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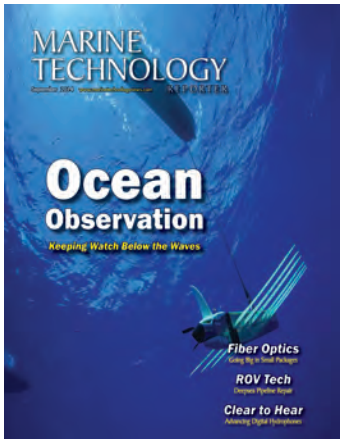

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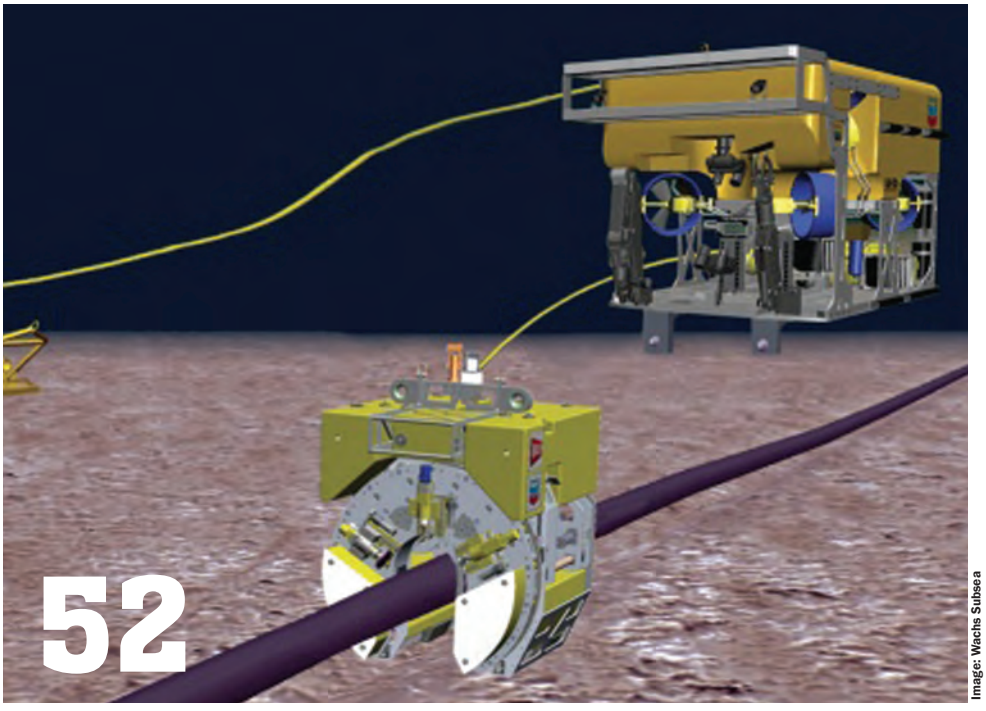

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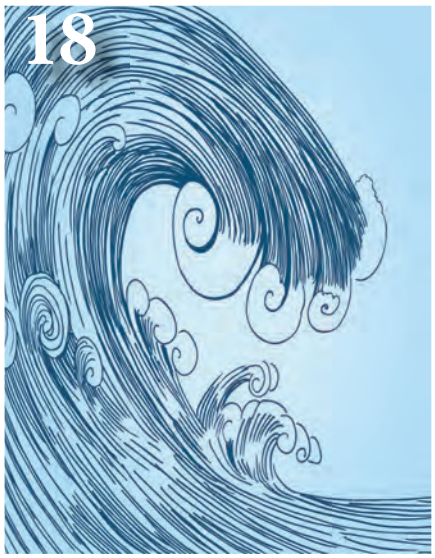

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(Photo courtesy of Adrian Round, Dir. of Observatory Operations, ONC)

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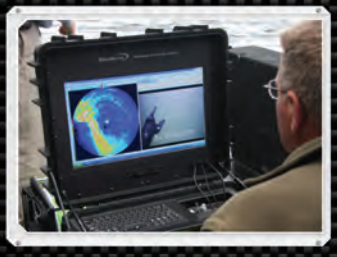

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The Authors in This Edition of MTR

Dennis Bryant

Michael Jones

Steve Bell

Claudio Paschoa

Tom Peters

Jon Wilkins

Bryant
Dennis L. Bryant is with Maritime Regulatory Consulting, and a regular contributor to Maritime Reporter & Engineering News. e: dennis.l.bryant@gmail.com *p. 18*

Jones
Michael B. Jones is President of The Maritime Alliance and The Maritime Alliance Foundation. He can be reached at mbjones@themaritimealliance.org. *p. 20*

Bell
Steve Bell is an Optical/Photonics Engineer at BIRNS, Inc. and has more than 25 years of expertise in designing and testing subsea and terrestrial fiber optic systems. E: sbell@birns.com. *p. 28*

Paschoa
Claudio Paschoa is Marine Technology Reporter's correspondent in Brazil. *p. 36*

Peters
Tom Peters is a freelance writer living in Lower Sackville, Nova Scotia. He is retired from the newspaper business after 41 years with The Halifax Chronicle-Herald. *p. 46*

Wilkins
Jon Wilkins is the US Sales Manager for Silicon Sensing and has been in the inertial field since 2001 with roles in engineering and program management. *p. 62*

Leska
Mark Leska is Senior Marketing Coordinator for Wachs Subsea and E.H. Wachs, A Division of ITW. E: sales@wachssubsea.com. *p. 52*

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118 E. 25th St., New York, NY 10010
Tel: (212) 477-6700; Fax: (212) 254-6271

FLORIDA
215 NW 3rd St., Boynton Beach, FL 33435
Tel: (561) 732-4368; Fax: (561) 732-6984

PUBLISHER
John C. O'Malley
jomalley@marinelink.com

Associate Publisher & Editor
Gregory R. Trauthwein
trauthwein@marinelink.com

Web Editor
Eric Haun
haun@marinelink.com

Contributing Editors
Capt. Edward Lundquist, USN (Ret.)
Claudio Paschoa

Production Manager
Irina Tabakina
tabakina@marinelink.com

Production & Graphic Design
Nicole Ventimiglia
nicole@marinelink.com

Sales & Event Coordinator
Michelle Howard
mhoward@marinelink.com

Manager, Public Relations
Mark O'Malley
momalley@marinelink.com

Manager, Information Technology Services
Vladimir Bibik
bibik@marinelink.com

CIRCULATION
Kathleen Hickey
mtrcirc@marinelink.com

ADVERTISING
Vice President, Sales and Marketing
Rob Howard
howard@marinelink.com
Tel: (561) 732-4368 • Fax: (561) 732-6984

Advertising Sales Manager
Lucia M. Annunziata
annunziata@marinelink.com
Tel: (212) 477-6700 • Fax: (212) 254-6271

Mike Kozlowski
kozlowski@marinelink.com
Tel: (561) 733-2477 • Fax: (561) 732-9670

Japan
Katsuhiro Ishii • *amskatsu@ dream.com*
Tel: +81 3 5691 3335 • Fax: + 81 3 5691 3336

Gregory R. Trauthwein
Associate Publisher & Editor
Email: trauthwein@marinelink.com

See you in St. Johns ...

It is hard to believe that another Oceans (www.oceans14mtsieeestjohns.org) is upon us, set for September 14-19, 2014 in picturesque St. Johns, Newfoundland and Labrador, Canada. This will be my first trip back to St. Johns in about two years, and to be perfectly honest it is one of my favorite places to visit on the planet. Not only do the residents offer a legendary brand of hospitality mixed with a scenic environment, the city and the province are home to one of the broadest and deepest subsea clusters in the world. While there are many geographic regions throughout the world that claim to be a cluster, St. Johns is truly a cluster like one I've never seen, with a tight-knit community of professionals, companies, government and educational resources that is hard to match. Above and beyond all else I am anxious to see the growth of the companies and the industry in St. Johns, as on each of my three previous trips, generally spaced about 18 months apart, I was struck each time with the rapid maturation and strong growth of individual entities and the cluster as a whole. If you have not been to St. Johns and/or an Oceans event lately, I highly recommend you make the trek to this one.

On top of producing this edition, we concurrently made our editorial plans for 2015, which is summarized nicely on page 80 of this edition. What you see there are our traditional nine print editions of MTR. What you do not see is our three new "Electronic Only" editions dubbed ***MTR White Papers.*** In response to a dramatic increase in demand from our readers to publish and distribute White Paper style reports to our world-leading circulation of more than 25,000, and a concurrent rapid growth of or "Emag" circulation to more than 10,000, we decided to launch ***MTR White Papers*** to effectively serve both needs. Each edition is tightly focused, with the first on "Oceanographic," the second on "Hydrographic," and the third on "Unmanned Marine and Subsea Vehicles." As always, we encourage valuable input from the industry, and I welcome your call or email to discuss ways in which you can contribute.

MARINE TECHNOLOGY REPORTER
www.marinetechnologynews.com
Vol. 57 *No. 7*
ISSN 1559-7415
USPS# 023-276
118 East 25th Street,
New York, NY 10010
tel: (212) 477-6700
fax: (212) 254-6271

Marine Technology Reporter ISSN 1559-7415 is published monthly except for February, August, and December by New Wave Media, 118 E. 25th St., New York, NY 10010-2915. Periodicals Postage at New York, NY and additional mailing offices.

POSTMASTER: Send address changes to Marine Technology Reporter, 850 Montauk Hwy., #867, Bayport, NY 11705
Postmaster send notification (Form 3579) regarding undeliverable magazines to Marine Technology Reporter, 850 Montauk Hwy., #867, Bayport, NY 11705

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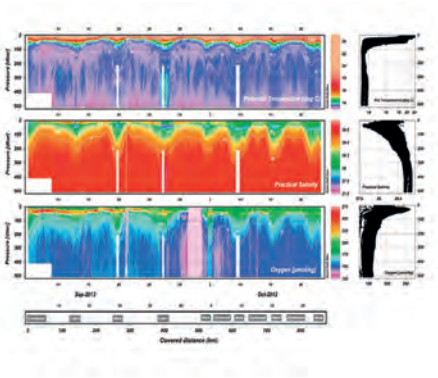

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(Photo courtesy of General Dynamics Electric Boat)

Submarine
North Dakota

The U.S.'s newest and most advanced nuclear-powered attack submarine, North Dakota (SSN-784), returned to the General Dynamics Electric Boat shipyard following the successful completion of its first voyage in open seas, called alpha sea trials. North Dakota is the 11th ship of the Virginia Class. North Dakota's alpha sea trials included a range of submarine and propulsion-plant operations, submerging for the first time, and high-speed runs on and below the surface to demonstrate that the ship's propulsion plant is fully mission-capable. In May, the U.S. Navy underscored its commitment to an advanced and adaptable submarine force by awarding Electric Boat a contract valued at $17.6 billion for the construction of 10 additional Virginia-class submarines. Virginia-class submarines displace 7,800 tons, with a hull length of 377 feet and a diameter of 34 feet. They are capable of speeds in excess of 25 knots and can dive to a depth greater than 800 feet, while carrying Mark 48 advanced capability torpedoes and Tomahawk land-attack missiles.

ULSTEIN PX121 *for Otto Offshore*

Ulstein Design & Solutions entered into a contract with Wuchang Shipbuilding Industry Co., Ltd, China, for the delivery of ship design & equipment to four PX121 type platform supply vessels. The ship owner is the Singapore based Otto Offshore Ltd., which is scheduled to receive all vessels in 2016. The contract also includes an option for four vessels.

These PX121 vessels are capable of supporting offshore activities which are being carried out further from shore and in deeper waters. The vessels can carry flexible loads. In addition to tanks for various contents such as oil, water, and drilling fluids, they have four stainless steel tanks for flammable liquids or corrosive chemicals (LFL tanks). The vessels are certified by DNV and carry the 'Clean Design' notation.

Measuring 83.4 m long with a beam of 18 m, they have a cargo deck of 840 sq. m. and a load capacity of 4,000 tons (dwt).

Each ship has a maximum speed of approximately 14.5 knots and accommodates 30 people. They carry the X-BOW hull line design, which is designed to be efficient on all drafts, a factor critical for PSVs, as they frequently operate with varying drafts. The X-BOW has unique and documented qualities in head seas, in which the bow shape eliminates slamming and reduces bow impact, noise and vibration. This leads to better performance and increased operability, increased crew comfort and safety and reduced fuel consumption. Each ship will be equipped with dynamic positioning system Class II and meets the requirements of Comfort Class.

Otto Offshore is a company in Otto Marine Ltd. The contract with Ulstein includes the deliveries of design, engineering and main equipment. An extensive delivery from Ulstein Power & Control includes integrated control systems, bridge (radio, navigation), switchboard, diesel electric propulsion and frequency converters, and communication systems. The vessels will be prepared for offshore crane and mezzanine deck for ROVs.

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Photo courtesy of Nakilat Damen Shipyards

Mooring Boats Launched for Port of Ras Laffan

Nakilat celebrated the delivery of two 16-m mooring boats built by shipbuilder Nakilat Damen Shipyards Qatar for towage operator Nakilat Svitzer Wijsmuller. The vessels were built in Qatar and will be operated at the Port of Ras Laffan. The two Stan Tug 1606 mooring boats, named Ras Al Allaj Qatar and Al Esaiwed, are the first of a seven-vessel order that Nakilat Damen Shipyards Qatar is currently working on for Nakilat Svitzer Wijsmuller.

The vessels will work on a long-term charter to Qatar Petroleum and will be part of the growing fleet of Nakilat Svitzer Wijsmuller vessels in the Port of Ras Laffan. Nakilat Svitzer Wijsmuller already operates a fleet of 25 vessels at Ras Laffan and a another five vessels at Halul Island, performing about 12,500 tug jobs per year in the Port of Ras Laffan.

Triton Submarines' New Submersible

Triton Submarines will introduce its newest model, the Triton 1000/3 LP (Low Profile) at the 2014 Monaco Yacht show. Triton's model line now includes 11 models configured for two to eight passengers with depth ratings from 1000 feet (305 meters) to 5500 feet (1675 meters) as well as the full ocean depth rated Triton 36000/3.

Yacht-based submersibles continue to gain popularity in the yachting community. Until now, size and weight restrictions for existing tender garages have kept many yachts from integrating a sub. Triton's CEO, Bruce Jones thinks that is about to change. "The Triton 1000/3 LP will make it possible for most larger yachts to carry a submersible. It's an absolute game changer and we are excited to be introducing the design in Monaco."

At only 5.6 feet tall (1700 mm) with a modest crane weight of 7,650 pounds (3475 kg) the Triton 1000/3 LP is a light, compact three-passenger deep diving submersible (1000 foot/305 meter depth rating).

The Triton 1000/3 LP design was driven by the demand for a submersible design that could be integrated into existing superyacht tender garages without the need for a major refit. The design of 1000/3 LP utilizes a forward acrylic hyper-hemisphere for the two passengers and a rear steel hyper-hemisphere for the pilot and internal systems. This arrangement utilizes smaller spheres while also providing for a design that does not require a large external frame.

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SRSVs for RederijGroen

The delivery of the 7-Oceans to offshore services company RederijGroen (Scheveningen, the Netherlands) marks a new milestone in OSV construction. The vessels have been designed in close cooperation with both RederijGroen and its customer. The Seismic Research Support Vessel (SRSV) is constructed by Maaskant Shipyards Stellendam, part of Damen Shipyards Group, and the first of a series of three identical vessels. Charterer Dolphin Geophysical opted for a 35m design from Vestvaerftet in Denmark. This design is even closer to a fishing vessel compared to the two 40m newbuilds Maaskant delivered to RederijGroen last year.
For optimal maneuverability, two Vethazimuth stern drives (ASD) were chosen. They are each driven by an active front end, frequency controlled electric motor of 500 kW each. Power is generated by three Caterpillar C18 generator sets of 525 kVA. Also a 90 kW electric bow thruster is fitted. Accommodation is arranged for a crew of six with extra capacity for eight service crew.

OceanScience Adds Autonomy

The Oceanscience Z-Boat 1800 remotely-operated hydrographic survey boat has completed final trials with an on-board autonomous waypoint navigation system, and is ready to survey. The latest GNSS controlled, IMU aided "robo" Z-Boat option is a result of a partnership between The Oceanscience Group (USA), MSubs (UK) and Swathe Services (UK) and adds autonomy to the substantial list of options for the 1.8 m (6 ft.) portable hydrographic survey system. While under manual or autopilot control, the Z-Boat can gather single or dual frequency echosounder bathymetry, side scan imagery, water quality or ADCP velocity data.

According to the company, the surveys conducted with the first autonomous Z-Boats illustrate the line following performance of the MSubs autopilot, even at survey speeds up to 8 knots. Cross track error is usually measured in inches and centimeters not feet or meters, and significantly exceeds the route following accuracy possible on a manned boat resulting in laser straight survey lines.

The navigation package was designed around existing hydrographic survey software. Survey line plans may be exported from HYPACK or Hydromagic directly into the Z-Boat Run Planner navigation package, and translated into navigation waypoints. With an exact match between the Z-Boat route plan and the survey line plan, data acquisition may also be completely automated. The route plan is uploaded from the shore control laptop to the Z-Boat out on the water by a radiomodem system, and once the survey starts the Z-Boat operates independently of the shore controller. Data are streamed to the shore and simultaneously recorded onboard, and in case of any unexpected events the operator can switch to manual control with an "Xbox" style hand-held controller. The Z-Boat can operate well over a mile from the control station but remain in contact with the surveyor through the radio link.

The autonomous Z-Boat option benefits surveyors conducting large area surveys on inshore waters where access for a manned boat is difficult or impossible. Operator productivity may be maximized by reducing the need for continuous attention to vessel navigation, and spectacular ruler-straight datasets can be provided to clients. Smooth heading control is particularly beneficial for side scan data from the Z-Boat, which uses hull mounted transducers.

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North Sea Atlantic Joins Technip fleet

In late July a ceremony was held in Bergen, Norway to officially name the latest new subsea construction vessel to join the Technip fleet, the North Sea Atlantic. More than 200 guests from shipowner North Sea Shipping, ship charterer Technip and supply chain partners, gathered to attend the ceremony held at the NorYards BMV AS shipyard (previously Bergen Group) in Laksevåg, Bergen, Norway. The event was hosted by North Sea Shipping CEO, Hallvard Klepsvik, and his wife, Sigrid Anne Våge, acted as the vessel godmother.

Technip announced in 2012 that it had signed a long term charter agreement with North Sea Shipping for an advanced new build construction vessel. During the two year construction period, teams from the two companies worked together closely to ensure the project was delivered to expectations. Designed to Technip's specifications, this multi-purpose vessel is capable of undertaking pipelay, subsea construction and IRM projects.

The vessel's design meets the highest requirements for subsea work and although she will work predominantly in the North Sea, she is also suitable for deepwater operations worldwide. This advanced DP class 3 vessel is equipped with a 550 ton active heave-compensated crane and a 2,000 ton underdeck carousel for product storage. She can accommodate an Openable Vertical Lay System for pipelay of flexibles and umbilicals.

Island Performer
for Deep-Sea Subsea Work

The Ulstein Verft subsea newbuild, Island Performer, was delivered to Island Offshore. The flexible, state-of-the-art RLWI/IMR vessel will serve her first five years for FTO in the Gulf of Mexico.

"The vessel is customized to suit the scope of work in the FTO contract, in which RLWI (Riser-less Light Well Intervention) and IMR (Inspection/Maintenance/Repair) are the main tasks. She is able to perform operations at depths down to 3,000m, and the contracted work start at year's end," said Managing Director Håvard Ulstein, Island Offshore. "However, the very first assignment will be for the RogFast connection in Norway, in which the scope of work will be to investigate the sea bottom."

"A large intervention tower is placed over the 8- x 8-meter main moon pool. She is equipped with a 250-metric-ton AHC (active heave compensated) offshore crane with a below-deck winch, and carries two deep-sea work ROVs, one to be launched through a dedicated moon pool and the other from the starboard side," Ulstein said.

Island Performer is the next generation subsea vessel from Ulstein, with large accommodation, storage and lifting capacities. She meets the highest standards for station keeping, redundancy and dynamic positioning (DNV GL class notation DYNPOS AUTRO, equivalent to DP3). Additionally, operability in DYNPOS AUTR (DP2) operational mode is maximized due to the Operation+ feature with a three-split configuration on main machinery. This set-up allows the vessel to retain system integrity and to continue operations uninterruptedly even after a substantial single system failure.

A shelterdeck is stretching all the way past the main moon pool and aft to the main crane. This increases the operational window for moon pool work and offers a shielded space for various equipment. Arranged on the shelter deck is a multi-skidding system for handling 100-metric-ton skidding pallets. The design also includes a heavy-load cargo deck for transporting equipment for a multitude of operations and construction work.

(Photo: Ulstein Group/Marius Beck Dahle)

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[Figure 1 - EXO2 Platform]

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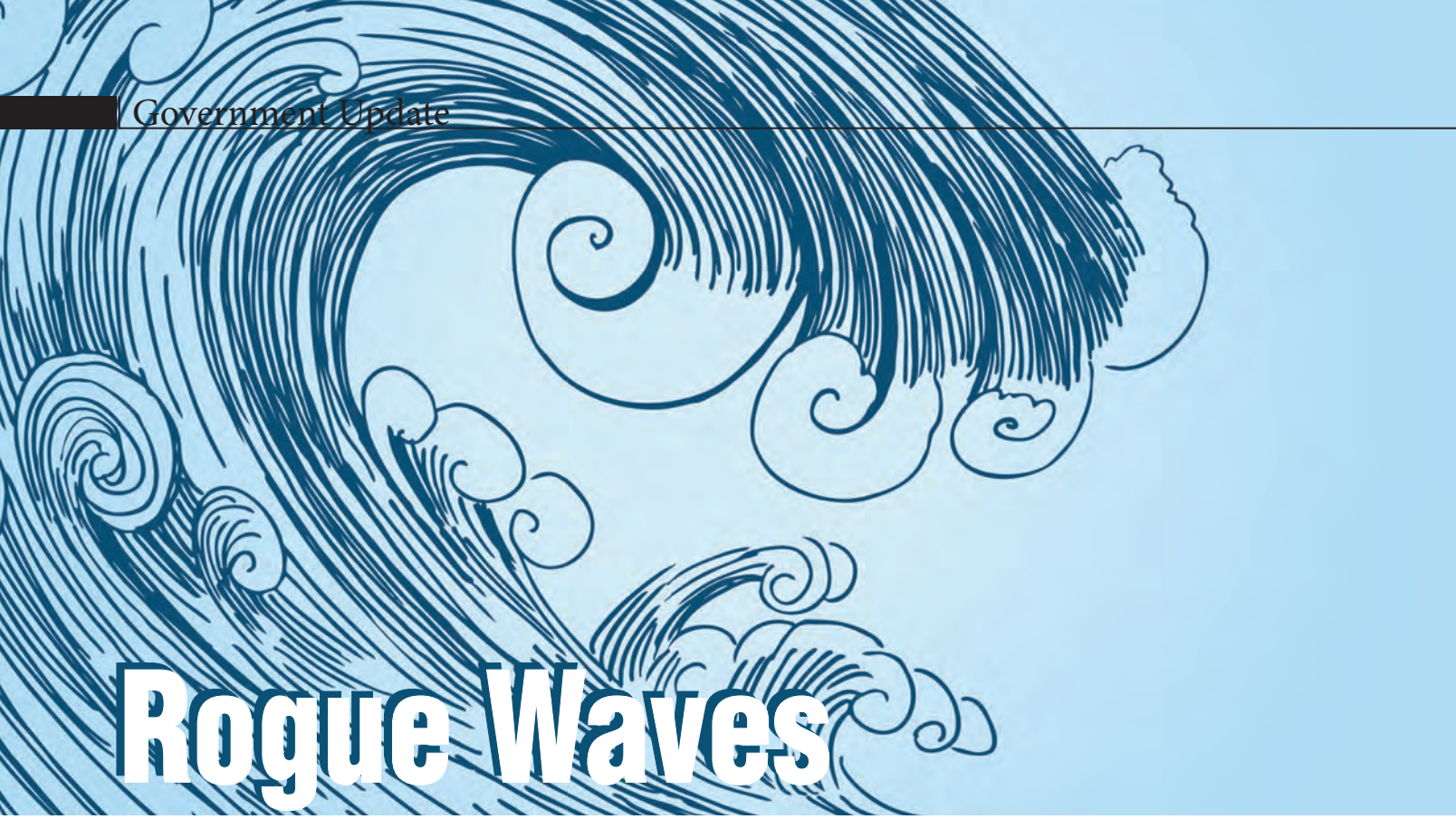


Rogue Waves

By Dennis L. Bryant

Ever since man has taken vessels onto the seas, mariners have reported encounters with monstrous waves that seem to arise out of nowhere from an otherwise average sea state. On his third voyage to the New World in 1498, Christopher Columbus recorded in his logbook that a giant wave lifted up his vessels as they transited the waterway between the Paria Peninsula of Venezuela and the island of Trinidad, a waterway he then named Bocas del Dragón (the Mouths of the Dragon). In 1853, the ship Annie Jane carrying 500 emigrants from England to Canada was struck by a monstrous wave off the Outer Hebrides and sank. Only 100 persons survived. In 1943, the ocean liner RMS Queen Mary, converted to a troop carrier, was crossing the North Atlantic at high speed when it was struck by two rogue waves in rapid succession. The ship survived, but it had rolled 52 degrees before slowly recovering. The waves broke windows on the bridge 90 feet above the waterline. On June 14, 1968, the 736-foot tanker World Glory was off the southeast coast of South Africa when it was suddenly struck by two waves of an estimated height of 70 feet each. The first wave put the ship in a hogging position, cracking the main deck. The second wave produced sagging forces that broke the ship into two and sinking it. Ten crew members survived to tell their tale. On March 2, 2001, the cruise ship Caledonian Star was crossing the Southern Ocean after a visit to the Antarctic Peninsula when it was struck by a rogue wave estimated to be in excess of 90 feet high. The wave broke through the bridge windows, toppled and injured the first mate and the helmsman. The ship rolled heavily, but was about to recover and make it to port without further incident. Meteorologists and oceanographers discounted the reports as exaggerations because they could not duplicate the phenomenon ashore and because the mathematical formula that they utilized to predict wave heights would not yield waves anywhere near the heights reported by mariners. This all changed on January 1, 1995. At the Draupner offshore oil platform in the North Sea, significant wave heights of 36 ft. were being automatically recorded. At about 3:30 pm, a single wave of over 80 ft. was measured. Scientists could no longer ignore the mariners' reports. They determined that they had been using the wrong mathematical formula. For one thing, instead of adding the wave heights, they should have been adding the wave energies. Rogue waves are now defined as waves whose height is more than twice the significant wave height. Significant wave height is the mean of the largest third of the prevailing waves.

As the scientists adapted to the new reality, they learned, using non-linear equations, to configure wave-tank experiments to simulate the conditions for generation of rogue waves, but on a smaller scale. They learned that rogue waves can occur when a storm swell encounters an opposing powerful current, a not-uncommon situation in the North Atlantic's Gulf Stream or in the Agulhas Current of the Indian Ocean off South Africa. Large storms can generate powerful wave systems capable of traveling many miles into areas with relatively calmer conditions. If such a powerful wave system comes up against a strong current in a crossing situation, the stage is set for one or more rogue waves to be generated. Scientists, risk managers, and governments are now attempting to predict rogue waves.

At the European Center for Medium-Range Weather Forecasting, scientists use the Benjamin-Feir Index to make twice-daily forecasts for marine areas measuring 20 km on each side. If forecast conditions meet the index's standard, a rogue wave warning is issued. Theoretically it is possible for a ship carrying sophisticated sensors and powerful computers to create a three-dimensional map of the sea state and calculate whether a rogue wave is imminent. Until that becomes possible, ships will have to rely on the available, but imprecise predictions from ashore.

Utilizing a different approach, the European Union (EU) funded a project called Extreme Seas between 2009 and 2013. It brought together meteorologists, oceanographers, researchers, and naval architects for the purpose of designing vessels so as to better withstand the forces generated by rogue waves. The jury is still out on whether there has been meaningful progress in this effort.

Climate change indicates that an increasing amount of energy is manifesting itself in Earth's atmosphere. This may result in additional and stronger storms, increasing the likelihood of rogue waves on the world's oceans.

The cruise ship Louis Majesty departed Barcelona on March 3, 2010 for a routine voyage across the Mediterranean Sea to Genoa. There were about 1,000 passengers and a crew of 600 on board. Three hours out of port, in moderately stormy weather, the ship was suddenly hit by three rogue waves. As the ship rolled and pitched, a wall of water smashed through the windows of the lounge on Deck 5, over fifty feet above the normal waterline. Two passengers were killed and 14 were injured. The tragic incident was filmed (as is almost everything these days) by cell phone cameras. The video is very telling. As passengers are milling about the lounge and a buffet meal is being served, a wave suddenly breaks through the windows, throwing passengers to the deck and sending furniture across the room. The sea state quickly returned to normal and the vessel returned to port. A hindcast later revealed that a powerful wave train from the northeast had converged with another powerful wave train from the southeast at the location in the Mediterranean just as the Louis Majesty was traversing. This type of incident may occur more frequently in the future.

Now that stakeholders are more aware of the problem, efforts can be undertaken to reduce the risk of further rogue wave encounters. Ships can be more ruggedly constructed. Meteorological and oceanographic forecasts can be made more precise and timely. On-board technology can be improved. In the meantime, keep a sharp lookout.

The Blue Economy

If You Can't Measure It, You Can't Manage it … or Get Attention and Funding!

By Michael B. Jones

Understanding and promoting the Blue Economy and BlueTech is critical for the future of the U.S. and the world. Yet we don't know in the U.S. and around the world how big our ocean and maritime tech industries are. Why? Because in most countries traditional, "visible" maritime industries (e.g. fishing and shipbuilding) have been on a decline while fast growing BlueTech companies have been largely invisible. Why are they invisible?

First, BlueTech manufacturers typically sell 98-99% outside of wherever they are located so they don't belong to the local Chamber of Commerce or Economic Development Agency nor do politicians know they exist. Second, because BlueTech companies are so diverse, while most belong to relevant industry associations, it is not immediately obvious why they should participate in a regional cluster association that represents companies linked primarily by all being ocean related. And on an institutional level, economic industry codes (e.g. NAICS codes for Canada, Mexico and the U.S. in NAFTA) sweep BlueTech companies into larger land-based categories so there is no baseline Blue Economy to assess. Why should economic development and elected officials pay attention if there is no way to understand the current economic value of the oceans let alone future potential?

We need to create a national Blue Voice in every country. We need to create formal BlueTech clusters around the U.S. and around the world to develop a local/regional Blue Voice that regional officials can "hear" and support. And we need to change economic activity codes because both manufacturing processes and products/services for the oceans are very different from those on land.

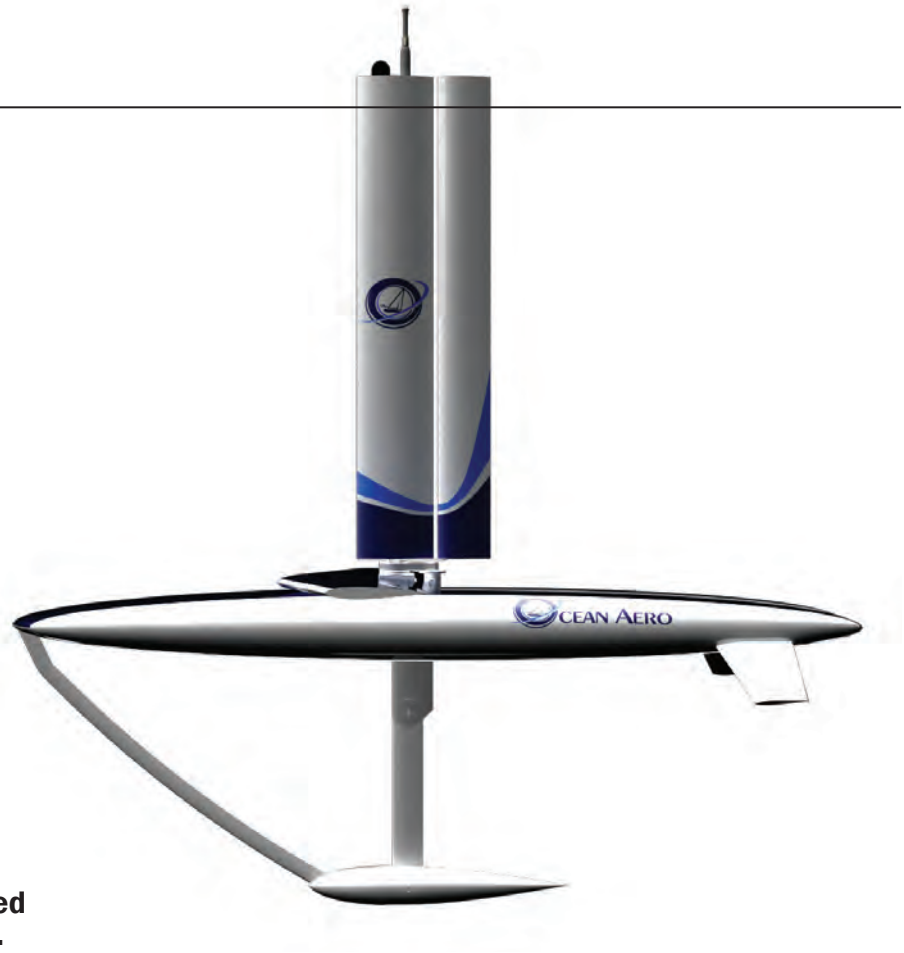
The Maritime Alliance

The Maritime Alliance (www.themaritimealliance.org) was created in 2007 and The Maritime Alliance Foundation (TMA Foundation) (www.tmafoundation.org) was established in 2013. TMA is a 501c6 advocacy-oriented non-profit that is the organizer of the San Diego maritime technology cluster (essentially a BlueTech industry association) focused on: Economic Development; Ecosystem Development; and Community Outreach. TMAF is a 501c3 education-oriented non-profit focused on: Workforce Development (including OceanSTEM); Research; and National/International Outreach. We believe in creating BlueTech and Blue Jobs by promoting sustainable, science-based ocean industries. We do this by bringing education, policy and technology resources together to promote innovation and economic development in the Blue Economy and to create a Blue Voice.

TMAF has worked with partners to prepare a series of research studies to understand the value of the Blue Economy and BlueTech in San Diego. But we do not believe that we are unique in the U.S. We represent the biggest concentrated cluster with an estimated 200 BlueTech organizations, but we estimate there are 4,000+ BlueTech companies nationally that have never been studied like we have begun to study our region. We use our cluster and unique studies as a case study to help encourage other parts of the U.S. to create formal BlueTech clusters.

The San Diego Maritime Industry Report 2012 is the base study of the regional Blue Economy showing (based on 2011 data) 46,000 direct jobs and $14 billion in direct revenue annually. The Maritime Alliance represents the maritime technology or BlueTech sub-industry group, which was invisible until we organized the cluster. BlueTech proved to be the largest, fastest-growing part of the local Blue Economy with 19,000 direct jobs and $6.2 billion in direct revenue. Many of our BlueTech companies are growing 15-35% per annum typically with 98-99% sales outside the San Diego region of which 40-60+% are exports. The San Diego Regional Economic Development Council now considers us to be a key cluster in the regional Innovation Economy.

On July 21, 2014 – the last day of the 60 day comment period – The Maritime Alliance submitted a document requesting changes under the 2017 NAICS revision process. To put this in perspective, the San Diego Report showing $14 billion in direct revenue (before indirect and induced job consideration) did not include tourism. Based on current NAICS codes, the NOAA National Ocean Watch portal calculates that "All Ocean Sectors" in San Diego County in 2011 were $5.6 billion, which included $3.8 billion of tourism and recreation. So that would be $1.8 billion (net of tourism) in ocean industries. In the 2012 report, $1.4 billion was identified as "Traditional Maritime Exclusive Industries" which one could roughly compare with the NOAA number of $1.8 billion. The other two big seg-



Ocean Aero www.oceanaero.us is developing the Submaran – a patent-pending, hybrid unmanned surface and underwater vehicle.

ments in the San Diego report are "Maritime Technology" of $6.2 billion and "Other Maritime" of $6.5 billion for companies that included some maritime, which are not captured as maritime related revenue by NAICS today.

But we are much more than research studies. Our contribution to STEM (Science, Technology, Engineering, & Mathematics) education is the OceanSTEM initiative – the branding of STEM related to oceans. We have unique posters developed to capture the attention of young adults to see their future in the Ocean Technology Industry. A cornerstone of OceanSTEM is collaboration and we are pleased to work with more than 60 organizations and companies across the county. And we helped organize a regional Workforce Development effort with educators and workforce development agencies, including those focused on veteran transition to the private sector, to start preparing for the next generation of engineers and techs that will be needed to support the growth of the regional Blue Economy.

On the Economic Development and Business Ecosystem Development side, we will put on or support more than 20 events in 2014 including our biggest event of the year – the 6th annual BlueTech and Blue Economy Summit and Tech Expo scheduled for Nov. 12-13 in San Diego. As they have gotten to know each other, some of our BlueTech companies have found ways to collaborate and new companies have formed. One such example is Ocean Aero (www.oceanaero.us) that is developing the Submaran – a patent-pending, hybrid unmanned surface and underwater vehicle. And we are educating bankers, economic development & elected officials, investors, insurance agents, lawyers and other professionals so they will support regional BlueTech companies.

On the National & International Outreach side, we are pleased to be working with a number of organizations nationally and internationally. Of particular note is our work with the NOAA U.S. IOOS office on the economic value of ocean observation for the U.S.; multi-year collaboration with CICESE in Ensenada, Mexico; our MOU with the vibrant ocean tech cluster in St. John's, Canada; our participation with the "Maritime Innovative Territories International Network" (MiTiN) created in July 2012 by the ocean tech cluster in Brest, France; and our recent work with the University of Southern Mississippi as it prepares to organize a BlueTech cluster on the Gulf.

To learn more, please visit our websites, contact me, and participate in our 6th annual BlueTech and Blue Economy Summit on Nov. 12-13. The Maritime Gala Dinner & Award Ceremony is a highlight on the evening of Day 1. Rick Spinrad, the new Chief Scientist at NOAA, will be the after-dinner speaker addressing "Blue is the new Green – Promoting OceanSTEM, Maritime Workforce Development and a national Blue Voice".

We thank the *Marine Technology Reporter* for agreeing to be our Industry Media Sponsor this year!

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Innovative Solutions Mark SWE's Heritage

A proud and rich history of innovation and a laser focus on customer-driven solutions are the hallmark of SouthWest Electronic Energy (SWE), which is celebrating its 50th anniversary this year.

SWE's business philosophy remains constant throughout these five decades: partner with customers to meet their ongoing needs, with a focus on service and quality.

Industry pioneer Len Benckenstein, SWE's Chairman and CEO, has been at the heart of SWE since its founding, when he was a student at The University of Texas. In the earliest days, he learned the value of listening to his customers, at first guiding the company to meet the needs of Schlumberger for specific switches, and teaming up with customers such as NASA to deliver exact solutions. Later, he entered the Lithium battery pack business with solutions for Baker Hughes and others, fueling the horizontal and directional drilling oil and gas revolution. Continuing innovation has extended to Lithium-Ion technology with cutting edge battery solutions.

In recent years, he embraced the subsea industry's challenge to find advanced battery management options and in 2013 SWE launched its breakthrough subsea ready Lithium-Ion battery products and solutions.

Founder Benckenstein praises SWE's employees and their expertise, as well as their commitment to service, quality, reliability and innovation. "Our customer has always been, and will continue to be, our focus. I learned how important it is to always listen to our customers and not just discover how to meet their specific needs but to exceed their expectations."

Battery System Solutions

SWE has a solid niche providing advanced technology that is the foundation of its innovative custom energy management solutions, particularly Lithium and Lithium-Ion battery technology for oil and gas and subsea applications.

After extensive research, development and testing, SWE successfully found a way to provide safe, long lasting battery power for deep subsea. Proven battery management solutions, in pressure tolerant tested subsea batteries, now enable AUVs and optically tethered ROVs to actually perform deep and remote oceanographic research.

SWE's new battery solutions offer the ability of continuous monitoring, which ensures safer and more reliable operations. SWE's new battery solutions are an asset for offshore oil and gas operators who need cost-effective solutions for making oil and gas more accessible.

"Meeting with our customers, we clearly heard that the subsea oil and gas deep-water field equipment industry needed battery solutions that deliver more electrical capacity at less weight and smaller size than the old technology of sealed lead acid (SLA)," said Leon Adams, VP of Sales. Older technology has limitations because it is heavier and larger and does not last the length of time needed for the current subsea conditions, he continued.

"The result of the groundbreaking work by our research and development team is SWE SeaSafe, our pressure tolerant battery solution that delivers breakthrough safety, reliability and configure-to-order flexibility for subsea vehicles and operations," said Adams.

Advantages

The company maintains thatSWE SeaSafe Lithium-Ion batteries deliver longer life and:

- ***Four times more energy***
- ***Six times more available energy at colder temperatures found in the seabed***
- ***Eight times longer cycle life, leading to longer missions***
- ***6,000 meters deep pressure tolerance***

SWE SeaSafe Lithium-Ion is safe and reliable:

- ***Lithium-Ion does not outgas during charge.***
- ***SWE uses smart, automatic, autonomous battery management in each battery module that is constantly watching, balancing, and preventing charging and discharging errors.***
- ***SWE SeaSafe provides health and status reporting on demand.***

Adams explains that these wide-reaching advantages bring

superior solutions to subsea applications:

- ***Longer operating life for deep-sea oil and gas infrastructure electronics and lights, and high voltage, high power for electric motors to backup hydraulics***
- ***Lighter weight and local instant electric power for ROVs***
- ***Deeper divers and longer missions for AUVs***

Oil and gas customers appreciate that the SWE SeaSafe battery solution enables electric powered monitoring, sensing, propulsion, feedback control, and high power electric motor support, leading to more efficient, precise and reliable subsea operations.

Other subsea ready battery components introduced by SWE include the SWE SeaSafe Battery Case, a pressure compensation case designed to hold four SWE SeaSafe Modules with Parallel Integrator Isolators.

The "intelligent" battery management system has a unique suite of safety and reliability features. The SWE SeaSafe Observer, a PC-based health and status software-monitoring package, with a graphical user interface, supports the SWE SeaSafe products by easily displaying the status of the SWE SeaSafe modules and battery systems.

Successful Pressure Testing

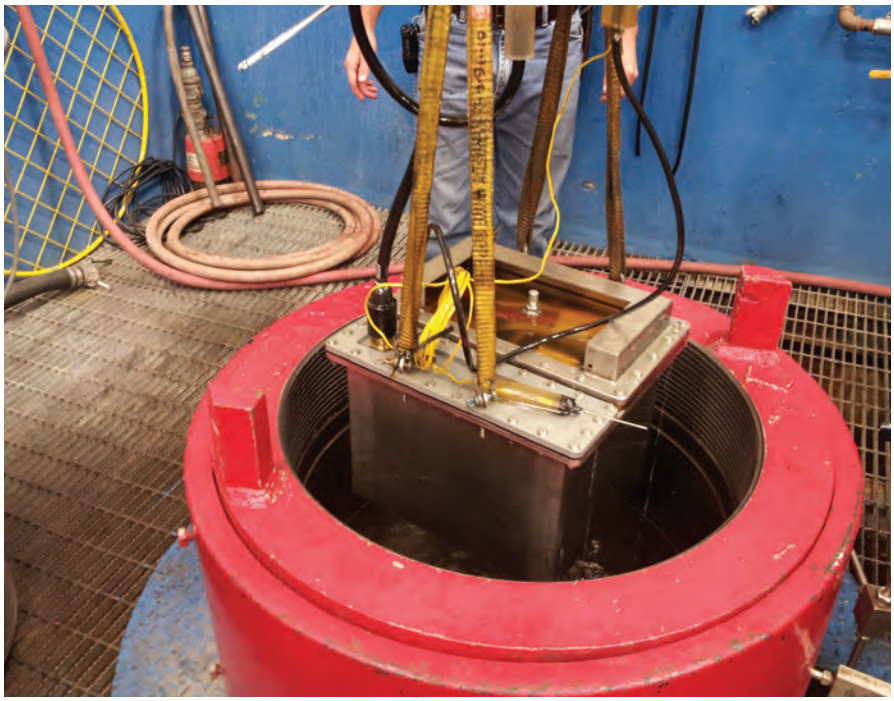
The SWE SeaSafe Battery Module successfully passed 10,000-psi pressure testing, achieving yet another industry milestone for SWE. During several years of functional testing, eight separate pressure tests were completed, mainly at the Southwest Research Institute (SWRI), an independent research laboratory in San Antonio, Texas.

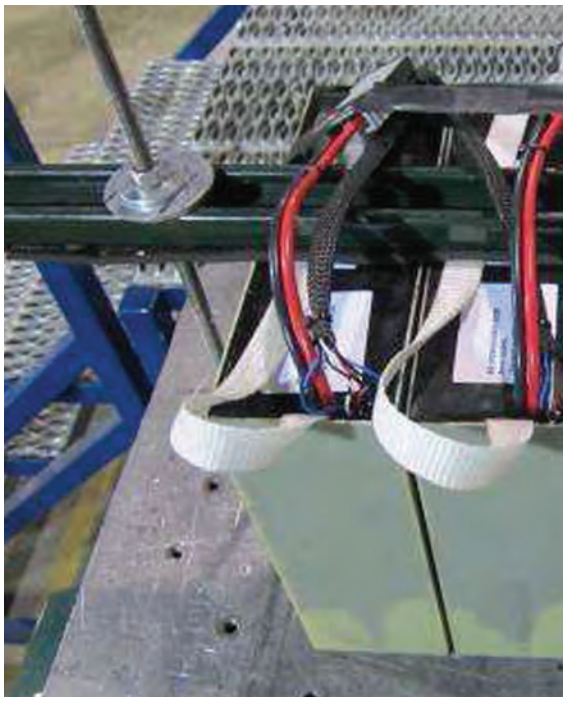
The extensive hyperbaric pressure test included nine complete pressure cycles between zero psi and 10,000 psi, while continuously performing battery charge and discharge. (10,000-psi enables a safe operating sea depth of 6,000 meters plus margin.)

Testing and certification for the SWE SeaSafe included international shipping safety certification by the Department of Transportation.

Battery cells, as well as battery modules, must complete HAZMAT certification for shipping, and the SWE SeaSafe module is now certified.

Woods Hole Oceanographic Institution (WHOI) provided requirements' guidance and feedback on the SWE SeaSafe modules. Sea trials of WHOI's under ice arctic ROV and the SWE SeaSafe modules showed the modules met or exceeded



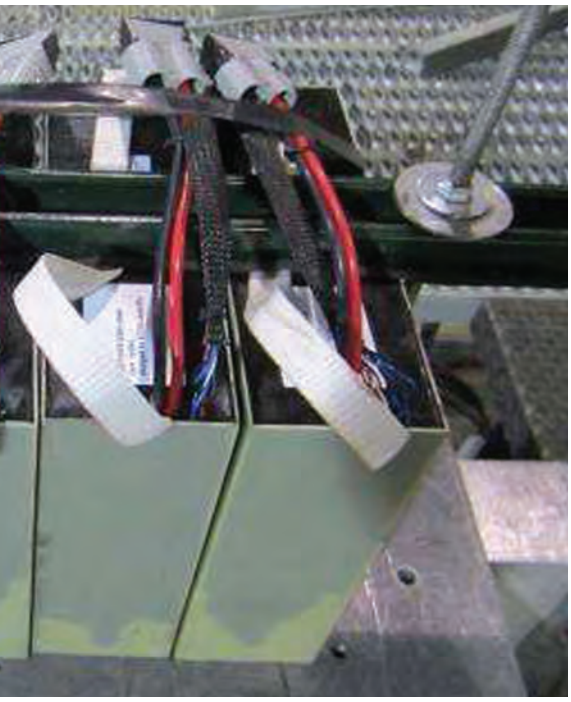


WHOI's requirements. SWE is exploring other considerations for deployment of SWE SeaSafe modules by WHOI and other customers.

SWE, based in the Houston area, is included in the *Marine Technology Reporter's* top 100 (MTR100) emerging technology companies. The company holds many patents, with 10 specifically in its Lithium-Ion battery management systems.

"We believe it is an honor and a privilege to provide solutions to our customers," adds SWE's long-time leader, Len Benckenstein. "Many of our loyal customers have entrusted us with their business challenges since the1960s and we value the confidence they have in our team."

SWE serves customers in oilfield services, seismic, pipeline inspection, medical, military, remote monitoring and process control, marine, solar renewable energy, telecommunications and homeland security. As SWE proudly moves into its next half century, Benckenstein and SWE's talented and steadfast team will continue to shape SWE's strong heritage built by a solutions-driven strategy and unparalleled customer service.



Multi-channel Fiber Optic System Design:

Going Big in Small Packages

By Steve Bell, Optical/Photonics Engineer at BIRNS, Inc.

Abstract

Data channels can be added to fiber optic systems by adding fibers, adding wavelengths, or adding both. Dense wavelength divisional multiplexing (DWDM) allows a single fiber to carry multiple data channels. Passive components, such as optical circulators, double a fiber's capacity by allowing information to flow in both directions. While these technologies are well known in the terrestrial communications industry, subsea designers may be less aware of what tools are available to them. These technologies allow the subsea designer to pass many data channels through small, single or limited fiber count connections.

Designers of terrestrial fiber optic systems have paved the way for today's subsea system designers in that their designs have already improved over the years as new technologies emerged. Subsea designers are seeing these same technologies "emerge" in the sense that they are discovering what's been available to their terrestrial counterparts for some time now. The advantage that the subsea designer has is that someone else has already been through the learning curve for these technologies. With high bandwidth devices such as side-scan sonar and high definition television becoming more commonplace, subsea designers find themselves in need of more efficient ways to add fiber connectivity to their designs.

Many designers tend to approach a project in a basic manner and then scale up as their systems grow in complexity and require more capability. Thus, many subsea systems start with a single optical fiber servicing a single instrument. That instrument talks whenever it needs to while the receiver is set to passively listen. In this simple arrangement, adding instruments is usually done by adding fibers. This is acceptable when only a handful of instruments are being considered, but quickly becomes unworkable when large numbers of fiber optic devices are added to a vehicle or system. This becomes even more apparent when the subsea designer needs to add instrument control, rather than just passive data collection. In the simple view of one fiber for one channel of data, adding control doubles the number of fibers in a system; one for transmitting and one for receiving data.

This duplication of fibers is avoided by using single fiber, bidirectional (BiDi) modules to convert the data from electrical to optical and vise versa. BiDi modules use coarse wavelength divisional multiplexing (WDM). They utilize two widely spaced wavelengths; usually 1310 nm and 1550 nm. They operate in pairs wherein one transmits on one of the two wavelengths while its mate receives on the other. This doubles the capability of a single fiber connector, like the BIRNS Millennium F-series connector, by changing it from a simplex connection to a duplex connection.

However, using BiDi modules still requires one fiber per instrument. Doubling the number of instruments on your vehicle

BIRNS Millennium 3F single fiber cable plugs (CPs) provide high bandwidth in a single optical fiber and can be expanded from a simplex connection to multi-channel connections using tools such as BiDi modules, optical circulators, or DWDM modules.

doubles the number of fibers required in both your cables and the connectors or penetrators you use. The optical circulator offers a way around this.

An optical circulator is a non reciprocal, passive optical device. By non reciprocal, we mean that light traversing the device will travel along a path determined by the direction of propagation. Light propagates through the device from one port to the next, but not in the opposite direction. Typically, these are three port devices. Light that enters through port 1 exits through port 2. Light launched into the circulator through port 2 exits through port 3; not port 1. Any light trying to circulate in the opposite direction is blocked.

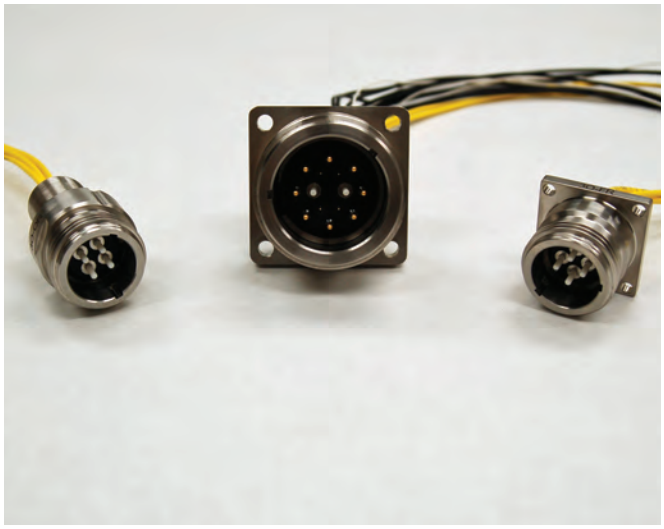
The simplest use of optical circulators would be to use a pair of them; one, for example, on an ROV and the other on the support vessel. The umbilical would connect the dry end circulator's port 2 to the wet end circulator's port 2. Light launched into port 1 on the dry end would emerge at port 3 on the wet end. Signal returning from the ROV would launch into port 1 on the wet end and be received at port 3 on the dry end. Thus, we establish two way communication with the ROV over a single fiber link. The difference is that, unlike the BiDi, this is done within a single wavelength band. The importance

of this will be discussed in more detail later.

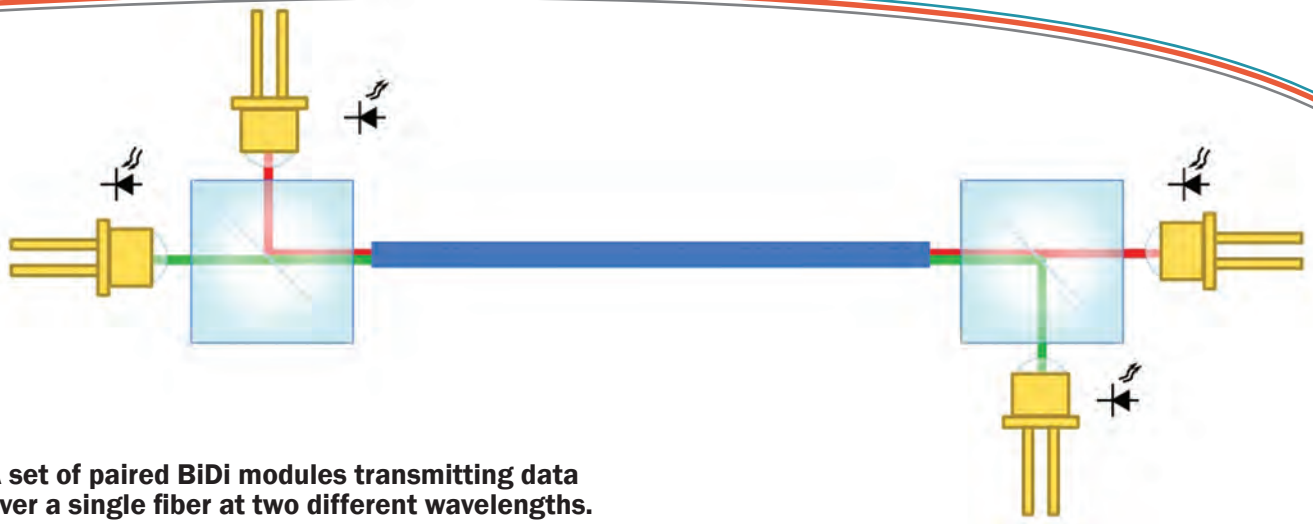
More devices could be added to our system by using multiple circulators. A ring is constructed using circulators connecting port 3 of each to port 1 of the next in a daisy chain configuration. Each port 2 would be routed to port 2 of an additional circulator that would route signals to and from the transceiver module's transmit and receive ports. Each device on the ring would have its own address and would retransmit any signal that was not addressed to it. This configuration also makes it possible for the devices to communicate with one another as well as with the support vessel, all through a single fiber connector or penetrator.

The drawback to this architecture is latency in the network. The maximum data throughput rate is limited to that of the slowest transceiver in the system. This is acceptable if there is no requirement for simultaneous communications over the network. However, if there is such a requirement, or if one or more of the devices cannot cache its data for transmission when the network is available, then dense wavelength divisional multiplexing (DWDM) offers an approach that will allow for simultaneous communications in the network.

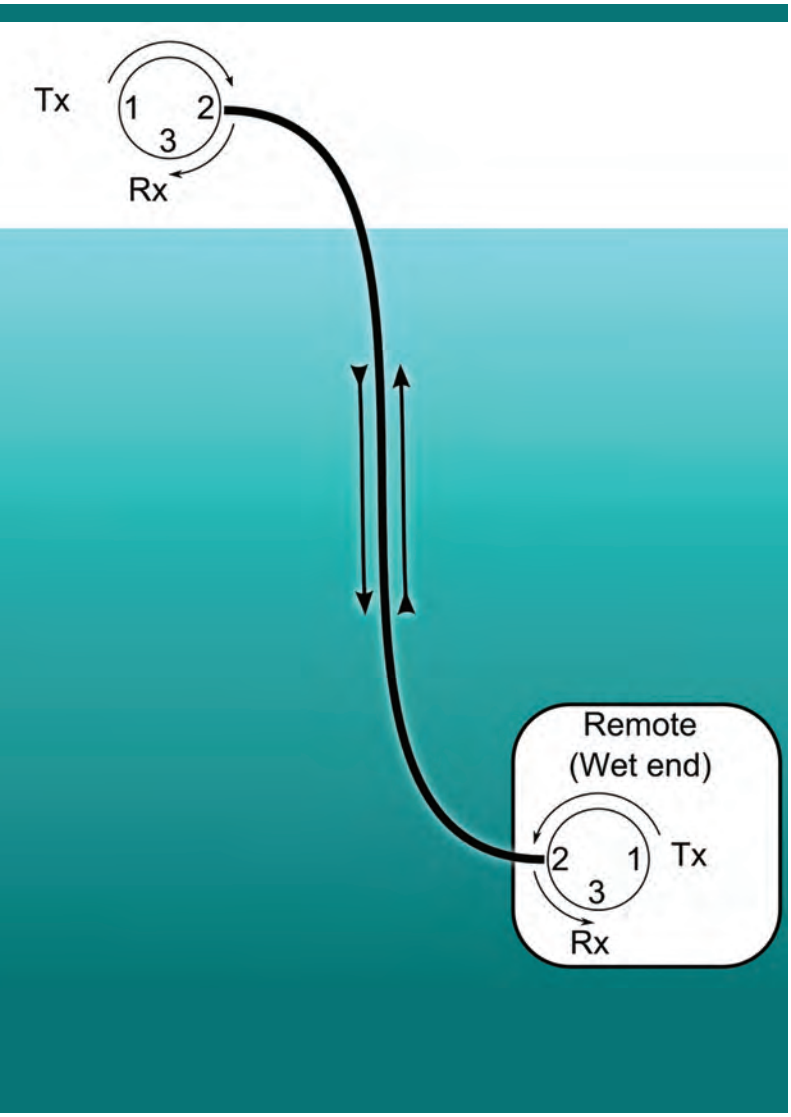
With DWDM, multiple wavelengths, or colors, of light are



(L-R) BIRNS Millennium 30 Dual O-ring Receptacle (OR) with four optical fibers, 3T flanged receptacle (FR) with two optical fibers and 30 FR with four optical fibers have a small footprint but offer significant versatility in data transference and spare capability for future subsea system upgrades.



A set of paired BiDi modules transmitting data over a single fiber at two different wavelengths.

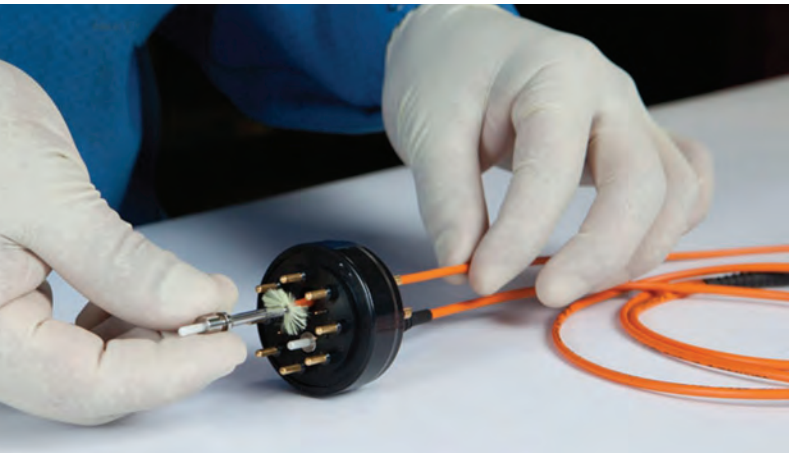


used. Each wavelength is its own data channel. The advantage is that the individual wavelengths do not interfere with one another. DWDM allows two or more devices to transmit data over the network at the same time without crosstalk.

DWDM utilizes another type of passive optical component called an optical add/drop module (OADM). An OADM either removes or adds light at its design wavelength. These are 3 port devices. Port 1 is the common lead, with all wavelengths present. Port 2 is the add/drop lead with only the design wavelength present. On port 3, all wavelengths except the design wavelength are present. When light is launched into port 1, the design wavelength is picked off and redirected to port 2. All other wavelengths continue on to port 3. When light at the design wavelength is launched into port 2, it is redirected back to port 1. When all wavelengths except the design wavelength are launched into port 3, the light is directed to port 1.

The power of dense wavelength divisional multiplexing to increase the capacity of a network is seen when we consider just how many wavelengths can be packed into a single fiber. DWDM channel spacings have been getting progressively tighter and tighter. 200 GHz modules were replaced by 100 GHz modules; then 50 GHz, then 25 GHz. The latest ITU standard is 12.5 GHz. The wavelengths span a spectral range from 184.5 THz to 195.9375 THz, or 1624.89 nm to 1530.04 nm. In this band, the 12.5 GHz is a channel spacing of approximately 0.1 nm, creating over 900 possible channels. The

A pair of optical circulators providing a multi-channel data link over a single optical fiber. Multiple data channels, each on a different wavelength, can be transmitted simultaneously through the circulators.



BIRNS optical technician inserts multimode optical fibers into an electro-optical insert with eight 2.5kV pins and four 600V pins.

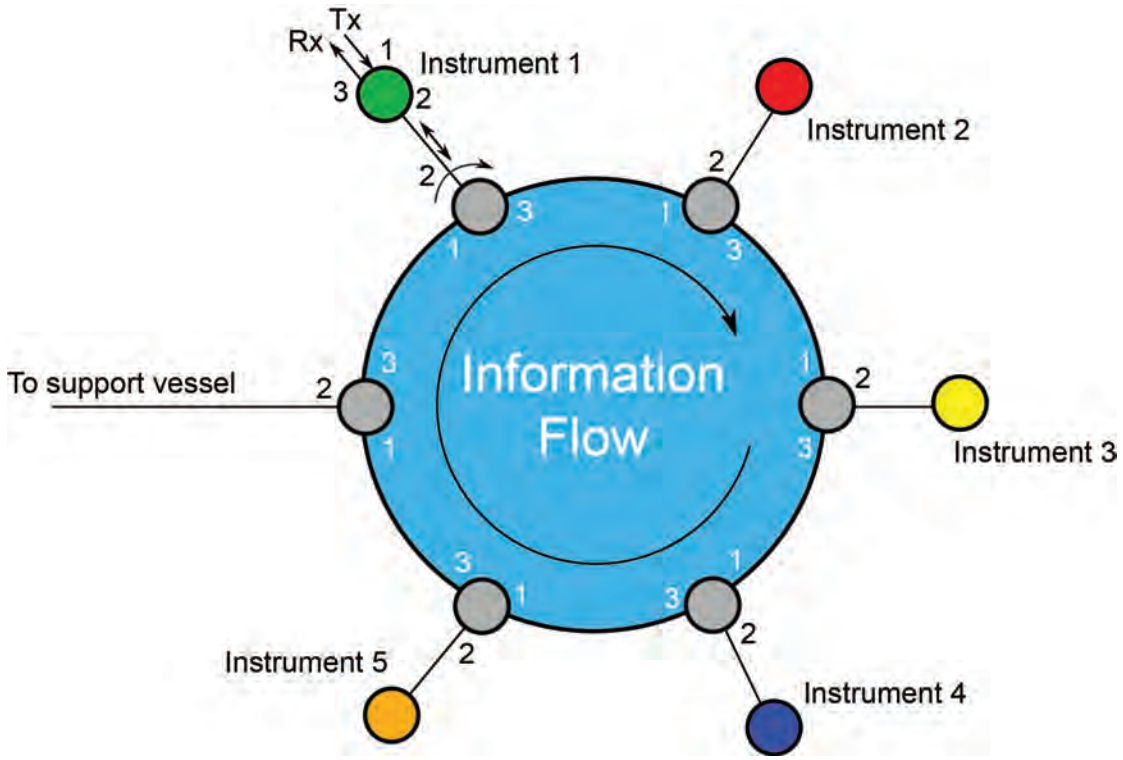
latest technological innovations have lead to fiber optic links capable of transmitting data at a rate of 1Tb/s.

DWDM operates in the C and L bands (1520 nm to 1620 nm). Optical circulators are available that can span this entire spectral range. Optical amplifiers are also available in this spectral band to increase the reach of a fiber optic network. Because of these components cover the same spectral range, we can combine DWDM and optical circulators to construct our network. To connect multiple devices on a single fiber, we would build two identical OADM networks; one for the dry end and one for the wet end. Each add/drop port would have a circulator to route signals to and from each device's transceiver module. Each device, along with its dry end controller, would transmit and receive over the network as though it were the only device present. It would be oblivious to the other devices operating at different wavelengths.

One advantage of this architecture is that we have simultaneous communications on our network. Another is that there is no requirement to construct a fiber ring to complete the network; the network is a single string rather than a closed loop. The network is also easily reconfigured. In ring architectures, removing a device breaks the ring. With a DWDM network, we simply unplug the device and cap the unused connector. Adding a device is easily done by adding another OADM to the end of the network. The disadvantages are that the network is more complex to construct and that the various devices cannot communicate directly with one another. Any device to device communication must be done through a server that's probably aboard the support vessel.

Yet another benefit of DWDM is the ability to reduce cost by

An example of a ring architecture to connect multiple instruments to a single optical cable. Each instrument's transceiver retransmits data addressed to the other instruments to the next module in the loop. A server aboard the support vessel manages communications between the instruments.



leveraging existing connectors, cables, and umbilicals. If we look back at how many designers start adding fiber optic capability to their systems, the average designer would have started by using a small, single fiber connector such as the BIRNS Millennium 3F-1F connector. By adding OADM and circulator networks on either end of an existing fiber link in a case like this, we increase its capacity while maintaining the same ½ inch aperture we started with. In multi-fiber or electro-optical connectors, we add bandwidth with a minimal effect on the other vehicle systems that also use the cable. Another way of looking at DWDM is as a method to "repair" a cable. By using OADM/circulator networks, we can redirect network traffic in a partially damaged cable from the damaged fibers to its remaining fibers. This may seem circuitous or cumbersome, but it may be a very reasonable option if a replacement cable has a high price and/or a long lead time.

These technologies also allow for much smaller packages. Rather than creating the need for a large, and expensive, multi-fiber cable to service all of a vehicle's data requirement, tremendous amounts of data can be sent through a 1-4 fiber cable. This is especially important for designers of small vehicles that require lightweight umbilical cables. The smaller the optical portion of a cable, the more space is left available for electrical power. As a result, the subsea designer can take advantage of small electro optical connectors such as the BIRNS Millennium O and T-series connectors to combine power and data into a single small hull penetration. As an example, the 3O-2F2 connector family can provide 2 electrical conductors and 2 fibers in an aperture that's only 1 1/8" in diameter. By utilizing passive components such as DWDM and circulators, a designer can route all of a vessel's data through one of the two fibers, reserving the other fiber in the 3O-2F2 as a spare, or as a convenient way to quickly add new instruments for particular missions.

More than ever before subsea designers are faced with limited space and limited budgets. Fiber optics allow the addition of high bandwidth devices without a dramatic increase in the size of a vehicle's tether. Terrestrial designers faced a similar limit to the space available to them. Public utility right-of-ways have only so much space available. These limitations lead them to use technologies such as circulators and DWDM to not only conserve space, but also to reduce their cost per data channel. And now that they've worked the kinks out of these technologies, the subsea designer can benefit and enjoy the same ability to put large amounts of data into a small package.

Photo courtesy of LROG-SLB

Wave Glider – *Ocean Monitoring in Motion*

By Claudio Pascoa

The Wave Glider is a remote control ocean robot, which uses wave motion as propulsion. As an autonomous marine vehicle, the Wave Glider is capable of conducting detailed meteorological and oceanographic surveys across large distances and under the most extreme wind and sea conditions. Since its inception, the Wave Glider has seen the roles it is capable of undertaking greatly expanded, with the Wave Glider becoming a key Metocean measurement asset for research institutes, academia, shipping companies, government agencies and oil companies. Marine Technology Reporter's Contributing Editor Claudio Paschoa spoke with Sudhir Pai, Vice President, Technology and Operations of Liquid Robotics Oil and Gas (LROG), a joint venture with Schlumberger, about the qualities and capabilities of the Wave Glider.

The Wave Gliders are in a distinctly different class of AUVs from previous gliders in that they are wave-propelled with continuous diurnal solar panel support of electrical systems. A sensor platform like the Wave Glider is capable of detecting solid data at depths where satellites data is unreliable. Sudhir explains the vision behind the design of the Wave Glider and how its development process occurred, "The Wave Glider development began out of a man's passion for whale songs. Joe Rizzi, Chairman, Jupiter Research Foundation, had a love for the sounds of whales as they migrated along the coasts of Hawai'i to Alaska. In order to capture their songs live, he enlisted Roger Hine, a mechanical engineer and robotics expert, to help develop an unmoored, station-keeping data buoy. A joint venture then began between Joe and Roger Hine. The initial prototyping and early testing was from approximately 2003 - 2008. Development of the first commercially available system followed in 2009 with extensive sea trials and broad market sales in 2010," said Sudhir Pai.

Image above: Wave Glider SV3 underwater view.

This surfboard-shaped vehicle, contains photovoltaic panels that continually replenish the lithium-ion batteries used to power its navigation, communication systems, computing and sensor payloads. Wave Gliders may also carry submerged sensor payloads underneath their wave-powered wings and rudder assembly, which are connected to the glider body by an umbilical. The low-profile surface float, high-strength umbilical and sturdy sub allow the vehicle to carry on through high winds and waves of the open ocean. The sub is sheltered from surface weather conditions and acts as a drift anchor to counter the effects of wind and wave on the surface float. During storms, it cuts through a wave and in stern seas it can surf waves too. This unique mode of propulsion allows tremendous range and duration of sampling at the air-surface-underwater interface as it uses wave energy for thrust and solar energy to power its rudder motor, navigation system and payload electronics.

The System

The Wave Glider system consists of a surface float and a submerged glider, connected by an electromechanical umbilical. The float weighs about 68 kg (150 lb.) with a standard payload and measures 208 X 60 cm (82 X 24 in). Its deck supports antennae for GPS, satellite communications and collision avoidance systems, as well as a mast to support a position marker light and flag for increased visibility. Seven smart battery packs housed within the float are each electrically isolated with separate discharging and monitoring circuitry that permits only two batteries to be in use at a time. Two payload bays support a total of 18 kg (40 lb.) of sensors and equipment. The umbilical, about 5.8 m (19 ft.) long, provides a robust, yet flexible connection between the surface float and submerged glider and transmits power and steering commands to the glider. The submerged glider, or sub, is 2 m (6.5 ft.) long. The sub glides on six pairs of underwater wings that propel the entire Wave Glider system forward. The sub frame supports a rudder and its control package. The sub frame weighs about 68kg. The combination of a very low-profile surface float, high-strength command umbilical and the weight of the sub allow the vehicle to carry on through huge waves and fierce wind.

"Initial funding for the Wave Glider development was created by Joe Rizzi and private investors. Subsequently, funding was provided by lead investors; Vantage Point Capital Partners (VPCP), Riverwood Capital and Schlumberger. The Wave Glider SV Series is comprised of the Wave Glider SV2 and Wave Glider SV3. They are positioned akin to the BMW Series of cars – different performance characteristics and features at different price points. The Wave Glider SV3 is a larger platform with modular power and payload capacity; it has an auxiliary thruster to navigate through extreme ocean

Wave Glider METOC data Hurricane Sandy.

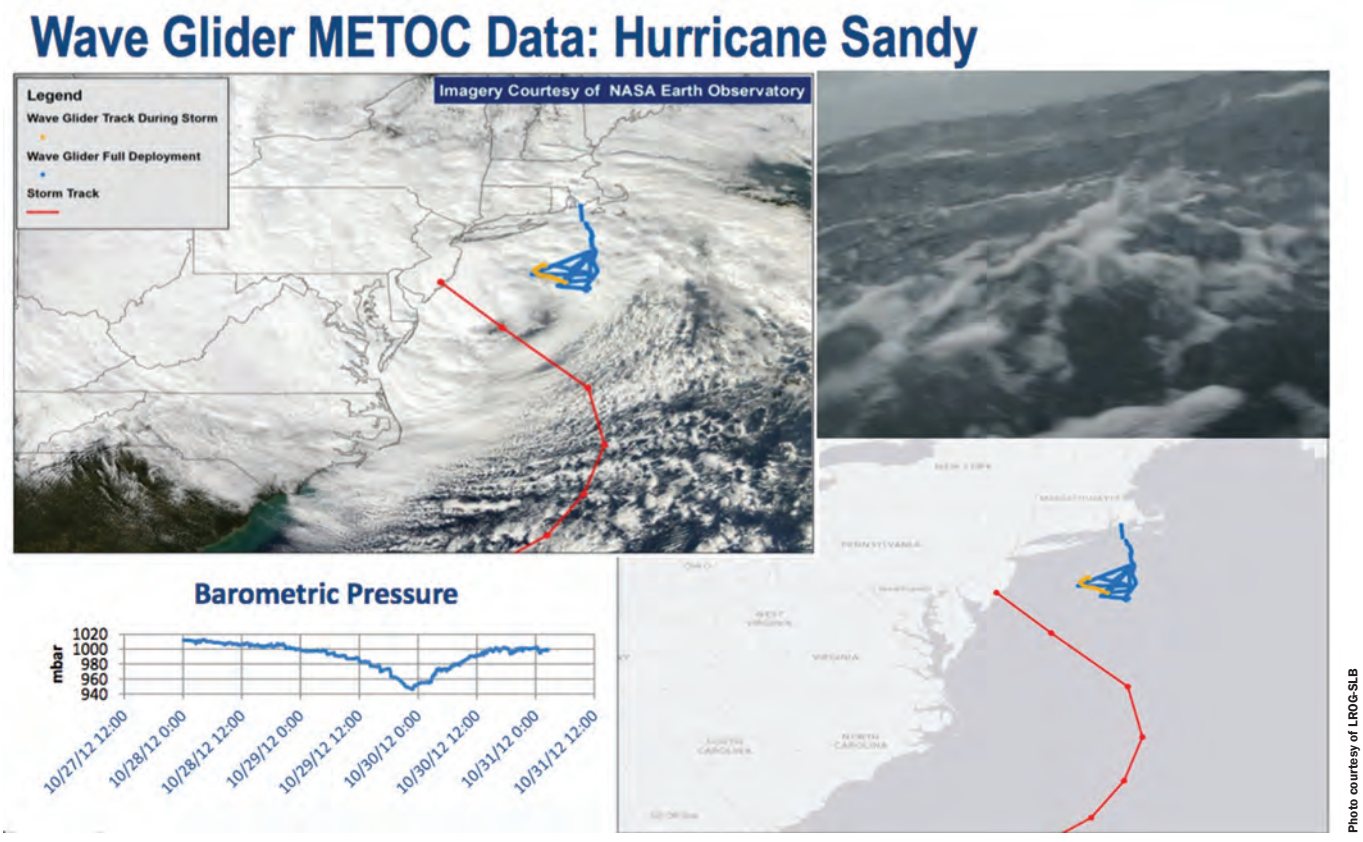


Photo courtesy of LROG-SLB

conditions (doldrums to high currents). In addition, the Wave Glider SV3 has an advanced operating environment with autonomy, automatic ship identification, avoidance features and enhancements for data delivery and communications," said Sudhir. To date, Liquid Robotics Oil and Gas, a JV between Schlumberger and Liquid Robotics Inc, has 44 of the Wave Glider SV2 platform and 25 of the Wave Glider SV3 platform. Later this year they plan to acquire an additional 25 Wave Glider SV3 platform to have a total fleet of 94 Wave Gliders conducting various missions around the globe. "The Wave Gliders are used around the world for climate change, ocean acidification, environmental monitoring, fish tracking, tsunami prediction and severe weather observation and monitoring. Oceanographic institutions such as Woods Hole Oceanographic Institute, Scripps Institution of Oceanology, Monterey Bay Aquarium Research Institution, along with international environmental research organizations such as the National Oceanographic Institute in the UK are all using Wave Gliders for long duration ocean observation," said Sudhir Pai. Wave Gliders are manufactured and assembled in California. The float is made from advanced composite materials and the glider (submarine) section is made from stainless steel with some parts made from titanium. All sensors are acquired from industry recognized, top of the range companies. The Acoustic Doppler Current Profiler (ADCP) is made by Teledyne-RDI; the weather station is made by Airmar; wave height sensor form Data Well; Acoustic Modems from Sonardyne; MAG sensors from Marine Magnetics. Hydrocarbon fluorometers are made by Turner Inc. and Chelsea Instruments.

To Boldly Go ...

In December 2012, a Wave Glider completed a 10,357 mile (16,668 km) scientific expedition across the Pacific Ocean, not only did it set a new world record for the longest distance traveled by an autonomous vehicle, the wave-powered glider reached Australia's Hervey Bay with wealth of data, including observations of rogue waves that satellites failed to detect. "The Wave Glider is a true game changing technology, key aspects of this technology is that there are no humans and no fuel on board, so it is able to execute operations in an environmentally friendly and safe manner while minimizing damage to assets and people. No other autonomous ocean robot provides the ability to stay out at sea for 1+ years, collect data, compute in-situ and transmit valuable real-time data back to shore. By removing the risk and cost barriers to long duration ocean observation, scientists can now study ocean basin scale phenomena from the surface of the ocean gathering high-resolution temporal and spatial data in densities never before possible. An example of this is in severe weather forecasting. Today we can accurately measure the path of a cyclone/hurricane/typhoon but not the intensity (tropical storm or Cat 5). Collecting valuable data from the surface of the ocean during the live event has not been possible until the invention of the Wave Glider. Just last week, a Wave Glider in the South

Wave Glider Observations.

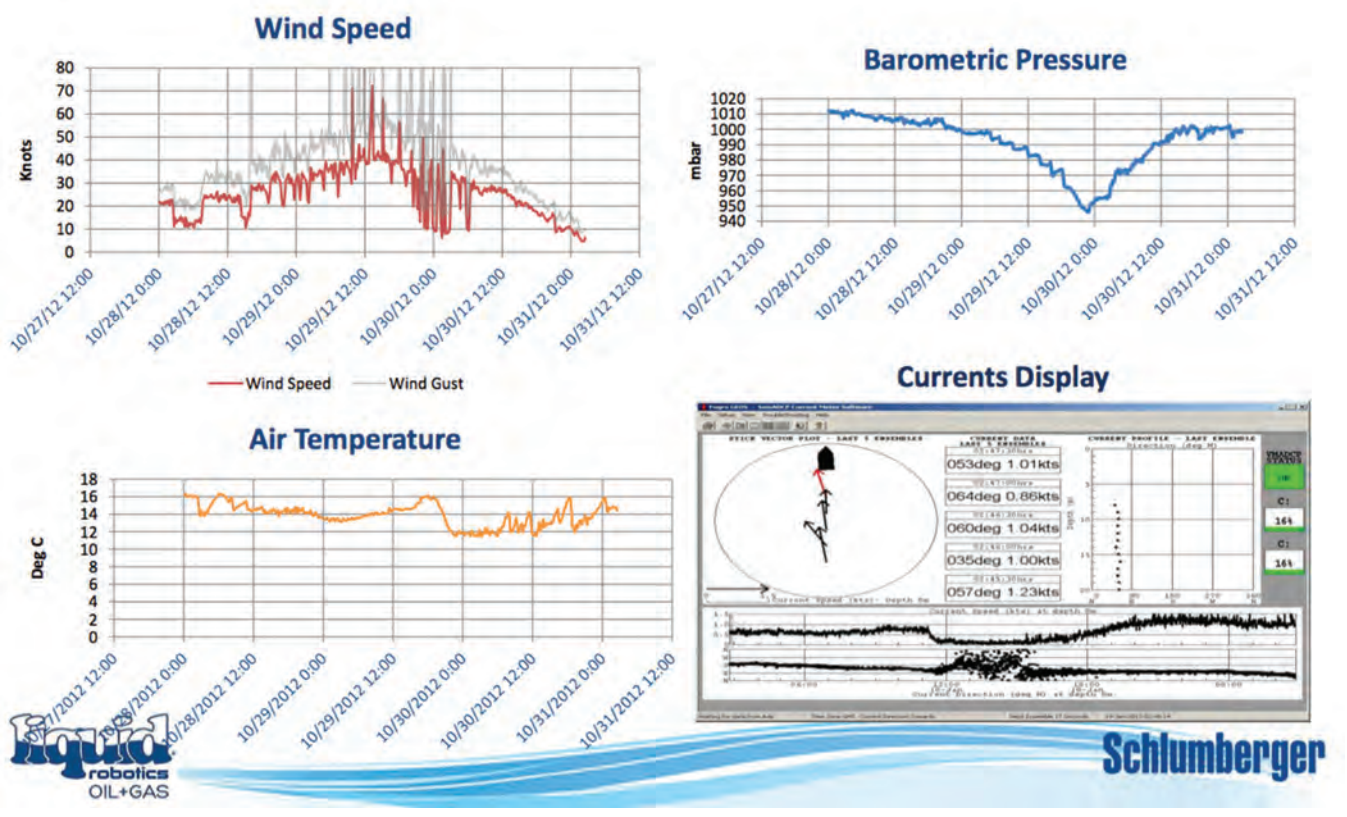


Photo courtesy of LROG-SLB

China Sea navigated through Typhoon Rammasun, one of Asia's biggest typhoons in the last 40 years. It continuously collected and transmitted data to satellite directly through the eye of the typhoon (150 mph winds, 45 ft. waves). This has the potential to provide meteorologists the data needed to improve forecast models to save human lives as well as billions in property damage," explained Sudhir Pai. The Wave Glider was remotely piloted through Super Typhoon Rammasun (Category 5) collecting and transmitting vital and rare, real time wave, temperature, conductivity and current data all from the surface of the ocean, while simultaneously collecting current data to 100 meters and full directional wave spectrum data, this collection of data gave scientists a unique picture of the extreme surface and underwater conditions encountered. For the first time ever a marine vehicle transited and survived a major typhoon class storm to collect surface and underwater data without severe risk to human life and property, at a fraction of the cost to boot.

"To date no LROG Wave Gliders have been lost at sea and

Sudhir Pai, VP of Technology and Operations of Liquid Robotics Oil and Gas, a Schlumberger company

Photo courtesy of LROG-SLB

Wave Glider SV2 & SV3 at sea.

Photo courtesy of LROG-SLB

In December 2012, a Wave Glider completed a 10,357 mile (16,668 km) scientific expedition across the Pacific Ocean, not only did it set a new world record for the longest distance traveled by an autonomous vehicle, the wave-powered glider reached Australia's Hervey Bay with wealth of data, including observations of rogue waves that satellites failed to detect.

we have had two incidents involving other ships and one may have been bitten by a shark. A key parameter recorded is days at sea. The 17 Liquid Robotics Oil & Gas missions have clocked 1250 days at sea. Overall, the fleets of Wave Gliders have collectively traveled over 450,000 nautical miles (almost a round trip to the moon)," says Sudhir Pai. Liquid Robotics Oil and Gas owned Wave Gliders have been active in working with operators around the world. "They have been used all over the world. Specifically, Western Australia, North Sea, Nigeria, Equatorial Guinea, Uruguay, Gulf of Mexico, Alaska and arctic regions are a few areas of operations for Liquid Robotics Oil & Gas. We are just getting ready to deploy systems in Brazil for the first time."

Schlumberger was quick to see the potential behind the Wave Glider system as a data acquisition system for offshore operations support. "Schlumberger is the world's largest oilfield services company with its key strength being secure data acquisition and management. The Wave Glider is an excellent platform in a marine environment, with integrated sensors to harvest this data as the vehicle traverses the oceans," said Sudhir Pai. Fleets of Wave Gliders can be used for environmental monitoring of large offshore areas, such as the long Brazilian coast or in Australia, which also has a large coast and this could be interesting from a financial and logistical standpoint. "The first mission done by LROG was for Chevron (CVX) off the coast of Onslow (Western Australia) to monitor particle suspension in water (Turbidity) during the Wheatstone Pipeline dredging operation. Wave Gliders will be deployed later this year around the Brazilian currents off the Campos Basin. Four more missions are currently going on concurrently in four different parts of the

The Wave Glider has 7 main business lines

- *METOC: Meteorology and oceanography, ability to monitor the physical properties of the ocean.*
- *SEEP: Hydrocarbon detection; background or oil spill*
- *GATEWAY: Ability to communicate with subsea and sea bottom sensors via acoustic communications.*
- *MAG: Computing Total magnetic Intensity (TMI) in a marine environment where EMO (Earth magnetic Observatories) are not available.*
- *PAM: Passive Acoustic Monitoring*
- *Seismic: Acquisition complementing streamer technology*
- *Others: Long distance communication, security and turbidity measurements. This opens the door to many others marine data acquisition services.*

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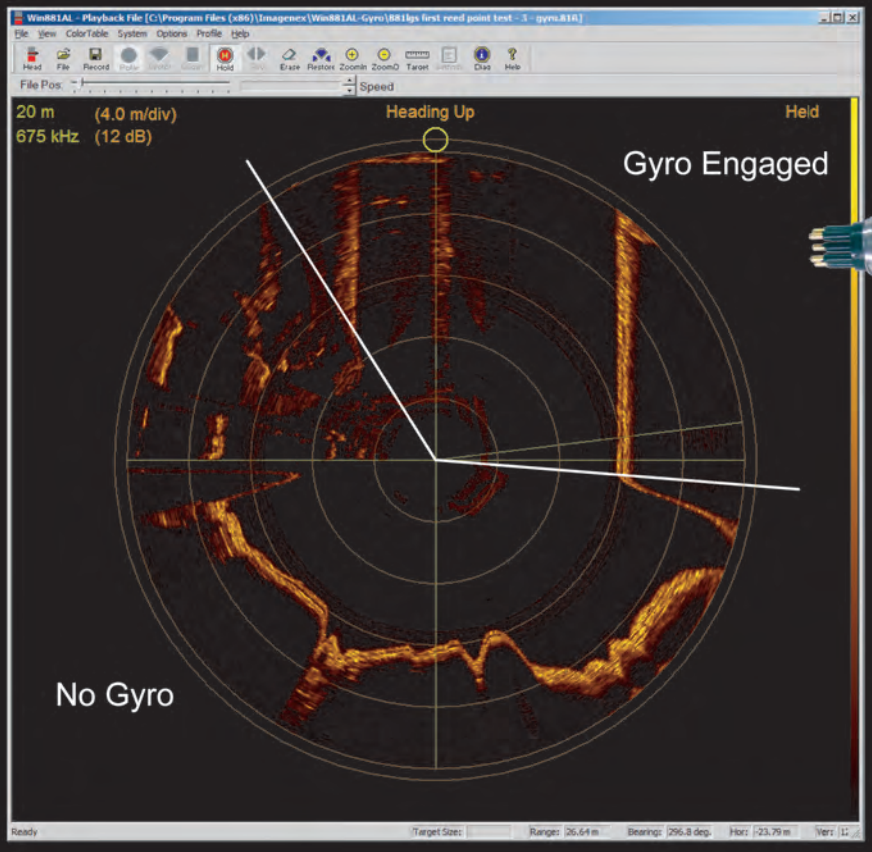

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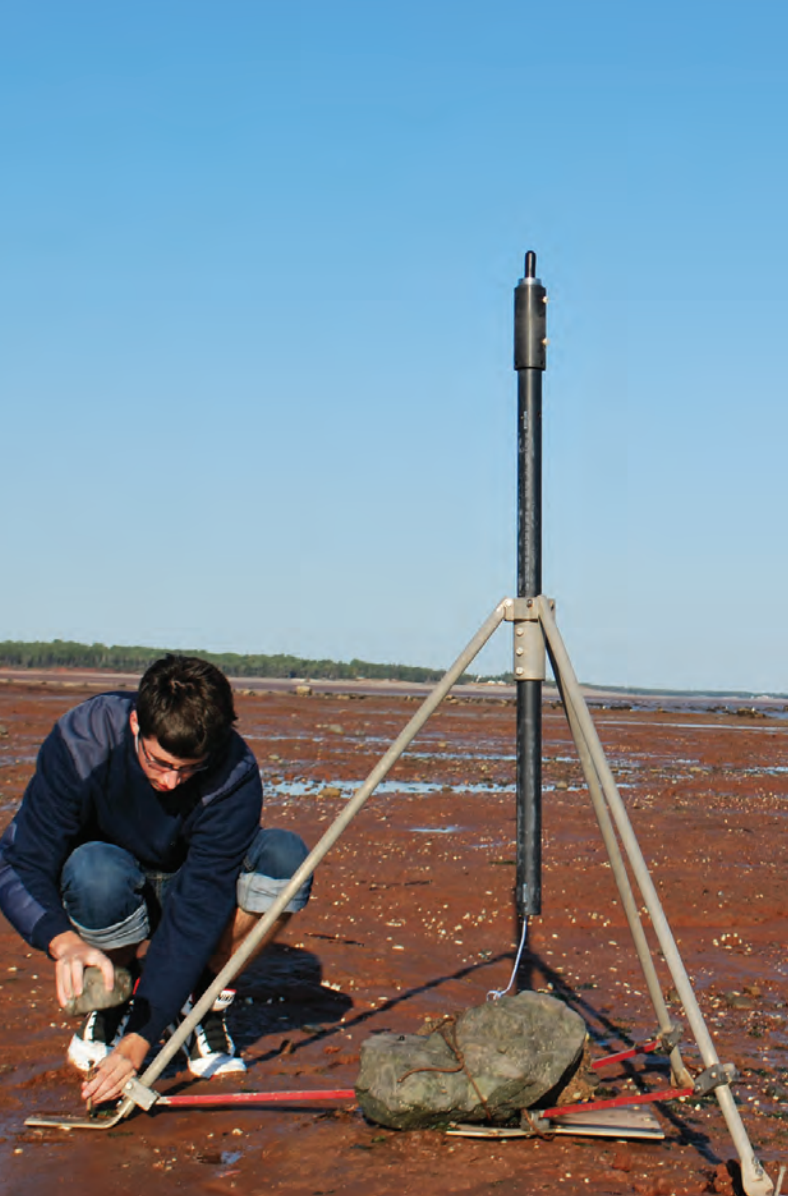
world. One important application for the Wave Glider is environmental monitoring from both a security and protection aspect and for early alert and notification of environmental disasters. Fleets of systems can be deployed in advance to monitor MPAs, EEZs and critical coastal areas," said Sudhir Pai.

The more powerful Wave Glider SV3 has an auxiliary vectored thruster, the function of which is to provide additional thrust capability in extreme ocean conditions (doldrums to high currents). It also provides thrust for quick mobility if needed for obstacle avoidance. The thruster is solar powered and runs off of the lithium batteries and when needed, a remote command is given to initiate the thruster. All sensors on the Wave Glider are acquired from industry leading sensor manufacturers.

Wave Glider is a very robust and reliable vehicle and its maintenance is conducted as Service Levels (SL). SL-1 is done after every recovery; SL-2 every six months and SL-3 every year. SL-2 involves a re-paint of the surface with anti-fouling paint and SL-3 involves a full quality check and extensive system upgrades. In future we may see Wave Gliders continuously monitoring Metocean data in petroleum basins, both for support of seismic operations and for E&P support. Sudhir Pai pointed out that, "LROG has conducted 17 missions so far, over half of those missions were to support seismic operations particularly during close pass of obstructions like rigs, platforms and FPSO. The Wave Glider equipped with METOC services provides real time intelligence to the navigation team on board to safely image as much of the area as possible. The Wave Glider is also useful in detecting oil seeps and the current generation of SEEP sensors (called GEN-2) can detect (Yes/No) presence or absence of hydrocarbon. Four Gen-2 Wave Gliders were used on a project to identify and sample seven separate natural hydrocarbon seepage areas in the Gulf of Mexico. The next generation SEEP technology (Gen-3) will be able to characterize the hydrocarbon." The future of the Wave Glider and its many possible uses by different industries and institutions are exciting to think about and future Wave Glider upgrades will be geared towards expanding and enhancing these capabilities. "The future is exciting and full of promise. Seismic service has undergone early tests and trials, which look very encouraging. The results were presented at the recently concluded EAGE-2014 in Amsterdam. This will help complement the streamer technology and help image areas that traditionally the vessels either cannot go due to depth or terrain or the service is cost prohibitive like the Permanent Reservoir Monitoring. Our overall objective is to provide our clients with technology, data and service of a very high quality so they can overcome their challenges in a safe and cost-effective manner" concluded Sudhir Pai.



Clear to Hear

By Tom Peters

In a rural community in Nova Scotia, a small ocean technology company is making some noise in the design and manufacture of digital hydrophones. Ocean Sonics Ltd. of Great Village, was formed by President Mark Wood in 2012 after Wood developed the concept of the smart hydrophone in 2005 at his company, Instrument Concepts, a design and engineering firm. Ocean Sonics assumed the role of the design and manufacture of the icListen Smart Hydrophones. Ocean Sonics has a strong commitment to preserve the health of the world's oceans through the continuous product research and development and listening to its customers.

"Underwater sound is one of the most important tools we have for understanding and studying the sea. It is vital for measuring the ocean's health," said Wood.

An engineer who started Instrument Concepts in 2000, Wood has an extensive background in acoustics having worked in the oil and gas industry and other ocean industries in Europe and the Gulf of Mexico.

Wood, a native of Fredericton, New Brunswick, who always had an interest in the sea, said the concept for the smart hydrophone was developed when "a customer wanted to do some listening in the ocean."

The analog technology available was very slow and not suited to the task "so we digitalized it," he said. The whole system was put into the water and the results sent to surface over a data link that worked well.

"That's where the idea of putting the smarts in the hydrophone turned on some light bulbs," he said. "We have a network interface on the hydrophone so we can actually access a web browser and talk to a hydrophone and change the way it does things."

Wood has approximately a dozen people working at Ocean Sonics with over half the staff working on the technology of the hydrophone.

The company's location in Great Village, a community of approximately 500 people, is located near the Bay of Fundy, an ideal testing ground for the products. In addition to the bay, there is a spring fed lake in the nearby Cobequid Mountains, a good place to do "quiet measurements," said Wood.

"So we can test in the lab, test in a tank and test in open

water. And we have a new calibration facility, so we have four-season testing capability," he said.

Ocean Sonics makes various models of the icListen Smart Hydrophone for high frequency applications and low and very low noise applications. These models have a webserver feature and icListen Smart Hydrophone users can communicate with the hydrophones through a PC software program produced by Ocean Sonics called Lucy. The software lets users view and interact with data collected by icListen Smart Hydrophones and displays real-time waterfall and time-series data.

Wood said the company also designs the smart hydrophones to work in certain water depths.

"We have one designed to work in 200 meters, we have one made of titanium that goes to 3,500 meters and also looking at one, also made of titanium, that will go to 6,000 meters," he said, adding for about 90% of the company's market, 3,500 meters is sufficient.

The Ocean Sonics' president says there are a number of characteristics that make the company's smart hydrophone different from the competition.

The most compelling, he says is, "Our instruments can provide unprocessed or processed acoustic data, according to the user's needs. It can be configured to detect specific events, count and store events and send a message when an event is detected. We have introduced the idea of data budgeting, where users are encouraged to evaluate what is really needed for their project and configure the instrument to collect just that data.

"When done successfully, this can significantly reduce post-processing time or eliminate it." Wood said the hydrophones are a "complete, self-contained, calibrated instrument."

Wood continued, saying that the instrument is the "lowest

self-noise of the acoustic data loggers or digital hydrophones available. This has been verified by three independent test laboratories. The instrument can be used as a data logger, streaming digital hydrophone or both at the same time."

"Users of the icListen Smart Hydrophones are looking for precise measurement of sounds whether that is mammals, fish, crustaceans and other aquatic life, ships and boats, wave and wind, seismic, pile driving and air guns or other anthropogenic (man-made) noise in the ocean," he said.

Man made noises, he noted, are becoming an ever increasing concern. "They are a new pollution of the sea. In fact, in Europe, man-made sound is officially a pollutant. That came about because of the busy shipping lanes." He said the noise is interference to the signals of whales and porpoises within their communities.

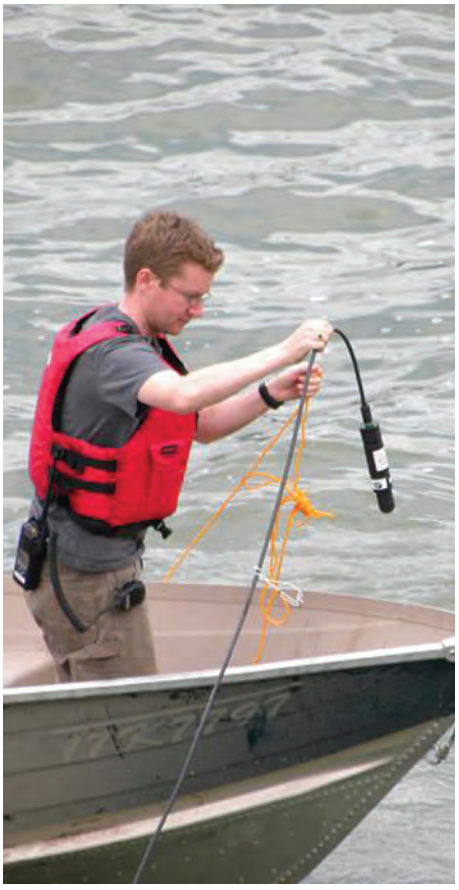
Ocean Sonics has a variety of customers around the globe with the majority working with ocean sound.

"Our customers are in the offshore energy, renewable as well as oil and gas, ocean science, observatories, research institutions and also environmental monitoring companies," he said.

Sounds impact sea mammals. During construction or pile driving in the ocean or in harbours, regulations dictate how loud sounds can be to protect sea life. The hydrophone can be set up to monitor these sounds and ensure they do not exceed required limits.

In a testimonial on the Ocean Sonics' instruments, Ross Chapman, equipment Professor Emeritus at the University of Victoria, BC, wrote: "I have used many different hydrophones on different systems but these icListen hydrophones are the best I've seen in many years. They're calibrated to very low frequencies where I have never been able to get reliable data."

As is the case in most industry, Ocean Sonics has its challenges.



"One challenge we face is a lot of people are used to using traditional hydrophones and so we find it takes a lot of work to educate them on the new technology and its benefits," he said.

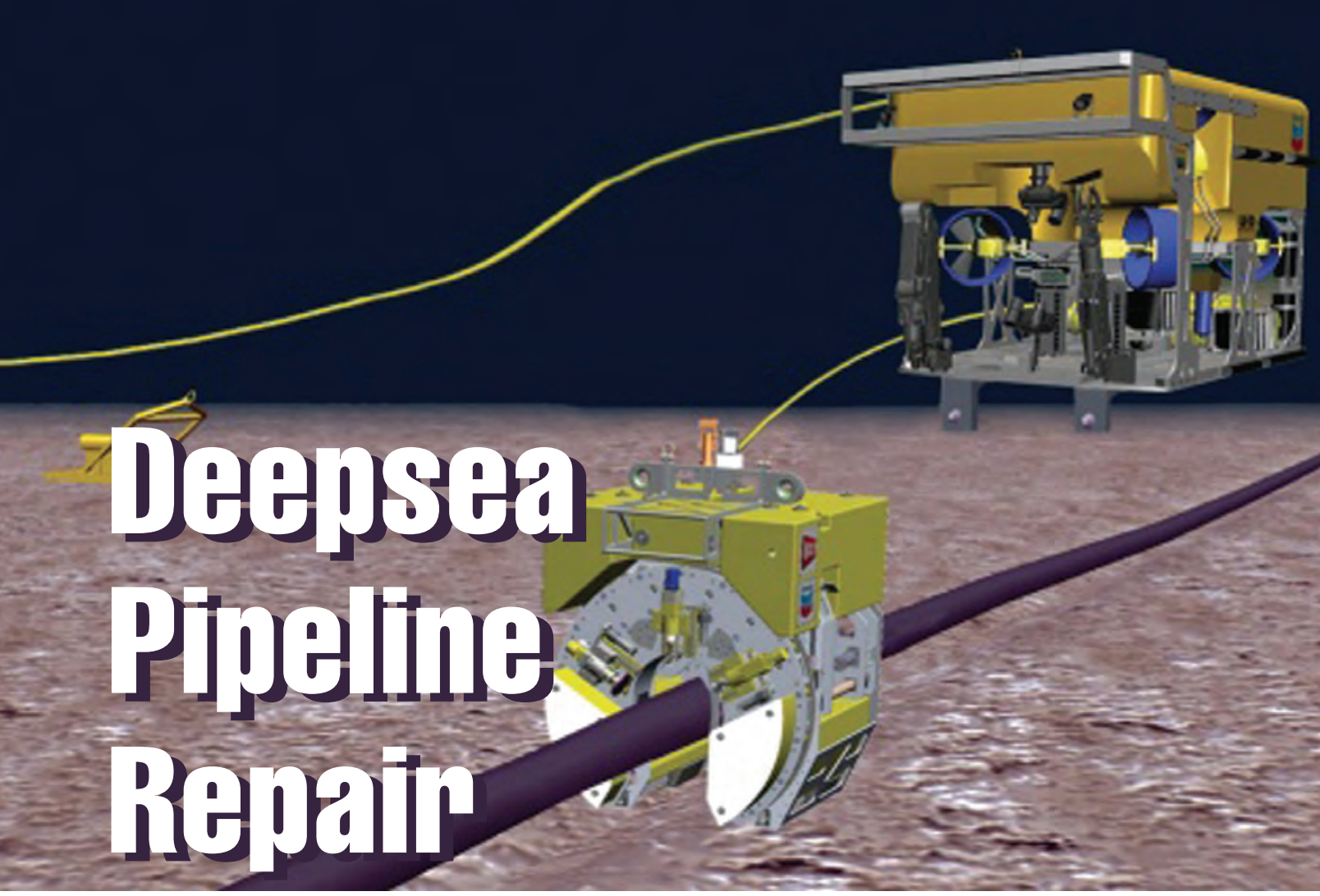
Another challenge is there is not always a level playing field when it comes to funding product development, he said.

Wood says it is challenging trying to stay ahead of the competition and doing just that is part of the company's IP strategy through research and development.

Geographically, Wood sees market potential on the East Coast of Canada and the U.S. in the oil and gas industry and offshore wind energy and environmental companies in Europe. There is a lot of activity in Asia and Ocean Sonics looks at China with enthusiasm. Ocean Sonics is also involved in tidal energy in the Bay of Fundy and the West Coast of Canada.

On the horizon are some big projects. Wood sees potential in monitoring and detecting "where people want to have a system of hydrophones working together, monitoring and tracking sea life and shipping. The Atlantic Ocean, Pacific Ocean and Gulf of St Lawrence are exciting opportunities to study these interactions between anthropogenic sounds, natural sounds and aquatic life."

The Ocean Sonics whale-tail logo symbolizes the company's strong connection to the sea. The logo also represents the company's commitment to helping wherever it can to preserve the health of our oceans.



Deepsea Pipeline Repair

Wachs Subsea Answers the Call for Chevron

By Mark Leska

When looking for an emergency preparedness system for the Gulf of Mexico and elsewhere, Chevron enlisted the aid of Wachs Subsea to create an automated pipeline repair system using Wachs Combination Prep Tool (CPT) as the key operational component. The design parameters included a machine that was lightweight so it could be transported by air, operational at depths to 3,000 meters (10,000 feet), and configured to perform all the pipeline machining tasks associated with installing a sleeved replacement pipe section (or spool) in a single deployment.

Wachs Subsea's CPT-3, or Combination Prep Tool Generation 3, is designed and manufactured to excel at this task. It's a complete hydraulically powered subsea machining system, equipped with three integrated modules that "combine" to perform five functions: cutting, ID and OD chamfering, weld seam removal and FBE (fusion bonded epoxy) removal. The CPT is a multifunctional device that is easy to deploy, easy to operate and leaves nothing on the seabed at completion. In the past this usually required three different machines, multiple vendors, trained dedicated operators, multiple deployments, big ships, and lots of time and money. The CPT-3 changes all of that.

The CPT's basic design is a robust twin clamp, open "C" framed rotary machining platform with a rotating frame travel range of 0-200 degrees from top in both directions. The CPT features a universal mounting interface for the attachment of the three operating modules, and is provisioned for the fitting of an IHPU (Isolated Hydraulic Power Unit or "Dirty Oil Pack"), which is recommended and available from Wachs

Image above: One machine. One operator. One Deployment. The CPT-3 and upcoming CPT-4 are game changing machines in deepwater pipeline repair and maintenance activities from 30 to 3000 meters.

CPT-3 compact footprint makes it easy to store. These machines form the center piece of a modern emergency preparedness system based on rapid response times.

Subsea as an option. Each module is individually remote controlled, and each is equipped with a subsea camera for live monitoring. Electric power for the ancillary, non-hydraulic components of the CPT is provided via hot stab 24V DC from the ROV.

The CPT-3 features the ability to transit ("walk") the axis of the pipe with an 8-in. (203mm) stroke, utilizing a caterpillar action of alternating clamps, pushing and pulling between the two. It's part of a cut, lift, remove and replace system designed to machine subsea pipelines from 12 to 24-in. OD (DN300-600) at depths up to 3,000 meters (9843 sfw). Available soon is the CPT-4, utilizing the same technologies as the CPT- 3 but scaled up in size and capabilities to accommodate pipelines in the 26 to 44-in. OD (DN650-1050) range.

The CPT-3 is compact, measuring just 70.75-in. (180cm) long by 72-in. (183cm) wide by 56.25-in. (143cm) high (machine only, without the deployment frame). Weight in air for the machine itself is a comparatively light 6145 lbs (2793 kg). With its deployment frame, tooling and fluids lifting weight is approximately 11000 lbs (4990 kg). Weight in sea water is virtually neutral buoyant at 50 lbs negative (23 kg), user adjustable.

All clamping, walking, cutting, chamfering and removal operations are controlled remotely via the included CPT iVP controller program, running on a dedicated laptop included with the sys-

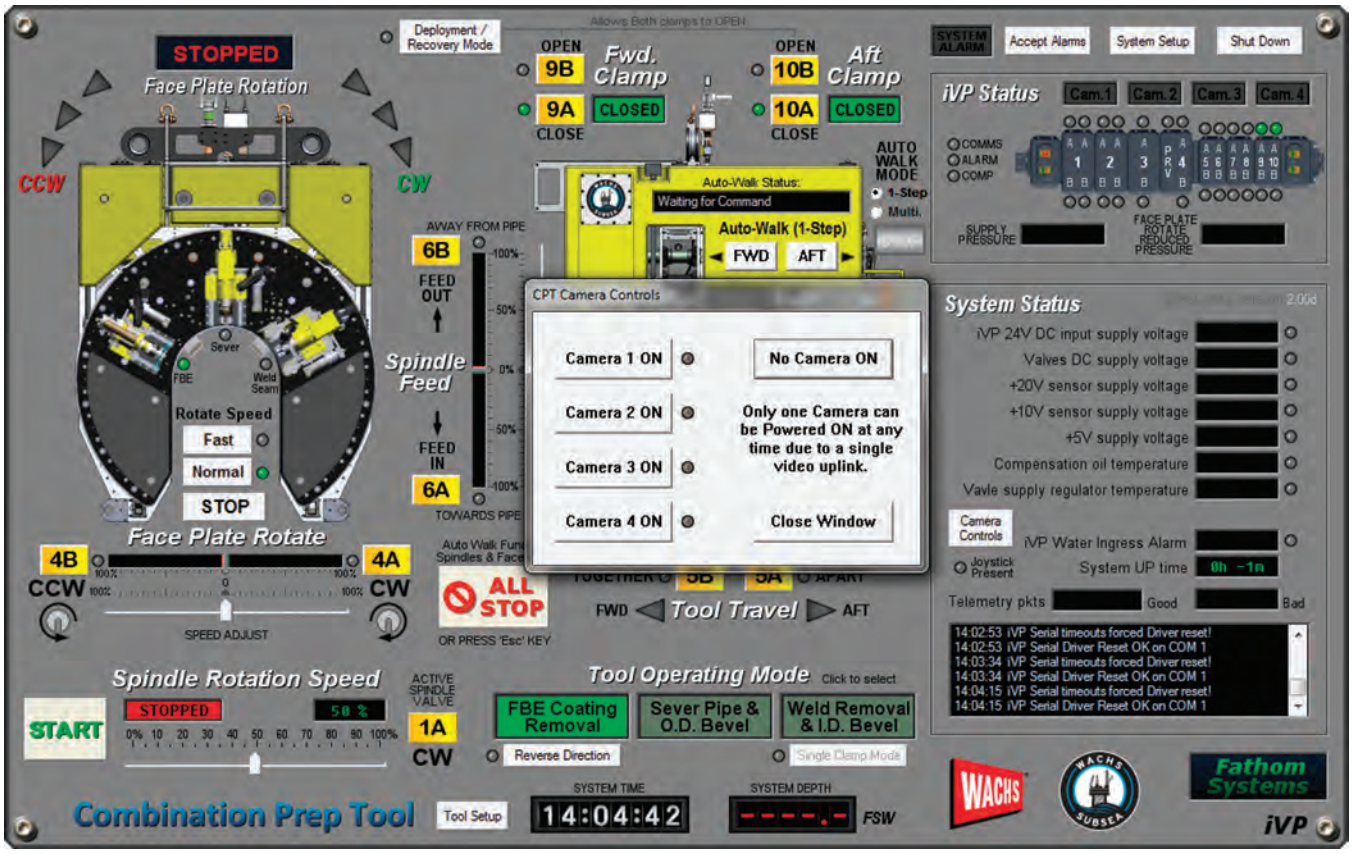
tem. The graphical user interface on the iVP based software is intuitive, allowing for ease of use without the need for intensive operator training. iVP was the preferred platform for the CPT-3 due to its widespread use in the industry, as an ROV pilot familiar with other iVP operated equipment will enjoy a very short learning curve.

The CPT-3 controller software was developed by real world testing using experienced ROV pilots. Every operation of the machine can be viewed on a centralized screen (Figure 4), with additional menus opening as required, for example camera operation. While easy for an experienced pilot to quickly master, factory training for your operator(s) is included with every CPT series machine. In addition Wachs in-depth Factory Acceptance Test procedure offers a rich technical learning experience for your crew.

Every Wachs Subsea CPT is engineered and built to the high-

Wachs Subsea CPT-3 performs cutting, ID and OD chamfering and weld crown and FBE removal in a single deployment on pipelines from 12" to 24" OD (DN300-600) at depths up to 3,000 meters.

Detail of CPT-3 iVP controller program secondary menu that appears when a specific function is selected, in this example the CPT camera control menu window is shown



est standards under ISO 9000-2008. Each machine is hand assembled and built with the finest materials including high strength aluminum, epoxy coated syntactic flotation, high alloy stainless steel, bronze and heat treated carbon steel with protective plating. As the CPT will be used almost exclusively in salt water the machine includes integrated cathodic protection. Every part on Wachs Subsea's CPT is designed to resist corrosion and require minimal maintenance.

The machine's hydraulic and electrical systems are equipped with depth compensation for deepwater operation under extreme pressure, and each includes an advanced warning system to alert the operator if seawater infiltration is detected. While primarily developed for deepwater operations it's worth noting that the CPT series is equally suitable for shallow water operation, in keeping with the industry trend of keeping divers out of the water and out of harm's way. The CPT-3 and CPT-4 will function equally well in 30 meters of water as in 3000 meters.

Another feature worth noting is the machines ability to perform on near vertical work pieces. With its centralized center of gravity plus it's near neutral buoyancy it's an easy maneuver for the ROV operator to position the CPT on a pipeline ascending or descending even the steepest seabed feature.

Deploying the machine begins by positioning the CPT in its custom deployment frame on the seabed, in close proximity to the repair site. The CPT clamps securely to a center fixture on the frame for transport and storage. The deployment frame features a single pivot arm for ease of lowering and lifting, and a mudmat to prevent stiction on the seafloor and to minimize silt clouding. As pressure compensation is integrated into the CPT, the deployment frame requires no additional compensation.

The CPT-3 is compact and light enough to be deployed with a wide array of ROV's, and is energized and powered by the ROV via electrical and hydraulic zero leak hot stabs. The pipeline repair begins with the ROV pilot removing the CPT from its deployment frame, then flying and clamping it on the damaged pipeline near the initial cut line. The CPT Severing/OD Chamfer module performs the first severing operation. Its hydraulic autofeed system produces pinch-free severing with a smooth, controlled cutting action suitable for pipelines under light compressive loading. For heavy compressive loading some manner of subsea pipe handling equipment (by others) is recommended. Wachs CPT-3 has been successfully integrated into several manufactures pipe lift systems.

The CPT is then transited to the second cut line, where the operation is repeated. The replacement jumper spool section, following metrology measurements, is typically fabricated topside at this stage and made ready to lower to the seabed. Following removal of the damaged section the CPT chamfers the pipe OD to prevent sleeve connector damage

when installing the replacement spool section.

The Weld Seam Removal module utilizes a combination face mill and ID chamfer tool to face mill the weld crown for a smooth sleeve mounting surface, and indexes and pull mills the ID, creating an internal chamfer to prevent pig snagging. The final prep has the FBE Removal module abrading the FBE (fusion bonded epoxy) from the pipe with a high speed rotary abrasive disk, utilizing a combination of axial indexes and radial rotation to deliver unlimited axial removal lengths. The weld crown and FBE removal steps are performed to ensure a good seal and tight grip of the sleeve connectors.

The CPT system is designed to carry out all severing and preparation work in a single deployment. Apart from tooling the only consumables in the entire operation are the jumper pipe spool section and two pipe connectors. Upon completion the CPT is unclamped from the repaired pipeline and flown back to its deployment frame by the ROV. The machine is clamped to the deployment frame fixture, de-energized and hoisted topside, leaving nothing on the seabed. The CPT is then cleaned and prepped for the next deployment, or for storage.

Wachs Subsea CPT represents the latest thinking in subsea pipeline repair and emergency preparedness. It's a single multifunctional machine, with its compact size and light weight allowing it to be air lifted within hours to any repair site. Its size eliminates the need for a large surface support ship or for a heavy workclass ROV to deploy it. And like all Wachs products the CPT is built to last, with high quality components that require minimal maintenance, and a small footprint for storage.

Designed for air transport, the CPT-3 is engineered to be strong yet lightweight. Ideal center of gravity and neutral buoyancy make the CPT series equally effective vertically as well as horizontally.

All machining operations utilize well proven technologies for the reliability associated with the Wachs name. Autofeed sever module uses plunging milling technology to handle compressive loading.

(Photo courtesy of Adrian Round, Dir. of Observatory Operations, ONC)

Biofouling Foiled

UV Light Harnessed for Biofouling Control

By Jehan Zouak, Marketing Coordinator, Chris Bueley, Mechanical Engineer & Pete Reedeker, Director of Sales & Marketing, AML

Since the first deployment of in-situ monitoring instrumentation, biofouling has been a problem. Without an effective solution, people have historically had to accept the limits biofouling imposes on ocean sensing work, with significant repercussions. When instrumentation is deployed in-situ, the value of the data taken during the deployment corresponds with the longevity: information gleaned from a longer deployment is often more useful than information from one of a shorter term. When marine growth begins encroaching upon sensors it alters the readings, rendering the data collected inaccurate. Biofouling can encumber instrumentation within a few weeks, severely limiting the duration of deployments and hindering environmental monitoring efforts.

Ocean observatory networks around the world are growing as efforts increase to monitor the world's oceans. The technology used on observatories is allowing more in-depth research of these bodies of water than ever before. Since these underwater networks have in-situ instrumentation deployed for long periods of time, biofouling control is needed to keep sensor readings accurate and camera footage clear. Without biofouling control to maintain sensors and camera lenses, ocean observatories yield information of diminishing reliability over time.

Current antifouling methods have substantial drawbacks. Those encountering biofouling must choose between using toxic chemicals which harm the waters they are trying to monitor, and methods of limited efficacy, such as mechanical wipers and copper plating. Vulnerable to malfunction and fouling themselves, mechanical wipers are also unsuitable for sensitive lenses and surfaces with complex contours. Copper has a limited lifespan as an anti-foulant; its effectiveness decreases over time. Significant technological advancements have been made in ocean monitoring instrumentation, but their full potential has not been reached due to the shortcomings of these antifouling methods.

Although the potential of UV radiation as an anti-foulant has been known for over three decades, this year marks the first it is commercially available. Looking to eliminate the leading cause of sensor drift, instrumentation manufacturer AML Oceanographic of Sidney, BC, Canada, began researching the prospect of UV light as a viable method of biofouling control for in-situ sensors. However, based on the encouraging results, AML broadened the scope of this method to include other devices installed underwater.

AML established the efficacy of UV light as a method of biofouling control first with fundamental tests of the technology, and then further testing with more advanced product prototypes in various environments. Once the basic technology was proven at the Institute of Ocean Sciences in Sidney, BC, and Ocean Network Canada's (ONC) observatory at Folger Pinnacle off the west coast of Vancouver Island, an early

Image Left: Although AML's UV antifouling technology has a conservative effective range listing of 'up to 10 cm' depending on environmental conditions, the clean patch on an ONC camera's sphere shows off a UV-Xchange's incidental reach of over 30 cm during the CTD test at Folger Pinnacle.

prototype was developed. After local testing, this prototype was deployed at the Hawaii Undersea Research Laboratory near Honolulu, where biofouling is prolific. The trial demonstrated the effectiveness of UV light as an anti-foulant even in aggressive fouling environments. While unprotected surfaces of the platform were quickly inundated by marine growth, the sensors bathed in UV light and surrounding areas receiving UV light incidentally remained spotless. Longer term testing, once again at the ONC observatory at Folger Pinnacle, delivered the same results: after four months underwater, the UV protected sensors remained clean. In both tests, the unprotected sensors began to drift after two weeks, while the protected sensors maintained their measurement integrity for the span of the deployment. The test at ONC continued through July of 2014, nine months in total. Included in the deployment were three AML Metrec-X CTDs, two with UV-Xchange installed and one without. Also deployed was a Sea-Bird CTD with its chemical biofouling control system as a reference. Data from AML's sensors protected by UV-Xchange remained in agreement for the duration of the test, and closely tracked the reference instrument. To confirm the maintained accuracy of UV-protected conductivity sensors, water samples were collected from the platform and analyzed with a laboratory salinometer. The results of this check verified C-Xchange conductivity sensors protected by UV-Xchange hold their accuracy. When compared to the salinometer-based 'true' values, the error of the UV-protected AML sensors was indistinguishable from the error of the reference sensor.

When the Folger Pinnacle platform

(Photo courtesy of Adrian Round, Dir. of Observatory Operations, ONC)

A sample comparison of two identical sensor configurations: On the left is an AML Metrec-X instrument with UV-Xchange installed to protect all four sensors. On the right is identical instrumentation without UV-Xchange. Note the glass tubes of the C-Xchange protected by UV-Xchange are crystal clear after nine months in-situ at ONC's Folger Pinnacle observatory.

was retrieved at the end of the trial, the sensors' critical surfaces protected by UV-Xchange were not the only surfaces free of fouling. The camera sphere – situated over 30 cm from the nearest UV-Xchange – had a large clean patch due to receiving incidental UV light. Although AML's UV technology has a conservative effective range listing of "up to 10 cm" depending on environmental conditions, the contact with the camera sphere demonstrated the reach extends further in certain situations.

Through the use of their Folger Pinnacle platform, Ocean Networks Canada has played a key role in the testing of UV biofouling control. Tom Dakin, Sensor Technologies Development Officer at ONC, is looking forward to seeing the effect this technology will have on ocean monitoring:

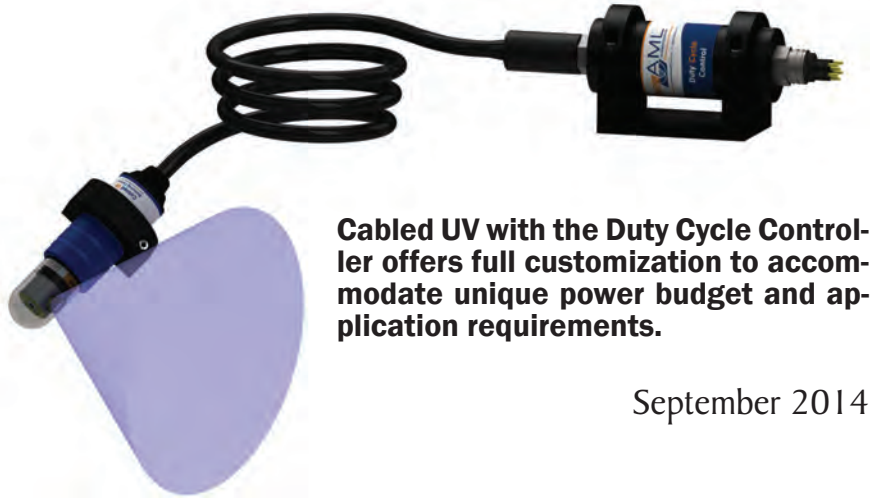
Biofouling is obviously a problem on our ocean observing systems. Poison is an undesirable mitigation strategy due to the long term environmental implications. Repeated manual cleaning is expensive and wipers are effective only on limited surfaces. The announcement of a UV antifouling system was therefore greeted with interest, but cautiously.

A technology demonstration was carried out by comparing a poison protected Seabird CTD to UV protected AML Oceanographic CTDs and an unprotected CTD. The results after 8 months were conclusive. The UV protection was as effective as the poison but had the benefit of being able to protect external surfaces as well as areas exposed to moving water. Based on the sensor protection success we are now eager to try this technique on camera lenses.

In another demonstration, Micro-X instruments with UV-Xchange installed were delivered to Fastwave Communications in Australia to protect hydrocarbon sensors used to detect oil. Retrofit to the sensors without any modifications required, AML's UV technology was the only antifouling method suitable for keeping clean the sensors' inlets due to their complex geometry. Rapid fouling of the sensors necessitates sending crews out often to clean off the heavy growth. UV-Xchange is expected to dramatically reduce these maintenance requirements, resulting in substantial cost savings. Two months into the deployment, Nick Daws, Director of Business Development at Fastwave, is pleased with the technology's performance:

Due to the biofouling problems encountered in Australian waters, Perth based company Fastwave has been testing the AML UVX modules in local waters. Initial results look very promising, and when this first stage of evaluation is completed, testing will be moved to the tropical North West coast of Australia, where the most aggressive biofouling problems occur, particularly in the summer months as sea temperatures rise. Fastwave has deployed a substantial number of marine environmental monitoring systems in this region, and reducing the impact of biofouling on sensors will deliver significant benefits in terms of reduced sensor maintenance requirements. Successful deployments around the world in locations such as Canada, the United States, Australia, and Dubai have proven UV to be an effective antifoulant in a wide range of environments. At the time of writing this, several other deployments around the world are in the early stages.

Since the technology's debut at Oceanology International in London, over-



Cabled UV with the Duty Cycle Controller offers full customization to accommodate unique power budget and application requirements.

whelming interest in UV as an anti-foulant for a vast array of underwater devices and unique applications has compelled AML to design another product to accommodate this demand. The result is Cabled UV. It shares the feature of adjustable, exchangeable LED modules with UV-Xchange, but instead of requiring an AML instrument to operate, it is simply a UV source integrated into the end of a cable. Cabled UV adapts to the strict requirements of a deployment, bringing UV biofouling control to a broader scope of applications. Cabled UV's easy integration into a broad range of equipment and full customization of duty cycles makes it ideal for an extensive array of operations. In addition to a high volume of requests for Cabled UV on third-party CTDs, inquiries have come in for use on ADCPs, camera lenses, underwater lights, hydrophones, sonar heads, and more.

Human presence in the world's oceans is surging, driving the need to expand ocean monitoring efforts. This increase of activity in the oceans is occurring simultaneously with the expansion of global awareness of our effect on the environment, demanding a method of biofouling control that enables optimal performance of monitoring devices with minimal environmental impact. As the most universally applicable anti-foulant, UV biofouling control has the potential to revolutionize ocean-based operations, extending the duration of in-situ deployments and improving the quality of information collected from our oceans.

AML's UV-Xchange sporting 3 horizontal LEDs and 1 vertical, ideal for protecting sensors on multi-parameter instruments.

High Precision MEMS

Silicon Sensing Inertial Sensors and Systems

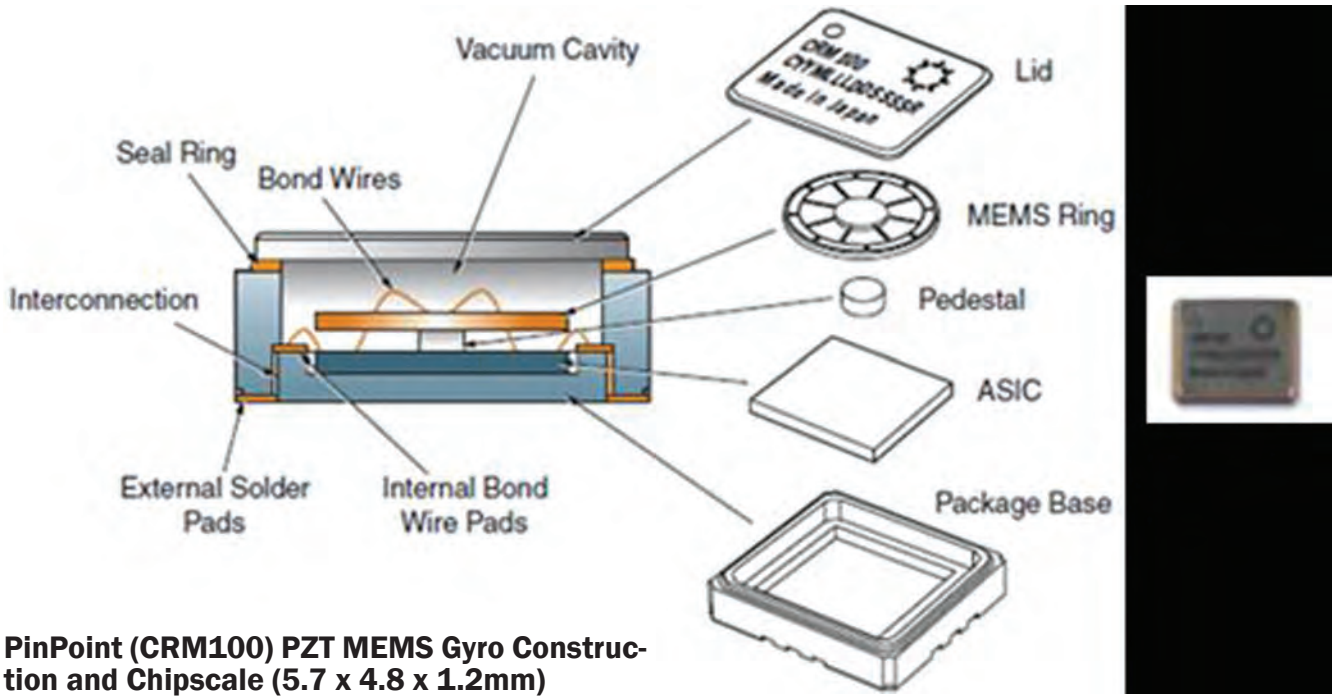
By Jon Wilkins, Silicon Sensing

Formed in 1999 Silicon Sensing's is known for precision in the field of MEMS inertial sensors. 30 million MEMS gyroscopes, accelerometers, and Inertial Measurement Units (IMUs) have been supplied to hundreds of customers worldwide for use in a diverse spectrum of applications from marine applications through to space vehicle control.

Recent developments have expanded these capabilities to meet the accuracy requirements typically reserved for FOG (Fiber-optic Gyroscopes) and RLG (Ring Laser Gyroscopes) technologies by providing evolutionary high precision MEMS inertial products with low output noise and bias instability. These products have emerged from pedigree processes and platforms to offer lower cost, robust, and reliable products coupled with compact packaging to help meet the ever decreasing space and cost constraints of today's marine applications.

Silicon Sensing produces a wide range of single-axis silicon MEMS gyroscope sensors and modules to suit a diverse range of applications with varying performance specifications. The family of gyroscopes all use the same unique patented Vibrating Structure Gyroscope (VSG) resonating ring technology to sense rotation rate through the Coriolis Effect. VSG ring technology is designed to provide superior performance in high shock and vibration environments. Silicon Sensing has coupled this base technology with in-house foundry expertise to successfully and efficiently develop high yield mass production capability of three generations of MEMS VSGs. These field proven generational technologies include Inductive (VSG3), Capacitive (VSG4), and the latest fifth generation PZT (VSG5). Silicon Sensing leverages its inertial experience to develop custom and discrete electronics in conjunction with the various VSGs to assemble and package the family of products with the desired performance characteristics and output parameters. These intrinsic capabilities allow Silicon Sensing to produce a wide range of MEMS VSG gyros from low-cost, precision, chipscale sensors (e.g.PinPoint) up to FOG-grade high performance MEMS Gyro modules (e.g. CRS39 and CRH02).

Silicon Sensing provides a diverse group of single-axis



PinPoint (CRM100) PZT MEMS Gyro Construction and Chipscale (5.7 x 4.8 x 1.2mm)

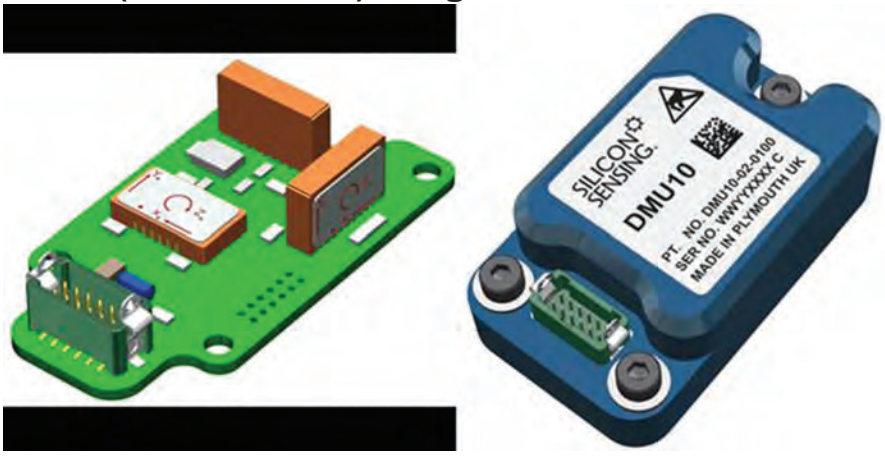
MEMS gyroscope sensors and modules products with performance in the 0.08 °/hr – 14 °/hr bias instability range. The latest of which being the PinPoint chipscale sensor which is built around the VSG5 technology incorporating unique thin film PZT MEMS processing. This sensor offers low angle random walk (0.28 °/√hr) performance characteristics.

Silicon Sensing also provides a range of high performance single-axis MEMS gyroscopes which deliver very low bias instability (0.7 °/hr - <0.08 °/hr) performance. These sensors are suitable for marine attitude and positioning control system applications requiring high accuracy and reliability, in a compact and affordable module. Following the success of the CRS09 gyro (0.7 bias instability and <0.1 °/√hr angle random walk) gyro, the CRH01, CRS39, and CRH02 emerge from Silicon Sensing offering lower cost, robust and compact alternatives to expensive FOG and RLG technologies. These sensors further expand the well-established VSG3 inductive technology for superior performance with proven reliability. Typical performance characteristics are indicated in the table below.

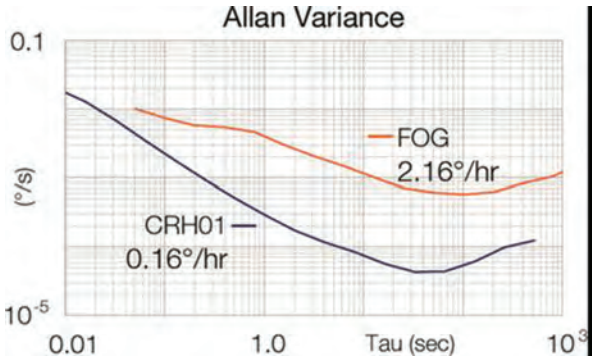
Silicon Sensing High Performance Gyroscope Typical Performance Characteristics

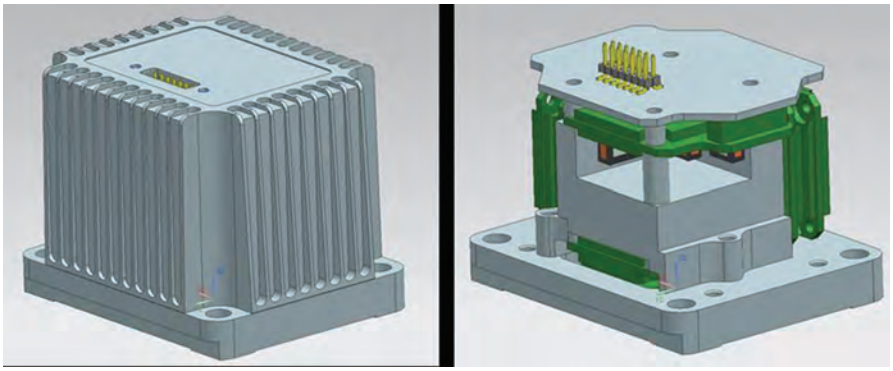
Silicon Sensing Part Number	Bias Instability (Typical)	Angle Random Walk (Typical)
CRS09	<0.7 °/hr.	<0.01 °/√hr.
CRH01	<0.2 °/hr.	<0.04 °/√hr.
CRS39	<0.08 °/hr.	<0.009 °/√hr.
CRH02	<0.09 °/hr.	<0.01 °/√hr.

DMU10 OEM (41 x 22 x 11mm) and Module (45 x 26 x 16mm) Configurations



Silicon Sensing CRH01 Performance vs. FOG





DMU30 (L65 x W54 x H51mm)

The CRS39 series high performance sensors offers a dynamic range of ±25 °/sec and four variants of the CRH series sensors are available to accommodate user dynamic range requirements from ±25 °/sec to ±400 °/sec.

Traditionally MEMS gyroscopes have exhibited performance that was an order of magnitude greater than good FOG devices. The Silicon Sensing MEMS gyroscopes are now delivering performance levels comparable to FOG devices.

These high performance product offerings have expanded the Silicon Sensing MEMS inertial sensor capability to include gyro compassing applications. Using these sensors, specifically CRS39, in a gyro compassing application it is typical to see <1° of pointing accuracy within 1 minute and <0.2° of pointing accuracy within 12 minutes.

Silicon Sensing will continue to expand these capabilities through continued development efforts to gain additional high performance improvements in the VSG3

inductive technology product line. These improvements will be integrated into future robust, reliable, and compact product offerings consistent with Silicon Sensing current high quality product portfolio.

Along with the wide range of MEMS gyroscope products, Silicon Sensing also offers a MEMS accelerometer, Gemini. Gemini is a high performance two-axis accelerometer in a single package that offers five product variants across dynamic ranges from 0.85g to 96g in a small robust and compact planar or orthogonal mounted package. Precise linear acceleration sensing is achieved by a Silicon MEMS detector forming an orthogonal pair of sprung masses. Each mass provides the moving plate of a variable capacitance formed by an array of interlaced 'fingers.' Linear acceleration results in a change of capacitance which is measured by demodulation of the square wave excitation. This design and measurement technique yields exceptional performance results for bias and scale factor repeatability (1 year) across the product variants.

Silicon Sensing leverages its in-house gyroscope and accelerometer technology and products to produce an organic MEMS combi-sensor chip, Orion, as well as complete package six-degrees-of-freedom (6-DOF) Inertial Measurement Units (IMUs).

Orion is a single axis gyro (VSG5 PZT MEMS resonating ring) and dual-axis low-g accelerometer (Gemini MEMS accelerometer element) MEMS combi-sensor. The unit features user-selectable dynamic range and bandwidth, with a digital SPI output. The Orion combi-sensor chip is available in flat and orthogonal formats with a hermetically-sealed ceramic LCC surface mount package.

Silicon Sensing currently offers IMUs and is in the final stages of development for a new dynamic measurement unit; DMU10, which will be available in the early fall of 2014. DMU10 is designed to be a low-cost, high precision, 6-DOF IMU which offers robust and user friendly formats with OEM and Module configurations, either of which can be supplied un-calibrated, calibrated at room temperature, or calibrated over the full operating temperature range. Silicon Sensing has also designed in expansion capability to integrate additional sensors (e.g. magnetometers and pressure sensors). Evaluation units are currently exhibiting <8 °/hr gyro bias instability and <0.05 mg accelerometer bias repeatability across all three axes.

Silicon Sensing is also currently engaged in development of a MEMS High Performance IMU (HPIMU); DMU30, which is slated for customer evaluation units in spring 2015 and production in the summer of 2015. This unit will integrate the new high performance VSG3QMAX (high 'Q') inductive resonating ring gyro technology together with the capacitive MEMS accelerometers. The entire assembly will be sealed in a metalized housing and ISA block. The DMU30 is being designed with flexibility and customization in mind to accommodate the end-user's interface and performance requirements.

Karen Seath

Jill Rivette

Jim McClaugherty

Paul Hopkins

• **Karen Seath** will join Decom North Sea (DNS) in September as General Manager.With the total cost of UKCS decommissioning expected to reach approximately $7.5 billion in the next five years, these are strategically critical times for the North Sea decommissioning industry.

• **Jill Rivette** has joined C & C Technologies' Geotechnical Division in Houston as a Senior Geotechnical Engineer. She is a licensed Professional Engineer in the State of Texas and brings with her many years of experience in geotechnical engineering.

• **Jim McClaugherty** has joined SeaTrepid International as senior sales manager for the Gulf of Mexico. McClaugherty joins with 45 years of experience in the offshore industry, starting his career as a commercial diver in 1970 in the Gulf of Mexico, and over a 10-year period moved up the ranks as diver, lead diver and diver supervisor.

• **Jack Davidson** has been promoted from the role of operations director to managing director at Energy industry service company Fisher Offshore, part of James Fisher and Sons plc. The expansion of the company's subsea tooling department was a focus in the first quarter of 2014 and was followed in Q2 with the completion of a $3.3 million investment program.

• **Paul Hopkins** was appointed as principal engineer at 2H Offshore, an Acteon company, to develop 2H Offshore's growing client base in Norway. Hopkins worked for 2H Offshore from 2001 - 2006 on a diverse range of riser projects, including Exxon's Kizomba A and B developments and BP's Shah Deniz project.

• **Phil Zivich** has been promoted to Manager, Inside Sales/Customer Service at PMI Industries, Inc. Zivich is responsible for managing PMI's customer-facing timely responses and day-to-day interaction.

• **Tyson Alvanos** has joined the L-3 Klein Associates marketing and technical sales group.Alvanos joins Klein with 10 years of experience as a senior technical sales engineer in the semiconductor, solar LED and medical product applications fields.

• **McMillan Design** is celebrating 20 years of design, manufacturing and sales of the **Sea Catch Toggle Release**. Since 1994, Sea Catch, a quick release hook designed for the release of lines or objects under load, has gained praise from engineers and users in 14 major industries around the world and is now available in more than 68 different models with capacities ranging from .65 tons to 150 tons or larger. The standard unit is connected via common shackles at each end whereas the LM Series is formed with enlarged jaws to receive and release fiber line or wire rope rather than a shackle. Retrieving hooks and off-load hooks have been added to the general product line in recent years. Chevron USA recently used a Sea Catch TR18RAM as an emergency disconnect on the mooring line that secured an oceangoing barge to the stern of a drill ship for well test flowback.

• **LUSCHI** will mobilize its vessel Giovanella to Espírito Santo to assist in the dredging and final disposal of accumulated sediments in the seawater storage canal of ArcelorMittal, one of the world's leading steel and mining companies. The canal has approximately 600 m long and sedimentation volume in the order of 46,000 cu. m. The project aims to use a self-propelled trailing suction hopper dredger that allows it to suck up the sediments into its own cisterns for disposal in offshore waters, provided by Companhia Docas do Espírito Santo - Codesa.

• **Calecore** unites with sister company N-Sea to continue geotechnical and ROV survey operations in Barents Sea Calesurvey, Calecore's Offshore Geophysical division has seen steady increase in demand over the past two years for ROV Survey Services. In June, WROV operations were undertaken onboard the Kommandor Calum for a project West of Shetland whilst the Kommandor Stuart has been undertaking multiple integrated 2DHR, ROV and seabed testing and sampling campaigns offshore Northern Norway.
The Siem Stork replaces the Kommandor Stuart. The vessel is equipped with a new SMD Quasar Work Class ROV and Calegeo supplied Seabed Geotechnical tools. The Kommandor Stuart will be heading

Tyson Alvanos

Sea Catch for Chevron

Photo courtesy Chevron USA)

North with Calecore's geophysical vessel Kommandor Calum and Geotechnical Borehole Vessel Highland Spirit to commence a multiyear contract in the Russian Arctic.

• **Seatronics**, an Acteon company, signed a worldwide contract with Digital Edge Subsea Ltd. for Digital Edge Subsea's complete range of digital video inspection systems. Seatronics will be equipped with Digital Edge Subsea systems for each of its global bases and they will be available for both rental and sales.

• A **MacArtney** MERMAC SC mooring winch solution was selected by MBARI (Monterey Bay Aquarium Research Institute) to empower the deployment and recovery of scientific moorings onboard MBARI vessels R/V Western Flyer and the R/V Rachel Carson. The new mooring winch represents the second MacArtney winch system in operation with MBARI, adding to a MacArtney ROV and AUV tether management winch system in operation on R/V Rachel Carson. The new MacArtney MERMAC Mooring Winch is designed as a powerful self contained steel construction with protection frame, replaceable drum, level wind, gear box, electric motor and remote control.

• **OceanServer Technology** received orders for four new Iver3 AUVs across three different U.S. Navy contracts. The new vehicles will include two standard Iver3-580 units and two new Iver3-450 Nano AUVs. The Iver3 Nano AUVs represent a new class of very small lightweight AUVs weighing less than 39 lbs.

LUSCHI

Photo courtesy of LUSCHI

Calecore

Autonomous Surface Vessels

Photo: ASV

UTEC

Caltech Robotics Team

• QinetiQ, as part of a new Marine Surface Target Service, signed a contract with **Autonomous Surface Vehicles (ASV)** for the supply and operational support of autonomous surface target vessels. The partnership is part of a new initiative enabling QinetiQ's Marine Surface Target Service to meet customer needs for trials and training against appropriate targets. The Marine Surface Target Service is an addition to the wider QinetiQ Target Services, which offers aerial and underwater targets for 'real' test, evaluation and training. With speeds greater than 50 knots, the targets are fast and versatile and can be customized to meet many trial or training requirements, including being fitted with Miss Distance Indication (MDI) systems to provide accurate scoring.

• **UTEC StarNet** is part of the Houston-based UTEC group of companies and it announced an expansion to its partnership with Sky Futures for 3D inspection and onshore and offshore asset management. The collaborative approach helps enhance both companies' positions in their chosen marketplaces by providing a total solution thanks to a combination of UTEC StarNet's IMDC and laser scan capabilities and Sky Futures' advanced unmanned aerial vehicle (UAV) inspection and measurement services. These are delivered via UTEC StarNet'si-Site integrated 3D web-based software package.

• Thales is supporting the next generation of engineers with its sponsorship of the **California Institute of Technology (Caltech) Robotics team's** entry into the 17th Annual International RoboSub competition. The event, cosponsored by the AUVSI Foundation and ONR, aims to advance the development of Autonomous Underwater Vehicles (AUV) by challenging new engineers to perform realistic missions in an underwater environment.

• **Subnero** focuses on enhancing underwater networks and communications. It offers high-performance underwater communications, navigation, monitoring and sensing solutions for researchers as well as commercial deployments. At the crux of these solutions is the flexible Subnero underwater modem. The Subnero software-defined modems run UnetStack (www.unetstack.net), an agent based network stack designed to run highly optimized protocols for use in underwater communication networks.

• **Fastwave** has been appointed Australian distributor by Kongsberg Maritime for the supply, installation, training, service and support of the Seaglider system. The Seaglider is an AUV developed for continuous, long term data acquisition for oceanographic, environmental, defense, research and other marine applications, with a range of over 4,500 kms and depth of up to 1,000m.

• **Delta SubSea** formally opened its new 20,400-sq. ft. Tooling Solutions facility earlier this summer. This new facility will add to DSS's already vast infrastructure and provides DSS's new Tooling Solutions Division with the needed space to provide state of the art Tooling Solutions to their customers.

• **DeepWater Buoyancy** won a major contract to supply flotation to the University of Washington's Applied Physics Laboratory for the cabled observatory component of the Ocean Observatories Initiative (OOI). The OOI, a project funded by the National Science Foundation (NSF), is planned as an integrated infrastructure of science-driven platforms and sensor systems to measure physical, chemical, geological and biological properties and processes from the seafloor to the air-sea interface. DeepWater Buoyancy will deliver more than 32,000 lbs. (14,500 kg) of DeepTec syntactic foam in support of the cabled observatory component of the OOI.

• **Unique Maritime Group (UMG)**, an integrated turnkey subsea and offshore solutions provider, announced an equity investment from Blue Water Energy. Founded in 1993, UMG is a specialist in the provision of services and the sale and rental of equipment for the marine, diving, hydrographic, oceanographic, oil and gas, inspection and NDT market sectors.

• **Teledyne RD Instruments** (TRDI) – manufacturer of Acoustic Doppler Current Profilers (ADCPs); Conductivity, Temperature and Depth (CTD); and Doppler Velocity Logs (DVLs) for offshore, academic and defense applications – an-

Subnero

Fastwave

nounced it will host a two-day training seminar focused on their Doppler Velocity Log (DVL) technology in Houston, October 21-22, 2014. DVLs are used extensively onboard underwater platforms and surface vessels to provide precision navigation capability. All current and potential DVL users are encouraged to attend this event to quickly expand their working knowledge of their DVL and its application to their underwater platform.

- **Teknologic Engineering Services** Inc. announced that it has completed the asset purchase of Ross Laboratories Inc. on July 25, 2014 and formed a new company called Ross Labs LLC. The new company headquartered in Edmonds, Wash. will continue to manufacture the popular line of Ross Hydrographic survey equipment which is sold both in the U.S. and internationally. The new company will operate under the name Ross Labs LLC.

- **Teledyne BlueView, Inc.** announced that Technitrade, part of the Geoaction group located in Arpajon France, has invested in a BV5000 3D Mechanical Scanning Sonar. This high resolution measurement instrument can be used for underwater structural inspection, complementing the workflow of specialist dive teams, conventional sonar survey and terrestrial LiDAR techniques. This purchase adds to the 2D Multibeam Imaging Sonar Technitrade invested in from Teledyne BlueView earlier this year.

- **MacGregor**, part of Cargotec, secured a new contract from Chinese shipbuilder, Fujian Mawei Shipbuilding Ltd., for two 100-metric-ton active heave-compensated subsea MacGregor cranes. The cranes will be fitted to two 86-m multipurpose PSVs under construction. Delivery of the cranes is scheduled for the end of September and October 2015.

- **J2 Subsea**, an Acteon company, opened a new facility in New Iberia, La., to make its range of remotely operated vehicle (ROV) tools more readily available for subsea operations in the Gulf of Mexico. The facility, which includes a new hydraulic workshop for tool preparation, servicing and support, will provide torque tools, analyzers, Webtool cutters, intensifiers, grinders, work packs, jetters and cleaners to ROV and diving companies in North America.

- **Rowe Technologies, Inc. (RTI)** won an order of six SeaPilot DVLs from Oceaneering International. RTI developed a 4,500-m rated titanium SeaPilot DVL for deepwater deployments which the company said provides a slightly smaller footprint when compared to other products in the market and also provides the industries newest electronics platform. A leak detection sensor is integrated into the SeaPilot DVL to provide ROV pilots real-time information on the status of the structural integrity of the DVL and will allow pilots the opportunity to shut-down the DVL in the case that the structural integrity is compromised.

CTI SonarWiz

Chesapeake Technology announced an advance to its flagship software SonarWiz processing with the addition of a Real-Time Acquisition Server for the EdgeTech 4600 and recently-introduced EdgeTech 6205 interferometric bathymetry systems. The EdgeTech bathymetry systems are unique in the industry offering advanced wide swath bathymetry with no nadir gap and true co-registered dual frequency side scan sonar. SonarWiz now not only offers data processing for the EdgeTech interferometric bathymetric data, but the ability to collect and map real-time bathy data along with the side scan data. It opens a whole new simpler way to collect and visualize the data in real-time.

www.chesapeaketech.com

SeeByte Sells Five Licenses

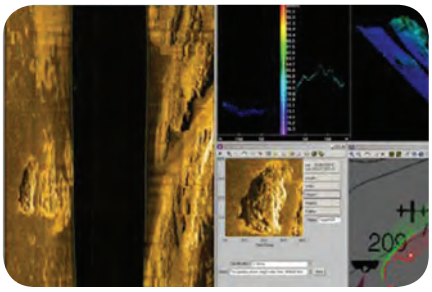
SeeByte, a creator of smart software for unmanned maritime systems, sold another five SeeTrack CoPilot licenses to Seatronics. This software will be integrated into Seatronics' Predator ROV, allowing the system to benefit from improved capabilities. SeeTrack CoPilot is an advanced, plug-and play software that aims to make piloting any ROV a much simpler task. SeeTrack CoPilot permits pilot controlled auto-transit and stop-and-hover, whilst providing automated sonar tracking and movement relative to a target.

www.seebyte.com

SonarPro Language Options

L-3 Klein Associates said that its Side Scan Sonar data acquisition and display software, SonarPro, is now available in multiple languages. Klein's SonarPro, which provides sonar control, data acquisition and display of both bathymetry and side scan data was developed for users, by users of Klein side scan sonar and bathymetry products. L-3 Klein said that in many instances it found that trained sonar operators are more effective when Klein's SonarPro is displayed in the user's native language, and therefore it has built in the capability to select the language displayed in Chinese, English or Japanese.

www.l-3com.com/klein



(Image: L-3 Klein)

High Resolution Data Logging

Dyena PRO simplifies long term recording of vessel structural accelerations, providing scientific data without having to trawl through months of spreadsheets. When an event occurs above the programmable threshold, raw data from before and after the event is stored in a single file alongside the daily overview spreadsheet and a Google

Image: Dyena

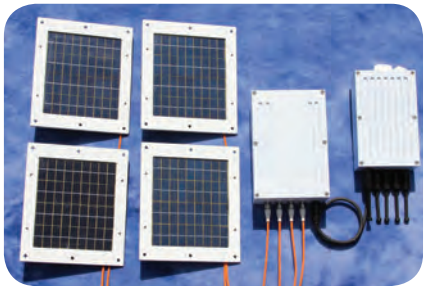
Earth 3D map trace. The Dyena PRO unit constantly monitors the shock and vibrations received by the vessel structure and stores the data to the onboard solid state memory, alongside position, speed, heading and time. Sampling at 1,200 Hz, recording the peak and RMS averages every second and storing individual daily records stored alongside a Google Earth 3D map trace, this provides the user with a concise and easy to interpret overview of vessel operations.

Raw data is continuously buffered and when a significant event is observed, Dyena PRO records the accelerations leading up to the event as well as those afterwards at 1,200 Hz, providing the user with the complete record of the relevant acceleration data. There is no longer any need to review a mass of spreadsheets, as any data from events that exceed the user configurable threshold are presented in a clear and formatted manner with all the information in a single file along with the daily overview spreadsheet and 3D map trace, meaning the user can build up a complete picture of the vessels use and the cause and effect of any incident.

www.dyena.com

DANTE's Solar PowerPak

Soundnine Inc. (S9) shipped eight DANTE Buoy Controller Systems with a new Solar PowerPak. S9 Value Added Partner and systems integrator Imbros Pty. Ltd. of Hobart, Tasmania will install the Buoy Controllers, Solar PowerPaks and Sea-Bird Scientific water quality monitoring instruments on locally fabricated buoys, producing turnkey monitoring systems with Iridium data telemetry. The mechanical designs of the Controller and PowerPak permitted a smaller, simplified and less costly buoy. The turnkey DANTE System is designed to provide a total solution for measurement acquisition, data delivery, and data display and management. The DANTE Buoy Controller was introduced at Oceans 2013. The new Solar PowerPak will make its public debut at Oceans 2014. It can be used with up to four plug-in solar panels that are immersion-proof, corrosion-proof and extremely robust, thanks to a unique reinforced composite construction.



www.soundnine.com

New Chlorophyll Sensor

Turner Designs developed a chlorophyll sensor that uses a red excitation light source to detect algal fluorescence for estimating algal abundance. According to Turner, the sensor is ideal for environments rich in DOM and blue-green algae. Because DOM doesn't absorb red excitation energy, but algae do, red excitation fluorimetry provides fluorescence detection free from interference errors caused by DOM. Studies done with both blue and red excitation chlorophyll sensors showed at least a 16% overestimation of the actual chlorophyll concentration when using the blue excitation sensor and not applying a correction, whereas the red excitation sensor needed no correction. This new red excitation chlorophyll sensor is available as a single sensor in our Cyclops-7 Submersible Sensor family or as one of three sensors on the C3 Submersible Fluorometer. Standard optical kits are available for detecting: in vivo Chlorophyll (blue or red excitation), Crude Oil, Refined Fuels, CDOM/FDOM (dissolved organic material), Blue/Green Algae, Fluorescein Dye, Rhodamine Dye, PTSA Dye, Optical Brighteners, Tryptophan, and Turbidity.

www.turnerdesigns.com

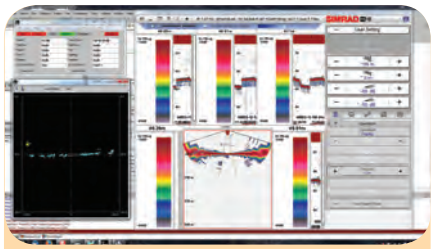


Image: Hypack

NOAA Selects HYPACK, HYSWEEP

HYPACK and HYSWEEP software were selected by NOAA to support fishery and habitat mapping missions HYPACK supplied five NOAA Fishery Survey Vessels with the HYPACK and HYSWEEP software solution. The vessel, outfitted with the Simrad ME70 scientific multibeam system on board, is used by NOAA for various missions to support fishery and habitat mapping.

The latest version of HYSWEEP includes an interface for the ME70, for the data collection, and real time visualization of the sonar. The software suite will provide the operator with all the visualization tools included in the HYPACK and HYSWEEP software. In addition, the new Real Time Cloud provides the operator detailed views of the seafloor during the transect. This program will be useful for easier feature detection and categorization, system calibration and verification, and data quality control.

Once data is collected, processing will be done through the HYSWEEP MBMAX64 software. On board the vessel, the scientific crew will be able to analyze the data set shortly after data collection.

www.hypack.com

Balefire for SeaView ROV

(Photo courtesy of Greensea Systems)

Greensea Systems installed its ROV control system, Balefire, on a Saab Seaeye Falcon DR owned by SeaView Systems, Inc. SeaView supported NOAA earlier this summer in the multibeam survey of several shipwrecks in Thunderbay National Marine Sanctuary, Lake Huron, Michigan. To complete the survey, it was required that the vehicle be able to correlate navigation data and multibeam data accurately, hold station to allow for close-up camera inspection and conduct automated surveys at constant speeds and planned line spacings. Balefire provides for these capabilities and Greensea worked with SeaView to install and test the system in less than a week in preparation for the survey.

Combined with a FOG-based INS developed by Greensea, the Balefire control system added autopilots, station keeping, dynamic positioning, autonomous control modes, path following, mission planning and sensor fusion to the basic Falcon DR ROV system. Balefire provides these functions in an operator workspace that gives pilots an intuitive and powerful interface. Greensea integrated its standard Balefire product to the Falcon ROV by developing a simple software driver for the Falcon handbox controller. No modifications were made to the ROV with the exception of installing the INS. The small Balefire computer simply interfaced with the handbox and the topside interface unit of the Falcon.

SeaView completed the survey for NOAA and delivered quality multibeam and video data efficiently and cost effectively with their Falcon system. “Mission planning and operations were a breeze. Not only does Greensea’s [Balefire] control system enhance the efficiency of the project, it enhances the efficiency of the ROV by reducing the wear of the thrusters. Integrating the control system will reduce project costs and vehicle maintenance,” said Geoff Cook, Operations Manager for SeaView.

Balefire is the new commercial ROV control system product built on the openSEA software architecture which provides robust ROV automation and a powerful operator workspace. Greensea provides the Falcon interface as a standard configuration for Balefire.

www.greenseainc.com

Image: Tritech

Gemini Profiling Sonars for STR

Tritech announced the sale of multiple Gemini 620pd multibeam profiling sonars to Subsea Technology and Rentals (STR), Great Yarmouth. The sales of Gemini 620pd, technology for subsea profiling operations, follow on from the introduction of the Gemini Narrow Beam Imager (NBI) to the company's multibeam range.

STR, which has recently refocused its business, already offers a suite of Tritech industry-standard sensors and sonar for rental. This latest purchase will augment its rental pool and further support customer requests for a multibeam bathymetric profiling tool, Tritech said.

Tritech's Gemini 620pd profiling sonar operates at 620 kHz and is able to provide 10mm range results with an angular resolution of 0.5Â°. The Gemini 620pd can be configured as a single-head system, or set up as in a dual-head mode for accurate pipeline profiling utilizing the Gemini Hub for accurate synchronisation while processing.

www.tritech.co.uk

Rowe Adds new DVL to its SeaPILOT Line

Rowe Technologies launched a new Doppler Velocity Log (DVL) for the SeaPILOT product line. The SeaPILOT OC (Observation Class) is the result of collaboration with several small ROV manufacturers to provide a compact, high performance DVL, designed specifically for observation/inspection class ROVs. The OC is small (5-in. [127mm] wide x 6-in. [152mm] tall and 8-in. [203mm]), lightweight (~1 lb [0.45 Kg] in water), is rated for 300m operating depths, and is available in 1,200KHz and 600KHz operating frequencies. To ease integration, the OC supports several input and output data formats and is compatible with a number of third-party control and navigation software packages.

www.rowetechinc.com

Image: Rowe Technologies

SS260 Series Deep Blue Vector

SIDUS Solutions, LLC, a manufacturer of surveillance equipment, positioning devices and integrated systems, introduced its newest pan and tilt positioner – the SS260 Series Deep Blue Vector. Able to withstand subsea, deep sea and hazardous areas, this electrically driven, high torque two-axis positioning device has a single turn resolution of 0.001° (precision of movement) and the repeatability of position of .01° incorporates superbly machined, extremely low backlash gears and a field serviceable modular design.

This positioner series increases overall operational efficiency, offers enhanced stability, accuracy and resolution. The advanced electronics allows for any remote settings via the data connection or internet and the modular design simplifies routine maintenance requirements. This device is designed for any application that demands large loads to be positioned remotely (>150 lbs.) and contains internal software allowing for seamless integration with existing equipment.

SIDUS offers EPCi-Engineering, Procurement, Construction and installation support with the capability to interface/integrate our systems with all of the major automation/PLC/SCADA systems.

www.sidus-solutions.com

Hi-Traq Trencher

IHC Merwede introduced the four-tracked subsea trencher, specifically developed for shallow water operations and targeted towards cable burial in offshore wind farms. The Hi-Traq was presented at a special event at the Stadium of Light in Sunderland, which was attended by offshore wind industry professionals from the U.K., Europe and the U.S. The new remotely operated vehicle (ROV) has been developed to be capable of tackling the full range of challenges typically faced in this application. High wave loadings and strong currents at the

Image: IHC Merwede

seabed meant the vehicle had to have a minimum weight to guarantee safe, accurate working and efficient trenching operations, for example. Varied seabed soil conditions were also considered in the Hi-Traq's design. The Hi-Traq's four-track undercarriage design enables it to climb slopes with gradients of up to 20 degrees.

www.ihcmerwede.com

Kongsberg Upgrades Digital Stills Camera

Kongsberg Maritime added an Ethernet control interface and a new graphical user interface to its high resolution digital stills camera the OE14-408. The OE14-408 with its 1/1.7-in. CCD sensor, 5x optical zoom and achromatic doublet lens has the ability to capture stills images up to a 10 megapixel resolution while correcting for chromatic aberration, Kongsberg said. With the addition of an Ethernet interface the operator has the ability to control all camera functions remotely. Captured images, in either RAW or JPEG format, can be stored to the camera's 16GB internal memory or downloaded as soon as they are taken through the 10/100 Base-T connection. The camera supports both static and DHCP address protocols.
Images can also be transferred by USB or over an ad-hoc wireless network.

www.km.kongsberg.com

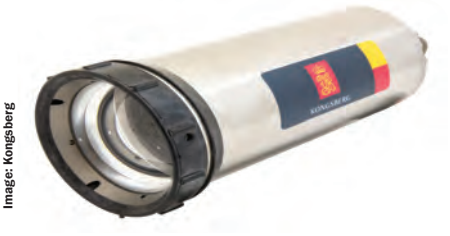


Image: Kongsberg

Thien Nam Buys Sonardyne's Ranger 2

Vietnamese survey company Thien Nam Positioning JSC has recently invested in its first Ranger 2 USBL acoustic positioning system from Sonardyne International Ltd., purchased through the company's regional office in Singapore. Ranger 2 will be used to track a Remotely Operated Vehicle (ROV) during the installation of a pipe flowline and a gas export pipeline protection mattress in an oilfield offshore Vietnam. Ranger 2 is designed as a high performance acoustic position reference system designed for tracking underwater targets and positioning dynamically positioned (DP) vessels. The system uses the Ultra-Short BaseLine (USBL) method to calculate the position of a subsea target, in this case Thien Nam's ROV, by measuring the range and bearing from a vessel-mounted transceiver to an acoustic transponder mounted on the target. Multiple subsea targets over a wide area and range of water depths can be simultaneously and precisely positioned.
Subsea structure installation requires accurate and precise positioning. Sonardyne Wideband 2 at the core of 6G technology uses ultra-wide bandwidth signals for more precise ranging, providing the necessary accuracy and precision for these projects. For this operation, transponders will be mounted on the mattress so that Ranger 2 can track it as it descends, ensuring that it is laid within permitted ranges for protecting the pipeline.

www.sonardyne.com

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Editorial Calendar

MARINE TECHNOLOGY REPORTER

Issue	Editorial	Bonus Distribution	Ad Close
January/ February	**Underwater Vehicle Annual: ROV, AUV, and UUVs** **Market:** Subsea Engineering: Oil & Gas **Tech:** Harsh Environment Systems for Arctic Ops **Product:** Scientific Deck Machinery	**Arctic Technology Conference** March 23-25, Copenhagen, Denmark **Subsea Tieback** March 3-5, New Orleans, LA	January 21
March	**Oceanographic Instrumentation: Measurement, Process & Analysis** **Market:** U.S. Navy Strategic Initiatives **Tech:** Ocean Business 2015 Technology Spotlight **Product:** Sonar Systems & Seafloor Mapping	**Ocean Business** April 14-16, Southampton, UK **Sea-Air-Space** April 13 - 15 National Harbor, MD	February 18
April	**Offshore Energy Annual** **Market:** Seismic Vessels & Systems **Tech:** Deepwater Positioning, Mooring & Anchoring **Product:** Subsea Vehicles and Systems for Pipeline Survey & Inspection	**Offshore Technology Conference** May 4-7, Houston, TX **AUVSI 2015** May 5-7, Atlanta, GA	March 27
May	**Underwater Defense** **Market:** Offshore Renewable Energy: Wind, Wave & Tide **Tech:** International Naval Technologies **Product:** Remote Sensing & Environmental Monitoring	**MAST Asia** May 13-15, Yokohama, Japan **UDT** June 3-5, Rotterdam, NL	April 24
June	**Hydrographic Survey** **Market:** Comms, Telemetry & Data Processing **Tech:** GPS, Gyro Compasses & MEMS Motion Tracking **Product:** Interconnect: Underwater Cables and Connectors		May 27
July/ August	**MTR100** **The 10th Annual Listing of 100 Leading Subsea Companies** **Market:** Offshore Europe Tech & Trends	 **Offshore Europe** September 8-11, Aberdeen, UK	July 21
September	**Ocean Observation:** Gliders, Buoys & Sub-Surface Networks **Market:** Oil Spill Monitoring & Tracking Systems **Tech:** Seafloor Engineering & Remote Operations **Product:** Geospatial Software Systems for Hydrography	**OTC Brazil** October 26-29, Rio de Janeiro, Brazil **SeaTech Week** October, Brest, France	August 21
October	**AUV Operations** **Market:** Research Vessels **Tech:** ROV Technology: Workclass to Micro Systems **Product:** Underwater Tools and Manipulators	**Oceans 2015** October 19-22, Washington DC **SNAME** November 4-6 Providence, RI	September 25
November/ December	**Subsea Engineering & Construction** **Market:** Fresh Water Monitoring & Sensors **Tech:** Offshore Inspection, Maintenance & Repair (IMR) **Product:** Underwater Imaging: Lights, Cameras & Sonars	**Underwater Intervention 2016** New Orleans	November 26

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