

# World-Class Facilities Boost Ocean Technology Companies' Research & Development

By Andrew Safer



**Oceanic Consulting Corporation research on ice loads on an FPSO from a first-year ice ridge, in the ice tank at NRC-IOT**

Whether they're helping oil companies engineer solutions to the challenges posed by deepwater exploration and production, finding new ways to increase efficiency and reduce fuel consumption for inshore fishermen, or developing a system for harnessing wave power, ocean technology companies, as in the examples below, are making use of the extensive network of specialized facilities located in and around St. John's. Following are examples of how some of these facilities are being used by local ocean technology companies.

In conducting applied research and technology validation experiments in hydrodynamics and Arctic engineering, Oceanic Consulting Corporation provides national and international industry clients access to a range of facilities at the NRC Institute for Ocean Technology (NRC-IOT), the Ocean Engineering Research Centre at Memorial University, and the Fisheries and Marine Institute of Memorial University.

Thirteen of Oceanic's 45-member team work out of offices in NRC-IOT where they conduct maneuvering, seakeeping, resistance, propulsion, mooring analysis,

icebreaking, ice-ship and ice-structure interaction, Vortex-Induced-Motion (VIM), and Vortex-Induced-Vibration (VIV) research on behalf of international clients. The VIM and VIV projects are focused on mitigating the wobble effect of ocean currents on the vertical cylinders that make up the risers and spars used on offshore oil and gas projects.

"Oceanic takes the unique capabilities that are here in this building and resident in the people in their company, and they sell that to the world," says Noel Murphy, NRC-IOT's business manager. "They're traveling around the world, fairly aggressively seeking out new markets and new clients, and bringing them back here." Oceanic subcontracts NRC-IOT to both run the facilities and assist with a portion of that work, typically in the areas of control systems and dynamic positioning systems for ships and offshore structures. Oceanic's team also uses the Ocean Engineering Research Centre's 58-meter wave/towing tank, housed in the Faculty of Engineering and Applied Science on Memorial University's main campus, for projects involving small craft (vessels up to 150 feet; the models are up to 7.5 feet) and small-scale VIV work.

They use the NRC-IOT's 200-meter wave/towing tank for projects involving large vessels, and its 90-meter ice/towing tank for Arctic and cold-ocean research projects.

Early on, Oceanic discovered that the 22-meter flume tank at the Marine Institute is ideal for conducting experiments that need to run longer than the 200-meter length of the towing tank allows. They investigate hydrodynamics by keeping the model stationary as the currents are generated in the tank. "If it weren't for the flume tank," says Dan Walker, Oceanic's founder who is currently Executive Director, Business Development and Marketing, "we wouldn't have gotten into the VIV or VIM work we do today."

Having access to this suite of facilities remains a prime competitive advantage, says Walker, who adds that today it's also Oceanic's substantial years of experience and the numerical capability they have developed using both commercially available software and the codes their engineers have developed in house. He points out that most other major research centers don't have ice tank facilities. Increased interest in the Arctic has translated to more frequent use of NRC-IOT's tank, he says, as well as more physical research and numerical simulation for Oceanic in recent years.

In mid-2011, Fleetway, Inc., a member of the J.D. Irving, Limited Group of companies, acquired Oceanic Consulting Corporation. The acquisition brought Oceanic full-circle, considering that its first commercial contract 16 years ago was an icebreaker study for Saint John Shipbuilding, an Irving-owned company.

**Marine Robotics Inc. (MRI), a subsidiary of Marport Deep Sea Technologies Inc., used the NRC-IOT facilities extensively to develop the twin-hulled SQX-500 autonomous underwater vehicle (AUV). The SQX-500's unique propulsion and control system provides high maneuverability and the ability to both hover and turn 360 degrees around its vertical axis.**

MRI's 9-person staff works in a prototype-development laboratory and in offices within NRC-IOT where they have used the 200-meter towing tank, the 75-meter Offshore Engineering Basin, and the cavitation tunnel for component development and to measure various characteristics of the AUV. At the Marine Institute, they used the pressure chamber and the flume tank for various tests and to validate measurements. Neil Riggs, MRI's vice president of research and development, says that by adding water currents, the flume tank brings the testing process one step closer to the real world. NRC-IOT's expertise in hydrodynamics, underwater vehicles, computational fluid



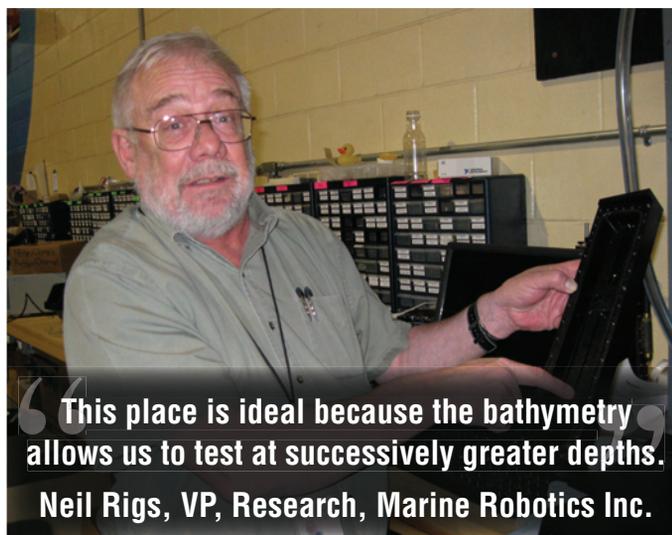
**Marine Robotics Inc.'s co-op engineering student Scott Holmes, preparatory to launching the SQX-500 at the Holyrood Marine Base.**

dynamics, and propeller design assisted in the development of the technology, adds Riggs. He says that being part of IOT's Petri dish culture of innovation has been key role to MRI's development process.

When it came time to begin testing the SQX-500 in the ocean, Riggs and his team drove 30 minutes from St. John's to the Holyrood Marine Base, which the Marine Institute opened in August 2010. Holyrood provides ocean frontage, and support services for at-sea ocean technology research, development, training, and education activities. Robert Coombs, the Marine Institute's manager of marine services, identifies the superior water quality and the lack of both significant vessel traffic and incidental sources of noise underwater as the Marine Base's key characteristics.

In the mission control room, MRI's lead engineer and a software engineer are testing and fine-tuning the SQX-500's control systems as it executes a mission in the bay. As a safety measure, two technologists follow behind in a chase boat. "This place is ideal," says Riggs, "because the bathymetry allows us to test at successively greater depths." For the first nautical mile, the water depth is 15 to 18 meters, and then it increases to 30 meters—still within diver territory—and, finally, to 200 meters in the approaches to nearby Bell Island. "This allows us to first conduct our tests in shallow water," Riggs explains, "then we move out further in the bay. It's a way of managing risk in the real-world testing process."

Unlike other locations he investigated on the island's coast, the waves here are rarely high enough to prevent testing. "As long as the ice doesn't come in," Riggs says, "we can keep going. Without Holyrood, we would have achieved ¼ to ½ of what we've achieved to date."

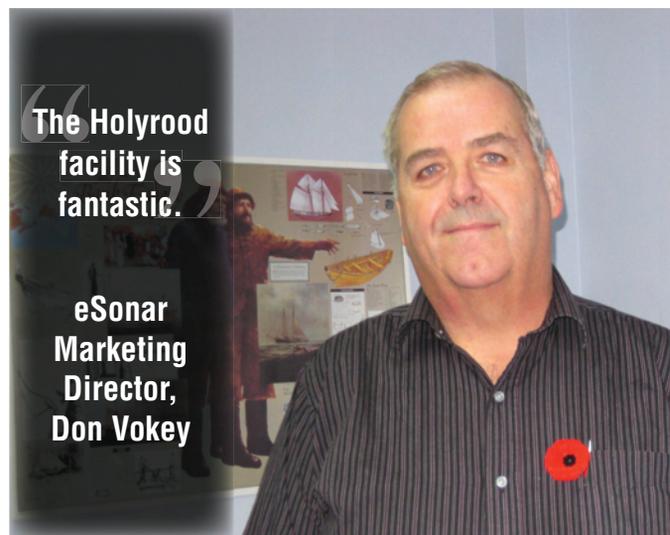


The ability to work on the vehicle in the multi-purpose building has also saved a substantial amount of time and money, Riggs says.

When it comes time to perfect one of their sonar-based fishing trawl monitoring systems, eSonar uses the facilities at the Marine Institute’s Centre for Sustainable Aquatic Resources and its Centre for Applied Ocean Technology, both housed within the same building. eSonar’s systems incorporate sensors to provide information about the operation of the trawl, distance to the bottom, and other fishing parameters. The development team goes to Holyrood to test the components of their trawl systems in saltwater. “The Holyrood facility is fantastic,” says eSonar Marketing Director Don Vokey. “They’ve given us permission to mount various components in strategic locations as long as it’s not interfering with work someone else is doing.”

If eSonar had to go out of province to do their testing, that would add “a huge bump to development costs,” Vokey says. The economics help the company maintain a low price point on their products. “I think we are perhaps the most affordable system out there,” he adds. And their collaboration with the Marine Institute goes beyond product development. “They have been one of our strongest partners from day one,” says Vokey, recalling a three-day course the Marine Institute hosted for research groups from the United States about three years ago. When he found out they were fisheries scientists, Vokey asked to meet them, and the Marine Institute provided the introduction. eSonar staff spent a full day with them demonstrating their product “and as a result of that,” he says, “we got our first customer.”

When SubC Control Limited of Clarenville, NL wanted to locate a satellite office in St. John’s, the company moved



into the Genesis Centre, Memorial University’s incubation centre. SubC develops high-definition video, digital stills, and recording solutions for the professional underwater market. For example, one camera enables an ROV to transmit live standard-definition video topside, while recording high-definition video and digital stills to the camera for later retrieval. Over the last 12 years, the Genesis Centre has assisted both Memorial graduate students and local entrepreneurs in building 50 companies around new technologies—40 of whom have “graduated” and moved on. “Our focus has been trying to develop technology-based companies for this region,” says President and CEO Dave King. “Through the Genesis Group we also monitor the research coming out of the university and then try to transfer that over to industry so they can commercialize it, but sometimes a new company is the best vehicle for commercialization.” The centre has been instrumental in helping to develop a strong ocean technology sector, having graduated seven companies. The ocean tech focus continues with SubC Control, Grey Island Energy, and EMSAT Corp., three of the companies currently located there.

SubC’s Sales and Marketing Director Ron Collier appreciates being co-located with eight other technology companies, “from the guys who are just starting out to the ones who are on their second or third company they’ve helped launch,” he says. “We can leverage their experience and their contacts and take their advice on which road we should take, from product development to marketing and promotion. Some of them have 30 years’ experience.” Collier says SubC has received valuable advice from their Genesis Centre advisory board regarding matters such as ensuring quality control of products through ISO certification and contacts to enter foreign markets.

Through their Ocean Technology Enterprise Centre (OTEC), NRC-IOT staff assist Genesis Centre companies in further developing their technologies. “We’re bringing technical expertise, and they’re bringing business, marketing, and finance expertise to the table,” says Noel Murphy, NRC-IOT business manager. “You’ve really got to have the whole package.” Grey Island Energy (GIE), developer of the Sea Wave Energy Extraction Device (SeaWEED), has offices in both locations. Genesis Centre CEO Dave King introduced GIE to former Genesis Centre member Brian Lundrigan, CEO of Wyse Design and Development. Since then, Lundrigan, who is now a co-owner of GIE, has provided significant input into the design of the scale prototype the company is currently

testing in the NRC-IOT towing tank. Being part of OTEC enables them to avail of the “tremendous expertise in wave energy” at NRC-IOT, says GIE Chief Operating Officer Daniel Hoyles, 24, who graduated from Memorial University with a Bachelor of Commerce (honours) in 2010. IOT staff advise GIE on testing methods, and assist in the testing process. “They help us order the wave regimes to send at the device, which leads to significant savings,” Hoyles says, adding, “there aren’t many places in the world where you can walk from your office to the ocean wave facility you’re going to use for testing.” The other key benefit of OTEC, he says, is “talking to people in the offices around us who have experiences with the day-to-day struggles of building a company.”

**Oceanic Consulting conducted research on the Red Hawk cell spar in the flume tank at the Centre for Sustainable Aquatic Resources, Fisheries and Marine Institute of Memorial University of Newfoundland.**

