Partnering The Mission

By Trident Controls Pvt. Ltd.

It is a well known fact that the earth is over burdened with a lot of industries, agriculture and other activities, to meet the basic requirements of the growing population. And one of the key ingredients for human survival is water, which is drying up fast and making survival a challenge. Another key resource —land— is also shrinking. To meet the requirements of the existing population and the generations to come, these resources have to be carefully utilized.

Statistics reveal that more than 50% of the world and 70% of India is water stressed. The growing population needs more water, food and work to subsist. Hence, it is imperative to evolve and adopt strategies that not only save the resources for future requirements but also fulfil current needs.

97.5% of the total water available is saline, 1% of which is brackish; and out of the 2.5% of fresh water, two thirds is frozen and the remaining bit is available as surface and ground water. Desalination plants numbering 14,450 across the globe produce around 16 billion liters of water per day.

The practice of tapping ground water for drinking, farming and industrial use has risen and depleted the aquifer levels from 100 feet in 1950 to more than 600 feet presently. One out of eight people lack access to clean water, 3.3 million die due to water related health problems, millions of the world's poor live with just 25 liters of water where as the minimum stipulated by WHO is 140 litres per capita daily (lpcd). 46% of the people do not have piped water in their homes and women in developing countries still walk more than 3.5 kilometers to fetch water. In the next decade more than 2 billion people will live under the stress of severe water scarcity.

Water's traditional adversary is the waste generated by factories and farming; a study revealed that fish downstream of a sewage treatment plant have traces of diltiazem, norfluoxetine, carbamazepine and diphenhydramine, apart from antihistamines. The consumption of these fish endangers poses sever health problems.

Many rivers across the world are polluted and ground water samples drawn across the globe have shown traces of minerals, chemicals and pesticides —prohibiting the use of such water for human consumption.

Under these circumstances —since industrialization or farming cannot be discontinued— research and development of technologies that treat water completely and replenish the depleting ground water resources, is of foremost importance.

Ground Water Disaster

Samples of groundwater were collected from eight places in three states: Haryana, Gujarat and Andhra Pradesh, and tested for concentrations of some known pollutants. All samples had high levels of mercury, which caused the Minamata mercury poisoning disaster in Japan in the 1950s. One sample had more than 268 times the mercury level than is considered safe. Groundwater in industrial areas of India is unfit even for agricultural purposes.

It is only for the past five to six years that attention is being given to groundwater pollution. To begin with, 22 critical sites have been earmarked all over the country. The result is frightening, and it is believed that even more shocking results will come forth in the future. The primary reason for such extensive groundwater contamination is industrial pollution and excessive farming leading to agrochemical pollution of the groundwater.

In case of industries, it is due to discharging untreated effluents into rivers and streams that leads to groundwater pollution. Even if there is a facility for treating effluents, industries do not have proper drainage systems for treated effluents, which again leach into the ground. It may be noted that treated effluents also carry toxic content. The Gujarat belt is one such example, thousands of industrial units have been polluting the groundwater for years.

Similarly, excessive farming has also caused agrochemical pollution of the groundwater. Nitrates and DDT are two major hazardous chemicals that farming adds to groundwater. Besides this, there are natural pollutants, like fluoride and arsenic that contaminate the groundwater due to overexploitation. Delhi has a high level of fluorides due to overexploitation, while there is natural arsenic contamination in the groundwater of West Bengal.

Water Essentials & Reuse

The world is using water faster than it can store or produce it; hence to survive judicious use and understanding the need to conserve this commodity has to be of primary importance. In short, water needs to be saved, stored and reused. Conservation and reuse is now no longer an option, but a grim necessity. States have now resorted to legislation for enforcing water reuse laws, as municipalities are no longer able to adequately service the growing population's needs for water, especially in urban areas.

Need, Deficit & Mitigation Strategies

India has 16% of the world's population and 4% of the fresh water. Consequently, with growing population, India is soon going to be a water stressed country, so mitigation strategies have to be evolved and implemented before this crisis erupts.

The total availability of fresh water is estimated to be around 1,869 billion cubic meters; 40% of this is not available due to geological and topographical reasons, another 4,000 BCM (Billion Cubic Meters) of fresh water is available in the form of rain and snow, but most of it just drains into the sea.

According to the census of 1955 the per capita availability of fresh water was 5,300 cubic meters, which came down to 2,200 cubic meters in 1996, and by 2020 it is estimated to fall down to 1,600 cubic meters, which is less then the least basic need of 1,700 cubic meters.

According to the drinking water department's estimates, 700 million people live in 1,420,000 habitations spread over 15 diverse ecological regions as rural citizens. It has established water pumping and delivery mechanism in 1,270,000 habitations and 1,30,000 are partially covered, and 1,5,917 are not at all covered.

An estimated amount of Rs. 1,10,500 crores was spent till the end of 10th plan towards the establishment of the water supply mechanism in the habitations on a community level basis. If carefully analyzed around 42 lac rupees must have been spent per panchayat and 87,000 lac per habitation by the end of 10th plan.

Out of the total extracted water from the underground aquifers, 92% is for agriculture, 5% for industrial and 3% for domestic use. Out of the surface water sources, 89% is being drawn by agriculture, 2% for industrial and 9% for domestic use; hence it is very important to treat the water drawn, along with the wastewater being discharged into water bodies because this damages the whole ecological system.

Industrial Wastewater Treatment

Present Scenario

There are more than 2 lac industries emitting liquid waste discharge. These industries comprise of: paints, pharmaceuticals, bulk drugs, chemicals, textile, dyes and prints, tanneries, steel and paper industries. All these industries generate lacs of litres of wastewater comprising of TDS ranging between 5000 ppm to 25000 ppm and corresponding BOD and COD levels, apart from pH imbalance, which is detrimental to nature.

The communities and the government have begun putting stringent norms in place for emission control and it has become difficult for the industries to generate wastewater within permitted limits.

Existing Practices

All wastewater generating industries have either individual or common effluent treatment plants. The technologies taken up begin with ordinary filtration, oxygen infusion, multi filtration, ultra-filtration, bio-remediation, reverse osmosis and also forced evaporation.

These practices consume enormous amounts of electricity and still do not solve the problem in entirety. To understand the CAPEX (capital expenditure) and OPEX (operational expenditure) of an effluent treatment plant, let us review an existing facility. The capital cost of a common effluent treatment plant established by 25 textile units in Tirupur was

more than 200 crores and the monthly electricity charges were more than 15 lacs.

The system implemented was collection, equalization, chlorine dozing (to remove colors) and bio-remediation (to neutralize the pH because the wastewater becomes acidic after excessive chlorination). The water after bio-remediation was sent through the clarifier, and then processed through ultra-filtration. After ultra-filtration the water is processed through RO three times, to achieve 70% recovery rates, with lesser TDS the remaining water is sent to evaporation. The water collected with high residual impurities is kept in ponds for solar evaporation.

The practice turned out to be most up to date, with high cost inputs but little satisfaction. Of the total water treated, around 30% had high TDS. So in spite of huge investments and expenditure the treatment is not total. Sludge disposal and evaporation remain an unresolved issue in the process.

Present Costs

Each industry that generates more than fifty thousand liters of effluents has to establish its own treatment plant and this costs more than rupees fifty lacs. And the average costs of the plant depending on the technology for ordinary filtration with multi-layers is around Rs. 30 per liter as CAPEX, and for the most advanced technology will add upto more than Rs. 150 per liter as CAPEX.

The operation costs come to anywhere between rupees 1 to 2 lacs for a plant of fifty to hundred thousand liters capacity per day

Recover

The latest product from Trident treats effluent water with 'Mr Green' a unique bio- treatment method using POSEIDON/ POSEIDON-500 and aeration, using diffusing technology to reduce the TDS to permitted levels (by converting the TDS into TSS) and multi-layered filtration to control the TSS before being processed by micro-level filtration for the output water to be pH neutralized and TDS reduced.

Technology

Recover is the only technology which reduces TDS totally, up to the permitted levels and pH neutralizes as well, apart from addressing the issues of suspended solids. In most cases the recovered water has been purer than the source water.

It is not a new practice to use bacterial dosage in effluent treatment, industries have been using coliform bacteria to address the issues of COD, and aerobic dosage is practised to address iron removal in underground water.

The Trident Technology team has developed a new microbe, which is a gram-positive endospore that is rod shaped and probiotic in nature, as it has been especially designed with specific plant material fermentation. The plant material has been judged to be efficient in addressing the issues of water cleansing. The microbe has been developed with a combination of multiple plant materials fermented together under a specific process, rather than identifying and isolating an existing bacterum.

The microbes are added into the effluent water under specific percentages and provided aeration. It was noted that after aeration and filtration through reverse flow method, all the suspended solids at the bottom of the tank could be collected. The TDS absorbed by the microbial treatment was converted into suspended solids for removal by filtration.

Recover adds on the ultra-violet purification process wherever the water is re-used for the process, to enable negative bacterial content addition during the process. Recover consumes very little amount of electricity because power is only required for aeration and ultra-violet radiation that can also be replaced by solar-radiation.

Since *Recover* does not use any RO, ultra-filtration or evaporation the power consumption is very little. The biological treatment effectively reduces the TDS and almost the total amount of water is recovered for re-use, thus reducing the burden of daily water requirement for industrial processes.

About The Article

This article has been contributed by Trident Controls Pvt. Ltd. Trident has developed many path breaking, innovative technologies to bridge the gap between rural and semi urban India. The Company develops customized rehabilitation and re-settlement plans for large industrial projects keeping in view the needs and aspirations of the affected people.