Seabotix' underwater robots plumb the depths

by Bruce V. Bigelow

If there has been an ebb and flow to the underwater technology industry, SeaBotix Inc. may be part of a new tide in maritime innovation.

SeaBotix specializes in designing and building a relatively new class of underwater robots known as ROVs, or remotely operated vehicles.

PLUMBING THE DEPTHS - A SeaBotix robot is maneuvered near a San Diego Harbor Police boat as deputies trained with the device. The ROVs are 20 inches long, 10 inches wide and 10 inches tall. CNS Photo by John Gibbins. ROV technology burst into public view in 1966, when an underwater robot operated by a team of Navy researchers based in San Diego recovered a lost U.S. hydrogen bomb from the bottom of the Mediterranean Sea near Palomares, Spain.

San Diego soon gained renown as a leading center of underwater robotics technology. Advances were made at the Navy's San Diego-based Ocean Systems laboratories; University of California at San Diego's Scripps Institution of Oceanography; and Hydroproducts and Ametek Straza, two companies that made ROVs in San Diego during the 1970s.

By the 1980s, though, ROV development had moved from San Diego to the capitals of the offshore oil and gas industry along the Gulf Coast and Britain. Today, "heavy work" ROVs developed for such deep-water work are often as big as a Jeep and can weigh more than 11 tons.

In contrast, the ROVs developed by SeaBotix weigh from 25 to 35 pounds, with a standard size of 20 inches long, 10 inches wide and 10 inches tall. SeaBotix founder Don Rodocker describes the new class of miniature robots as an "ROV for the masses."

Since SeaBotix made its debut seven years ago at an industry conference, the San Diego company has sold 500 of its mini-ROVs.

SeaBotix's revenue was $5.4 million in 2007, almost 23 percent higher than in 2006, Rodocker said.

While mini-ROVs can perform many tasks, Rodocker said they are ideally suited for underwater inspections of pipelines, bridge footings, piers and other structures.

The ROVs' innovative design includes electronic features that make them easy to reconfigure for different uses.

"They have different input/output ports to plug into," said Kevin Hardy, who is familiar with SeaBotix's ROVs as director of engineering at Deep Sea Power & Light, a San Diego company that makes underwater lighting systems.

"So you can put a little sonar on it, or little hydrophones, or sensors to sniff chemicals," Hardy said. "It's kind of like having a little shopping cart where you can push things around that are heavier than what you'd be able to carry yourself."

In November, a San Diego business used a SeaBotix ROV to help recover a 30-foot powerboat that had sunk 387 feet in Lake Powell, Ariz., after a fatal boating accident Sept. 15. A similar ROV was used 11 months earlier to retrieve the body of a skater who had broken through the ice at Donner Lake, near Truckee, Calif. The body was found 187 feet below the surface of the frigid lake.

A mini-ROV can be safer and less expensive to use than a dive team in many situations, and dive teams often

use such ROVs to inspect an underwater work site before beginning their job, Rodocker said.

Rodocker, 61, said he began working on the design in the 1990s, with the idea of creating a mini-ROV that was affordable, easy to operate and highly maneuverable.

A major innovation was the lightweight umbilical line, or tether, that is used to operate the robots from the ocean surface.

Rodocker said he wanted the diameter of the tether to be less than one-third of an inch, a design specification met by FalMat Cable of San Marcos, Calif.

"We knew that a small ROV must have a small-diameter umbilical; otherwise, you end up with the 'tail wagging the dog' syndrome due to umbilical drag," Rodocker said.

The ROV also has benefited from advances that included the miniaturization of high-resolution cameras and electronics, improved battery efficiency and light-emitting diode, or LED, lighting.

SeaBotix now makes more than a dozen ROV models, which cost from $22,000 to more than $150,000, and can operate at maximum depths of nearly 2 1/2 miles.

Hardy says he describes the SeaBotix robot as "schleppable" because "it would be really easy to backpack it to some ancient Inca site and drop it down some of the wells that they have."

SeaBotix has even developed a four-wheel ROV "crawler" for ship inspections below the waterline, using an innovative "vortex generator," a pump mounted on the bottom of the ROV that creates enough suction to keep the ROV pressed against the bottom of the hull.

"A sailor can drop it overboard, and the video data can be sent anywhere," said Michael B. Jones, who works part time as SeaBotix's chief financial officer and heads The Security Network, a San Diego industry group.

Jones said the ability to share video data is important, because "if you find something on the bottom of a ship's hull, you have to figure out what it is. Is it a limpet mine? Is it radiological? Is it contraband?"

The company, which has 42 employees, is growing fast and plans to move in coming weeks to a bigger facility.

The rise of SeaBotix also has been welcomed by scores of other underwater technology companies that have remained in San Diego throughout the industry's shifting fortunes. Most of the companies are small businesses, but Jones estimates there are as many as 150 specialized maritime companies that constitute a thriving cluster of related technologies.

Like SeaBotix, many businesses are also flourishing from the surge in Department of Homeland Security spending and the recent boom in the offshore oil and gas industry.

For example, Sidus Solutions, which specializes in underwater pan-and-tilt cameras, has been working to install thermal security cameras on the jetty at the liquefied natural gas receiving terminal that Sempra Energy is building near Ensenada, Mexico.

"We're doing a very, very strong business," Sidus owner Leonard Pool said. "Most of our customers are out of Houston; Aberdeen, Scotland; Norway - anyplace where there's a large concentration of offshore oil and gas."

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