

ExpertSpeak

Oxygenation, Bioremediation set to play significant role in water treatment

Anil Attavar, Director, Way 2 India, feels that as India moves ahead on its plans on urbanisation, water treatment will be a key concern. The country is grappling with the problems encountered in maintaining, preserving and nurturing water bodies that are under the onslaught of urbanization and industrialization in the cause of economic growth. In this regard, oxygenation and bioremediation can play an important role in mitigating these problems.

A country can afford to neglect its water sources only at its own peril. The overall scenario in Indian water sector demands state of the art wastewater treatment technology, achieving best results with ease of operation, economy and safety. Water, one of the most important substances on earth, sustains life. Natural resources like rivers, lakes, tanks, ponds and such other water bodies play a significant role in our lives. The burgeoning population of our country is increasing pressure on the environment – water in particular - and the primary concern is to conserve and preserve, in good condition, this most precious natural resource. Rapid urbanization is creating tremendous stress on existing infrastructure. India is in dire need of water management, with 17% world population against 4% water availability. Increase in water treatment facilities using efficient water treatment technology is the only option. Most of the water bodies in our cities and towns are in a state of neglect (see photographs). Many water bodies which were flourishing - and attracted people a few decades ago - are in despicable condition, shunned by general public - and are causing health and hygiene problems resulting in several diseases and ailments.

Oxygenation and Bioremediation

It is in this backdrop that oxygenation and bioremediation can prove to be an effective method to treat and preserve water

stagnating in lakes, tanks, ponds and other such countless water bodies in our cities, towns and villages.

The technology has been accepted and shortlisted by National Mission for Clean Ganga, for its Namami Gange project. This technology is all set to play a significant role in water treatment, as the country's water experts grapple with the problems encountered in maintaining, preserving and nurturing water bodies that are under the onslaught of urbanization and industrialization in the cause of economic growth. While the aerator alone would need to be imported (being patented), all other components of the system would be procured locally, to maximize indigenization and give a fillip to the Government of India's 'Make in India' initiative.

Rapid urbanization is creating tremendous stress on existing infrastructure



Anil Attavar, Director, Way 2 India

The treatment involves oxygenation or bioremediation, or a combination of both, depending on the quality of the water to be treated. The primary application in the treatment of wastewater is achieving 100% DO (Dissolved Oxygen). By achieving this, the BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand) are reduced, enabling the slurry's microbes and solids to exist in a balanced atmosphere resulting in a neutral effluent.

One of the most significant contributors to quality of life is air that does not stink, and the SAR reactor can achieve this with minimum fuss. The process of treatment is simple. The stagnant water is treated by aeration, in which nano bubbles carry oxygen to the water, achieving full aeration in one pass through the unit. Given the simplicity of the equipment, very little operator training is required. Fish can thrive and foul odours are removed, eliminating negative community impact. The operation can if required,



Dead Fish at Ulsoor Lake, Bengaluru

be monitored remotely, using wireless communication systems.

The equipment comprises broadly, an aerator, a pump and a blower, apart from an electrical panel, switches and interlocks. Efficiency of aeration depends on bubble size and consistency. Smaller the bubbles, more efficient the transfer of oxygen. Nano and micro size bubbles are produced consistently, and much more efficiently than traditional aeration devices. Traditional aeration devices like fountains, sprays and sprinklers are grossly inefficient due to the large particlesize, having a small surface area, leading to less absorption of oxygen. Moreover, the droplets of water fall locally in the immediate vicinity of the fountain or the spray, and homogenous oxygenation is not

The advantages to the user are manifold. The equipment requires very little maintenance, as there are no moving parts, adding to the safety of the operating personnel, during operation. Constructed with stainless steel and high density polyurethane, possibility of corrosion, abrasion and contamination do not exist. The simplicity of the equipment leads to requirement of very little operator training



A picture of neglect

achieved. Additionally, the power consumption is very high as more power is required to throw water into the air than the other way round. In SAR aerator, the aerator internally disperses air immediately, reaching up to 130% of oxygenation through nano and microbubble contact with the water in the SAR Aerator. Full aeration is achieved in one pass through the SAR Unit.

The aerator achieves high throughput as the water is fully aerated, passing through the aerator in fractions of a second. The process requires very low input pressures of water and air while achieving high throughput capacity. Immediate and consistent oxygenation of the entire water mass is achieved while being distributed throughout the water mass. The small size of the aerator requires minimum footprint and the equipment can be very easily retrofitted.

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The technology also finds application in Bio-Remediation. Pollution has been occurring in nature since the beginning of time, and nature, has, in the past, been able to mitigate pollution's detrimental effects by producing an offsetting set of circumstances so as to naturally control the pollution. A "babbling brook" undergoes natural



A SAR 100 GPM Aerator



Before: (using a traditional venture aerator)



After: (using SAR Aerator after 30 days of operation)

bioremediation. The “babbling” occurs when small waterfalls, stones or any obstruction in the flow break up the water into droplets exposing the water surface to air. These droplets absorb oxygen from the air. Microorganisms (bacteria) of all kinds live in the water. They need oxygen to live. As long as the brook is babbling, the water is being oxygenated, and the bugs can live. These bugs eat the pollutants in the water. Without such babbling or movement of water, the oxygen is not replenished. Without oxygen the bugs die and the pollutants build up, creating a high BOD (Biological Oxygen Demand) which results in stagnation and odour, and contaminating drinking water sources.

For the first time, by using this technology, large volumes of water can be bio-remediated. 10 EBRs, which fit into

a 10 foot by 10 foot space can oxygenate, add bacteria and nutrients, to 20,000 gallons of water per minute. Applications for this technology are endless as bacteria “eat” all sorts of pollution.

Installation of the aerator requires no special skills other than a qualified electrician. Each unit comes skid mounted with an electrical panel containing all the relevant breakers, switches and communication devices. The assembly requires no special skills. Since there are no moving parts to the aerator itself, service is extremely easy. The only service required for the aerator itself is occasional cleaning of the internal liner. This requires removal of the liner, replacing it with a clean one and putting the unit back into use. This operation takes approximately 15 minutes. If continuous operation is required, a second liner should be on hand for immediate

replacement. The stainless steel liners are cleaned periodically, and if not physically abused, have lasted over nine years of continuous use.

Case study - Calgary Airport

Several case studies are available, prominent being the Calgary Airport case where ethylene glycol, used for de-icing aircraft during cold weather, was accumulated in a pond upwind of the main terminal, causing the pond to become anaerobic in spring, emanating foul odours. Removal of ethylene glycol entails very expensive chemical and mechanical methods like ozone treatment and distillation. It was therefore necessary to introduce a bacterium which secreted surfactants in order to produce a froth cap on the pond. An “oil eating” bacteria was introduced into the liquid flow of the aerator through a dosing pump, and a froth cap was produced. The odour emitting from the pond was eliminated. The froth cap covered the entire oil slick. When the froth cap was pushed aside where the oil slick had been, there was no longer an oil slick. Professors of Biology at the University of Calgary concurred that the oxygenation of the froth cap would greatly enhance bioremediation, as the largest inhibitor to aerobic bacteria bioremediation is – simply - lack of oxygen.

Thus, SAR aeration, in conjunction with aerobic bacteria addition, results in consumption of organic compounds by forming a froth cap, which is the most effective method of distributing bioremediation bacteria on bodies of water.

This technology has also been extremely useful in addressing odour problems in mushroom farms, resulting in the added advantage of huge savings in power costs, due to reduced power consumption. Apart from thousands of dollars saved in power, millions of dollars would have been spent had the mushroom company been forced to relocate due to negative community impact caused by its activities. ➤

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