BiOWiSH™ TECHNOLOGIES

User Guide

# BiOWiSH™ Aqua

## Bioaugmentation for Biological Nutrient Removal Units

Biological treatment systems utilizing activated sludge have been used to remove carbonaceous (organic) waste for many decades. BiOWiSH™ bioaugmentation technology works within existing treatment systems, and requires no significant capital or equipment expense to address and solve real problems.

### What is BiOWiSH™ Aqua?

BiOWiSH™ is a proprietary composite biocatalyst that enhances a broad range of hydrolytic, oxidative and reductive biochemical reactions. BiOWiSH™ contains a novel consortia of metabolically cooperative micro-organisms, with endogenous and exogenous enzymes and small-molecule metabolic co-factors. BiOWiSH™ products are composed of all natural materials and are non-genetically modified.

#### Benefits

- Enhance nitrification rates by catalyzing Ammonia Oxidizing Bacteria (AOB) pathways in oxidative conditions
- Increase denitrification rates both in anoxic and high dissolved oxygen environments
- Reduce sludge disposal, chemical, and energy costs
- Avoid capital expenditure

### How safe is BiOWiSH™?

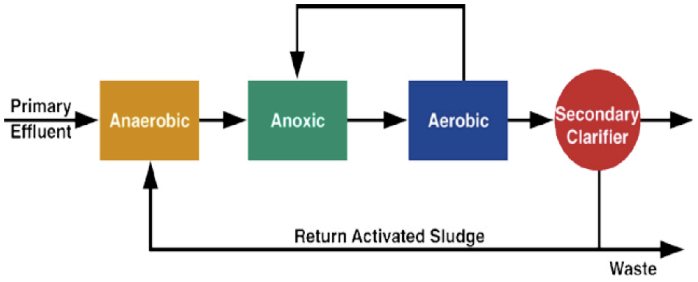
BiOWiSH™ products have no detrimental effects on the environment, humans, plants or animals. The core technology behind these products is also used in human ingestible supplements, animal feed additives and crop-enhancement products also produced by BiOWiSH Technologies. Environmental toxicology studies have shown no adverse effects from the use of BiOWiSH™ products. Aquatic toxicity testing has shown that BiOWiSH™ is non-toxic at recommended dosage levels.

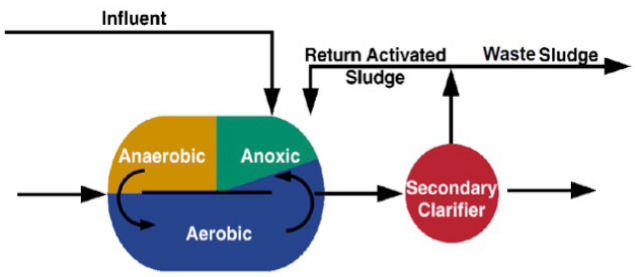
### Does BiOWiSH™ build up in the environment or discharge locations?

No. Unlike some other water quality conditioning agents BiOWiSH™ will not build up over time. BiOWiSH™ is 100% biodegradable which prevents any long-term build up.

### Dosing Recommendations

These recommendations are based on an $A^2/O$ or Oxydation Ditch process for enhanced P and N removal:




For different system setups please contact wastewater@biowishtech.com.

| Dose | BiOWiSH™ | Target Concentration | Notes |
|---|---|---|---|
| **Continuous dosing** | 1 to 5 kg per 10,000 $m^3$/day of treated effluent | 0.1 – 0.5 ppm | Up to 14 days of product can be prepared and the active solution can be drip dosed into the system's inlet. |
| **First week only** | 3 to 15 kg per 10,000 $m^3$/day of treated effluent | 0.3 – 1.5 ppm | Initial week is dosed at 3× target concentration to promote biological growth into unit's recirculated activated sludge. |

## Dosing Point

Active solution can be dosed into Anaerobic, Anoxic or Aerated reactors.

## General Application Instructions

Dissolve the BiOWiSH™ powder concentrate in clean water at a minimum ratio of 10 L/kg. Using a metering pump, dose the desired flow continuously into the selected dosing point.

### Unit operation and trial monitoring:

Depending on the objective behind the bioaugmentation program, different monitoring strategies may be put in place. However it is suggested you monitor the following parameters for inflow and effluent:

Treated flow, COD, BOD, TSS, TKN, $NH_3$-N, Nitrites, Nitrates, TN, TP, FOG, pH, temperature

The following operational data will also be key:

Reactor MLSS, Reactor DO, SVI, RAS/WAS, Aerators consumption (energy), Total dry sludge per day

### Focusing on nitrogen management:

Whether pursuing increased nitrification or denitrification, close monitoring of Anoxic and Aerated reactor feed and effluent will be required. A nitrogen balance for each reactor as well as basic operating parameters will need to be tracked to prove and maintain increased rates.

### Focusing on operational cost:

Unit operation should remain unaltered for the first two weeks of dosing. On week three reactor MLSS should be reduced by 10% every two weeks and reactor dissolved oxygen should be kept 1.5 mg/L < DO < 2.5 mg/L.

### Using a material balance, keep track of the following:

kW/h spent per kg of BOD/day degraded.

Dry tons of sludge per kg of BOD/day degraded.

Plot the above usage on a weekly basis.

For additional support and data analysis:

## Contacts

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Biological help for the human race

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