

NEW BILGE

Water Treatment System Design

Protecting bay waters with a low-maintenance, long-lasting system was a high priority.

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Universal Environmental Solutions (UES) of Tampa, Fla., recently began operating its new industrial wastewater pre-treatment system. UES is an affiliate of Hendry Marine Industries, an 88-year-old business that began as a dredger and is now a ship repair company.

The plant was officially unveiled to the public on April 17 by Ed Kinley, president of the company, in a ceremony at the Hendry dry docks and berths in Port Tampa Bay.

The new plant was designed to treat oily bilge water from ships using the Port of Tampa Bay in a manner that is highly protective of the environment. Bilge water is water that does not run off the ship's deck and collects in the lowest part of the ship; it can include sea water taken in from rough seas, and it typically contains residual petroleum hydrocarbons generated from leaks, routine repairs, cleaning and other maintenance activities conducted on board. Pollution prevention regulations prohibit the contaminated oily bilge water from being pumped overboard.

This facility was partially financed by an economic development opportunity from the state of Florida. The facility's

operation will benefit Florida not only because it minimizes potential marine pollution, but also the residuals from the plant are recycled by way of energy input production.

The plant's primary treatment method is based on the use of dissolved air flotation (DAF) technology, a proven technology that can be used to reduce biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrogen, phosphorus and certain metals in a wide variety of wastewater streams. The DAF was designed to treat influent concentrations of 2,000 milligrams per liter (mg/l) oil and grease (O&G) and 500 mg/l total suspended solids (TSS) to less than 100 mg/l O&G and 870 mg/l TSS, so that the effluent meets Tampa's pre-treatment standard for disposal in the city's sewer system.

The major parts of the treatment plant complex include:

- A 10,000 square foot operations building that houses, in containment, the treatment system and plant controls.
- A transfer pipeline that allows oily bilge water to be off-loaded from ships docked at the Hendry berth. The pipeline is made of a fused high density polyethylene (HDPE) pipe and has double-walled construction to

Exhibit 1: Dissolved Air Flotation (DAF) unit is shown above.



capture leakage, allowing it to be re-processed. The interstitial space between the two pipe walls is continuously and automatically monitored for leakage from the operations building within the plant.

- An aboveground bulk storage tank farm and transfer pump system. The tank farm receives the flow from the pipeline or tanker trucks and provides approximately 270,000 gallons of storage. The main tankage was created by refurbishing four steel tanks purchased from the city of Key Largo that were formerly used at its wastewater treatment plant. Transfer pumps feed the DAF reactor at a maximum

flow rate of approximately 175 gpm (252,000 GPD). The tank farm is surrounded by a concrete spill containment wall built to the 100-year flood elevation.

- A high volume "Butterworth/Gas Freeing" tank cleaning system at the Hendry Corporation shipyard. Cargo tanks of petroleum service barges are cleaned in advance of repair and "hot work/welding" in the shipyard. These cleaning efforts can result in as much as 1,000,000 gallons of wastewater treated per vessel.
- A 10,000 gallon capacity DAF reactor unit (Exhibit 1) constructed of 304 stainless steel, mechanical peripherals and an automated control system manufactured by Piedmont Technical Services, Charlotte, N.C. As the flow comes into the head of the DAF, more compressed air is introduced into the lower part of the unit. The compressed air bubbles rise through the flow and simultaneously sweep oily particles up to the surface. The heavier solids continue to coagulate and sink to the bottom of the unit. The floating oily layer (called *float*) moves to the end of the unit where it is skimmed and processed to initially separate the oil from the water.
- A chemical injection and mixing unit. As the flow comes into the treatment plant, flocculating chemicals and compressed air are introduced into the DAF piping system. The flow moves through a circuitous pipeline to allow time for the chemicals to start the flocculating

process on the solids and oily droplets in the wastewater. Bench tests conducted by the DAF vendor demonstrated the efficacy of the chemical application.

- Two 1,000-gallon decant tanks that promote separation of the float into two phases, an oily layer phase and a clarified water phase. The oil residue is then pumped out to the tank farm and stored in tote containers where it is periodically transported to an off-site reclamation facility and refined for re-use. The clarified water is mixed in with the treated effluent from the DAF.
- A sludge thickening area. Settled sludge drawn from the DAF unit is pumped to a sealed, water-tight roll-off box which is periodically transported for disposal of its contents at an off-site permitted solidification facility.

Treated effluent discharged from the DAF unit is pumped into a new sanitary sewer gravity main which connects to Tampa's main wastewater collection system. The flow rate is monitored by an ultrasonic meter and digital recorder.

Redundant systems are used on the plant to reduce the potential for adverse environmental impact. These systems include 1.) placing the entire treatment system and related pumps and piping inside a covered spill containment area, including spill curbing for the sludge roll-off container, 2.) high-level alarms and pump shut-down in the farm tanks and DAF unit and 3.) use of double-walled piping with continuous interstitial leak monitoring for buried piping.

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The plant's engineering design, permitting and construction plans were completed by SCS Engineers, Tampa. The plant required four environmental permits, three from the city and one from the county. The plant construction was handled by Seavy & Associates, Tampa, Fla., and was completed in six months and within budget. Mr. Kinley indicated that the Hendry facility provides a significant amount of space for future expansion of the treatment plant as other wastewater sources are anticipated.

Ed Kinley is president of Universal Environmental Solutions LLC, Tampa, Fla.

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