

Bioaugmentation-I've heard a lot about it, didn't it have the reputation in the past as snake oil?

Yes, we agree with you. In the past there were tons of misconceptions about biological products. There were many companies trying to sell biological products and tons of companies trying to manufacture products. There were many names, different types of products, totally different recommendations on dosing and pricing seemed like it was picked out of a hat. Bioaugmentation reps had a worse reputation than car salesmen.

It was perpetuated by the fact that the biological portion of a wastewater system seemed like the mystery black box. Engineers who were comfortable with numbers could evaluate other parts of the system. You could measure flow, pumps, hydraulics, loading, or many other variables in and around a system. Those darn little bugs just did not follow any real math. So many engineers and operators were not really fond of the biological portion of the system. Many times polymers and chemicals were used as Band-Aids to overcome any deficiencies in the biological portion. There was not a lot of easy to follow training on the biological portion of the system either. A lot of the training was at a highly technical level and many operators were overwhelmed at what appeared to be a daunting task to understand what was going on in their system.

Many companies popped up 20-30 years ago selling biological products. Overdosing occurred and was often abused since some of the sales reps could take advantage of the lack of understanding of the biological portion of the system. They assumed the sales rep knew more than they did, believed them and often over purchased products and then were often disappointed in the results.

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

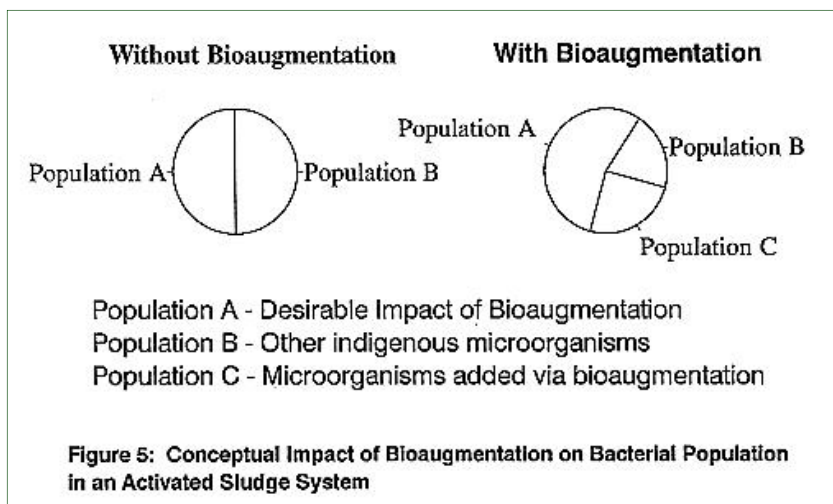
- Residual should be measured in the final effluent.

**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, zooglea, 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.

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Lots of information on our website www.EnvironmentalLeverage.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 630-906-9791 Long term programs include training, process recommendations and periodic lab analyses.		

