

Responding to Changing Marine Emissions Standards



What a hybrid tugboat means for our environment.

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Two of the United States' largest ports, Los Angeles and Long Beach, will soon have a new way to combat poor air quality—a hybrid tugboat. Together, these ports handle more than 40 percent of all containerized cargo coming into or leaving the United States.¹ Both ports have been under pressure to meet the goals of the San Pedro Bay Ports Clean Air Action Plan, which touches every facet of port operations, from reducing emissions on delivery trucks to ensuring that all cargo handling equipment is retrofitted or built to be as environmentally friendly as possible.

Part of the plan calls for all harbor craft based at San Pedro Bay ports (including Los Angeles and Long Beach) to meet Environmental Protection Agency (EPA) Tier II emissions requirements in the next two years.² The ports of Los Angeles and Long Beach contributed \$1.39 million to make delivery in mid-2008 a reality. In exchange for this funding, Foss has agreed to homeport the new hybrid tug in Southern California for five years.

Matching Power to Need

The hybrid technology that will be incorporated into the propulsion system of the new tug minimizes fuel consumption by using a specialized power management system to match required power to the most efficient combination of batteries, generators, and main engines at whatever power level is needed.

For example, if a tug is simply idling or docked, a lower amount of power will be provided. For escorting or moving a ship, the full horsepower of a Dolphin-class

Tugboats are a good fit for the hybrid technologies because, while they have extremely high power requirements, it is only necessary for short durations. Existing hybrid technology, which has a flexible design allowing it to be adapted to a variety of power and duty requirements, will be modified for use in the tug.

tug will be available immediately. There are several different modes of operation for the tugs:

- minimal emissions, with a 0-5 percent load when idling or stopped;
- eco-cruise, with a 6-19 percent load during slow transit;
- mid-range, carrying a 20-65 percent load at faster speeds or while assisting ships;
- full power, carrying a 66 percent to full load at full-power ship assist speeds.

Based on the performance of the standard Foss Dolphin tugs operating in San Pedro Harbor, it is estimated that the hybrid will spend at least 75 percent of its operating hours in the lowest two modes of operation. In these modes there will be no main engine operating, only batteries and generators.

The Payoff: Reduced Emissions

Tugboats often spend time idling in a harbor or doing tasks less strenuous than full-powered ship assists. When that power is supplied only by diesel engines, resources are spent and unnecessary emissions are cre-





Part of the Clean Air Action Plan calls for all harbor craft based at San Pedro Bay ports to meet EPA Tier II emissions requirements in the next two years, which is where the planned hybrid tug comes into play. Photo courtesy of Foss Maritime.

ated. The hybrid tug will rely on battery power, supplemented by diesel generators and main engines.

Particulate matter and nitrogen oxides are expected to be reduced by 44 percent, as compared with the Dolphin tugs currently operating in San Pedro Harbor. Carbon and sulfur emissions—major contributors to greenhouse gases—are also expected to be reduced, as the hybrid tug is designed to burn less diesel fuel.

Though the first hybrid tug is a new build, other tugs could be retrofitted with the new hybrid technology,

Specifications

The hybrid tug will look and perform like its 78-foot Dolphin-class sisters and will retain the Rolls-Royce azimuthing stern drives for propulsion. The engine room of the hybrid tug, however, will look quite different.

Two Cummins QSK50 Tier II main engines rated at 1,800 hp will be used instead of the two 2,540 hp engines carried by most of the Dolphin fleet. Supplementing the Cummins engine, the hybrid design will feature one 600 hp battery pack and two 1,200 hp motor generator sets.

The two auxiliary generators will increase in horsepower from 168 hp to 402 hp. The hybrid tug will also be able to recharge batteries from shoreside power, in addition to using the auxiliary generators.

since the hybrid design has already been proven and is understood in other applications.

Possible Benefits Beyond Reduced Emissions

We expect the hybrid tug will demonstrate benefits beyond using less fuel and having fewer emissions, such as fuel and lube savings, reduced life cycle costs, and the possibility of the hybrid tug acting as a mobile power generating station.

Also, by using battery power in standby mode and only bringing generators and main engines online when higher power is required, the hybrid tug will be generally quieter than traditional tugs.

About the author:

Ms. Susan Hayman, a graduate of the Merchant Marine Academy, holds an MBA from Harvard Business School. Responsible for driving the strategic and tactical work that ensures Foss's safety culture, Ms. Hayman oversees all company programs requiring that equipment and operating practices meet all applicable government and regulatory requirements.

Author's note:

In 2007, Foss joined the SmartWay Transport® Partnership, accepted into the program for its marine transportation services. The partnership is a voluntary collaboration between the U.S. Environmental Protection Agency and the freight industry, designed to increase energy efficiency while significantly reducing greenhouse gases and air pollution.

Foss is also certified under the American Waterway Operators Responsible Carrier Program, a set of safety, quality, and environmental standards for the U.S. tugboat, towboat, and barge industry. On May 28, 2008, Foss was awarded the EPA's Clean Air Technology Award for its development of the hybrid tug.

Endnotes:

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1. See www.portoflosangeles.org.

2. The EPA Tier II requirements are part of a series of major initiatives that will reduce emissions from passenger vehicles, highway trucks, buses, and non-road diesel equipment, including harbor craft.