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Demonstration Bulletin

Aqueous Biological Treatment System (Fixed-Film Biodegradation)

BioTrol, Inc.

Technology Description: This patented biological treatment system, called the BioTrol Aqueous Treatment System (BATS), uses an amended microbial population to achieve biological degradation. The system is considered amended when a specific microorganism is added to the indigenous microbial population in the wastewater to optimize degradation of a particular pollutant. The system (Figure 1) accomplishes removal of both the target contaminants and other background organic contaminants.

Contaminated water enters a mixing tank where the pH is adjusted and inorganic nutrients are added. If necessary, the water is heated to reach an optimum temperature; a heat exchanger is used to minimize energy use. The water then flows to the reactor chambers where organic contaminants are biodegraded.

The microorganisms that perform the degradation are immobilized on a highly porous packing in a three cell, submerged fixed-film bio-

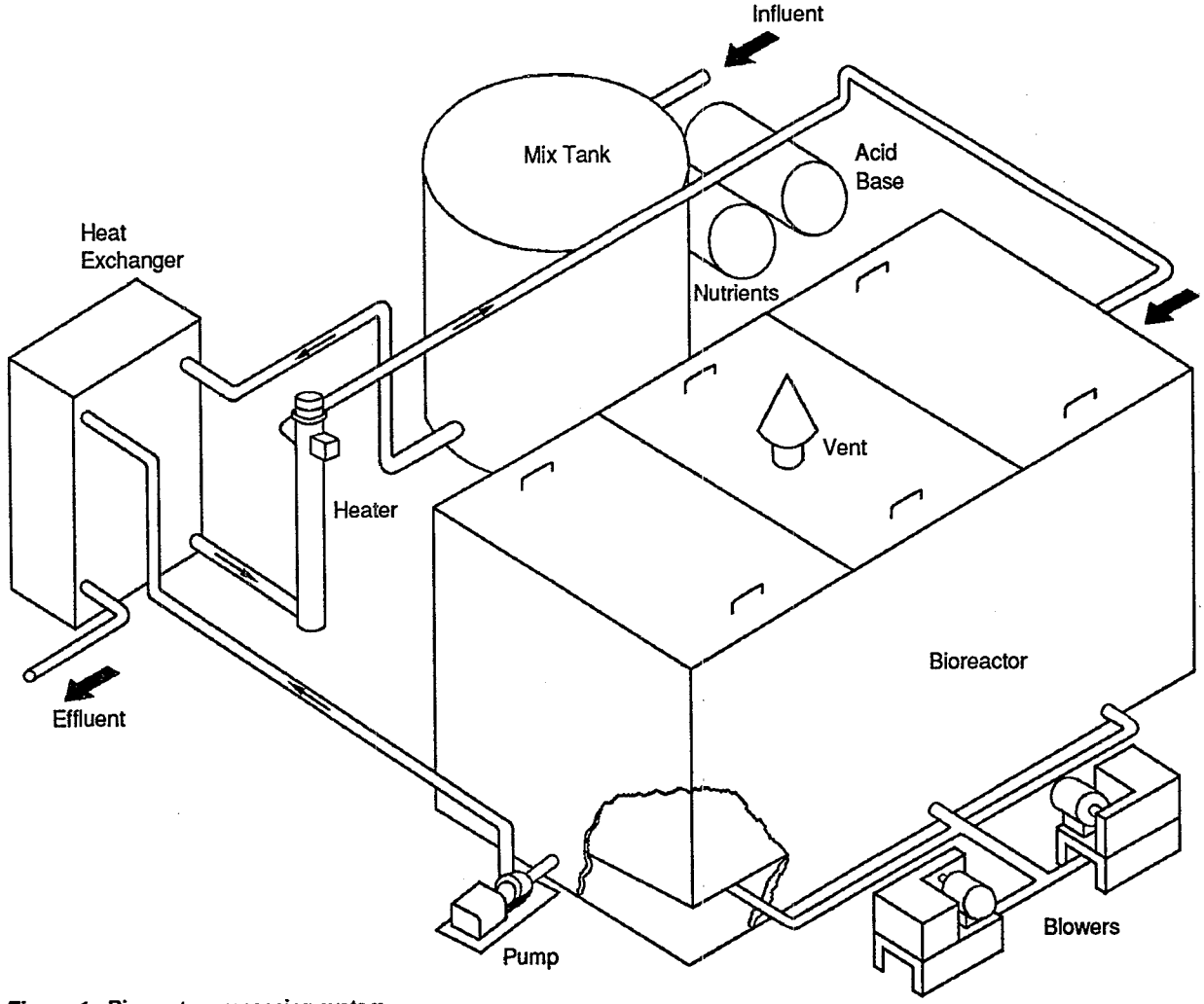

Figure 1. *Bioreactor processing system.*

reactor. The biological growth is first developed during a short (1 to 2 weeks) acclimation period. Air is supplied by fine bubble membrane diffusers mounted at the base of each cell but the system also may be operated under anaerobic conditions.

As the water flows through the bioreactor, contaminants are degraded completely to carbon dioxide, water, and, in the case of chlorinated organics, chloride ion. The resulting effluent may be discharged to a Publicly Owned Treatment Works (POTW), reused onsite, or even discharged directly under a NPDES permit.

Waste Applicability: This technology is applicable to a wide variety of wastewaters, including groundwater, holding ponds, and process effluents. Contaminants found to be amenable to treatment include pentachlorophenol, creosote constituents, gasoline and fuel oil, chlorinated hydrocarbons, phenolics, and solvents.

Demonstration Results: This process was demonstrated on pentachlorophenol-contaminated groundwater at a wood preserving facility in New Brighton, Minnesota, over a 6-week period from July 24 to September 1, 1989. A 5 gpm, trailer-mounted unit was operated for 2 weeks at each of three throughput rates: 1, 3, and 5 gpm after an initial 2-week acclimation period.

Operation of the system
- successfully reduced pentachlorophenol concentrations from ~45 to 1 ppm or less in a single pass;
- achieved 96% - 99% removal of PCP (see Table 1);
- produced minimal sludge and no air emissions of pentachlorophenol;
- successfully mineralized chlorinated phenolics;
- eliminated biotoxicity present in the groundwater;
- appeared to be unaffected by low concentrations of oil/grease (~50 ppm) and heavy metals found in such water; and
- required minimal operator attention.

Table 1. Average Pentachlorophenol Removal

Flow (gpm)	Groundwater (ppm)	Effluent (ppm)	Removal (%)
1	42	0.13	99.8
3	34.5	0.34	98.5
5	27.5	0.99	96.4

A Demonstration Report and an Applications Analysis Report describing the complete demonstration will be available in the spring of 1991.

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