

Hybrid Hauler

Hornblower's new ferry is more than just a nice ride.



The new hybrid ferry gets its power from several sources.

By **KEN HOCHE**,
SENIOR EDITOR

With the recent push to conserve energy and “go green,” it’s not surprising that hybrid power is becoming very fashionable. What is surprising, however, is the speed in which the marine industry is embracing the new technology.

In 2005, San Francisco-based **Hornblower Cruises & Events** was awarded a 10-year contract to provide water and land transportation services for Alcatraz Island. The National Park Service contract stipulated that Hornblower include ferries in its fleet that were built or refitted to a higher level of environmental standards. Not only did Hornblower accept the challenge, it ran with it.

Alcatraz Cruises, a Hornblower business unit, moved quickly to put its 700-passenger, diesel-electric-powered *Alcatraz Clipper* and *Alcatraz*

Flyer on the new route. The company billed the two ferries as the “greenest boats on San Francisco Bay.”

Now the company has taken the next step by acquiring an aluminum Gulf of Mexico commercial dive boat, converting it into a hybrid ferry, and placing it in service. The *Hornblower Hybrid* is a 149-passenger, 64’x30’ catamaran that uses a combination of diesel-powered Tier 2 generators, electric motors, vertical-axis wind turbines, and photovoltaic solar panels to power it around the bay. The retrofit, repower and refurbishment took several months to complete at **Bayside Boatworks** in Sausalito, Calif. Almost 90 percent of the former dive boat was refitted. The boat’s final price tag was around \$3 million.

“We funded this vessel ourselves — no spon-

Hornblower Cruises & Events

sors, grants or government money,” said Hornblower’s CEO Terry MacRae. “We’re hopeful that people are inspired by this innovation and more money becomes available for exploring new, green technologies for the maritime industry. This is stimulus that promotes sustainability, provides jobs, and will be enjoyed by many people for years to come.”

POWER SOURCES

The main idea behind the *Hornblower Hybrid* is its ability to use alternative technology to power not only a more environmentally friendly vessel, but also a ferry that doesn’t sell out its effectiveness as a workboat to go green. It’s got enough power to reach a service speed of 10 knots, and that’s usually accomplished with a single engine, saving energy and cutting down on the release of particulate matter.

“When we’re underway, we only have to run one engine,” said Keir Moorhead, one of Hornblower’s project managers for the new ferry. “We can force everything under one engine.”

Hornblower didn’t have to look far to find the people it needed to cobble these different modes of power into a single source. The company’s in-house engineering department handled the design, planning and engineering chores.

“We found a boat and repurposed it, instead of building new,” said Moorhead. “We’ve gone out of our way to make it easy to run.”

The propulsion system is made up of twin Series 60 MTU Tier 2 diesels

stoking two **Marathon** 320-kw generators that power two **Yoskawa** variable frequency drives. The drives control the output of two 400-hp electric motors. The electric motors are connected to 4-bladed, 33"×30" wheels.

In addition, there is a 380-volt DC battery bank, two 1.2-kw (2-kw maximum) normal output 10' tall wind turbines, and a 1.2-kw solar array panel. “The wind turbines can be out in 80- to 90-mile-per-hour winds and be fine,” said Moorhead.

The cleaner, fuel-efficient engines were installed to reduce fuel consumption, emissions, and the ferry’s overall carbon footprint. The customized drive system lets the captain monitor the *Hornblower Hybrid*’s energy needs and choose the most efficient power sources.

When the boat is idling at the dock, for example, the engines shut off and the motors run off the energy stored in the battery banks. “House batteries run all the equipment inside,” said Moorhead, “or while at the dock we can plug into shore power.”

Hornblower’s architectural and engineering team was looking to get



The ferry has two vertical-axis wind turbines.

Hornblower Cruises & Events

the most bang for the buck. “It’s an electric-diesel. It can use only one generator,” said Moorhead. Power from the wind turbines and solar panel are stored in battery banks that power the navigation tools, lighting, and other electronic needs. Any excess power that is produced is stored in the main propulsion battery banks.

ZF Cruise Command with proprietary power management handled the control system responsibilities.

EDUCATIONAL TOOL

The *Hornblower Hybrid* began its Alcatraz and Angel islands combination tours on a limited basis in mid-

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March. Daily tours are scheduled to begin on Memorial Day. Before the new ferry went into service, Hornblower officials said they had carried three million passengers to Alcatraz Island since winning the Park Service contract.

Angel Island has been a fishing and hunting site for the Miwok Indians, a cattle ranch, and a U.S. Army post. From 1910 to 1940, thousands of immigrants, mostly from China, were processed through the island, and

during World War II both German and Japanese POWs were held there.

Alcatraz is most famous for its use as a federal penitentiary.

Hornblower officials saw an opportunity to use its new hybrid ferry as an educational tool as well. "We always planned for the boat to be educational," said Hornblower spokesperson Tegan Firth. "We wanted to share with them a little history of the boat and ways we made this boat environmentally friendly. It's a really engaging process. We want people to know about it."

Passengers can read about the ferry's theme on a large display in the wheelhouse. "This boat is much more than just the propulsion system," said Moorhead. "We really wanted it to be a learning platform."

One of the boat's most popular educational tools is an exercise bike hooked up to a miniature, functioning representation of the same system that directs solar and wind turbine power to

HORNBLOWER HYBRID SPECIFICATIONS

Owner: Alcatraz Cruises/Hornblower Cruises & Events

Designer: Tri-Kat Marine Inc. (original hull design); Hornblower Cruises & Events (hybrid system design)

Mission: Ferry service, education

Length: 64'

Beam: 30'

Draft: 5'8"

Main Propulsion: (2) Reliance 3-phase AC induction motor, 400 hp @ 1,100 rpm

Ship's Service Power: (2) MTU Series 60, with Marathon 320-kw generator

Propeller: (2) 33"x30", 4-bladed

Controls: ZF Cruise Command with pro-

prietary power management and control system

Speed (Knots): 10

Hull Construction: Aluminum

Passenger Capacity/Crew Capacity: 149/6

Tankage (Gallons): Fuel, 1,000; water, 500

Ancillary Equipment/Systems: 1.2-kw solar array; (2) 1.2-kw vertical-axis wind turbines; (2) 380VDC battery banks for propulsion.

Classification/Certification: U.S. Coast Guard, Subchapter T

Delivery Date: October 2008

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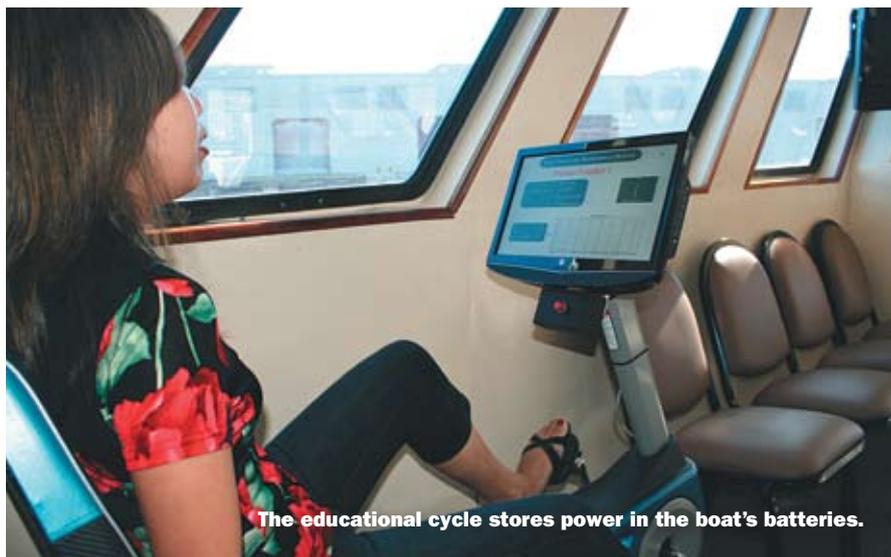
the battery pack. Passengers can peddle the bike and actually generate power for the boat's batteries. "The bike is very popular with the kids," said Firth.

On the materials side of the project, the *Hornblower Hybrid* features **Vetraz-zo** countertops throughout the vessel made from pieces of recycled bottles. "In the main cabin, the counter top is made from Skye vodka bottles with one Heineken bottle," said Moorhead.

The carpet contains recycled materials and is itself recyclable. Most of the interior signage is printed on plyboo, a composite material made from sustainably grown bamboo, not chemicals.

Moorhead said LED fixtures light the main deck and pilothouse, requiring a fraction of the energy of standard bulbs and provide an equal or greater amount of illumination. "All the lighting in here comes from florescent tubes that have no mercury in them," he said.

All the interior modifications meet the U.S. Green Building Council LEED



Hornblower Cruises & Events

The educational cycle stores power in the boat's batteries.

criteria for recycled content.

The vessel's main goal is to get passengers around San Francisco Bay safely and comfortably, and maybe give them something to think about after they disembark.

"What we would like is for people to just look at some of the things they're using at home, and maybe there are things they can do at home [to make it more environmentally friendly]," said

Moorhead. "Are you really making the best use of the energy you use 24 hours a day? It should really make people think about the technology in your home and other industries."

Hornblower is planning a second hybrid ferry for San Francisco and one for its New York-based **Statue Cruises**. The company expects those ferries to meet or exceed the abilities of the *Hornblower Hybrid*.

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