11 MLD Decentralised Sewage Treatment Plant at Mira Bhayander

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WORLD WATER DAY

WASTEWATER: TREATMENT & RESOURCE

The wastewater treatment market in India is estimated to reach a total market size of USD 10.185 billion by 2026 from USD 4.394 billion in 2019 clocking at an annual growth rate of 12.76%.

The home of almost 18% of the world's population, India is amongst the world's fastest–growing economies and also the second–largest populated nation. But, it ranks among the countries most vulnerable to climate change and extreme weather conditions. More extreme weather events resulting from climate change – including cyclones, disastrous floods, and prolonged drought could make it even harder for the poorest people to access clean water.

In India, around 65% of the country's population lives in rural areas, and most of them live without proper access to clean water. Water Aid's annual analysis examines the state of rural access to safe drinking water around the world and warns that diseases such as cholera, blinding trachoma, malaria, and dengue are expected to become more common and malnutrition more prevalent. Rural communities dependent on farming to make a living will struggle to grow food and feed livestock amid soaring temperatures, and women – typically responsible for collecting water – may have to walk even greater distances in their daily struggle to access clean water.

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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. As per Central Pollution Control Board (CPCB) report, urban India is generating nearly 72.36 billion liters of sewage per day whereas the installed capacity of all STPs put together can treat only 31.84 billion liters a day. Even out of this installed capacity, developed and operationalized capacity is 26.87 billion liters and only 20.23 billion liters is the actual utilized capacity. Out of the total sewage being generated in urban India; only 28% is being treated leaving a big gap of 72% sewage not receiving any form of treatment and being released into water bodies.

12.5 MLD Effluent Treatment Plant, Bahadurgarh Industrial Area, Haryana

India with an increasing population and growing demand for water is not utilizing the valuable resource of wastewater to augment the water supply and cater to the non–potable needs of industries and irrigation. Greater consideration is needed to construct better wastewater treatment infrastructure for abetting water pollution and a reliable solution for water sustainability.

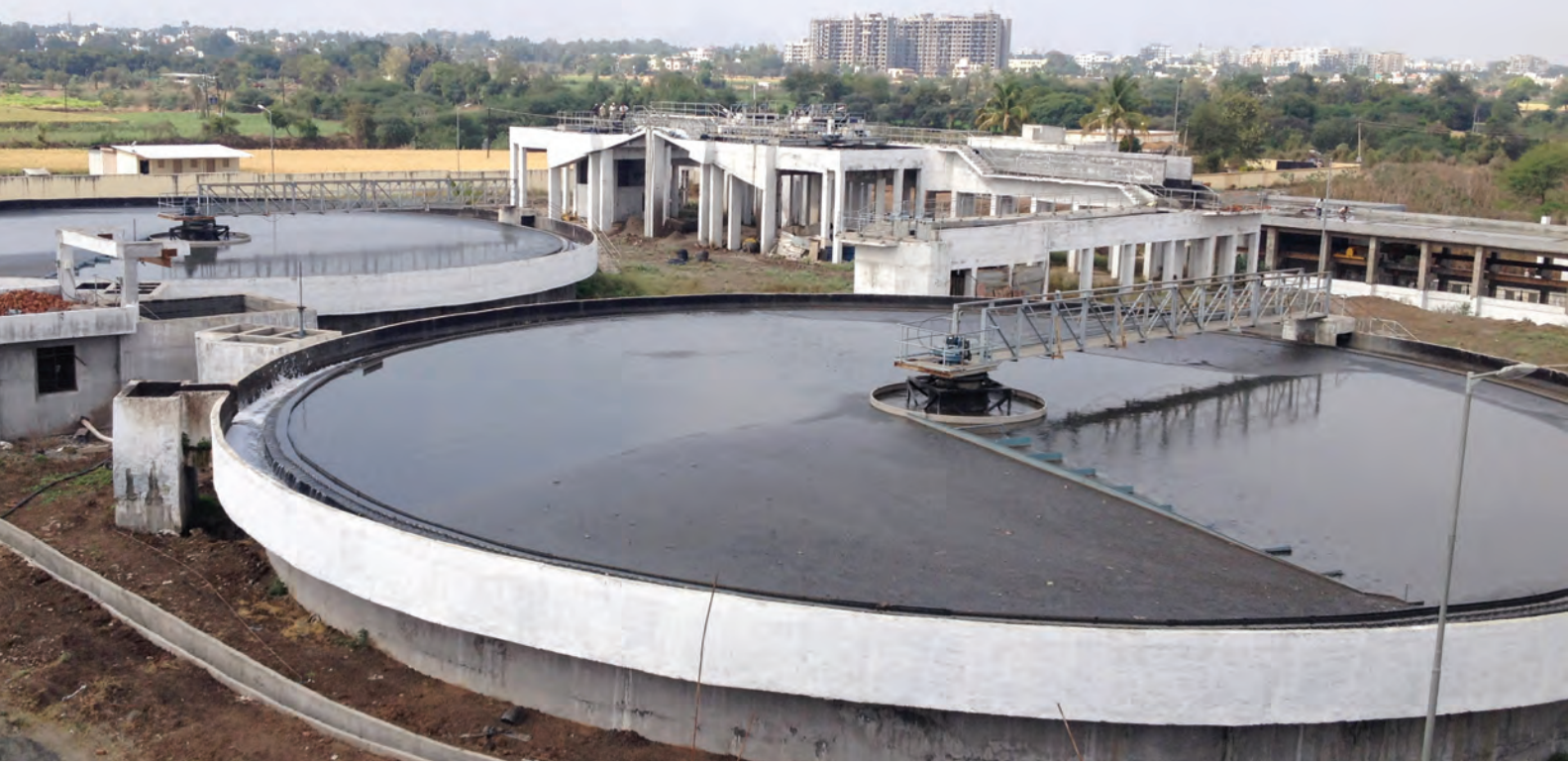
Traditional methods of wastewater treatment become increasingly challenging with the identification of more contaminants, rapid population growth, increasing industrial activities, and ever–shrinking freshwater sources. The effectiveness of the conventional process has become limited due to new challenges; increased knowledge about water pollution and public demand for better quality water have enforced the implementation of much stricter regulations. This is an age of smart technology and the same is applied in wastewater treatment and management also. Today we need a smart treatment system for treating wastewater for complete reuse purposes for all our requirements except for drinking. The water and wastewater treatment (WWT) technology market was valued at over USD 2.1 billion in 2021, and the market is projected to register a CAGR greater than 8% during the forecast period of 2022–2027 as technology intervention is expedited due to unprecedented pandemic outbreak globally claiming lives of over 61 million people.

42 MLD Sewage Tretament Plant, Kanpur

Globally, over 3.4 million people die of water–borne diseases annually. The world faces a huge challenge in ensuring a safe water supply to 7.75 billion people.

The reuse of municipal and industrial wastewater and the recovery of potential

Aging infrastructure, conventional technologies and microbial or chemical contamination are major threats to public health.



70 MLD STP, Nasik, Maharashtra

pollutants used in industrial processes become more critical. The reclamation has become easier with advanced treatment technologies which can remove various potentially harmful compounds that could not be effectively removed by conventional treatment.

Wastewater as Valuable Resource

The innovations and new technologies and ideas revolve around the simple wisdom, the reuse of wastewater results in less extraction of water and thus saving the fast depleting natural resource from extinction. It's a good proposition to address the ever–increasing water demands and explore new ideas for wastewater treatment.

New Technologies for Wastewater Treatment

Wastewater treatment technologies are crucial for urban water systems. Some of the new technologies being used and introduced for wastewater treatment globally to reclaim the resources:

- **Membrane Filtration:** Membrane filtration is essential for advanced water reclamation. Micro and ultra–filtration membranes provide excellent pre–treatment to remove a wide range of dissolved contaminants. Membrane bioreactor filtration technology is being extensively used for advanced treatment followed by RO and UV treatment to produce non–potable water.
- **Nanotechnology:** The emergence of nanotechnology and the incorporation of living microorganisms in bio–microelectronic devices has revolutionized the treatment process. The best part of nanotechnology is that it can easily merge with other technologies and modify, endorse and clarify any existing concept. It offers an innovative approach to developing and exploit these processes in completely new ways. Nanotechnology concepts are being investigated for higher–performing membranes with fewer fouling characteristics and improved hydraulic conductivity. Several new researches are being conducted for producing fabrication of membranes from nano materials for decomposition of toxic compounds during the treatment. It will also provide effective segregation of metals, bimetallic nanoparticles, mixed oxides, zeolites, and carbon compounds, etc. from the wastewater resources. With improved membranes and configurations, more efficient pumping and energy–recovery systems will be possible.
- **Automated Variable Filtration (AFV) Technology:** Automated Variable Filtration (AFV) technology is a state of the art technology used for wastewater treatment in which upward flow of influent is cleaned by the downward flow of filter media. During the treatment process itself, the filter media is cleaned by the filtered influent thus there is no requirement for any additional filter media cleaning or freshwater. The AFV process comprises two sets of media filters that can be operated in series or parallel. The two–stage series configuration is used

to produce very high–quality filtrate. This mode is ideal for refining secondary wastewater for reuse. The AFV process is equipped with actuated valves, sensors, and programmable logic controllers to automatically switch from serial mode to parallel mode during wet weather conditions or other preset operating conditions.

- The key benefits of the system are:
- Higher solids capacity
- Continuously cleaned media beds
- Elimination of ancillary equipment
- Even flow distribution
- Cost–effective to install and low operating and maintenance costs
- Average reject of 5–15%
- Extremely low power consumption
- Ease of Operation & Maintenance

- **Microbial Fuel Cells:** Microbial fuel cells is a breakthrough technology where electrical energy could be extracted directly from organic matter present in the waste stream by using electron transfer to capture the energy produced by microorganisms. Microorganisms are grown as a biofilm on an electrode; the electron donor is separated from the electron acceptor by a proton exchange membrane, which establishes an electrical current. This technology is still in its development stage and significant advances in process efficiency and economics will be necessary before it could be used widely to produce electrical energy directly from organic matter present in the wastewater.
- **New Urban Sanitation Technology:** The New Urban Sanitation Technology aims at wastewater treatment with the reuse of energy and minerals with a combination of Electro flocculation (Elflox) and Anaerobic Digestion technologies.

Elflox treatment is based on the separation of the organic pollution from community wastewater with Electrocoagulation (ECF reactor). Organic sludge of the ECF reactor is sedimented in a circular sedimentation vessel; Sludge (organic compound) which is then fed to an anaerobic reactor gets converted into Biogas which can be converted to Energy for captive utilization.

Anaerobic fermentation technology, generates optimum Biogas due to two separate processes of Hydrolysis– the long–chain carbon compounds are broken down into smaller compounds such as fatty acids; and Methanogenesis the fatty acids get converted into biogas.

- Natural Treatment Systems: The natural treatment systems (NTSs) is also improving with the emergence of new methods and technologies and a variety of physical, chemical and biological processes work simultaneously to remove a range of contaminants comprehensively. Natural treatment systems are increasingly being used to capture, retain and treat storm water, thereby converting this sheer wastage into a valuable source of water. These natural systems have the advantage of being able to remove a wide variety of contaminants including nutrients, pathogens and micro–constituents including endocrine disrupting chemicals. This treatment process is very effective for water reclamation.
- Cokeoven (CO) Byproduct Wastewater Treatment: The steel producing plants in India are using this treatment process to recover ammonia from cokeoven liquid. Water pollution problems would be worse if ammonia is not recovered, the most polluting among all the wastes from production units. In the CO effluent, most of the pollutants are in the dissolved state. Other pollutants are subjected to biological treatment along with residues of phenol and ammonia. The two most common processes used for the treatment of cokeoven effluents are trickling filter and activated sludge process.
- Urine Separating Process: Urine is part of domestic wastewater which contains up to 90% of the nitrogen and 50% of the phosphorus. The development of urine separating toilets and technologies for treating it to produce fertilizer products is a key to managing nutrients with minimal requirements for outside resources, such as additional energy. Producing the same amount of petroleum–based, nitrogen–rich fertilizer takes an enormous amount of energy and non–renewable resources.

Urine–separating toilets have already been developed and advanced research is going on to refine it further and use them for wastewater management and creating resources.

SPML Infra Contribution

SPML Infra Limited has been working in water and wastewater treatment and management segment for over 40 years now and during this period it has designed and constructed a large number of municipal and industrial wastewater treatment plants that has contributed significantly in environmental sustainability. SPML Infra has built sewage and effluent treatment plants which are fully equipped with automation system and reliable treatment technology for efficient operation and maintenance.

Some of the significant wastewater treatment plants constructed by SPML Infra Limited include:

- 240 MLD Sewage Treatment Plant in 4 modules of 60 MLD each with each module having its own primary & secondary treatment section plus sludge thickening & digestion facilities in Ahmedabad, Gujarat. Common facilities for disinfection of biologically treated water, biogas collection & flaring, supernatant/filtrate collection & recirculation system, collection of digested sludge & digested sludge dewatering system along with common chemical preparation & dosing facilities were created in this project.
- 72 MLD Sewage Treatment Plant in Okhla, Delhi based on activated sludge process with gas mixing technology complete with gasholder and compressor to generate energy.
- 70 MLD Sewage Treatment Plant in Nasik, Maharashtra along with two gas holders of 11m x 5m with gas flow meter for 4800 m^3/day of gas production.
- Executed one of India's largest and first Comprehensive Underground Sewerage Systems in Mira Bhayandar, Maharashtra having 113 km of sewer lines; 10 pumping stations, and 10 decentralized

sewage treatment plants with a total 115 MLD capacity having the latest MBBR technology.

- Executed a sewerage network and sewage treatment plant project for Kanpur city having a 130 km sewerage network of 150 to 1800 mm dia pipelines, three pumping stations of 14, 40 and 42 MLD and 42 MLD sewage treatment plant based on activated sludge process including power generation from biogas.
- SPML Infra also contributed to the prestigious XIX Commonwealth Games held in Delhi in 2010 by constructing 25 MGD (million gallons per day) effluent pumping station (EPS) including twin transmission mains for carrying 33.34 MGD treated effluent to the power plant to generate power which eventually illuminated the games.
- A number of Combined Effluent Treatment Plants were also constructed that includes 35 MLD CETP at Bawana, Delhi; 24 MLD CETP at Okhla, Delhi; 21.6 MLD CETP at Naraina, Delhi; 12.5 MLD CETP at Bahadurgarh, Haryana and 12 MLD CETP at Lawrence Road, Delhi for industries situated in these areas.

Way Forward

The new treatment processes with resource recovery along with the integration of urban water and waste management systems will improve the sustainability of our water resources. New wastewater treatment technologies can significantly reduce water abstraction from our already resource–constrained world. Reclaim water must be managed properly to maintain the integrity of the overall treatment system. The energy consumption in treatment plants also requires active management to make the entire process efficient and effective by producing enough energy from treated wastewater that could support the energy requirement of treatment plants. Technologies to meet these challenges already exist and work is going on to refine and integrate them into higher performing more sustainable systems.

The challenge is to choose the most appropriate one from the available options and develop institutional arrangements for implementing them in the most effective ways.