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WORKBOAT[®]

IN BUSINESS ON THE COASTAL AND INLAND WATERS

DECEMBER 2006

Top 10

News
Stories
of 2006



2006 INTERNATIONAL
WORKBOAT SHOW

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IN BUSINESS ON THE COASTAL AND INLAND WATERS
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On the Cover

Photos, clockwise from top left, U.S. Coast Guard, Donn Young/Port of New Orleans, Bollinger Shipyards Inc., U.S. Army Corps of Engineers, Seacor Holdings Inc.



34

From greenhorn to mate in 24 months.



154

Low-emission boats may be the beginning of a 'green' marine wave.

FEATURES

34 Focus: Fast Track

Program's goal is to produce mates in two years.

40 Focus: What's Cookin'

Talented cooks play a big role in improving onboard health and morale.

50 Focus: Gassed Up

Increased LNG demand brings with it a need for more mission-specific tugs.

60 Focus: Taxwise

Two federal programs can help cut boat owners' tax tabs.

64 In Business: Bay Link

Chesapeake Bay rail-barge service covers 26 miles of open water.

78 Cover Story: Newsreel

WorkBoat's Top 10 News Stories of 2006.

108 2006 Boatbuilding Review

Boats that appeared in *WorkBoat's* On the Ways boatbuilding section.

166 Show Biz

Conference and exhibitor lineups at the 2006 International WorkBoat Show.

BOATS & GEAR

70 On the Ways

Eastern Shipbuilding tug, Gulf Fleet newbuild program, 30' landing craft.

154 Clean and Green

Environmentally friendly boats are planned for both coasts.

160 Sobering Experience

For most workboats, alcohol-testing kits will be standard equipment.

NEWS LOG

- 26** Gulf lease-sale lawsuit, SENESCO sold, single-hull liability limits raised, TWIC card.

AT A GLANCE

- 12 On the Water:** The TWIC card — Part II.
12 Captain's Table: An educational cruise on the Danube River.
13 WorkBoat Composite Index: Index jumps 50 points in October.
14 OSV Day Rates: Day rates continue to slip.
16 Inland Insider: Skilled labor shortage is acute for Gulf shipyards.
18 Book Review: The Port of Baltimore's first 300 years.
20 Q&A: An interview with Sen. Susan Collins of Maine.
22 Legal Talk: The role of a maritime attorney.

DEPARTMENTS

- 4** Editor's Watch
8 Mail Bag
222 Port of Call
235 Classifieds
236 WorkBoat Business
237 Product Locker
238 Calendar
239 Advertiser Index
240 WorkBoat Looks Back

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BOATS & GEAR

GREEN BOATS



Clean and Green

The Explorer is a hybrid biodiesel-electric boat.

runs through 2016 with the National Park Service, the dinner-boat and yacht-charter operator plans to build a radically new 600-passenger trimaran ferry for the two-mile route between the former prison island, San Francisco's top tourist attraction, and the mainland. The hybrid design would use a combination of solar, electric, and diesel power.

"The extremely short run makes a multifuel approach feasible," said Tegan Firth, promotions director for Alcatraz

Cruises, a Hornblower business unit. "Obviously, solar power has the lowest environmental impact, and with our solar sail, on good days we hope to be able to offer four knots under solar and wind power alone."

Firth said that although the design has a rigid "sail" on a vertical mast, the effect of the wind would be minor. "If the wind is from the right direction, then there'll be some benefit from the sail effect, but the primary purpose of the sail is to provide the surface area necessary for the solar cells."

Alcatraz Cruises has been in discussions with Solar Sailor of Australia concerning the vessel's design. "Solar Sailor operates a successful hybrid ferry in Sydney Harbor," Firth said, "and they've come up with an innovative design that we really like." Alcatraz Cruises has been in discussions with Kvichak Marine for construction of the boat.

'HOLISTIC' BUILDING

While the WTA's ferries are the most practical of the three designs, and the Alcatraz ferry the most advanced, the 149-passenger Explorer takes a middle course,

A new generation of low-emission boats are coming.

BY MAX HARDBERGER,
CORRESPONDENT

A government agency and an environmental education group, a continent apart but close in spirit, are making new strides in bringing "green boats" to the passenger-vessel industry.

On one side of the country, RiverQuest, a Pittsburgh non-profit organization that operates a fleet of "floating classrooms" dedicated to educating people about the marine environment, has launched the Explorer, a \$3 million steel 94'x26' hybrid biodiesel-electric excursion boat. And on the Pacific Coast, the San Francisco Water Transit Authority has contracted with Nichols Brothers Boat Builders, Freeland, Wash., and Kvichak Marine Industries, Seattle, to build two aluminum 149-passenger low-emission ferries for San Francisco Bay service.

The Explorer, built by Freeport

Shipbuilding Inc., Freeport, Fla., features the new Siemens ELFA propulsion system that automatically regulates the electrical supply to the drive motors and automatically starts and stops the biodiesel engines as the vessel's power needs require.

The Explorer can also operate on batteries recharged with shore power. "Grid power is much cleaner than diesel power," said Karl Thomas, RiverQuest's director. "The Explorer can run an hour on grid power stored in her batteries, and when she does have to switch to engine power, she burns low-emission, renewable biodiesel."

The aluminum 108'x28' WTA ferries are expected to burn diesel. However, Mary Culnane, the WTA's manager of marine engineering, said the boats will employ selective catalytic reduction to reduce air emissions 85 percent beyond federal EPA requirements — 20 times cleaner than current vessels — while carrying up to 149 passengers and 25 bicycles.

Another San Francisco Bay operator, Hornblower Cruises & Events, is working to reduce emissions 100 percent on its shuttle run to and from Alcatraz Island. Under a contract that

blending proven propulsion technology with advances in electrical storage and control.

“Diesel-electric drives have been around since World War II,” Thomas explained. “The *Explorer*’s high-tech electricity-storage device consists of 60 8D lead-acid batteries using 100-year-old technology. What the Siemens ELFA system does is automate and optimize the conversion of electricity to propulsive power.”

The RiverQuest approach has been to utilize common-sense materials and methods in a “holistic” approach to building and operating a green boat. By using tinted windows, environmentally friendly HVAC, interior paneling made entirely from recycled materials, and all water-based paint, the boat’s Jacksonville, Fla.-based designers, DeJong & Lebet Inc., designed the vessel to become the first boat approved under the U.S. Green Boat Council’s Leadership in Energy and Environmental Design (LEED) initiative. The designation is still pending.

“As a non-profit we have to be very cost-conscious, both in initial purchase and in maintenance,” Thomas said. “We were impressed with the Siemens system, and although there’ve been some delays in getting the bugs worked out, we’re confident that it will offer many years



New San Francisco Bay boats will be 20 times cleaner than existing EPA requirements.

of trouble-free service.”

The propulsion system uses two John Deere Powertech 6081AFM75 diesel engines each developing 180 kw at 1,800 rpm, and a Deere Powertech PE4045TFM75 producing 55 kw at 1,800 rpm. These supply power to Siemens 1FV5139-SWS24-Z12 water-cooled generators through SIPCO speed-increasing gearboxes. The generators supply 440-volt electricity to traction inverters that convert the power to synchronous electricity, then to two Siemens 1FV5139-SWS24-Z12 water-cooled generators through SIPCO speed-increasing gearboxes. The generators supply 440-volt electricity to traction inverters that convert the power to synchronous electricity, then to two Michigan Wheel Workhorse four-bladed 38"×34" propellers through shafts and SIPCO spiral-bevel 5:1 reduction gears.

“The advantages of diesel-electric drive are well-known, and so are the disadvantages,” said Thomas. “It’s not for long ocean voyages. But in a low-speed excursion boat that returns to the dock regularly to ‘refuel’ from the grid, it’s the best currently available.”

GRID POWER

Thomas stressed that grid electricity is the most environmentally friendly power com-



A proposed trimaran for the Alcatraz Island, Calif., run would be solar, electric and diesel powered.

mercially available. “Utility power plants produce much less pollution than even the cleanest diesel engine,” he explained.

“It’s also ironic that we have strict oil-spill pollution controls, but water exhausts are universally allowed in part because they are quieter than a straight air exhaust. But blow-by products that make their way past the rings and seals get into the exhaust and then into the water, contributing significantly to overall pollution.” Exhausts on the *Explorer* are dry.

On longer cruises, however, the boat will have to switch to diesel power when battery power runs down. “We can cruise an hour at four knots on battery power alone,” he said. “The ELFA system is programmed to bring the generators on-line at the optimum point of battery power remaining.”

Siemens’ engineer for the Pittsburgh project, Thomas Orberger, said the system is extremely efficient. “When the operator first calls for

BOATS & GEAR: GREEN BOATS

power, one generator starts and supplies power to both propulsion motors,” he said. “When more power is required than one engine can supply, the second engine starts and contributes to the overall vessel electrical supply.” Even the house generator, which can be isolated to the house load to ensure lighting and communication with both main generator systems down, can contribute to the main power supply when necessary.

“Another beauty of the system,” Orberger continued, “is that at any given time, any power being produced by the generators over that required by the motors automatically goes into the batteries, to be drawn out later under battery-only operations. That way, power that is usually wasted when diesel engines operate at reduced power is saved for use later.”

In keeping with its educational role, the *Explorer* has three classrooms on the main deck, each lined with recycled wheatboard paneling. The classrooms are wired for broadband Internet access and have bathrooms and eye-wash stations. The second deck houses the wheelhouse forward and a large open observation area aft.

The vessel’s fuel tanks are separate from the hull — the equivalent of a “double-bottom” — and are piped so that different fuels can be carried in each tank and blended as they are fed to the engines. “We intend to act as a test bed for biodiesels, so this was an important feature,” said Thomas.

SOLAR CELLS

RiverQuest also plans to add a solar array to the roof of *Explorer*’s second deck in 2007, providing up to 1.5 kw of electricity, and then install another 2.5 kw of solar cells on the vessel’s dock.

“Whether the *Explorer* is underway or at the dock, the solar cells will be making electricity while the sun is shining, reducing the cost of refueling from the power grid,” said Thomas. “Further, our system will be set up so



that when the *Explorer*’s batteries are full, the solar cells will be feeding power into the grid, further reducing our electric bill.”

Orberger said that the Siemens ELFA system is not marine specific, but can be adapted to any application suitable for diesel-electric power.

“We designed the system as a module,” he explained. “We’ve found that the power package works best in the 150- to 200-kw power range, so our modules are generally designed around that power output. For a given power requirement, as many modules as necessary can be hooked up together.”

Other uses for ELFA modules include large cranes, trolleys and locomotives.

“The *Explorer* is the first use of the ELFA system in a green project, and we’re proud to be part of it,” said Orberger. “We had some initial chal-

RiverQuest plans to install solar cells to the *Explorer*’s roof in 2007.

lenges in adapting the system to the *Explorer*’s requirements, but these are a normal part of being on the cutting edge.”

In the future, RiverQuest is looking to expand its green power options with the addition of wind and water turbines (to take advantage of river current past the dock). The San Francisco Water Transit Authority and Alcatraz Cruises are also looking toward tomorrow’s technology in their own efforts.

“Hydrogen fuel cells hold a lot of promise,” Cunnane said, “and the WTA has been actively researching that technology. But whether it’s through fuel-cell technology or otherwise, we’re committed to achieving zero emissions in the foreseeable future.” **WB**