

On-Site Industrial Waste Biodegradation

Bioreactors Can Reduce Navy Waste

Industrial waste handling and disposal continues to be a recurring cost and long-term liability issue for the Navy. To address this problem, the Navy is investigating a cost effective and unique application of sequencing batch reactors that can potentially eliminate these wastes on-site. These reactors also use an ultrafiltration module to recycle biomass and produce effluent that can be discharged to the sewer or used to dilute incoming waste. By recycling the biomass, high bacterial densities are maintained in the reactor, which rapidly degrade incoming waste to harmless by-products. This technology is being developed to handle several important Navy

industrial waste streams, from oily waste sludges to solvent-based paint waste.

Oily Sludge

The Navy spends in excess of six million dollars per year handling, processing, and disposing of oily sludge. Sources include tank bottoms, wash racks, and the bilge oily waste treatment system (BOWTS). Nationwide, including the private sector, this problem costs two billion dollars per year. Since this material cannot be burned or recycled, the only option is to landfill it at a cost of \$0.20 to \$1.50 per pound and the Navy remains liable. On-site biological treatment costs \$0.08 per pound and the residual biomass can be landfilled, landfarmed, or composted and the liquid stream discharged to the sewer. In collaboration with the Public Works Center (PWC)

By recycling the biomass, high bacterial densities are maintained in the reactor, which rapidly degrade incoming waste to harmless by-products.



The ultrafiltration module of a sequencing batch reactor.

Partnering with the Army, NFESC will use an 80,000-gallon reactor to treat an oily waste stream with characteristics different from PWC Pearl Harbor.



Oily sludge sequencing batch reactor at Naval Station Pearl Harbor.

Pearl Harbor and with additional funding from the Navy's Pollution Abatement Ashore Technology Demonstration/Validation Program (the YO817 program), the Naval Facilities Engineering Service Center (NFESC) installed a 10,000-gallon reactor at PWC Pearl Harbor. This system has successfully processed over 50,000 gallons of oily sludge waste (in FY03) at a significant cost savings to the installation. (To learn more about the processing of oily sludge waste, read our article entitled "Bacteria Eat Oily Sludge: Reducing Cost and Liability" in the winter 2002 issue of *Currents*.)

The Environmental Security Technology Certification Program (ESTCP) provided funding to NFESC to perform a demonstration/validation of this technology at the Scranton Army Ammunition plant in Scranton, PA. Partnering with the Army, NFESC will use an 80,000-gallon reactor to treat an oily waste stream with characteristics different from PWC Pearl Harbor. This application has the potential to show the versatility of the bioreactors.

Expired Shelf Life Solvent Based Paint

Expired shelf life paint is the Navy's most expensive waste per pound. While the volume has been reduced by recycling and by implementation of the Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP), facilities still handle and dispose of one million pounds of paint per year. The recurring cost to manage and dispose of this waste is in excess of two million dollars per year. Laboratory studies at NFESC demonstrated that bacteria present in oily sludge degrade the solvents and resins found in the most widely used paints. A pilot project to investigate the

potential capability of this technology is being conducted at PWC Pearl Harbor.

Bioeconomics

Depending on the volume capacity of the system, the cost for a reactor is approximately \$450,000 and yearly operations and maintenance costs are about \$60,000. The full-scale reactor installed at PWC Pearl generates \$186,000 per year in cost avoidance and the reactor at Scranton will generate twice this amount. It is estimated that the biological treatment of paint will generate 1.8 million dollars per year in cost avoidance. As a result, biological treatment systems pay for themselves in one to two years and have the additional benefit that long-term environmental liability is eliminated. [↴](#)

CONTACTS

Sonny Maga

Naval Facilities Engineering Service Center
805-982-1340
DSN: 551-1340
sonny.maga@navy.mil

Fred Goetz

Naval Facilities Engineering Service Center
805-982-1184
DSN: 551-1184
frederick.goetz@nfesc.navy.mil

If you would like to share your pollution prevention success stories, or would like additional information on the Navy's technology transfer program, contact Kurt Buehler, Naval Facilities Engineering Service Center, 805-982-4886, DSN: 551-4886 or BuehlerKD@nfesc.navy.mil.