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WASTEWATER TREATMENT: TECHNOLOGY INTERVENTION

In India, nearly 7 lakh premature deaths are attributed to water pollution. The country face huge challenges in ensuring safe drinking water supply to masses.

By Subhash Sethi, Chairman, SPML Infra Limited

We need to think big on the water and sanitation front if India has to achieve the place it is vying in the world economic order. The water future in India is turbulent and our approach towards water infrastructure development and management is mostly not sustainable. We have to act swiftly and required to develop large number of robust water and wastewater infrastructure and maintain them professionally.

With economic development, urbanization and population growth, India's water demand is increasing significantly. The demand supply gap is getting wider and water conflict is becoming a common phenomenon. The affliction point is insufficient availability of clean water for distribution and scarcity that is increasing every day. The water pollution, in general, and degradation of groundwater quality in particular are the added dimensions of water scarcity. Niti Aayog has released a report on water management last year, predicting that 21 major cities in India are racing towards zero groundwater levels by this year 2020, and nearly 600 million people in the country is likely to face extreme water stress. Big cities like Chennai, Mumbai, and Delhi have already started facing water crisis especially during summers. We have to think seriously as to how water could be put high up on the political agendas on a long–term basis. Until this happens, probabilities of solving water problems will remain be slim.

Amongst the world's largest population at 1380 million currently and expected to become the most populous by 2024 and continue growing for years to 1700 million by 2050, India even currently finds it difficult to serve the majority of that populace with clean drinking water. Water problems are a global issue and we all should focus on them. Every year, billions of rupees are needed to keep our water and wastewater infrastructure functional, safe and in compliance with current and future regulations.

Technological Intervention in Water & Wastewater

Past few decades, information technology and digital innovation has improved substantially and taken over in different segments and water sector has also got its share of technological intervention. Digital technology, computer software and cloud–based business applications have matured over the last two decades. The adoption of such technology has enabled water companies and utilities with robust analytics, real time data, and cellular sensor

technologies for timely decision making and service improvement.

Traditional methods of wastewater treatment has become very challenging with identification of more contaminants, rapid population growth, increased industrial activities, and ever shrinking fresh water sources. The effectiveness of conventional process has become limited due to new challenges; increased knowledge about the water pollution and public demand for better quality water have enforced 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 smart treatment system for treating wastewater to complete reuse purposes to cater our requirements except drinking. Reuse of municipal and industrial wastewater and the recovery of potential 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 Resource

The innovations and ideas along with new technologies revolve around the simple wisdom, reuse of wastewater. That will result 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 exploring new ideas for wastewater reuse.

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 innovative approach to develop 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. A number of 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 (AVF) Technology

Automated Variable Filtration (AVF) technology is a state of the art technology used for wastewater treatment in which upward flow of influent is cleaned by 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 fresh water. The AVF process comprises two sets of media filters that can be operated in series or in 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 AVF 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 reuse of energy and minerals with a combination of Electro flocculation (Elflox) and Anaerobic Digestion technologies. Elflox treatment is based on 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 then fed to anaerobic reactor gets converted into Biogas which can be converted to Energy for captive utilization.

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 Connect

With about four decades of experience, SPML Infra has gained a strong foothold in the area of design and construction of wastewater treatment plants. It has adopted modern treatment techniques and provides solutions for proper treatment and disposal of municipal and industrial wastewater to ensure that the generated wastewater does not harm our delicate ecosystem and is recycled for further usage.

SPML Infra is optimistic of India's water and wastewater sector prospects and the company role within. Having executed more than 600 projects in areas ranging from drinking water, bulk water supply for irrigation, wastewater treatment, and sewerage network, SPML Infra is one of the World's Top 50 Private Water Companies as per Global Water Intelligence, London. With so many water and wastewater treatment projects executed and under different phases of execution, the company provides drinking water facilities to over 50 million Indian populations that speaks amply about the company's dedication to improving lives of our fellow citizens.

Way Forward

It is very clear that water can act as an engine for economic growth and social development, generate employment and improve sustainability of our planet. If properly planned, water should contribute to a better quality of life and standard of living of citizens. However, this is unlikely to happen without strong and sustained high–level political support. We need to ensure the future of water in terms of food, energy and environmental governance and ensuring water security through coordinated policies, which include water and natural resources management and water reuse.

These new wastewater treatment processes with resource recovery along with integration of urban water and waste management system is the only way to improve sustainability of our water resources. New wastewater treatment technologies can significantly reduce water abstraction from our already resource constrained cities. Reclaim water must be managed properly to maintain the integrity of the overall treatment system. The energy consumption in wastewater treatment plants requires active management to make the entire process efficient and cost–effective. There are newer technologies available to meet these challenges and to integrate them into better performing more sustainable system.

About the Author:
Mr. Subhash Sethi is Chairman of SPML Infra Limited, a company dealing in water infrastructure solutions for past four decades and executed over 600 projects in India. Mr. Sethi has received several prestigious awards including Economic Times Global Asian Business Leader Awards for his immense contributions towards infrastructure development in the country.

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