



Bioaugmentation – Supplementing Biological Products to a Wastewater System

Adding bacterial supplements can significantly help when the plant may be over designed, under designed, having a hard time meeting permits, solids handling costs are too high, or there is grease from lift stations causing problems. Foaming or filaments problems can also be alleviated. Some benefits of adding bioaugmentation may be rapid building of a biomass during a system start-up, recovery from an upset or toxic shock, reseeded after chlorination for filamentous control, reseeded after hydraulic washout, or enhancing performance in once-through systems via ongoing supplemental inoculation.

Some programs may include ongoing biomass population enhancement of activated sludge in order to meet permit restrictions such as BOD or TSS. Solids Reduction and handling costs are also a growing area that are constantly in need of address even when the plant is running fine on other variables. These are areas where bioaugmentation can be used for short periods of time until process changes can be implemented long term to solve the problems.

Our MicroClear® and MicroSolv™ products are high potency, bacteria-laden, powdered formulation for use in degrading many types of waste. MicroClear® and MicroSolv™ contain a specially formulated blend of microorganisms, micro/macronutrients, and surface tension suppressants/penetrants. Because of the diversity of the microorganisms and enzyme systems, incorporated into this product, it is excellent for use in *Wastewater applications*. The safe, naturally occurring bacteria are present in high numbers to handle difficult municipal wastewater problems. Degrades FOG and enhances BOD/COD removal. Works well to supplement your existing biomass.

Here are a few quick and easy things to remember no matter where you purchase products from:

Bacteria are not cannibals - bacteria do not eat each other - and technically they will not eat old sludge and completely make it go away. There is a law of matter involved - for every pound of BOD - X amount of lbs. of Biosolids will be created. The ratios may change depending upon the type of industry you are in or your plant process, but these can be used as a quick rule of thumb.

BOD: Sludge Ratios

Basic Steel (coke):	1.0:0.15
Petroleum Refining	1.0:0.35
Chemical Process	1.0:0.35
Sanitary (Municipal)	1.0:0.3-0.5
Pulp & Paper	1.0:0.5
Brewing	1.0:0.6
Food Processing	1.0:0.7

You can use bacteria in an old sludge lagoon to reduce solids build up, but it is more a matter of old leftover organic material that has built up and by using selected bacterial products, you can reduce some of the solids to avoid dredging as often. Sooner or later though, all lagoons will need to be dredged. There will be some solids accumulation.

No matter which bacteria you use, whether you depend on the indigenous bacteria already in your system, or use liquid or dry cultures from a supplier, **all bacteria require** a minimum amount of steady conditions we call

“The Critical 5 plus One”. **Bacteria are not Superbugs - they all need these conditions monitored or they will not work correctly.**



Environmental Parameters for Biological Activity Including:

PARAMETER	ACCEPTABLE	OPTIMUM
Dissolved Oxygen	>0.5 mg/l	1.0 - 2.0 mg/l
Temperature	50 - 95° F	77 - 95 ° F
pH	7.0 - 9.0	7.5 - 8.5
Ammonia Residual	1.0 - 3.0 mg/l	2.0 - 3.0 mg/l
Ortho-phosphate Residual	0.5 - 2.0 mg/l	1.0 - 2.0 mg/l

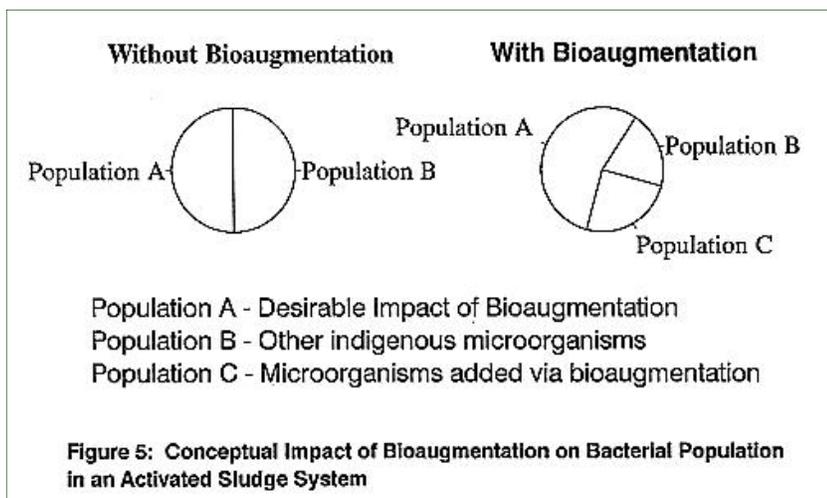
- Residual should be measured in the final effluent.

**Alkalinity is the plus one and is only applicable where nitrification is required.

Bacteria can come in many different sizes, shapes or formulations. There may be dry formulations, liquid, cubes or blocks. The reason they are made in different formulations is usually just for ease of application. General rule of thumb, dry products are almost always more concentrated and you get more of the bacterial formulation for your money instead of paying for liquid carrier. You must consider handling concerns and application though when choosing a product. Be careful about biological counts. Numbers are not as important as species type - check out our handouts on evaluation of biological products. Environmental Leverages line up below.



Application of bacteria can significantly improve many systems. Although many believe that there already are bacteria present in a system, so why should you supplement with more bacteria when you can grow your own? That may be true, there are bacteria in a system, but are they the right type and are they sufficiently achieving what your plant needs to accomplish? If your plant is currently meeting BOD and TSS permits, solids handling is not a problem, there are not filaments or foaming and everything is running the best it possibly can, then no bioaugmentation is needed.



There is a saying, if it isn't broken, don't fix it. We agree. The only reason to add bacterial supplements is when the plant may be over designed, under designed, having a hard time meeting permits, solids handling costs are too high, grease from lift stations is causing problems, Foaming or filaments are a problem. There has to be a need and a problem that might benefit from the bacteria in order to justify the cost of supplementing a system. If significant returns on investment can be achieved, then bioaugmentation should definitely be looked into.

Applications of biological products - **Biological products are used for many different reasons.**

Some of these may be rapid building of a biomass during a system start-up, recovery from an upset or toxic shock, reseeded after chlorination for filamentous control, reseeded after hydraulic washout,

Some may use products for enhancing performance in once-through systems via ongoing supplemental inoculation.

Some areas may include ongoing population enhancement of activated sludge in order to meet permit restrictions such as BOD or TSS. Solids Reduction and handling costs is a growing area that is constantly in need of address even when the plant is running fine on other variables. Filamentous control, foaming, grease reduction are areas where bioaugmentation can be used for short periods of time until process changes can be implemented long term to solve the problems. Under- designed plants or older plants where new growth in a community is faster than building new plants are often applications where biological products are used for only a period of time. Some plants only use biological products during the winter (colder) months when activity of the biomass slows down due to temperature drops (biological activity can drop one log growth for each 10 degrees). Many food or industrial plants that have pretreatment permits use biological permits to lower their surcharges. There are many applications for use of biological products. Make sure the cost justifies the return.

Why use biological products when there is always a plant down the street that I can just go borrow sludge from? The biosolids from a plant are **not free**- the cost of trucking and handling sometimes are more than the cost of prepared biological cultures. There are no pathogens, filaments, zoogea, tetrads, inorganic debris or other variables that might be present in sludge from a neighboring plant. With commercial cultures, the products are highly concentrated, stable, and can actually be "grown up" prior to application, which greatly enhances the cost-effectiveness.

You cannot buy "higher Life forms" These are indicator organisms. They show up in a system and disappear according to the health and age of the biomass. The bacteria in the system perform 98% of all BOD removal; not the little critters that people often assume are working in the system. See attached sheet on higher life forms evaluation.

There are many things to consider when determining biological applications - cost, ease of application, benefits, safety, environmental impacts, permit restrictions, etc. Bacterial products are not black magic; they can be easily applied and can significantly improve many situations. Just be sure to check all the variables and don't be afraid to investigate and do some homework! It really is quite easy and they are very efficient if treated properly.

Email us at: Elfenvironmental@aol.com

Lots of information on our website www.EnvironmentalLeverage.com

Online Wastewater Training – Visit www.WastewaterELearning.com.

Custom formulations can be developed to fit your specific needs. Programs are always developed and customized to your situation.

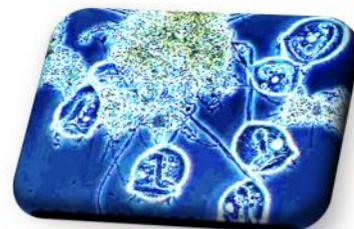
Excel based dosing Wizard included for all programs. Nutrient dosing wizard available.

Programs include technical support, computer based training. Long term programs include periodic Wastewater Biomass Analyses of your system.

Consultant, Training, Audits, Troubleshooting & Sales: Call 630-906-9791 or fax 630-906-9792
Long term programs include training, process recommendations and periodic lab analyses.



Turning Liabilities Into Leverage!





EnvironmentalLeverage.com

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BIOLOGICAL WASTEWATER TREATMENT PRODUCTS

Environmental Leverage® Inc. carries a full line of biological products, made at our own, in house, manufacturing facility in Batavia, IL. Water Soluble Pouches, Powder, Liquid or Solids in various different containers and numerous sizes specifically designed to fit your needs. Each product is specifically formulated for each task. Ask for individual product bulletins for the product that meets your needs. Environmental Leverage helps you with product dosing & program requirements, through your application of our products.



MicroClear® 101...Ponds, Lakes or Rivers...Formulated for lagoons, equipment system tanks, Canals & ornamental ponds that often have problems with excess algae growth. Specifically formulated to reduce the nutrients feeding the algae.

MicroClear® 105...Anaerobic - Formulated to help increase biological activity and gas production in Anaerobic reactors.

MicroClear® 201 Wastewater Treatment - Biological product specifically formulated to be effective in enhancing municipal / general wastewater. Activated Sludge, Lagoons, Aeration basins, Fixed film systems RBC's, oxidation ditch & trickling filters. Reduces BOD & TSS.

MicroClear® 207...Waste Water Treatment & Sewer formulation FOG control...Improved biological product, specifically formulated and packaged for use in treatment plants, lift stations & sewers to help degrade grease build-up and stop blockage. Highly concentrated.

MicroSolv™ 202... Landfill Leachate Biological product specifically formulated to be effective in enhancing Industrial wastewater biology in Activated Sludge, lagoons, Aeration basins as well as numerous industrial treatment systems.

MicroClear® Algae...Ability to breakdown excess waste material in ponds and reduce the amount of available phosphorous causing a reduction in the algal population. Naturally occurring cultures efficiently digest pond bottom materials and reduce the organic matter in the water column leading to cleaner water and higher oxygen levels.



MicroSolv™ 600L... **Fastest acting nitrifying bacteria available!** Reduces ammonia quickly! This product contains NitroSomonas sp. as well as Nitrobacter sp. Ships overnight, keep cold in refrigerator till use.

MicroBlock™ Solid Slow Release bio block products that are specifically formulated and packaged for use in lift stations, large restaurant grease traps, portable outhouse, collection tanks and upstream areas from wastewater systems.

Steel Mills MicroSolv™ 410...Highly improved biological product, specifically formulated & packaged for use in Steel mills to help with hard to degrade compounds. The bacteria are able to degrade rolling oils & are able to multiply & metabolize in the presence of certain heavy metals.

MicroClear® 205 Food w/High Grease formulation...Powdered product that was developed for use in the biological wastewater treatment of food based greases, fats and oils. This product helps digest the fats, oils & grease that can cause problems with foaming & filamentous bacteria.

MicroClear® BODeliminator™ - Liquid formulation is specially formulated for direct addition to WWTPs, Lagoons, drains and grease traps to eliminate BOD and TSS complications. Used anywhere liquid distribution systems.



MicroClear® 207 - Lift Station / FOG Control Used for softening and degrading food type fat, oil and grease in lift stations but can also be used in lagoon systems & WWTP's.

MicroSolv™ 200 Industrial - Formulation for use in degrading many types of organics in Industrial Wastewater Applications. Specially formulated blend of microorganisms, micro/macronutrients, and surface tension suppressants/penetrants. These safe, naturally occurring bacteria are designed to handle difficult organics and hard to degrade chemicals found in industrial wastewater facilities.

MicroClear® 207 Odor & FOG Control - is a proprietary formulation of ingredients containing a nitrate-based Electron Acceptor for Control of Odors. Contains a specially formulated, proprietary blend of microorganisms, micro/macronutrients, and surface tension suppressants/penetrants. Because of the diversity of the microorganism systems incorporated into this product it is specifically developed for use in situations where there is a particular high impact from odors as well as fats, oils and grease.
This product can be used in the treatment of liquid & solid organic waste.

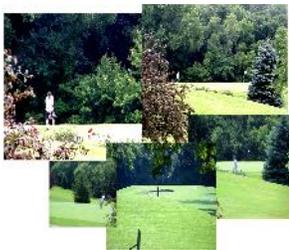


MicroClear® 206...High potency, bacteria-laden, powdered formulation for use in for Beverage, Fruit, Brewery & Winery applications. BOD removal and TSS reduction for a cleaner effluent / grey water reuse and land application.

MicroSolv™ 400 PetroChemical & Refinery...Improved biological product, specifically formulated and packaged for use in Refineries and Chemical plants to help with hard to degrade compounds. The bacteria are extremely resistant to toxic effects of the chemical pollutant fraction and are able to multiply and metabolize in the presence of certain heavy metals.

MicroSolv™ 118 Pulp and Paper mill...Improved biological product, specifically formulated & packaged for use in Pulp and Papermills to help with hard to degrade compounds. Because of the diversity of the microorganisms this product is excellent for pulp & paper wastewater applications where there are heavy influxes of cellulosic fibrous organic solids.

MicroClear® 501 Animal Feed Lots...New product specifically formulated and packaged for use in animal feed lots to help with odor control problems, reduce BOD and final effluent quality. Side benefits have been shown to increase animal health, increase weight gain, and reduce vet bills.



Golf Courses... MicroClear® 106 This product is specifically formulated and packaged for use in golf courses to help remove thatch, and help keep the grass greener and healthier.

MicroClear® M100 Micronutrient Supplement. Specifically formulated and packaged for use in biological wastewater treatment systems to obtain healthier biomass. It has been found to shorten the lag growth time and increase activity, as well as floc formation, BOD removal and TSS reduction. Use in equal amount to Bacteria.

MicroSolv™ L100-F...Specially formulated and packaged for direct addition to into wastewater treatment systems, wetwells & commercial buildings. A Special odor eliminator and fragrance is added to help kill odors nearly anywhere.



MicroClear® 108 Shrimp & Fish Farming...Feed additive and water treatment product formulated to promote the production of healthy shrimp and fish

MicroClear® 102...Saltwater Environments...High potency, bacteria-laden, powdered formulation for use in controlling algae through the competition of available nutrients and excess organics present in the water.



MicroClear® 35 S 1X...Liquid formulations for Car Washes Liquid solution of specially selected multi-cultured bacterial strain concentrate. These enzyme catalysts work synergistically for the fastest action available in a liquid digestant using natures' own cleaning agents.



MicroSolv™ L-Marine Liquid containing a synergized blend of biological organisms, all of which has been selectively chosen for accelerated degradation capabilities of organic compounds such as grease, fats, proteins, starch, sugars, and cellulose. MicroSolv L-Marine is specially formulated and packaged for direct addition to drains and small septic tanks. A special odor eliminator and fragrance is added to help kill odors nearly anywhere.

MicroSolv™ 200-T Industry Textiles High potency, bacteria-laden, powdered formulation

MicroSolv™420 Mining High potency, bacteria-laden, powdered formulation used in Mining applications

MicroSolv™ 203 Palm Oil High potency, bacteria-laden, powdered formulation used in Palm Oil plants

MicroClear® FOGgone™ - Liquid product is a high strength formulation developed to degrade fats, oils and grease quickly. It can be used in restaurants, grease traps and drain fields where food based grease is a problem. Liftstation & Wetwell applications. Industry holding tanks to reduce BOD.

Ask us about MicroChill™
Contains a unique & **newly patented** proprietary blend of psychrophilic microorganisms that are naturally occurring bacteria with the ability to grow at 4°C, & lower.

Custom formulations can be developed to fit your specific needs. Programs are always developed and customized to your situation.	Excel based Dosing Wizard included for all programs. Nutrient dosing wizard available	Programs include technical support, computer based training. Long term programs include periodic Wastewater Biomass Analyses of your system.
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Orders faxed directly to 630-906-9792 or Call us for Pricing, Consultant & Sales 630-906-9791 or Elfenvironmental@aol.com
Long term programs include Training, Process Recommendations & Periodic Lab Analyses.