NAVFAC ESC's Biological Detoxification System for Treating Oily Sludge Now Available

Leasing Allows Naval Activities to Easily Implement Technology While Avoiding Capital Costs

THE BIOLOGICAL DETOXIFICATION (BioDetox) System, developed by the Naval Facilities Engineering Service Center (NAVFAC ESC) under the Navy Environmental Sustainability Development to Integration (NESDI) program and the Environmental Security Technology Certification Program (ESTCP), is an environmentally friendly alternative to disposal of oily sludges. Once available only as a capital-cost unit, NAVFAC ESC and the licensee—Waste Resources Inc. (WRI)—have developed a leasing option to improve the system's availability to activities within the Navy and throughout the Department of Defense (DoD). Activities with annual oily sludge disposal costs exceeding $75,000 can now significantly reduce their oily sludge disposal costs without the responsibility for the initial capital costs.

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A P-3C Orion taxis through a wash rack. Wash racks are one of the sources of oily sludge generated by the DoD.
Photographer's Mate 3rd Class Shannon R. Smith

The Technology

Thousands of tons of oily sludges are generated by the DoD every year at its industrial wastewater treatment facilities, shipyards, fuel depots, and other maintenance and servicing facilities. Sources include oil sumps, load equalization tanks, wash racks, drum cleaning, and fuel tank bottoms. Most of this sludge cannot be recycled or burned, and is therefore drummed and shipped offsite for disposal. This incurs a cumulative annual disposal cost of $6.8 million for the Navy alone.

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The BioDetox System at SCAAP in Scranton, PA.

degraded to harmless byproducts—carbon dioxide, water, and biomass—by processing through a Sequencing Batch Reactor (SBR). The BioDetox System, a Navy patented and licensed system, consists of a bioreactor tank, receiving tank, pH controller, an ultra-filtration, and a Volatile Organic Compound filter. This system can be available through a lease agreement, thereby allowing activities to avoid high capital cost expenditures.

During the BioDetox process, oily sludges are typically blended for treatment within the bioreactor tank with fresh or oily wastewater to a mixture containing 2,000 to 20,000 parts per million (ppm) of hydrocarbon. To treat the mixture, air and nutrients (i.e., fertilizer) are added and the pH is controlled to optimize the growth and propagation of hydrocarbon degrading bacteria already present in the oily sludge. It typically takes three to four days for the oily sludge to degrade to a mixture of biomass solids, carbon dioxide, and clean water, which can be either recycled or discharged to the sewer. Laboratory analysis typically yields less than 50 ppm of hydrocarbons in the treated water.

Bio-Reactor Installations at Pearl Harbor, HI & Scranton, PA

BioDetox Systems are currently installed and in operation at two locations—a pilot-scale unit at the Public Works Center in Pearl Harbor, HI and a full-scale unit at the Scranton Army Ammunition Plant (SCAAP) in Scranton, PA.

Major Benefits of the BioDetox System

1. Reduces oily sludge disposal costs from an average of $0.76 per pound to less than $0.08 per pound.
2. Biodegrades oily sludge to non-toxic byproducts. Water can be discharged to sewers and biomass can be used as nutrients for composting or placed in a landfill.
3. Eliminates liabilities associated with long-term storage and disposal of oily wastes.

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The latter is owned and operated by General Dynamics Inc., Ordnance and Tactical Systems. Pearl Harbor's unit is a single batch reactor with capacity of 10,000 gallons. It is designed for treatment of a variety of oily sludges and wastes, including waste oil from Bilge and Oily Wastewater Treatment Systems and fuel tank bottoms. Scranton's unit is a system of two tanks connected in a series, each with capacity of 40,000 gallons. The system treats waste-quenching fluids from projectile forging plant operations at varying concentrations of water, solids and mineral oil.

Contractual Agreements

Using the leasing option, qualified activities within the Navy and Marine Corps can have the system installed at little or no initial cost. Following the installation and system start-up, participating activities will be billed a low monthly leasing fee, which can be covered by operations and maintenance funds for oily sludge transportation and disposal. The leasing option will have a lower monthly cost than their current disposal practice, and eliminates the need to justify and appropriate large capital funds for new equipment procurement and installation.

The Navy Cooperative Research and Development Agreement allows for the Navy's licensee, WRI, to partner with NAVFAC ESC to further implement the BioDetox System at more sites. WRI developed and operated the first targeted modularized system at Pearl Harbor in order to obtain data for a full-scale system operation. The data was used for advancement of the technology for installment at other activities within the government and among private sectors.

Currently, a full-scale BioDetox System has an estimated capital cost of $200,000 to install. Under the pending leasing agreement, activities will not be liable for this cost. The provision for equipment, installation, and training will be included in the lease agreement.

About the Resource Sponsors

The NESDI program seeks to provide solutions by demonstrating, validating and integrating innovative technologies, processes, materials, and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness. The program accomplishes this mission through the evaluation of cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and ensure they can be integrated into weapons system acquisition programs.

The NESDI program is the Navy's environmental shoreside Research, Development, Test and Evaluation program and the Chief of Naval Operations Energy and Environmental Readiness Division and managed by the Naval Facilities Engineering Command.

For more information, visit the NESDI program web site at www.nesdi.navy.mil or contact Leslie Karr, the NESDI Program Manager at 805-982-1618, DSN: 551-1618 or leslie.karr@navy.mil.

The NESDI program is the Navy's complement to ESTCP. The goal of ESTCP is to identify and demonstrate cost-effective technologies that address DoD's highest priority environmental requirements. Demonstrations are carried out at DoD facilities and sites to document improved efficiency, reduced liability, and direct cost savings. Innovative technologies are reducing the cost of environmental remediation and compliance, lowering lifecycle costs of weapons systems, and managing the impact of DoD's operations on the environment, while enhancing military readiness. For more information about ESTCP, visit the program's web site at www.estcp.org.

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