

State-of-the-Art Fuel Cleaning System Saves Millions of Dollars at Pearl Harbor

System Cleans Marine Diesel Fuel by Removing Particulate Contaminants & Trace Quantities of Seawater

A PROTOTYPE SYSTEM at Pearl Harbor that cleans marine diesel fuel removed from Navy vessels during maintenance availabilities is saving taxpayers and the U.S. Pacific Fleet millions of dollars in fuel replacement and disposal costs.

Prospects are bright for even larger savings—not just at Pearl Harbor, but Navy-wide—as placement of production models of the prototype fuel cleaning system is considered for additional Fleet locations.

The system is one of many initiatives of the Commander, U.S. Pacific Fleet's (COMPACFLT) Integrated Energy Strategy, under the leadership of Rear Admiral Kate Gregory, commander, Naval Facilities Engineering Command, Pacific, and Rear Admiral Richard D. Berkey, deputy chief of staff for fleet maintenance for the Pacific Fleet.

COMPACFLT funded the innovative prototype system, which was designed and developed by Keith Nesmith, Navy Region Hawaii's port operations program manager.

Before ships undergo maintenance or repair work at Pearl Harbor Naval

Shipyards, the fuel tanks often must be emptied. These tanks typically contain both marine diesel fuel (F-76) and seawater, which serves to compensate for weight lost as fuel is consumed, in order to preserve the ship's trim. While the two liquids don't mix completely, there's usually some seawater in the fuel and some fuel in the seawater. In the past, the

fuel was removed and discarded as waste, and the contaminated compensating water (comp water) was processed through a pierside Bilge and Oily Wastewater Treatment System (BOWTS). Recognizing the potential for significant savings, Nesmith envisioned a system that would clean the marine diesel fuel by removing particulate contaminants



Pearl Harbor's new fuel and comp water cleaning system consists of the fuel cleaner subsystem (at right behind the generator), the comp water cleaner (at left center) and the zinc remover (at far left).

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and trace quantities of seawater, enabling the fuel to meet military specifications. The result is the fuel can be used or returned for full credit. Without that processing capability, the Navy lost the use of the fuel, which currently costs more than \$3 a gallon.

“In the past, every time we defueled a ship, we had to pay a contractor to get rid of the fuel,” said Nesmith, “Not only did we lose the value of the fuel, we were paying to have it taken away, which made no sense to me.”

A couple of years ago, Nesmith located a 1969-vintage jet fuel cleaner at Marine Corps Base Hawaii and put it to work cleaning contaminated marine diesel fuel at Pearl Harbor. The unit was slow, unreliable and equipped with expensive filters prone to fouling.

Nesmith, a retired Navy officer, studied the subject of fuel cleaning and fuel specifications, and conceived a series of filters to trap contaminants and remove seawater. He was unable to find any commercially available systems, but did locate an east coast contractor willing to build a system to meet Navy requirements.

COMPACFLT provided \$250,000 from its Integrated Sea-Shore Energy initiative, a wide-ranging effort to reduce consumption of petroleum-derived energy under the Secretary of the Navy’s energy goals.

The new Fuel Oil Water Cleaning System uses a series of industrial filters to capture particulates from the fuel and coalescers to remove seawater. The system can process fuel at a rate of up to 500 gallons per minute.

“The Navy can reuse the fuel, saving millions of dollars in the process,” said Nesmith. The new system cleans fuel much faster and more thoroughly than the old jet fuel system. “It’s one-of-a-kind, state-of-the-art technology that paid for itself with the first 70,000 gallons of fuel it cleaned,” he continued.

Working with COMPACFLT’s energy manager Matthew Cohen, Nesmith had the contractor fabricate a second system to treat comp water removed during the defueling process.



Zinc removal subsystem on YON-328 at Pearl Harbor. In background is the comp water cleaner and at right is the fuel cleaner.

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A no-drip hose connection between a fuel barge and USS Chung-Hoon.

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The comp water removal system that Cohen and Nesmith devised provides the Navy with an alternative to using the BOWTS, which now costs 42 cents per gallon of water processed. In addition to removing fuel from the comp water, a third set of equipment removes trace quantities of zinc, which gets into the comp water from the sacrificial anodes that protect the steel fuel tanks from corrosion. Operated either as stand-alone units, or as a coordinated system, all three equipment packages are located on a fuel

barge (also known as a “YON” for Yard Craft-Oil-Navy) that can be placed alongside any ship requiring defueling.

“This new system is cost-effective in many ways, not the least of which is the reduction of the load on our BOWTS,” said CWO3 Timothy Greene, Joint Base Pearl Harbor-Hickam port operations officer. “In addition, it is also good for Hawaii’s environment.”

The full system works like this. Contaminants are removed from the fuel as a ship’s fuel tanks are emptied into the

tanks on the YON. There, the fuel and comp water are allowed to settle into separate layers (water is denser than marine diesel fuel). After the fuel and water have settled, the water is pumped out of the bottom of the holding tank, and cleaned of fuel and zinc before being pumped into a wastewater system ashore. The fuel that remains in the YON is run through the fuel cleaning system, which removes contaminants and any residual seawater. After inspection, testing and certification by a fuel laboratory, the fuel is ready for reissue to a ship or

submarine requiring fuel, or return to the local fuel activity for credit.

Captain Dan McNair, COMPACFLT deputy fleet civil engineer, says, “This project demonstrates the Secretary of the Navy’s goal of reducing waste streams conserves resources, increases combat effectiveness, and saves taxpayers millions of dollars,” a reference to Secretary of the Navy Ray Mabus’s energy initiatives.

“Every gallon of fuel reclaimed is one less we have to bring to Hawaii over very long supply routes,” McNair said.

About Keith Nesmith

PEARL HARBOR’S NEW fuel and comp water cleaning systems are only the latest innovation from the active mind of Keith Nesmith, port operations program manager for Navy Region Hawaii.

Nesmith retired from the Navy in 2006 as a commander, after 14 years of enlisted service and 16 years as an officer. His last job in uniform was port operations officer for Naval Station Pearl Harbor, so he didn’t move far when he retired. Since then, he has saved taxpayers tens of millions of dollars with innovations that include:

- **A multi-function paint/maintenance barge system to replace the scaffold-like contraptions that workers stand on while painting or preparing ship hulls for painting.**

In 2006, Nesmith designed the new paint/maintenance barge to incorporate a 32-foot hydraulic lift, lights, a power generator to operate power tools on the main deck and lift platform, and paint/hazardous material

2011 demonstration of the new paint maintenance barge that Keith Nesmith designed to replace the old cumbersome one-, two-, three- and four-tier paint floats at Pearl Harbor.

Keith Nesmith



containment system to a barge in order to support the Fleet’s maintenance requirements. The paint/maintenance barge is far safer, more stable and maneuverable and more environmentally friendly than the clumsy old system. The new paint/maintenance barge is also far less expensive to maintain and procure. The new paint/maintenance barge has proved to be more effective and efficient, reducing old paint float inventory by 50 percent, and saving \$1.6 million in annual labor and material costs, \$900,000 in annual preventive maintenance costs, and \$4.8 million in phase replacement costs.

- **Improved oil spill containment system for Pearl Harbor.**

In 2007, Nesmith devised a boom guide system that significantly reduced oil boom maintenance labor costs by 90 percent, and maintenance, cleanup and operating costs while ensuring efficient and effective containment of spills in the harbor. The system allows quick removal and installation of permanent oil boom for maintenance, repair and oil spill containment.

- **Replaced the aging USS Arizona Memorial ferry boats with new boats that run on biodiesel in 2009.**

The boats carry 1.6 million visitors a year. As a member of the integrated product team for the new boats, Nesmith ensured that the boats were designed to operate on clean-fuel technology, meet operational requirements, and provide a safe environment for passengers by designing cleats into the freeboard of the boat and were equipped with bow thrusters to assist the Navy crew in mooring evolutions. He also saw that the boats were numbered after the USS Arizona (39-1 through 39-6),



Lieutenant Commander Will Hagan and Matthew Cohen from the Commander, Pacific Fleet staff inspect comp water cleaner aboard fuel barge (YON-328) as it defuels USS Chung-Hoon (DDG-93).
MC2 David J. Kolmel

and with the help of the Commander, Navy Region Hawaii Public Affairs Office, were named for 7 December 1941, Medal of Honor recipients. “The boats are state-of-the-art, reliable, environmentally friendly and represent the Navy’s honor, courage, pride and commitment,” he says.

- **Designed a port operations computerized management program called Port Operations System Tracking (POST) process for Pearl Harbor.**

The program ensured port evolutions were executed on time and flawlessly every time. The POST system was incorporated in what is now known as Port Operations Management System (POMS), which is used to manage all port requirements in support of the Fleet. For an evolution such as a ship tying up at a pier, connections/disconnections of hotel services, POMS ensures all port support requirements are scheduled, published, executed safely, and on time, every time. “Personnel must answer questions in order to schedule an evolution. This process ensures my personnel and other organizations have all the right equipment and information to successfully manage and execute these tasks in support of the Fleet requirements. Every question has to be answered, down to ‘What size hose does the ship need for fueling?’” Nesmith said. The POMS system allows three people at Pearl Harbor Port Operations to do what would normally take several dozen.

These innovations, he says, “are, first, a result of ensuring my organization and personnel are extremely successful in executing their mission professionally and safely every time. Second, my ideas must



Keith Nesmith, Navy Region Hawaii port operations program manager, and COMPACFLT energy manager Matthew Cohen recall the months they spent perfecting the new fuel and comp water cleaning system.
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provide a one- to two-year return on investment for the taxpayer. Third, they must provide unprecedented efficiencies.”

Stay tuned. He’s already working on another idea to improve port operations and save significant money for taxpayers and the Navy.

“My challenge to the rest of the Navy is, if you have a good idea on how to be more efficient and effective, then share it with your chain of command so that it can be properly staffed and implemented,” he said.



Left and center, samples of comp water from two levels in the holding tank of a ship waste off-loading barge (SWOB). At right, water from the same tank after being run through the comp water cleaner.

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He credits Nesmith and Cohen for the success of the prototype systems.

“They worked tirelessly with the contractor to work the bugs out,” said McNair. “While the technology of fuel

waste. That fuel was run through the cleaning system and returned to military specifications, saving the Navy about \$355,000—a full return on investment after one use.

marine diesel fuel, saving COMPACFLT and the Navy over \$8 million in fuel replacement costs and more than \$3 million in cost avoidance from not having to dispose of the fuel as waste.

“In addition, once the comp water cleaning system is placed into full service, we expect to save up to a million dollars a year in comp water processing costs,” Nesmith added.

The fuel cleaning system is such a success that Nesmith has received approval and funding from Commander, Navy Installations Command (CNIC) to design and acquire a more compact, purpose-built platform for the fuel and comp water cleaning equipment to be mounted on.

The Navy can reuse the fuel, saving millions of dollars in the process.

—Keith Nesmith

filtration is not new, creating a system able to separate water and zinc contamination from fuel to meet military fuel specifications in large volumes was an untested idea.”

Nesmith says, “Now we’ve moved beyond testing into operations and are saving lots of money, while significantly reducing our amount of waste.”

For example, the cleaning system was recently used to recover 90,000 gallons of F-76 marine diesel that had failed a fuel laboratory test and been declared

In another case, the Defense Logistics Agency (DLA) and Naval Supply Systems Command (NAVSUP) asked Navy Region Hawaii to clean 100,000 gallons of F-76 marine diesel that had been pumped through newly replaced fuel pipelines and was deemed contaminated and unfit for issue. The fuel was cleaned and returned to military specifications, saving hundreds of thousands of dollars.

In its first year, Navy Region Hawaii has cleaned 2 million gallons of F-76

“The platform will make it easier to maneuver around the harbor and between ships,” he said.

Additional fuel cleaning systems are on order, with the next system scheduled for delivery to a Navy facility located on Washington State’s Puget Sound. [↴](#)

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