

Bio-Augmentation: A Fantabulous Technology in Waste Water Treatment

Maulin P Shah*

Industrial Waste Water Research Lab, Division of Applied and Environmental Microbiology, Enviro Technology Limited, India

Short Communication

Biological additives (the process of adding selected strains/mixed culture in a reactor for wastewater treatment, in order to increase the catabolism of certain compounds, such refractory organic or total COD/BOD/NH₄-N) is a promising method for solving practical problems in the installation of industrial wastewater plant treatment or waste water treatment, as well as to improve the efficiency of removal. The potential of these options can now be enhanced in order to take advantage of significant progress in the field of microbial ecology, molecular biology, immobilization techniques and advanced bioreactor design. The goal was to increase includes goals, such as: 1) increase the density of desirable bacteria, 2) achieves certain operating target, such as the breakdown of multifaceted organic compounds, 3) increases the overall organic removal and 4) recovering from a twisted in a biological system for processing. Many operators of industrial waste water in particular are faced with difficult business conditions and the stringent discharge permits that defy the ability of their wastewater treatment. Under these conditions bio augmentation can be money-spinning, interim or medium-term solution to maintain compliance of effluent to change the system and/or plant upgrades can be carried out. In other cases, bio augmentation can be time-consuming, cost-effective solution for the lack of capital assets and the cost of upgrading a system that often requires the spread of biological purification procedure including the expensive installation of supplementary aeration (oxygen production) capacity. In the aerobic biological treatment systems facultative aerobic bacteria uses oxygen decomposition (oxidation) of organic compounds. (NO) concentration, pH, mixed liquor suspended solids, dissolved oxygen (MLSS) concentration, sludge age (MCRT), food for microorganisms (F:M) ratio and the level of nutrients (nitrogen and phosphorus) are some of the serious parameters that conclude successful process of biological systems. Traditionally, the method control is focused on the monitoring and control of these parameters with a little awareness, a casual glance behind MLSS under a microscope, because of the nature and composition of microorganisms.

The microorganisms (or biomass) in the biological reactor workers in the system for waste water treatment. Biomass is still in turmoil, with different micro-organisms are dying while others are growing and becoming more and more dominant. Under unpleasant or traumatic environment, such as toxicity, variable pH, low DO, excessive load COD and high (or low) temperature wastewater, precise bacterial populations can be reduced or eliminated, causing poor effluent quality. Under these stressful conditions biological systems can be very slow to recover. In the United States, the National Pollution Discharge Elimination System (NPDES) permit violated or manufacturing/production stopped to avoid the legal consequences of violations of NPDES permits. Bio augmentation is designed to address the problem of slow recovery of biomass and amendments reduced or lost bacterial population. The prevailing belief is that, over time, lasting, effective fully customize ideal microorganisms will fill the system with activated sludge. This approach assumes that the indigenous or existing bacterial population is introduced via routes such as windblown solid, rainwater and the plant influent stream will always contain the best, most optimized microorganisms. In reality, although the natural microorganism population can develop in an acceptable

performance of biomass, there may be restrictions on equipment that can be overcome only through the introduction of superior strains of specially cultivated microorganisms. In the biological reactor (aeration tank, bioreactor, biological reactor) industrial sewage treatment plant can expect to find numerous strains of bacteria. This bacterial diversity is required, because some types of bacteria break down the various compounds more efficiently than others. These bacteria are generally well suited for the treatment of pollutants in waste water, and to adapt, over time, to ensure a sufficient degree of processing, assuming that to achieve steady state drive. But few, if any, industrial wastewater systems ever achieve stationary conditions. The nature and composition of industrial waste streams often change. Variations in the composition of waste water can be due to changes in production plans, chemical spills in the production plant or mechanical problems with the equipment. Because of the diversity, many industrial systems for facilities for wastewater treatment have a biological population that is not the optimal number or requires bacterial diversity. In these situations was Increase becomes a valuable tool that can be used by operators of wastewater in order to improve the efficiency of the biological treatment system. The Increasing use of selected microbial strains (grown bacteria), which are isolated from the environment to improve or increase the effort of biological systems for waste water. The increase in bio film, cultured bacteria used to improve performance of existing microbial populations with bacteria that have larger and more robust, skills. Cultured bacteria isolated from environmental samples were selected by conventional techniques enrichment. Grown bacteria grown on nutrient-rich medium containing a specific organic chemical as a sole source of carbon and energy or as a sole source of nitrogen (on bacteria grown initiate or improve nitrification). Bacteria that can handle relatively high concentrations of target chemicals selected. The selected bacterial species grown in large fomenters, and then concentrated in a centrifuge. The bacteria are then preserved by drying. Bacteria are competent to endure extreme environmental conditions, including organic overload, complex, refractory or difficult to access degrade organic, swings in the temperature of waste water, pH extremes, low levels of oxygen dissolved, limited nutrients and direct toxicity. Although bio augmentation may appear to be a perfect solution to contaminated soil, it can have its drawbacks. For example, the wrong type of bacteria can result in potentially clogged aquifers, or the remediation result may be incomplete or unsatisfactory [1].

Typical bio augmentation products consist of a mixture of several strains of microorganisms, usually bacteria or fungi. The microorganisms

*Corresponding author: Maulin P Shah, Industrial Waste Water Research Lab, Division of Applied and Environmental Microbiology, Enviro Technology Limited, India, Tel: +91-9099965504; E-mail: shahmp@beil.co.in

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are isolated from nature and are not genetically modified in any way. They were selected on the basis of rapid reproduction rates and their ability to perform certain functions, such as a good opportunity JIB-design in order to improve compliance in the clarifier or ability to degrade certain compounds. The products are sold in different forms, with a dry micro-organism in the bran carrier and liquid products, which are the two most common. Cultured bacteria grown to degrade heavy, complex, biodegradable substances. Bred bacteria and their enzyme systems are effective in degrading greater choice of substrate (measured by chemical oxygen demand or COD, five days biochemical oxygen demand or BOD 5 and/or total organic carbon or TOC) common bacteria activated sludge, bacteria are cultured unique skills that will enable them to survive and stay active in the severe environmental and operating conditions, which are not submitted, as well as other bacteria. Cultured bacteria can efficiently degrade rapidly degrade the COD (chemical oxygen demand) and COD difficult to degrade. Adult bacteria can more effectively compete for available nutrients and dissolved oxygen in the waste water from existing or indigenous bacterial populations and fibrous microorganisms. Perhaps more importantly, bio-reduction products can be used to treat a variety of toxic waste. Examples of industrial waste containing toxic or inhibitors can be treated by a cascade of increasing products include synthetic and naturally occurring organic chemicals and compounds, such as acetone, acrylic acid, ammonia, nitrite, furfural, phenol compounds and methyl ethylamine, name only a few. Many devices for the treatment of waste water have to deal with the increased flows and loads and more complex waste streams, marking and exceed the capacity of a biological system. It can cost millions in capital to upgrade and expand the system. By increasing the number of Microbiology and diversity of the microbial population through bio augmentation, significant improvements in the reduction of COD can be achieved. An important step in biological wastewater treatment is to remove solids, usually by sedimentation MLSS in the secondary clarifier. Bacteria make, and secrete, natural biopolymers (adhesive polysaccharides) which help in solving the formation of larger, denser, flock particles. Too inhibitory compounds, too much food (COD) or directly toxic shocks biological system will result in bacterial populations with little secretion of biopolymers, widespread formation of herds and bad qualities of the village. The efficacy of addition of the organic polymer or inorganic coagulant such deposition aids are often reduced when the stress due to the congestion of the bacterial population (excessive COD) and/or the presence of inhibitory compounds. System inoculation of microorganisms are known to be resistant to the formation of an excellent toxicity and herds, the polymer may be required to reduce, and its effectiveness in helping to solve the sediment remains high. By adding selected bacteria, low levels of a certain compound can be obtained from the sludge biological treatment systems, which cannot be indigenous or existing microbial populations. Many industrial plants waste water have difficulty in achieving nitrification because of design limitations, stressful conditions such as variable pH, inhibit or toxic shock. Regularly adding nitrifying bacteria, appropriate bacterial population necessary to remove the ammonia can be maintained. Other areas where bio increasing be useful to include a reduction in removing odors, oils and fats, start-up fast system and improved tolerance to toxic shock. There are several different approaches that can be taken in implementing the program was reinforcing. Bioaugmentation could be used as a tool for the removal of unwanted compounds that are not properly removed by conventional biological treatment system. When bioaugmentation is combined with A1-A2-O system for the treatment of coke plant wastewater it is very powerful [2].

Some plants wastewater simply add one pound of insects living in their biological reactor and will, based on the experience of operators, increase the amount of (5, 10 or more pounds per day), if there is a significant increase in the COD of waste water when there is no corresponding reduction in the concentration mixed liquor suspended solids (MLSS) or biological reactor to reduce the residence time. Daily Appendix reduction was base products "maintenance" doses used for healthy biological system, regardless of the variations in the waste water to be treated. When it was before was increasing, more formal or mathematical approach can be taken in response to the correction of biological (activated sludge) system works poorly. In this case, the bacterial culture is added in a treatment unit (in the aeration tanks, bioreactors, fermenters, etc.), higher dose followed by a lower dose which may be maintained until the effluent quality improved. If used introductory dose is typically ≥ 2 ppm to 4 ppm or more, and may be administered for 2-4 days before the dosing speed reduction. In most cases, the dosage is about ≤ 2 ppm and can be administered daily, weekly or as required. Two approaches are presented to calculate the dosing rate was amplification. The first method is conventional, simple approach, which is based on the use of the flow of the effluent of the biological system. Another approach is based on the addition amount of biomass is already in use bioreactor volume of the bioreactor (aeration tank) as the basis for determining the amount of insects added. These calculations are applicable to all aerobic biological treatment systems. Some additional time will be spent here detailed calculations of the dose rate, because there is little information available on how to do it. Surprisingly, even the makers of cultured bacteria provide little insight on the use of its biological products increase. With the implementation of the program was reinforcement cannot overdose, no matter how you add bugs. Instead, the more bugs you add, the sooner you will see the positive, good results in the quality of the effluent. The primary problem with the price of a drug overdose. It was not cheap to increase efforts to control costs is always a concern. A secondary problem is that it was increasing overdose usually results in the need for increasing the conditions consumes sludge in a bioreactor and to improve COD removal increases. Increasing loss of sludge and is associated with increasing sludge disposal is another increase in the cost of the treatment plant. Although you cannot accurately tailor a microbe for each environment, with a lot of research, many microbes can be identified as having the ability to survive in certain communities [3].

Efficiency bio augmentation program can be determined by the following procedures of supervision and control

1. Follow concentration of mixed liquor suspended particles (MLSS) per day, more preferably the mixed liquor volatile suspended solids (MLVSS) concentration in order to better show the change in the quantity of microorganisms in the bioreactor.
2. Performing a "general" microscopic analysis every few days to observe changes in the microorganisms in the MLSS.
3. Measure the inlet and outlet of the CCP from the bioreactor and calculate the percent removal of looking for a permanent increase in rates of removal of COD. Measure the total suspended solids (TSS) and/or turbidity of the supernatant into a settled MLSS sample, after 30 minutes of settling time, and monitor the progress of this value. Based on the volume of settled sludge in a sample MLSS to the usual 30 min using 1 L settleometer, calculate the sludge volume index (SVI) as shown in Equation 3. In order to fit best on the highest quality of turbidity in the clarifier overflow we are looking for Sludge Volume Index ≤ 150 ml/g.

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