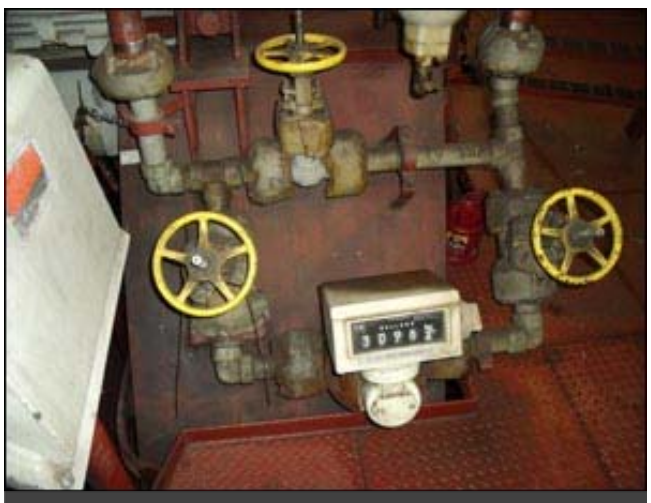
MSC conservation team improves shipboard energy efficiency

By James Marconi, MSC Public Affairs

The U.S. Navy is serious about going green. It's investing $2 billion to increase energy efficiency and to transition to 50 percent alternative-energy use by 2020. As the Navy at-large ramps up its energy-efficiency measures, Military Sealift Command continues to put a high priority on its longstanding commitment to preserve natural resources.

In 2010, MSC received $18.1 million in Navy funds for increasing energy efficiency. An additional $133 million will be distributed from 2011-2016 to upgrade the energy efficiency of ships in the MSC fleet. MSC's objectives are to save $357 million in fuel expenses by 2016 and reduce overall energy consumption 20 percent by 2020.

The command's energy-saving efforts are coordinated by the three-person Energy Conservation Office at MSC headquarters in Washington, D.C. In fiscal year 2010, this team - headed by Ren' Fry - conducted research aboard multiple ships to identify what behavior and technology changes could save energy in their ship classes. In 2011, MSC plans to complete research aboard Lewis and Clark-class dry cargo/ammunition ships and to install new energy-saving technologies.



During a class energy-profiling exercise, the old fuel flow meters (above) for the four main engines aboard Military Sealift Command dry cargo/ammunition ship USNS Robert E. Peary were replaced by new meters with sensors that measure fuel usage per minute (below). Readouts quickly gauge fuel consumption.

Energy conservation efforts in 2010

In 2010, Fry's office oversaw several efforts to determine what changes in technology and behavior could potentially save energy and money aboard MSC ships. The first step was having an energy audit team complete baseline shipboard energy analyses aboard MSC dry cargo/ammunition ships, hospital ships and fast combat support ships. These shipboard energy audits helped gain the maximum benefit from energy-reduction methods and reduced costs by analyzing how operational behaviors affected energy consumption. To be thorough, the audits were broken into two phases; one while a ship is in port, and one underway.

Another 2010 research initiative was the Class Energy Profiling Exercise performed aboard dry cargo/ammunition ship Robert E. Peary. A 28-person team went aboard Peary in November and conducted the eight-day CEPEx off the East Coast to begin building profiles of all the equipment used on that particular class of ship. The team comprised members of the MSC engineering directorate, personnel from the Navy's Operational Logistics Integration Program and employees from companies that designed several of Peary's systems.

"Phase one was to actually measure all of the energy levels for every evolution on the ship, from the motor being completely stopped all the way up to full power, [to measure] all the energy it takes to cook breakfast, lunch and dinner, how much energy it takes to make bread, to manufacture water and for all the lighting to be on," Fry said. "We measured that level of detail."

In addition to the CEPEx team, Peary's engineers, part of the civil service mariner crew, played an integral role during the exercise. They helped conduct CEPEx tests to determine the fuel efficiency of three of Peary's diesel engines at various percentages of their total operating capacity during different shipboard evolutions. While the CEPEx team performed measurements, Peary's Chief Engineer Steve Burdi and other engineering crew members controlled and carefully monitored the ship's engines.

"What we did was constantly reconfigure the plant in order to meet the test points," Burdi said. "For the heavier load tests, like for 75 percent or 100 percent, we were in engine room control, because if we had a problem on an engine, we wouldn't have time to negotiate or talk with the bridge to square it away. We wanted to be able to preclude any complications or damage to the equipment."

Data from the tests on the engines and other equipment will allow Fry's office to build a sophisticated profile of shipboard energy consumption. Once the rate of energy usage for a given piece of technology is determined during a specific evolution, that rate can be analyzed to determine whether an enhancement might save energy and money in the long term. The exercise is expected to result in changes applicable to the entire Lewis and Clark Class, with a conservatively estimated $1.5 million per year in savings.

Research and implementation in 2011

The second phase of the CEPEx for the Lewis and Clark Class will take place in spring 2011 on board USNS Charles Drew, the latest dry cargo/ammunition ship delivered to MSC. Several powering and maneuvering tests will be conducted in San Diego to determine whether energy efficiency can be increased with improvements to the ship's directional stability, steering maneuverability and course keeping.

"In layman's terms, we're going to see how easily and how fast the ship will actually turn in a powering run and how much rudder it takes to get to a certain turning rate," Fry said.

The tests will also help to determine the peak efficiency of the ship's trim, which is the balance of cargo from the ship's bow to its stern. This in turn affects how far up or down the ship's bow is relative to the water. Every class of ship, Fry said, has a "sweet spot," or the position of the bow that results in the maximum efficiency of the engine.

In addition to the tests planned for Drew, several technological components will be installed on board the Lewis and Clark Class in 2011. The first is a device called a boss cap fin, which is attached behind the ship's propeller and redirects excess energy back to the propeller shaft that would otherwise have been wasted. An initial case study showed that the boss cap fin will reduce overall fuel consumption by 3 to 4 percent. Air conditioning, refrigeration and ventilation improvements will also be installed later this year.

In addition to the energy audits and CEPEx, several energy-saving technologies were implemented in 2010. One of the technology upgrades - a new control system for the boilers on board hospital ship USNS Comfort - was installed in July. Tests demonstrated that the replacement, which cost $800,000, has already saved 5 percent in total fuel consumption, which is greater than the anticipated 3 percent and will pay for itself in four years. Similarly, MSC has begun to upgrade the engine control system on board the large, medium-speed, roll-on/roll-off ships of the Bob Hope Class.

"MSC has been working toward reducing our overall fuel bill for years," said Fry. "At the end of the day, we are starting to change our behaviors because we currently waste energy in places we never thought about on a ship. Whether we're in port or underway, we will be constantly thinking about how to go to the most economic mode of operation."