Bacta-Pur®

The Natural Solution

Application Bulletin

Start-up & Maintenance of Biofilters in Aquaculture

ECOPROBIOTICS®, of the Bacta-Pur® System, are beneficial communities of natural bacteria, which have been on earth for millions of years and have been selected for their synergistic ability to biodegrade pollutants and to improve water quality. ECOPROBIOTICS® increase biodiversity. Just as people take probiotic yogurt for its' ability to assure the presence of the optimal community for digestion and immunity, ECOPROBIOTICS® improve ecosystem health. EVERY PRODUCTION of Bacta-Pur® products is analyzed and cleared for shipment ONLY after passing all performance tests and being CERTIFIED PATHOGEN FREE using techniques from the food industry. ECOPROBIOTICS® are purely natural and beneficial; they NEVER contain added chemicals such as surfactants, emulsifiers or enzymes…, nor do they contain genetically modified (GMO) or deliberately mutated organisms. ECOPROBIOTICS® are safe and beneficial. Bacta-Pur® microorganisms are not subject to TOSCA (USEPA) and are listed on the DSL of Environment Canada.

Requirements for Efficient Biological Filtration

Biological filters are typically used to control ammonia and nitrite, in aquaculture and fish and seafood holding systems. Three categories of factors affect biological filters: the biological community, the water physico-chemistry and the physical design.

<u>Biological Community</u> — Control of ammonia and nitrite in biological filters is accomplished by nitrifying bacteria.

Nitrifying bacteria are very sensitive to environmental conditions; this is particularly true for *Nitrobacter*. Many factors can inhibit these bacteria. The active area of the biological filter should be in the dark; light is inhibitory. Excess organic material inhibits nitrifiers. A balanced population of heterotrophic bacteria is essential to control levels of soluble organic pollutants.

<u>Water Physico-Chemistry</u> — Ammonia and nitrite are only sources of nitrogen for the bacteria. Other nutrients including carbon, phosphorus and trace elements are also essential. Carbon must be inorganic and is measured as carbonate alkalinity. Sodium bicarbonate (baking soda) is commonly used to add carbonate alkalinity. Water with more than 100 mg carbonate alkalinity/L is normally adequate; lack of carbonate alkalinity will stop nitrification.

The alkalinity provides pH buffering. The optimal pH for nitrification is near 8.0. Values outside of 6.0 - 8.5 can be expected to reduce nitrification efficiency. *Nitrosomonas* produces acid during its growth; the pH must be monitored and adjusted.

Nitrifying bacteria absolutely require adequate oxygen. Water exiting a biological filter should always contain at least 4 ppm oxygen. The optimal temperature for nitrification is about 30°C (86°F); the rate will be cut in half for every decrease of 10°C (±22°F).

Thus a filter working at 30°C (86°F) may remove the same amount of ammonia as one twice as large but operating at 20°C (68°F).

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Physical Design — The role of all biological filters (trickle filters, RBCs or fluidized beds *etc.*) is to provide a home for the microorganisms. More surface area allows for the development of larger bacterial populations. Surface area, however, must be balanced against open area within the filter.

Biological filtration results in the growth of bacterial biomass; filters with inadequate surface area block rapidly. A well designed biofilter should be virtually self-cleaning. The nature of the physical substrate can also affect start-up time. Slippery surfaces are more difficult for the bacteria to colonize than rough ones.

Water flow patterns are very important. An adequate flow is essential to assure that the pollution or food reaches the bacteria, which are immobile. They use the nutrients around them, sufficient water movement is essential for good growth and performance. All water should be physically filtered or clarified to remove solids before the biological filter; these solids should be removed from the system as quickly as possible. Inadequate water flow combined with solids accumulation can be the cause of major headaches. Anoxic zones will develop where there can be a synthesis of ammonia and nitrite even in the biofilter. Nitrite is produced not only as a by-product of ammonia removal but also from the partial denitrification of nitrate.

The Bacta-Pur® System

The Bacta-Pur® System for biological filters consists of:

1. Bacta-Pur® N3000 — a balanced community of nitrifiers and selected heterotrophs;
2. BACTIVATOR®Ⓓ — automatic activation and addition of the Bacta-Pur® products.

Treatment with the Bacta-Pur® System

All water sterilization equipment should be turned off during start-up of a biological filter.

Dose Rates

Starting a Biological Filter — Add 100 mL Bacta-Pur® N3000 / 1000 L (4 oz Bacta-Pur® N3000 / 250 gal) of tank water. Continue additions of half this dose daily until filter activity has stabilized. **Small cold water systems, such as for lobster tanks, should have additions of 100 mL Bacta-Pur® N3000 / 200 L of tank water L (4 oz Bacta-Pur® N3000 / 50 gal) daily until filter activity has stabilized.**

Maintaining a Biological Filter — Add weekly 100 mL Bacta-Pur® N3000 / 1000 L (4 oz Bacta-Pur® N3000 / 250 gal) of tank water. **Small cold water systems, such as for lobster tanks, should have weekly additions of 100 mL Bacta-Pur® N3000 / 200 L of tank water L (4 oz Bacta-Pur® N3000 / 50 gal).**

Maintaining a Biological Filter with Fluctuating Loads — Please see our brochure which describes the BACTIVATOR®Ⓓ AQN or LSN – equipment for automated activation and addition.

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