



New Generation of Bio-Augmentation Products for Wastewater Treatment

Novel multi use micro organisms

Advanced/BIO Products

Improve Wastewater Treatment Plant Performance, Increase Plant Stability Reduction & Control of Specific Treatment Problems. Bulking, Shock loading etc Quickly and Economically

What is *Advanced/BIO* ?

Advanced/BIO is a new range of biological wastewater treatment products that contain both Bacteria and "extremophile" microorganisms. Archaea are a diverse group of single-cell, microscopic organisms that have no nucleus and other membrane-bound organelles. They are NOT Bacteria! they are found everywhere in Nature, in soil, fecal waste, wetlands, surface water, and enter treatment processes through fecal waste and inflow and infiltration. Unfortunately, the relatively small population size of halophilic/extremophile blends in the biomass does not permit the organisms to significantly influence treatment performance. Only about 0.1 % of the biomass consists of halophilic/extremophiles. We have spent the last 3 years developing new growing processes to provide highly concentrated amounts of ***Advanced/BIO*** Product Blends.

Extremophiles have several unique features that differ from bacteria. These features include enzyme systems that can degrade organic compounds that bacteria cannot degrade including the degradation of wastes produced by bacteria, higher metabolic rates that provide for more rapid degradation of organic wastes, and unique structural features that permit the extremophiles which makes them able to tolerate extremes in temperature, pH, and salinity. These differences compared to bacteria make is valuable new tool for use in Wastewater Treatment.

Advanced/BIO unique Bacteria/extremophile products have been developed to address specific problems faced by Wastewater treatment plants on a daily basis. They can solve a wide range of problems through ****bio-augmentation*** and significantly enhance plant performance and increase plant stability management.

What Can Extremophiles Do in Wastewater Treatments

Microorganisms can significantly improve and boost treatment plant performance but only when they are present in significant quantities which is now possible through the range of proven **Advanced/BIO** products. These products containing halophilic/autotrophic as well as bacteria are added to treatment processes to increase their desired population size in order to improve treatment performance, increase plant stability, and eliminate specific treatment problems quickly and economically.

Advanced/BIO Products are available to treat the following problems or enhance plant performance:

1. **Advanced/BIO AD** Anaerobic digester biogas enhancement
2. **Advanced/BIO AB** Enhanced BOD and COD removal
3. **Advanced/BIO GF** Fats, oils, and grease (FOG) removal
4. **Advanced BIO HD** Hydrocarbon removal
5. **Advanced/BIO OC/S** Odour prevention and control
6. **Advanced/BIO HN** Pure extremophile blend NH₄/NH₃,NO₃ removal
7. **Advanced/BIO BF** Seeding of bio filters for VOC,H₂s NH₄/NH₃,NO₃
8. **Advanced/BIO AAL** Hard COD removal

The Science Behind halophilic organisms, thermophilic organisms.

There are two major kingdoms, Crenarchaeota and Euarchoeota that are capable of performing significant roles in the degradation of organic wastes, when they are present in adequate numbers. Significant halophilic in the kingdom Crenarchaeota include thermophilic organisms, acidophilic organisms, and ammonia-oxidizing extremophiles/halophilic (AOA). The kingdom Euarchoeota include halophilic organisms, thermophilic organisms. All perform significant roles in the sulfur cycle. Their novel sulfur-utilizing enzyme systems can oxidize and reduce various forms of sulfur under aerobic and anaerobic conditions. An example of a role that halophilic microorganisms perform in wastewater treatment is the oxidation of sulfide (HS⁻) to elemental sulfur (S₀). This oxidation provides odor control by preventing the production of hydrogen sulfide (H₂S) odor and its release to the atmosphere. They also metabolize Ammonia directly and aids in Nutrient Reduction. The microorganisms form a syntrophic relationship with both nitrifiers and denitrifiers, enhancing robustness. The Difference is that they metabolize Ammonia directly without producing Nitrite at low carbon levels, indicating direct reaction of ammonia and nitrate to yield nitrogen gas plus water.

The product will be offered in liquid form 1 liter super concentrate and is sufficient for plants aeration capacity from 1000-1500 m³ just pour directly into each aeration zone.

***Bio-Augmentation** is the addition of microbial cultures to a wastewater treatment facility (plant or sewer system) to achieve a specific goal in order to reduce operational costs, achieve permit compliance, or correct an operational problem. Most bio-augmentation products only include bacteria but **Advanced/BIO** Products also contain extremophile microorganisms. Bio-augmentation increases the number of saprophytic (BOD-removing bacteria)

and nitrifying organisms in a treatment facility to a level where their enzymatic activity can be observed as an improvement in treatment performance. It requires the selection of appropriate organisms (genera and number) to be added as well as a proper addition point for the organisms. Selected cultures must be added to an operational condition that is favorable for their growth that is, an adjustment in one or more parameters such as pH or dissolved oxygen may need to be made.

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