and special implementation and monitoring schemes. Our governments need to work on a mission mode and get all the stakeholders including private sector involved in planning and execution of such projects. Our future sustainability depends on our water resource which requires complete and focused attention. There is a visible change in Indian water market. We have new technologies coming into the field which will change how the water industry is going to manage itself, how it will address the challenges and how it will be more efficient with the resources that we have at our disposal.

Government Initiatives

The government of India is determined treat wastewater, one of the landmark projects being



35 MLD CETP at Bawana, Delhi

the National Mission for Clean Ganga. Out of 191 projects, 97 are sanctioned. New sewage treatment plants with a capacity of 2,278.08 MLD and restoration of 574.8 MLD existing STPs are proposed. Laying / rehabilitation of 4,766.4 km sewer network for abatement of pollution in Ganga and Yamuna are part of these sanctioned projects. 20 projects are already completed, which have created 262 MLD STP capacities, rehabilitated 92 MLD STP capacities and 1,706 km of sewer network. There are currently 45 sewage infrastructure projects under execution to create 834 MLD sewage treatment capacities. Another 32 projects are under various stages of tendering which envisage creating 1,758 MLD sewage treatment capacities.

Way Forward

- Fast adoption of specific technologies for municipal and industrial wastewater treatment in enhancing energy efficiency in treatment process
- Implementing new technique and methods that purifies wastewater without chemicals in a cost–effective manner by using patented technologies and requires rélatively low operational and capital expenditure
- An environment friendly and cost efficient wastewater treatment system
- Indian water utilities and municipalities need to look at integrated water management approach that looks across sectors and systems
- Getting the regulatory framework and market conditions right for commercialization of water reuse is important
- India, with a large agricultural sector have the opportunities to create a market for fertilizer produced from treated sludge for a variety of applications and exploring opportunities to produce energy from sludge
- From national to municipal or city level, align policies to ensure that wastewater is treated properly and should be reused by agriculture and industries reasonably and it is equitable and apolitical
- Implementation of low energy devices, controls and the use of consumption data will lower the energy demand and make the projects sustainable
- Aim to enhance water efficiency in industries through water recycling or reducing water consumption
- Enhancing operational efficiency by leveraging on smart technologies such as robotics, drones, automation, data analytics and informatics, as well as video analytics in order to minimize the manpower required in operations and maintenance
- Advance research and development is important to develop innovative water solutions that can improve the efficiency of waste water treatment and keep our water supply sustainable
- For all wastewater treatment plants, the target should be of energy self–sufficient water reclamation plants through modern treatment technologies with the aim to minimize the energy needed to treat wastewater and recover more energy from the process, such that all wastewater treatment plants uses as much energy as it generates
- All wastewater treatment plants must use advanced nutrients removal/recovery process
- Wastewater originates near people habitats and in the industries, treatment should be done as close as possible to the source to make it a viable solution
- Decentralized sewage treatment plants in cities are the best option to treat the collected sewage locally rather than transporting it to a large STP
- The sector requires a sound legal and regulatory framework for the treatment and reuse

SPML's expertise in wastewater treatment as well as our strong credentials in infrastructure development has given us a clear edge over others to execute and deliver complex and large value wastewater projects. The number of wastewater projects executed by us confirms the added–value solutions and expertise that SPML provides to its water utility and municipal clients, so that their projects can both comply with regulatory and industry standards and improve the efficiency of their operations. Aiming for sustainable growth with excellent return on investment, SPML Infra has completed more than 600 water projects since its inception in 1981, the company is currently operating in over 20 states across the country apart from international projects in African countries like Ghana and Rwanda. The company's expertise, sectorial knowledge and pan India experience increases our ability to deliver complex water and wastewater projects and make it ideally placed to provide sustainable infrastructure development solutions to our esteemed clients.

We need to think differently the way our water resources are being managed in the face of growing challenges of availability and ground water pollution. Water will be the key to the economic success for many countries where demand is exceeding availability or it is becoming scarce. Creating awareness and promoting reuse with improved infrastructure, clear policy guidelines and better managed services can lead to better access to reliable and safe water supplies and complete treatment and reuse of wastewater.

About the Author

Subhash Sethi is the Chairman of SPML Infra Limited, a listed infrastructure development company with focus on creating sustainable solutions for water, power and sanitation. Mr. Sethi's innovative leadership management is a source of constant inspiration for the employees of the company and under his guidance SPML Infra has executed more than 600 projects and created significant value for the country that have touched the lives of millions of people. His valuable contributions towards the development of infrastructure have been recognized widely and he has received several awards and accolades.

SPML Infra Limted has integrated its strength in basic and in–depth engineering, process technology, project management, procurement, fabrication and erection, construction and commissioning to offer distinct responsibility under strict delivery agendas. Many of the engineering and construction projects executed by SPML have set new benchmarks in terms of scale, sophistication and speed. SPML has in–house engineering capabilities for both project design and construction. SPML design and engineering encompasses IT enabled facilities including modern CAD centre using various design and project management software.

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