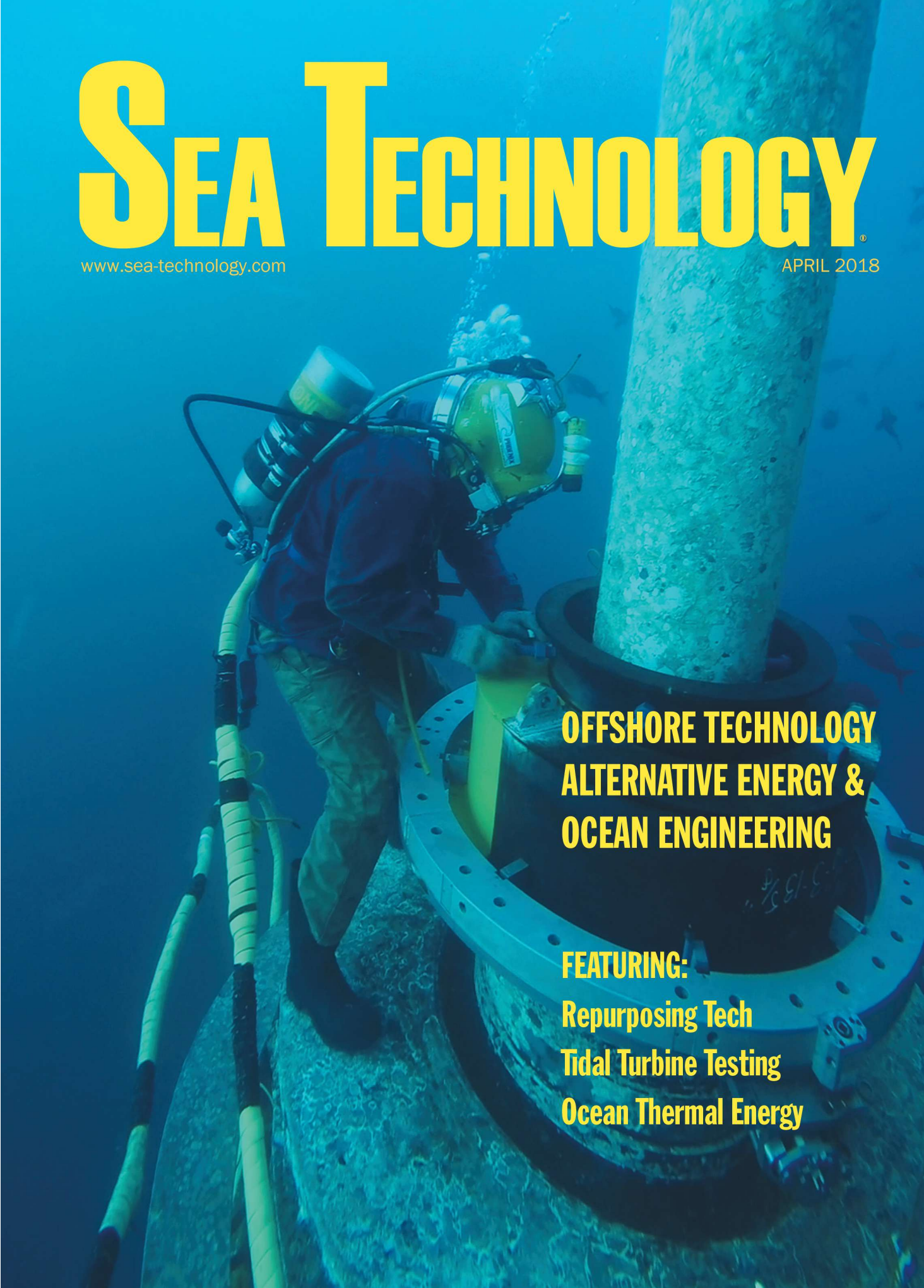


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A full-page background image showing a diver in a blue wetsuit and yellow helmet working on a large, cylindrical metal structure underwater. The diver is positioned on the left, leaning into a circular opening of the structure. The water is a deep blue, and the structure has a weathered, metallic appearance. The overall scene is an underwater industrial or maintenance activity.

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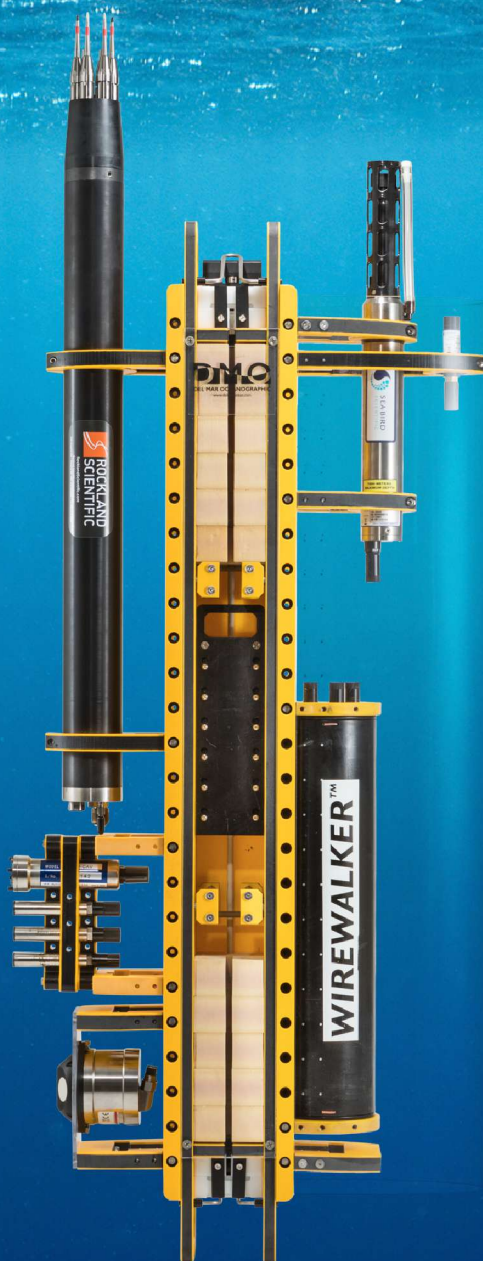
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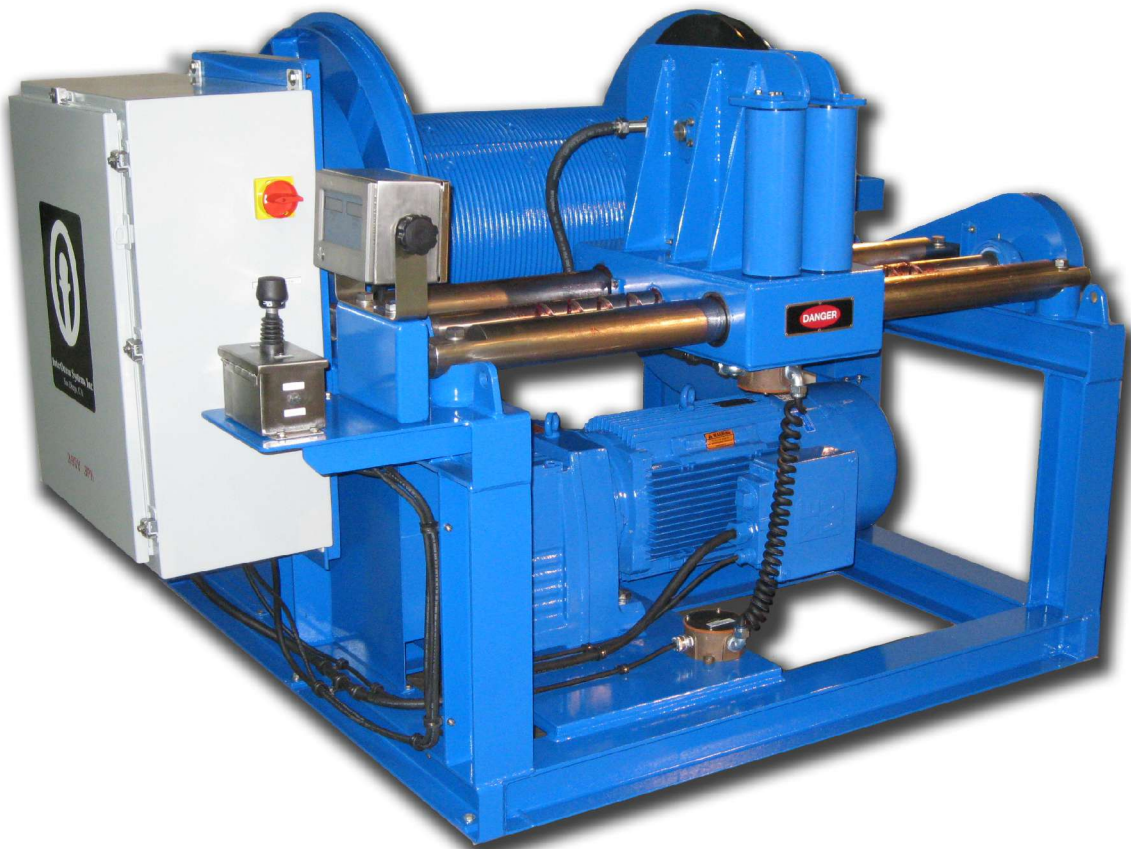
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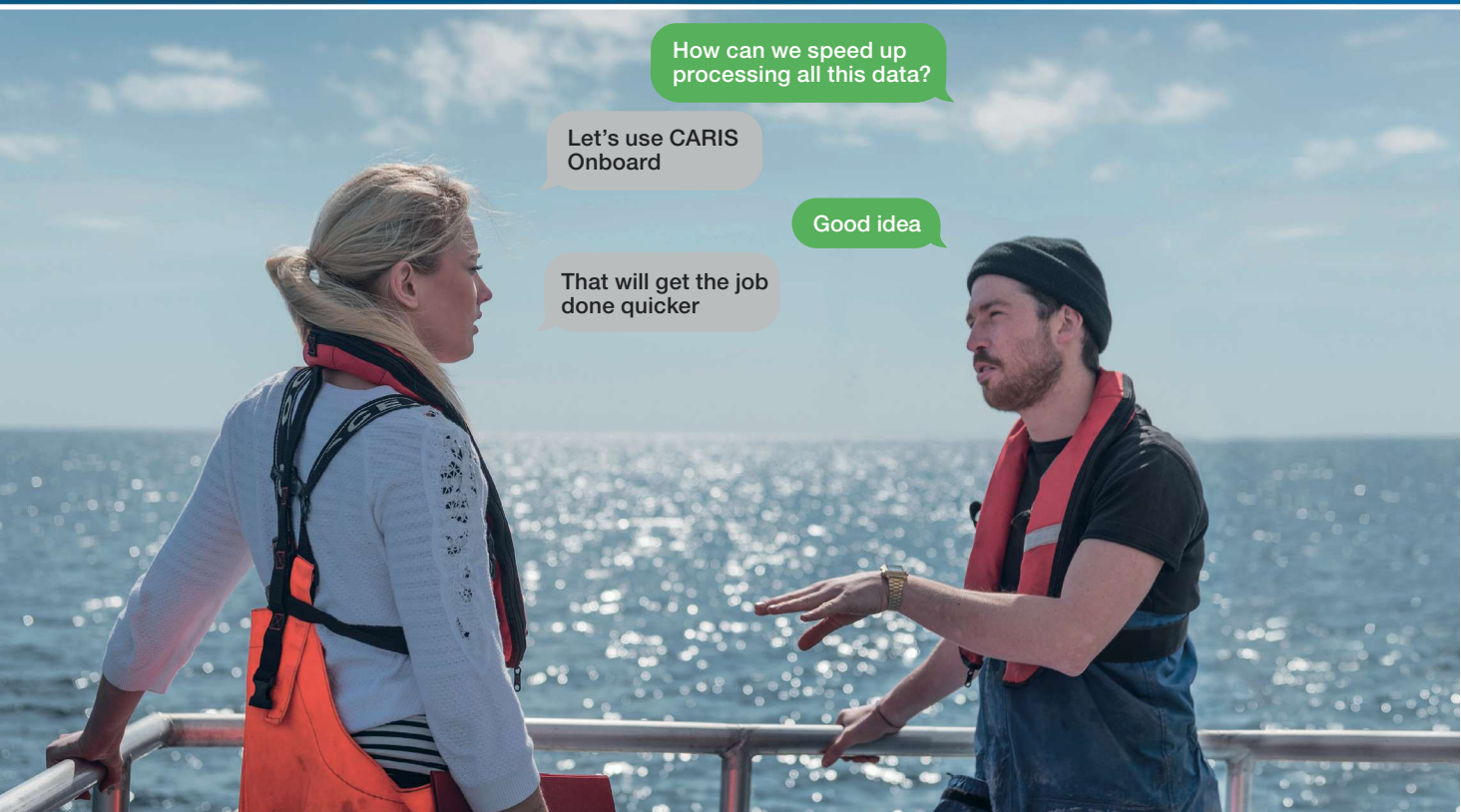
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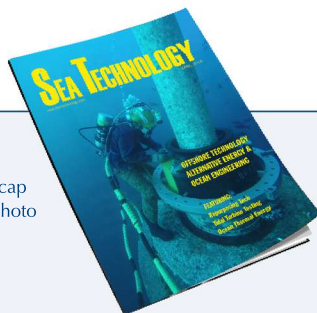
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COVER IMAGE

A diver in the Gulf of Mexico performing tendon corrosion cap removal using a low-clearance split frame saw July 2016. (Photo Courtesy of Phoenix International, Credit: Rosti Havlik)

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Leveraging Solutions From Other Industries

The ocean covers more than 70 percent of the Earth's surface and is a vital source of food, energy, transport and scientific discovery—yet its vast majority is unexplored. For industries ranging from oil and gas to marine renewables to biotechnology—and even those not traditionally focused on the ocean—the ocean represents huge untapped potential.

As we venture to deeper and more remote seas, safety for humans, marine life and the environment are critical factors. As companies ramp up oceanic activity in both known and unexplored areas, it is vital to look beyond our own industries to stay on top of technological trends and best practices that we can learn from and adopt for greater efficiency and safety at sea.

A major part of subsea operations across industries is the use of ROVs to overcome the limitations of human divers. But ROVs come with management difficulties. ROV pilots regularly face visibility challenges, which can slow down an operation, meaning additional costs for labor and support as timelines increase, plus greater risk. In the last several years, we have begun to see technological innovation in ROV operations coming from an unlikely place: the video game world.

Video games are designed and built on top of a game engine technology platform, which enables real-time visualization to track players and change their surroundings as they move through dynamic virtual environments. Several years ago, we discovered that by combining game engine technology with a robust geographic information system (GIS), real-time visualization power can be leveraged to monitor ROVs or anything else with a tracking beacon and to deploy an augmented reality (AR) overlay on the pilot's video feed to continue with an operation uninterrupted.

We have been using Unreal Engine, a video game development tool powerful and flexible enough for us to continually adapt to the needs of our clients across the subsea oil and gas industry. Pilots can track their ROVs with submillimeter accuracy and, through the gathering and processing of live data from the ROV, can receive a contextualized, real-time picture of the ROV's undersea environment, even when visibility is compromised. This benefits not just the ROV pilot; stakeholders at every stage, from design to construction and operation, can get a precise view of what is happening in real time in order to act better and faster, or get a realistic preview of what could happen in order to anticipate issues and speed up development projects. Teams can study the data captured to learn lessons that can be applied to future operations.

This untraditional technology has huge implications for safety and efficiency in ocean industries. Real-time location tracking and visualization means that entire teams can be moved from offshore to onshore and a project can be managed remotely. This improves safety and reduces costs for vessel maintenance and transport. The ability to stay onshore also helps jobs in our industries remain more competitive. For the oil and gas industry in particular, as oil prices keep dropping, having lower operational costs can help turn negative returns into positive returns and get previously nonviable projects going. Ultimately, across ocean industries, being offshore is where the greatest risks and costs lie. Technology that enables us to move more of the operation onshore is a huge benefit.

As the tech world makes strides in fields such as cloud computing, virtual and augmented reality, artificial intelligence, and machine learning, those of us working in ocean-based fields should continue to think outside the box for how these trends will revolutionize our operations. No doubt there is more untapped potential out there if we look for it—just like there is much more to discover in our largely unexplored ocean. **ST**

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THE FUTURE IS ELECTRIC

)) Floating Solar Power Station in the Works. Six Dutch companies and knowledge institutions are working together over the next three years on the development, construction and operation of the world's first floating solar power station. With financial support from the Netherlands Enterprise Agency (RVO), the consortium is developing a floating power station that will soon generate clean energy at sea using solar panels. The consortium consists of ECN, TNO, MARIN, TAQA and Oceans of Energy. For the pilot project, Sun at Sea, a small-scale solar farm (peak production approximately 50 kW) has been designed, built and installed offshore near a small gas production platform. TNO is working with the project partners on the infrastructure to measure, record and analyze the performance of the solar farm. The solar energy yield is subject to fluctuations just like wind energy, so it is essential to investigate how these fluctuations can be overcome to reduce dependence on gas and diesel generators without jeopardizing security of supply. Among the questions to address are whether a battery is needed and, if so, how large, and whether it is necessary to have a gas/diesel generator ready in reserve.

)) Maritime UK Calls Attention to Need for Orderly Brexit Transition. David Dingle, the head of British maritime business association Maritime UK, called on the U.K. government to prepare for an orderly transition when it exits the EU, *The Maritime Executive* reported. Brexit will be official March 29, 2019, and parliament is debating its extent. "We are lost in politics," said Dingle. "Our message is: Please, government, can you do this as quickly as possible because if there is no transition period the industry as a whole will be in trouble." The U.K.'s biggest ferry ports would be the most vulnerable if there is a chaotic transition. "Our biggest concerns are Dover and Holyhead. There will be new customs requirements that could cause particular challenges for roll-on roll-off ferry ports which handle tens of thousands of [trucks] traveling between the U.K. and the EU each day," Dingle said. Even a mere 2 min. added to the average time a truck takes to get through the Port of Dover could lead to traffic stretching 20 mi. long on nearby highways. There is no guarantee that the European Commission and the government of British Prime Minister Theresa May will reach a deal for a transition period. European ports are preparing for possible greater trade hurdles. Zeebrugge, Rotterdam and Calais are already hiring more customs officials and produce inspectors. The Port of Rotterdam alone expects to hire more than 100 additional agents. Dingle expressed frustration with the U.K. government's lack of urgency on this matter. "We are shouting loudly about this, we have been for a while, but you do feel you are banging your head against a brick wall," he said.

)) Global Bathymetric Project. Fugro is leading the marine survey industry in support of NF-GEBCO Seabed 2030, a global initiative to produce a definitive, high-resolution bathymetric map of the entire world's ocean floor by the year 2030. The initiative is being facilitated by the General Bathymetric Chart of the Oceans (GEBCO) project in partnership with The Nippon Foundation (NF) as a means to inform global policy, improve sustainable use and advance scientific research. Less than 20 percent of the world's oceans are mapped using modern survey techniques. In 2017, Fugro devised a methodology for collecting valuable high-resolution bathymetry data sets while its vessels are transiting between survey projects through Fugro's Office Assisted Remote Services (OARS), its proprietary technology that enables safe and efficient data acquisition without the need for dedicated survey staff on board. In 2017, Fugro deployed its in-transit data collection methodology on two survey vessels, delivering approximately 65,000 km² of crowd-sourced bathymetry data to GEBCO. The company has expanded that collection capacity to include four survey vessels and eventually intends to incorporate the approach across its global survey fleet. Fugro is also working with its clients to investigate how their data sets may be incorporated into the Seabed 2030 program.

)) Collaboration to Drive Industry Advancement. MacGregor, part of Cargotec, and the international maritime business platform SeaFocus are collaborating on new cooperation models to benefit maritime trade and drive industry innovation. MacGregor is now participating in Intelligence Hunt, a cooperation concept developed by SeaFocus, which brings companies and cross-faculty international university students together. The maritime and shipping industry is known for its traditional approach, even though it is a platform for very advanced solutions and technologies. Sharing best practices and innovative industry-specific solutions will benefit the marketplace as a whole and ensure its future sustainability.

)) Pioneer in Graphic Recorders Passes. Edward P. Curley, Jr., 79, formerly of Wenham, Massachusetts, died peacefully February 3, 2018 after a long illness. He was born in 1938 to Edward Sr. and Theresa (Savio) Curley. He was married for 51 years to Wendy Shaw, who died in 2013. After graduating from Yale in 1960, Curley worked at Clevite Transistor at the beginning of the semiconductor age. As a talented engineer, he moved on to EG&G, where he was an apprentice under Harold "Doc" Edgerton, the inventor of the strobe light and innovator of modern sonar technology. With support from family and friends, Curley left EG&G to start EPC Labs. He built the company into a successful international business, selling advanced sonar plotters. Curley is survived by his three sons—Michael Curley, Ted Curley and John Curley—and seven grandchildren. **ST**

Bourne Tidal Test Site

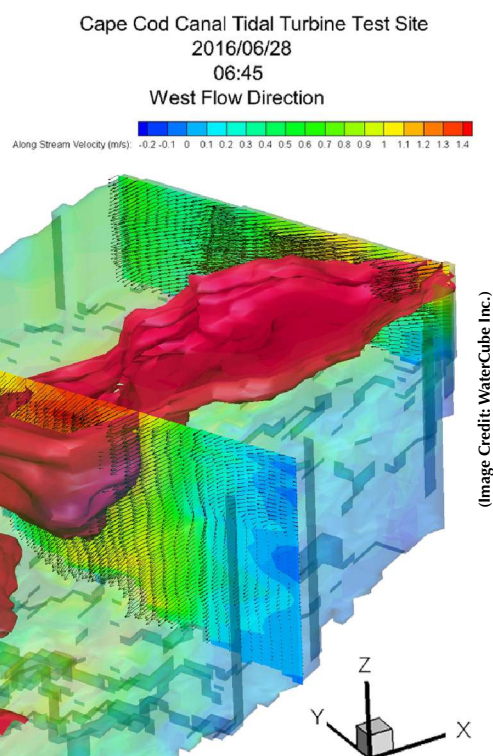
BTTTS Now Ready for Partial-Scale Device Testing

By Stephen B. Barrett • Maggie L. Merrill • John R. Miller

Improving energy output while preserving the environment is a worldwide priority. The call to develop renewable sources of energy has been heard globally.

The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report published in 2014 concluded, with 95 percent certainty, that the human influence on the climate system is clear and is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and an improved understanding of the climate system. To slow global climate change, 174 countries so far have ratified the Paris Agreement, which came together with the international acknowledgment that something must be done about the warming climate. In this context, many countries are seizing the opportunity to replace dirty and dangerous fuels such as nuclear power, coal and other fossil fuels with clean, renewable sources such as solar, geothermal, biomass and wind. Ocean energy is seen as a large, untapped frontier with initial successes demonstrated in Europe in the form of large offshore wind farms, with more modest testing and demonstrations of nascent wave and tidal technologies. Considerably more in-water testing will be required to move tidal and wave energy to the stage that offshore wind is at today.

The Marine Renewable Energy Collaborative (MRECo), a nonprofit dedicated to the sustainable development of renewable energy in New England waters, has taken up the challenge to connect ocean energy researchers, designers, policy analysts, engineers and other stakeholders in the interest of developing marine renewable energy. MRECo has learned from its work with stakeholders that there are many risks and high costs to developing devices that can survive in the harsh ocean

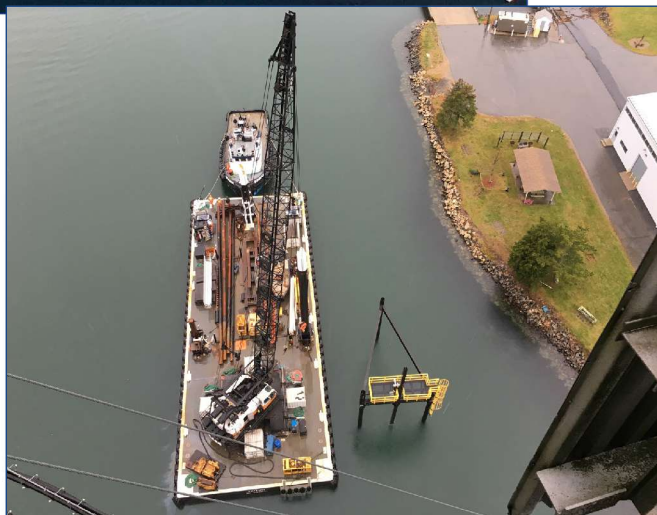


Data showing where the water turbulence is most favorable within the allowable site area. Current velocity has been measured at 2+ m/s (3 to 4 kt.).

environment. One fundamental solution to de-risk the development of new technologies is to provide developers with a place to test their devices in ocean waters, close to shore near infrastructure, a ready supply chain and a capable workforce, to facilitate commercialization.



(Top) View of Cape Cod Canal looking Northeast. The Bourne Tidal Test Site is located on the left side of the canal near the railroad bridge in the foreground. (Right) The barge-installed steel piles and work platform at the BTTS November 2017. The depth here is 7 m.



Funding

In 2016, MRECo was awarded a competitive grant by the Massachusetts Seaport Economic Council to enable the commercialization of partial-scale tidal turbines. These funds could only be used for capital investment such as structure design, manufacture and installation. The funds are being used to stand up the Bourne Tidal Test Site (BTTS), the only fixed, partial-scale pre-permitted site in the world now available for testing of tidal turbines, turbine components, marine sensors and marine coatings, and for other uses that require long-term immersion in saltwater with a turbulent flow.

In comparison, other test sites such as the European Marine Energy Center (EMEC) in Scotland and the Fundy Ocean Research Center for Energy (FORCE) in Canada are located further offshore, require full-scale devices and, in some cases, require additional permits. Installation and operations costs are also significant because the turbines require mooring systems that must be indi-

vidually designed and installed by special-purpose oceangoing vessels that are not always available. These barriers prevent many technology developers from appropriately testing and scaling their devices and using the accumulated experience to attract investment.

Site Characterization

With funding committed, MRECo identified a location in the Cape Cod Canal where the test site would be placed just west of the railroad bridge in Bourne. Environmental and resource assessment studies were conducted to better understand the nature of the proposed location. Scientists from University of Massachusetts Dartmouth completed a seafloor site survey to characterize the benthic habitat. An ADCP survey was done using a Teledyne Oceanscience Z-Boat (remotely operated surface vessel) to create a 3D profile of the water column near the

railroad bridge. The data were processed by WaterCube Inc. using its patented software to display water velocities. Once it was determined that there was a spot in the area that had water velocities approaching 2 m/s (4 kt.), the MRECo team applied for a full suite of permits.

Permitting

The construction and operation of the BTTS required MRECo to obtain permitting approvals from local, state and federal

authorities. The permitting process established by law and implemented through regulatory programs ensures protection of public resources, including infrastructure, navigation, recreation, wetlands, fisheries, endangered species and marine mammals.

MRECo filed an application with the Town of Bourne Conservation Commission under the Massachusetts Wetlands Protection Act and presented information about the project at a legally noticed public hearing. Before the commission can issue its order of conditions (i.e., the permit), it must receive letters from the Massachusetts Division of Marine Fisheries and the Massachusetts Natural Heritage and Endangered Species Program commenting on the potential impact of the project on fisheries and state-listed endangered species. In the case of the BTTS, these letters were issued stating no impact, and the commission issued an order of conditions at a second public hearing.

Under the Massachusetts Chapter 91 law, which dates back to colonial times, proposed projects cannot obstruct the public's ability to "fish, fowl, and navigate." In recognition of the need to support innovative projects, the state recently implemented changes to the Chapter 91 regulatory program to allow the issuance of a permit for test projects through an expedited process. MRECo applied for and received a one-year, renewable permit to construct and operate the BTTS. Once its benefits and impacts can be studied, MRECo will seek a 30-year license for the facility. A key element in the permitting process was the support of state and local regulators who recognized that impacts of new technologies could not be determined unless they were tested, and, therefore, these agencies were cooperative in applying appropriate requirements.

The BTTS also required a comprehensive license from the U.S. Army Corps of Engineers, which manages and operates the Cape

Cod Canal. The license included authorizations under the Rivers and Harbors Act of 1899, the Clean Water Act of 1970 and the Endangered Species Act of 1973. It also included a real estate license designating the property, both in the canal and on land, and uses that would be leased to MRECo as part of the project. The Corps issued its lease after all other approvals were obtained, allowing for construction to commence.

Structural Design Considerations

In recognition of the challenges of developing devices for use in the ocean, the U.S. Department of Energy has encouraged a deliberate development and testing regime and has applied the concept of technology readiness levels (TRLs), first developed for the aerospace industry.

The BTTS was designed to meet a missing piece of the test infrastructure: "TRL-5 – Testing of partial scale devices in relevant environment." While the size of partial scale will

depend on the size of full scale, MRECo determined that a 3-m-diameter axial turbine would have the greatest application for scaling and selected it as the ideal-sized test device for the BTTS.

Testing a device requires many considerations. For devices intended to operate "in stream," one of the first considerations is blocking. Any turbine causes resistance in a flow. In a hydroelectric dam, the design forces the water into the turbine, and this increases the energy conversion. In the case of a tidal "in-stream" device, the resistance causes flow to move around the turbine and decreases energy conversion. However, if the device is tested in a constrained flow, the blocking of the sides and bottom can force more water into the turbine and artificially increase the conversion efficiency. To properly test an in-stream device, blocking must be minimized. For the BTTS, this was done by ensuring the width (7 m) and depth (7 m) of allowed flow around the entire turbine.

A second consideration is access. New technologies are expected to encounter problems identified and corrected during testing. Easy access to the device for maintenance and upgrades is critical. The BTTS allows this by providing a lifting arm capable of raising the turbine out of the water. Additionally, the structure is close to shore, facilitating installation and removal, as well as the addition of sensors or other data acquisition components. Access for cabling or wireless communications is also simplified.

A third consideration in any testing environment is control. Open-ocean testing must be the ultimate test environment, but using it for scale testing can add confounding factors that can obscure issues influencing turbine efficiency. In particular, waves can change performance if the periodic surge aligns with the direction of current flow, alternately increasing or decreasing the flow on the turbine. Turbulence can also impact performance. The BTTS is particularly well suited because it is shielded from wave action and it is relatively turbulence free.

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A team of four ocean engineers from University of Rhode Island retrieved a trawl-resistant, bottom-mounted ADCP from a 30-day deployment at the BTTS January 2018 and installed a water level sensor on top of the work platform.

Installation and Operations

In November 2017, the BTTS structure was installed near the Cape Cod Railroad Bridge located on the southwest side of the Cape Cod Canal. A three-pile structure, the BTTS is situated in the spot that was determined to have the best overall flow. The structure has multiple sensors, such as a sensor on top of the platform that will measure the water height to correspond with the water velocity measurements being recorded underwater. There will also be a data acquisition and transmission system set on top of the platform to push data out in real time or as needed. Operations have been facilitated by oceanographic and maritime professionals using state-of-the-art equipment and expertise. Perhaps most importantly, the BTTS can be accessed by small boats, and the working window is not limited to slack tide, which is particularly useful when operations take a bit longer than anticipated.

As BTTS operations ramp up, the plan is to acquire a sensor suite that will enable device developers to

compare data with other test sites to show consistency. Power curve data and energy output are two crucial results needed by designers to enable them to assess the performance of their device and compare it to others that are being tested elsewhere. Standardization in data acquisition and processing is key to advancing the ocean energy industry.

Who Will Utilize BTTS?

Already two groups have deployed equipment at the site to verify sensor performance. Falmouth Scientific loaned its FSI-VCM current meter to MRECo to dry run data acquisition, processing and transmission methods. University of Rhode Island engineers studying water velocity and potential power output deployed an ADCP at the site for 30 days in December, and the data are being processed.

MRECo is working with at least three device developers to map out the deployment of their technologies in the spring and summer of 2018.

New England has a ready workforce and tremendous research, manufacturing and maritime capabilities to support the emergent technologies associated with converting the kinetic power of ocean processes to clean, reliable energy for the 21st century.

Massachusetts in particular has been a leader in clean energy development, as exhibited in the existence of a world-class clean energy sector that radiates out of MassCEC. MassCEC has made a large investment in the New Bedford Marine Commerce Terminal that is designed to accommodate the staging and assembly needs of the growing offshore wind sector, as well as providing coastal shipping support. Massachusetts also has the Wind Technology Test Center, one of the largest wind blade test facilities in the country, located in Boston.

Now that the BTTS is up and running, Massachusetts is an attractive place for ocean energy device developers to test and manufacture equipment for the U.S. and export markets. **ST**

Stephen B. Barrett is principal of Barrett Energy Resources Group (BERG) and a board member of MRECo. His professional focus is on the siting and development of renewable energy and infrastructure projects, including marine hydrokinetic, solar and wind. He has a bachelor's from Union College in international relations and a master's from the University of Virginia in marine affairs and environmental science.

Maggie L. Merrill provides communications, stakeholder outreach and marketing assistance to marine science and technology enterprises. Her recent focus is on the emergent marine renewable energy space. She holds a degree from Boston College in English and environmental studies, attended Sea Semester in Woods Hole, Massachusetts, and received a master's in public policy from UMass Dartmouth in marine science and technology policy.

John R. Miller is executive director of MRECo, a nonprofit dedicated to sustainable growth of marine renewable energy through education, collaboration and demonstration. He has 25 years of experience with technology commercialization. With engineering degrees from West Point and University of Washington and an M.B.A. from Worcester Polytechnic Institute, he has a history of tackling tough projects with ingenuity and pragmatism.



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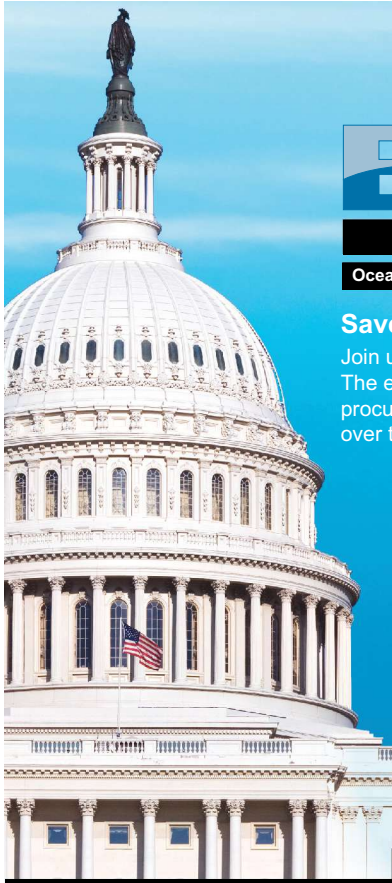
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For Information:
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NETWORKING SPONSORSHIPS: Rich Lawson, 202-389-9009; rich.lawson@iostia.org
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www.BlueTechExpo.org

OCEANS'18 MTS/IEEE Kobe/ Techno-Ocean 2018 Kobe

OCEANS'18 MTS/IEEE Kobe/Techno-Ocean 2018 Kobe (OTO'18) will take place May 28 to 31 in Kobe, Japan. The event provides a chance to foster a dramatic increase in marine-related science and technology and marine industries in Japan. It is also an opportunity to explore new aspects of the "Ocean Planet" we call home.

Topics

For OTO'18, more than 900 abstracts from around the world have been received under the following core conference topics: ocean and space technology collaboration; ocean natural hazard monitoring and social implementation; acoustic and optic cooperative application for underwater sensing and communication; fisheries, aquaculture and aquatic life-related technologies; marine renewable energy and environmental assessment; ocean resource exploration technologies; subseafloor engineering and operations (drilling, coring, monitoring and mining); coastal zone management applications; and marine law and policy for sustainable ocean development.

Exhibit

At the exhibition this year, more than 100 companies, universities and national research and development organizations will showcase the latest ocean-related products and technologies.

On the first and second day, the exhibitors' presentations will take place, and on the final day there will be a special exhibition session organized by Japan's National Research and Development Agency.



Event Location

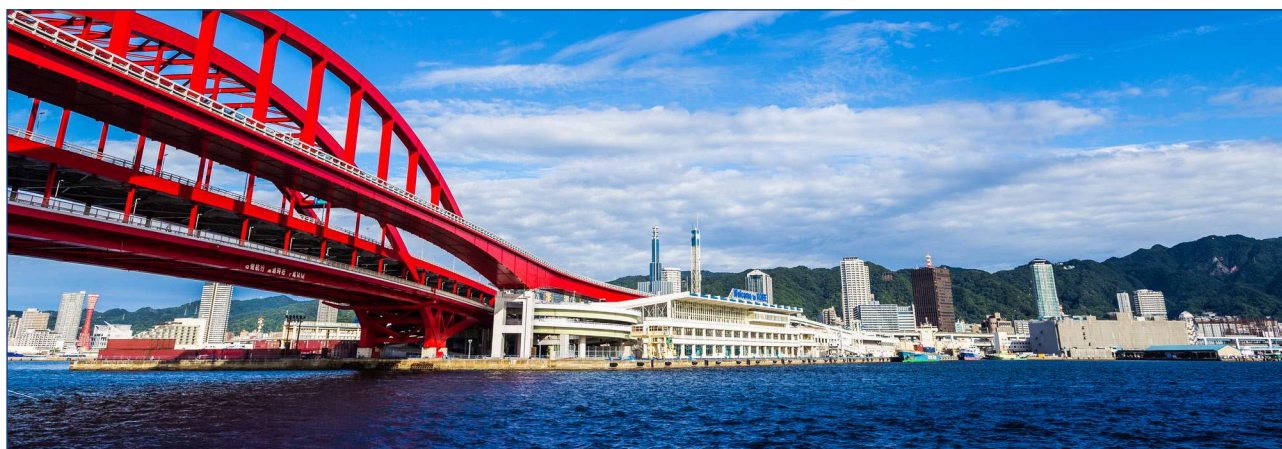
The host city, Kobe, has flourished as an international trading port since Japan's late Heian Era (12th century), largely due to the enterprise of the samurai leader Taira no Kiyomori in building the Port of Hyogo. Then, following Japan's isolationist period and the port reopening in 1868, Kobe began to wholeheartedly embrace other cultures from all over the world and thereby created its own unique identity. As such, this modern and stylish Japanese city, basking in natural surroundings, including hot springs, appeals to every visitor. This is where champions of international culinary culture such as "Kobe beef" and "Nada-no Sake" (Japanese sake) are produced.

What makes Kobe even more attractive for tourists is easy access to several UNESCO World Heritage sites, such as the ancient capitals of Kyoto and Nara, Himeji (known as "White Heron Castle"), Hiroshima (Hiroshima Peace Memorial, Itsukushima Shrine), and Mount Koya/Koyasan (sacred sites and pilgrimage routes).

Venue

The Kobe Convention Center, which will serve as the OTO'18 venue, is conveniently located on Port Island, which is about 10 min. from downtown Kobe. The venue connects to downtown via the efficient Port Liner rail transit system. The space includes the conference center, international exhibition halls, hotels and other key facilities.

For more information, visit www.oceans18mtsieeeekobe.org. **ST**



OTEC Market on the Rise

Ocean Thermal Energy for Power, Cooling

By Berend Jan Kleute

Tropical islands and coastal regions have population centers near the ocean and fast-growing energy demands. They also have the advantage of ideal conditions for deploying ocean thermal energy technologies. Ocean thermal energy, which can be used to produce electricity, is generated from the temperature difference between cold, deep ocean water and warm surface water.

The emerging ocean thermal energy conversion (OTEC) industry has the potential for fast growth with such a large segment of the world's population living near the ocean. Bluerise, in particular, is focusing on development of large-scale, low-cost, sustainable power and air-conditioning in the tropics. The company has advanced OTEC technology that provides reliable power year-round, day and night. While our offices are in Delft in the Netherlands and in Aruba, we are currently developing projects in Curaçao, Jamaica, Colombia and Sri Lanka.

Seawater District Cooling

Bluerise has designed, built and tested its OTEC power cycle together with Delft University of Technology, with the goal of increasing technical and economic efficiency. The core innovations lie within the power cycle of OTEC, applying a cutting-edge working fluid that consists of a mixture, in contrast to the pure ammonia working fluid that is used by other OTEC technology. The test performance of the technology is proof of the working principle and validation of our technology enabling lower costs per kilowatt-hour produced.

OTEC plants of a modest size (i.e., 10 to 25 MW) can now be competitive in many islands and remote regions, where electricity is relatively expensive at \$0.20/kWh or higher and often powered by diesel/heavy fuel oil generators. The market for OTEC will expand as the price for the technology decreases with advancing technology. Independent estimates show that just by reaching economies of scale, OTEC installations can reach a levelized cost of electricity as low as \$0.07/kWh.

We continue to develop our OTEC system and have crafted a roadmap for the scale-up of our technology in preparation for our first pilot under real-world conditions in Curaçao in 2019.

A commercial seawater district cooling (SDC), or seawater air-conditioning, project will be part of our OTEC development. An SDC system can make synergetic use of an OTEC pipeline that brings up deep seawater at a low temperature. This cold seawater is passed through a heat exchanger, where freshwater is chilled and distributed through a closed loop to a building's cooling system, replacing conventional chillers or cooling towers. The sole use of electricity comes from the pump, which consumes as little as 10 percent of the amount of electricity used by a conventional chiller.

An SDC system relies on a sustainable and predictable ocean energy resource that can provide coastal cities with an opportunity to significantly reduce their energy costs. SDC is not dependent on the outside air temperature or humidity but on the consistent supply of cold, deep seawater. This eliminates extreme spikes in power demand.

SDC's advantages include: cost benefits from reduced operating costs with cooling that is 10 times more efficient compared to traditional comfort cooling; stability in future energy costs by using freely available deep seawater; reduction in peak power demand in the electricity grid; and significant reduction in CO₂ emissions.

Having the deep seawater infrastructure in place, the projects can grow into a so-called "ocean ecopark," inspired by the Natural Energy Laboratory in Hawaii and similar undertakings in Japan and Taiwan. An ocean ecopark is a sustainable industrial park with high-tech production and research facilities relying on the availability of deep seawater.

Apart from cooling and electricity production, deep seawater would be used for efficient freshwater production, agriculture and aquaculture, to name some examples.



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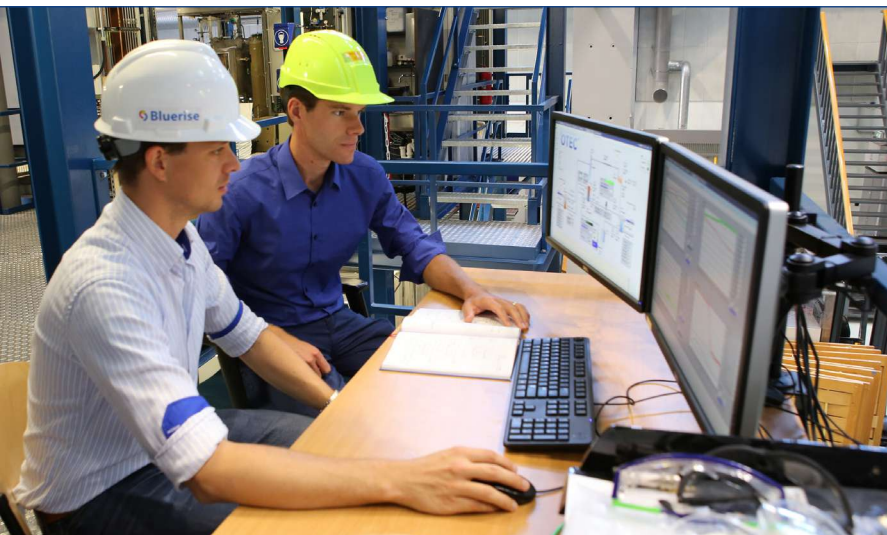
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Bluerise's OTEC demonstration plant.



This development would be an economic driver for small tropical islands, creating jobs, increasing exports and leading to more efficient energy and water generation and consumption.

The synergetic use of cold, deep seawater will bring our OTEC technology closer to commercial realization. Eventually, we will conduct commercial-scale OTEC projects with capacities in the order of 10 to 30 MW.

Target Group

Bluerise has identified tropical islands and coastal regions as its early market. Due to their size, most of these communities depend solely on the import of diesel or heavy fuel oil for electricity production. These are among the most expensive continuous energy generation methods and, after coal, produce the largest amount of CO₂ per kilowatt-hour. Being dependent on oil-based products also subjects these markets to intense volatility in the cost of energy.

Ocean thermal energy systems require minimal land use and provide a source of constant energy and cooling; the temperature in the tropical ocean varies only slightly. This capability to provide constant energy allows for ease of integration into the current electricity infrastructure, complementing existing intermittent renewable energy options such as wind or solar power.

Energy-mix modeling demonstrates that even with a significant uptake of wind or solar power, the desired targets for greenhouse gas reductions cannot be met due to their intermittency and availability. New solutions that can deliver reliable power must be added to the energy mix. Bill Gates, who stated that we need an “energy miracle” to fill this gap, created the Breakthrough Energy Coalition of private investors focusing on clean, affordable, reliable energy available 24 hours every day. The ocean, being our largest natural solar collector and battery in one, can supply this “energy miracle.”

OTEC Market Size

The market size for OTEC includes 100 countries and territories when considering direct access to the ocean thermal energy resource. In these countries, ocean thermal energy can be an important part of the energy mix.

Without taking into account any replacement of existing capacity, or increase in electricity demand, an average of 37 GW of additional capacity per year would need to be built in the tropics during the next 25 years. This represents investments in excess of \$100 billion per year. A large concentration of the world's population lives on or near the coasts, so providing the needed additional capacity with affordable, renewable power plants is a major market opportunity. Ocean thermal energy is key for energy independence in tropical coastal areas.

The numbers are even bigger when considering that the International Energy Agency forecasts a substantial

rise in energy demand from tropical regions. By 2035, new power-generating capacity in tropical regions (without including China) will need to be installed to cover in excess of 7,000 TWh a year.

Competition

Renewable energy is Bluerise's core activity, and, as a consequence, our competitive landscape has multiple dimensions. First, there is general competition from existing and upcoming fossil resources such as LNG. Second, there is (perceived) competition from other renewable energy resources such as solar and wind. And third, there is competition with a handful of other OTEC developers.

Fossil fuels will only have a temporary role in the transition phase to a sustainable future. Other renewable energy solutions such as solar and wind have the disadvantage of not being available 24 hr. per day. These resources alone can only partly cover the electricity demand, even in combination with storage.

There is a limited number of parties around the world working on OTEC technology, most notably in the U.S. (for example, Lockheed Martin and Makai), France, Japan, Korea and the Netherlands. Currently there are two grid-connected pilot plants in operation (100 kW in Hawaii and 100 kW in Japan). The largest OTEC plant that is now under development is a 16-MW plant for Martinique. This project is largely funded through the European Commission's NER 300 program for innovative low-carbon energy demonstration projects. Having built a good relationship with these other OTEC parties, we have created a setting conducive to collaboration.

Projects

Bluerise is co-developing two projects in the Caribbean: one in Curaçao and one in Jamaica.

The project in Curaçao consists of the development and operation of a 10-MW thermal deep seawater district cooling system, combined with 500-kW OTEC power generation. This project alone will cre-

ate more than 700 jobs and have a positive impact of about 1 percent GDP, as estimated by the Ministry of Economic Development of Curaçao.

In Jamaica, Bluerise has signed a joint venture agreement with its partner New Leaf Power for the development and construction of a 21-MW thermal deep seawater district cooling system servicing the Montego Bay Freeport area with sustainable and affordable cooling. The project has received a "letter of no objection" from NEPA, the Environment and Planning Agency and the Caribbean Development Bank, and the Canadian government has provided support for initial customer education programs.

Bluerise has more projects in the pipeline, including ones in Colombia (San Andrés and Barranquilla) and Sri Lanka, where it has performed feasibility studies with a positive outcome. In all these projects Bluerise is closely cooperating with governments and experienced partners.

As a Dutch company, we are fortunate to have the support of the Dutch government and relatively easy access to what can be considered our home market: Saba, Statia, Bonaire, Aruba, Curaçao and St. Maarten, the Caribbean islands in the Dutch Kingdom. Execution of these first projects will accelerate the commercialization of our OTEC power technology.

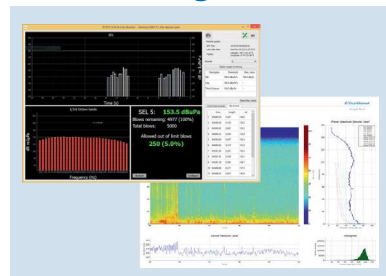
Additionally, we are looking into OTEC market opportunities that involve the production of drinking water and the cooling of greenhouses for fresh food as well as other products. **ST**

Berend Jan Kleute is CTO and co-founder of Bluerise (www.bluerise.nl). He holds a B.S. in mechanical engineering and M.S. in offshore engineering from the Delft University of Technology (DUT). Through his involvement in various international offshore renewable energy projects, in collaboration with industry, he found his passion and works hard to accelerate the implementation of OTEC. At Bluerise, he led the development of a room-size advanced OTEC power plant, built in cooperation with DUT. Currently he is working on scaling the technology to projects in the Caribbean and Southeast Asia. Parallel to his work at Bluerise, he helps lead the Ocean Energy Platform at DUT.



UNDERWATER LISTENING SYSTEMS

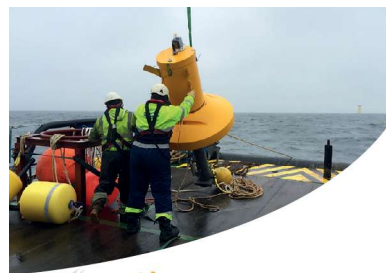
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Offshore Technology Conference

The 2018 Offshore Technology Conference (OTC) will be held April 30 to May 3 at NRG Park in Houston, Texas.

OTC is where energy professionals meet to exchange ideas and opinions to advance scientific and technical knowledge for offshore resources and environmental matters. The conference, in its 50th edition, attracts 70,000 attendees from 100 countries and more than 2,000 exhibiting companies.

It is sponsored by 13 nonprofit organizations in the energy industry who work cooperatively to develop the technical program. Revenue from the event directly benefits the membership of these societies.

Technical Program

The OTC 2018 technical sessions and topical breakfasts and luncheons will continue the expansive coverage of topics from past conferences. In addition to recurring topics, sessions will focus on the current state of the industry, reducing costs and improving overall value, breakthrough technologies in a low oil price environment, industry-leading safety practices, and more.

Highlights of the 2018 program include: celebrating 50 Years of OTC with programming that reflects on OTC's history, the current state of the industry and what is on the horizon; solutions to reduce the development timeline of projects and create project-ready technologies that meet current industry challenges; ways to decrease costs and improve overall value while maintaining high standards for safety, operability and reliability; a focus on how advanced software, nanotechnology and the digital revolution are integrating disciplines and triggering a historic transformation in the offshore energy sector; meeting the energy needs of fast-growing economies while reducing

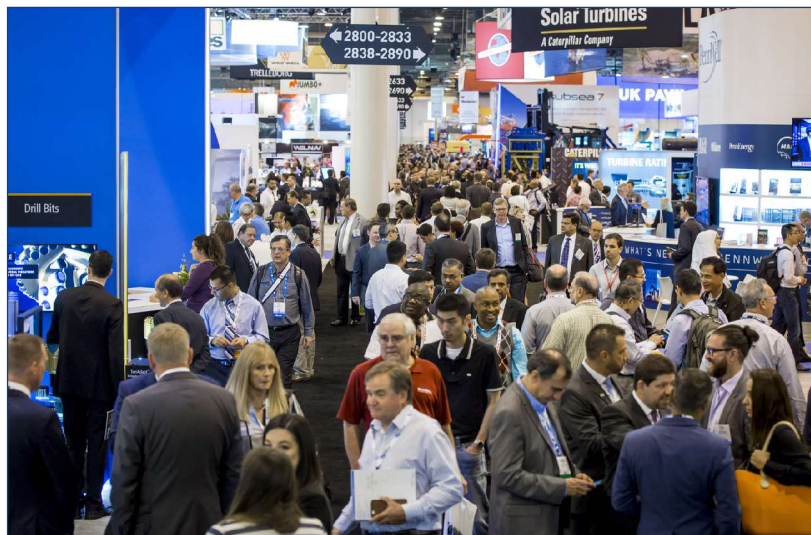


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carbon emissions and carefully considering the impact of digital technology; and updates on the latest landmark projects that have resulted in breakthrough technologies in a low oil price environment. Executives from service companies and operators, including IOCs (international oil companies) and NOCs (national oil companies), will share accomplishments from projects in Canada, Malaysia, the Gulf of Mexico and the North Sea.

Event Highlights

OTC's topical breakfasts and luncheons will feature top executives from major IOCs, NOCs and independent operators. Presentations cover a wide variety of management, global, research and technology-related issues. Working with the U.S. Department of Commerce, OTC organizes industry breakfasts that offer expert views on doing business in emerging geographic areas of interest for the oil and gas industry.



TOTAL OCEAN MARKET COVERAGE

2018

JANUARY

Annual Review & Forecast

FEBRUARY

Instrumentation: Measurement, Processing & Analysis

***Oceanology International*, March 13-15, Excel London, U.K.

***Canadian Hydrographic and National Surveyors' Conference*,
March 26-29, Victoria, Canada

MARCH

Electronic Charting/Vessel Management/Ports &
Harbors/Dredging/Homeland Security

APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

***Offshore Technology Conference*, April 30-May 3, Houston, TX

***AUVSI XPONENTIAL 2018*, April 30-May 3, Denver, CO

***OCEANS '18 MTS/IEEE Kobe / Techno-Ocean 2018*,
May 28-31, Kobe, Japan

MAY

Communications, Telemetry, Data Processing

***BlueTech Expo*, June 4, Washington, DC

***CLEAN PACIFIC 2018*, June 19-21, Portland, OR

***UDT 2018*, June 26-28, Glasgow, U.K.

JUNE

Seafloor Mapping/Sonar Systems/Vessels

JULY

Deck Gear, Cable, Connectors, Power Systems & Salvage

AUGUST

Geophysical Exploration/Seafloor Engineering

***SEG 2018*, October 14-19, Anaheim, CA

SEPTEMBER

Ocean Resources Development & Coastal Zone Management

***Offshore Energy 2018*, October 22-24, Amsterdam,
The Netherlands

***EURONAVAL 2018*, October 22-26, Paris Le Bourget, France

***OCEANS '18 MTS/IEEE Charleston*, October 23-25,
Charleston, SC

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

***International Water Conference*, November 4-8, Scottsdale, AZ

***CLEAN GULF*, November 13-15, New Orleans, LA

NOVEMBER

Undersea Defense/Antisubmarine Warfare

DECEMBER

Diving, Underwater Vehicles & Imaging

***Underwater Intervention 2019*, February 5-7, New Orleans, LA

**EXTRA SHOW DISTRIBUTION (additional shows will be added as information is obtained)

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- Soapbox
- ST Looks Back

OTHER OPPORTUNITIES

- *Sea Technology Buyers Guide/Directory* (2019 edition closes October 5, 2018)
- *Sea Tech e-News*
- *Commercial Fisheries News*
- *Fish Farmers Phone Book/Directory*
- *Fish Farming News*
- *Commercial Marine Directory*
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1963 - 2018 Celebrating More Than 54 Years of Serving the Global Ocean Community

Whatever you are looking for in offshore energy, you will find it within the OTC exhibits. The exhibition will be held in multiple indoor and outdoor locations: NRG Center, NRG Arena and OTC Parkway. There, you will find countless networking opportunities while learning of new trends, technologies and equipment.

Designed and organized by young professionals, The Next Wave young professional program helps open communication between the generations. Young professionals will have the opportunity to share, learn and network with their peers. The 2018 program is entitled: "The Next 50: The Evolution of the Industry."

The Rice Alliance Startup Roundup at OTC is a partnership between OTC and Rice Alliance. The showcase event on April 30 will present up to 50 emerging energy companies available for investment. It offers a great opportunity for OTC attendees to learn more about these evolving businesses and enable potential partnerships and investments. Attendance is complimentary with your OTC registration.

Several special events will commemorate OTC's important milestone, including the Opening Ceremony Commemorating 50th OTC, which will feature speeches by industry executives discussing the milestones of the last 50 years, the offshore technology revolution of the previous 50 years, and what innovations we can expect for the next 50; the 50th OTC Legacy Luncheon, which will celebrate the success of OTC and pay homage to the volunteers and exhibitors who have given their time

and hard work throughout the years to make OTC what it is today; and the Chairman's Panel on Energy Transformation, which will include a powerhouse panel of cross-industry executives, moderated by the 2018 board chairman Wafik Beydoun, discussing their outlook and strategy regarding the transition from hydrocarbons to renewables.

Industry Awards

The conference will feature the OTC Distinguished Achievement Awards Luncheon to recognize the OTC Distinguished Achievement Award recipients, raise funds for a worthy cause and provide an excellent opportunity for industry leaders to network with colleagues from around the world. Sponsorships support the 2018 beneficiary, Young Women's College Preparatory Academy.

The Distinguished Achievement Award recipients are Brian Skeels for individual achievement; Shell and SBM Offshore for institutional achievement; Cesar del Vecchio for the Heritage Award; and a Special Citation for Tom Sifferman.

The awards for innovative technologies are part of the Spotlight on New Technology program, which is exclusively for OTC exhibitors. The program showcases products that recently entered the marketplace but are already advancing the oil and gas industry. The awards will be presented on April 30.

Additional information about OTC 2018 can be found at <http://2018.otcnet.org>. **ST**



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AUVSI XPONENTIAL

There is considerable innovation and exciting activity in maritime unmanned systems. Unmanned marine vehicles are used for a wide range of military and commercial applications. The military uses unmanned maritime systems for purposes such as mine countermeasures (MCM); intelligence, surveillance and reconnaissance (ISR) operations; anti-submarine warfare (ASW); and port security. Commercial uses include oil and gas exploration and construction, oceanographic data collection and environmental surveys.

XPONENTIAL 2018 is the destination for those looking to harness the power of all unmanned technology, including unmanned maritime systems.

An intersection of cutting-edge innovation and real-world applications, XPONENTIAL is the one event



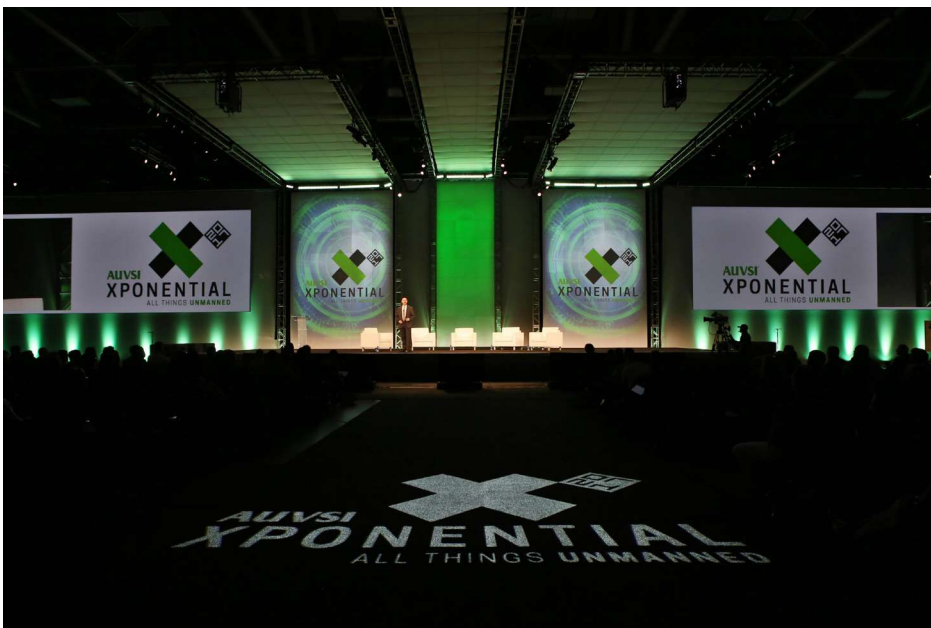
that brings all things unmanned into sharp focus. More than 8,500 professionals, crossing a wide spectrum of industries, will

gather in Denver, Colorado, from April 30 through May 3 to participate in four days of forward-thinking, advanced education and networking and have the chance to explore a 370,000-sq.-ft. exhibit hall.

As the largest gathering of professionals in the unmanned systems and robotics industry, XPONENTIAL 2018 will serve as an event for representatives from more than 20 vertical markets. From agriculture to energy, mapping and surveying to oil and gas, and construction to telecommunications, there will be opportunities for establishing new relationships and enhancing existing ones.

Topics

Four tracks focused on policy, technology, business solutions and trending topics will provide more than 200 unique opportunities for education at XPONENTIAL 2018. The curriculum will feature keynote speeches by leaders and visionaries in unmanned systems. There will also be technical sessions and panels discussing the latest maritime developments, including swarming applications for maritime search and rescue, improving autonomy for autonomous maritime systems, use cases in the oil and gas sector and regulatory impacts on maritime operations. The-



“The most imaginative and technological minds in the unmanned systems and robotics industry gather for a weekend with all the parts and materials necessary to innovate, collaborate and create solutions that are limited only by their creativity and the clock.”

ater presentations in the exhibit hall will also provide attendees with the knowledge and resources they are seeking to get ahead.

Exhibit Hall

The show floor at XPONENTIAL 2018 will be the largest ever. Attendees will have the chance to experience hands-on exhibits, interactive demos and never-before-seen products and devices from more than 725 companies and organizations that are advancing the unmanned systems industry with innovative products and solutions.

Hackathon

Something new for this year is X-Build, a buildathon/hackathon, which will take place just before the start of XPONENTIAL 2018 in nearby Boulder, Colorado. Imagine the excitement and energy that will be generated when the most imaginative and technological minds in

the unmanned systems and robotics industry gather for a weekend with all the parts and materials necessary to innovate, collaborate and create solutions that are limited only by their creativity and the clock.

UMS Advocacy

This year, we are also excited about the AUVSI Unmanned Maritime Systems (UMS) Advocacy Committee. The UMS Advocacy Committee is a coalition of industry leaders working throughout the year to support innovation in the military's acquisition processes for unmanned technologies, address regulatory hurdles for commercial deployment and support the growth of the UMS market.

If your professional future is in the unmanned field, XPONENTIAL 2018 is where you want to be. You can join 8,500 thought leaders from across the spectrum of unmanned systems and robotics to share ideas, gain insight and witness groundbreaking innovation.

To learn more, visit xponential.org. **ST**

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Chevron Releases its Second Climate Change Risk Report

Chevron published its second report describing the company's approach to managing climate change risks and its resilience under a low-carbon scenario. Titled "Climate Change Resilience – A Framework for Decision Making," the publication provides more detail on the company's approach to governance, risk management, strategic planning and emission reduction investments and activities, including key metrics.

New Mariner Training Program Opens in Mumbai, India

MITAGS-PMI established its latest Navigation Skills Assessment Program (NSAP) training center in Mumbai, India. The new facility is located on the campus of Anglo-Eastern Maritime Training Centre (AEMTC), India's leading maritime institute. NSAP is a risk-based measurement tool using Class A full mission simulators to measure mariner skills against internationally accepted STCW standards. The program is offered at locations throughout the world, including two in the U. S., Croatia, the Philippines, the U.K. and now India.

Maritime Group Works with UN Global Compact Initiative

OSM Maritime Group has signed a memorandum of understanding to relaunch the Mozambican Higher School of Nautical Sciences and is actively working to increase the number of females in its global pool of 11,000 qualified seafarers as part of its involvement in the UN Global Compact (UNGC). OSM is one of the first companies in the ship management segment to join the UNGC, and it has submitted an initial report detailing its desire to set new industry standards, with a focus on the four key areas of human rights, labor, environmental protection and anti-corruption.

Rotterdam Port Fund Invests in Magnet Anchoring Product

Investor Rotterdam Port Fund and InnovationQuarter have acquired a majority interest in McNetiq bv, a Rotterdam technology company that has placed an innovative magnet anchoring on the market. McNetiq offers the Controlock technology without the use of temporary welds. The Controlock is the first magnet that can be tested and used on different surfaces. It offers considerable advantages compared to traditional steel connections, such as drilling and welding.

New Standards in Development For Ballast Water Sampling

Paris-based aqua-tools will participate in the formulation of an international standard for ballast water sampling and analysis. The company will work with French standardization organization AFNOR (Association Française de Normalisation) and the International

Standards Organization (ISO) to establish new chapters for ISO 11711 – the Ships and Marine Technology, Piping and Machinery, Ballast Water Sampling and Analysis standard. aqua-tools will participate in ISO/TC 8, ISO's ships and marine technology subcommittee for piping and machinery and is also working with the French delegation to the International Maritime Organization.

New Partnership Will See Broader Use Of Robotics in Oil and Gas Industry

Petrus and ECA Group signed a €6 million agreement for subsea robotics services over four years. The A18D AUV designed and manufactured by ECA Group can dive up to 3,000-m depth and work autonomously for 24 hr., as well as carry out inspection and 3D mapping missions, revealing seabed conditions before or after construction of an underwater structure, pipeline or cable and during decommissioning of subsea installations. Petrus will carry out and coordinate missions ranging from preparation to data processing and delivery of results to the customer.

Hyperbaric Chamber Manufacturer Acquisition to Boost Defense Jobs

JFD parent company James Fisher and Sons plc has acquired diving and recompression specialist Cowan Manufacturing. This acquisition will create Australian defense industry jobs and expand JFD's presence in Australia. The acquisition of the Newcastle-based business complements existing high-tech facilities at Bibra Lake, south of Perth, and Kirrawee in Sydney. Cowan Manufacturing is recognized worldwide for its design and manufacture of lifesaving recompression and hyperbaric chambers.

Arctic Icebreaker Consortium Launched to Establish Research Metrics

The kickoff for the EU-funded Arctic Research Icebreaker Consortium (ARICE) was held in Bremerhaven in February and was attended by Arctic research representatives from 13 countries in Europe and North America. The World Ocean Council (WOC) is the lead partner on the consortium. The ARICE Project will enable scientists to collect more data in the Arctic by coordinating improved use of existing polar research vessels and working through the WOC to engage commercial vessels operating in the Arctic to collect oceanic and atmospheric data.

Mariner Input Wanted on Key Standards For Development of Navigation Equipment

The Nautical Institute announced a consultation to help assess the latest proposals for standardized navigation equipment. The latest suggestions were presented at the IMO's fifth navigation, communication and search and rescue subcommittee meeting by the institute and other stakeholders. Navigators' views are sought on the latest concept for S-Mode, which is in its final stages of development before being finalized next year.

Subsea 7 Acquires Stock

Subsea 7 has agreed to acquire a 60 percent interest in Xodus Group, and existing shareholder Chiyoda Corp.

of Japan will retain a 40 percent interest. Xodus recently expanded into Egypt, and it manages a significant portfolio of global life-of-field projects. The company is known for its integrated services spanning subsea and pipelines, flow assurance, wells, integrity, vibration, safety, risk, environment and commercial advice.

New Geosolutions Division

Next Geosolutions announced the launch of a new division, Next Geosolutions UK Continental Shelf (Next UKCS), following its acquisition of RMS Submarine in 2017. Operating in the cable and renewables industries, Next UKCS will provide solutions to the operations and maintenance market. Next UKCS is located in Norwich, the east of England's energy hub, and will offer local knowledge and skillset in the North Sea and the Baltic.

First LNG-Fueled Bulk Carrier Delivered

Hyundai Mipo Dockyard (HMD) and ILSHIN LOGISTICS have successfully delivered the world's first LNG-fueled bulk carrier under the dual-class of Lloyd's Register (LR) and Korean Register. The 50,000 dwt bulk carrier has also been verified to be in compliance with the international gas fuel (IGF) code. The ship has a Type C LNG fuel tank with a capacity of 500 m³.

AML Profiler for Chinese Ship

Xiamen University has purchased a moving vessel profiler (MVP) for the research vessel *JIA GENG*. The

university's State Key Laboratory of Marine Environmental Science will use the MVP300 to collect CTD, sound velocity and environmental data in support of both hydrographic and ocean science applications. The contract marks AML's 127th MVP order and the 18th such contract to be delivered to China.

Caribbean Rescue and Relief Organization Receives Anchors

Fortress Marine Anchors has partnered with International Rescue Group (IRG), a nonprofit that uses donated vessels to deliver food, water and medical supplies to coastal communities affected by disaster in the Caribbean. Often more nimble with the ability to respond quicker than governments and national humanitarian aid agencies, its 70 volunteers and 15 boats play a vital role in filling the life-threatening gap prior to large-scale responses. Fortress donated anchors for the organization.

Bureau Veritas Now Offers E-Certification

Bureau Veritas is now issuing both classification and statutory e-certificates following successful pilots with shipowners and flag states. Digital certificates may now be issued on behalf of 52 flag states, representing 72 percent of the Bureau Veritas classed fleet. E-certificates, delivered by email or accessible via the My VeriSTAR mobile application and the VeriSTAR Info desktop portal, reduce the administrative burden both on board and ashore. **ST**

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US Coast Guard Makes Progress On Funding Icebreaker Fleet

The U.S. Coast Guard (USCG) launched plans to acquire a new heavy icebreaker vessel intended to be the first of a six-ship installment and the beginning of a robust U.S. icebreaker fleet. Announcing the proposal at the 2018 State of the Coast Guard address, Commandant Adm. Paul Zukunft said it is the first step in protecting the “fourth coast” of the U.S.—the Arctic. The U.S. icebreaker will have military-grade weapons and cutting-edge UAV capabilities.

Sub-Bottom Profiler Used in Wave Energy Project Siting

The University of Queensland used Syqwest’s Stratabox 3510HD for a seabed survey off King Island for a wave energy company. Sub-bottom profiling (SBP) with the Stratabox3510 HD revealed a need to relocate the survey to a location further west. To characterize benthic surfaces within the survey area, a series of transects using a sub-bottom profiling system focused on mapping the potential placement site.

Underserved Ocean Research in San Diego Receives Foundation Grants

The San Diego Foundation announced \$632,934 in grants for 10 programs that strengthen San Diego’s innovation economy by creating opportunities for students from underserved communities pursuing STEM opportunities. The San Diego Foundation Science & Technology Program grant making supports the findings from Our Greater San Diego Vision, a report that found that a majority of residents want to increase opportunities for those who work and learn in the San Diego region. The grant recipients include the Ocean Discovery Institute and The Maritime Alliance Foundation, among others.

Greensea Honored with Prestigious MTS Award for ROV Development

Greensea Systems received the 2018 Corporate Excellence Award presented by the ROV committee of the Marine Technology Society (MTS) at Underwater Intervention in New Orleans, Louisiana. The MTS ROV Committee began its award program in 1990 to recognize outstanding individuals and organizations in the ROV community. To maintain a high degree of distinction, awards are not necessarily presented annually, but only as deemed appropriate.

Energy Storage Systems Added to Mexican Platform Supply Vessels

Corvus Energy was selected by SEACOR Marine and Kongsberg Maritime to supply lithium ion-based energy storage systems (ESS) for four platform supply vessels (PSVs). The Orca Energy ESS from Corvus will supply electrical power to the PSVs’ propulsion and dynamic positioning systems’ electrical network. All four PSVs are

owned by Mantenimiento Express Marítimo SAPI de CV (MEXMAR), SEACOR Marine’s joint venture in Mexico. By July 2018, hybrid power retrofits will be complete for the Mexico-based SEACOR vessels.

Ship Cybersecurity is Bolstered by Threat Intelligence Integration

Integration World-Link Communications has added to its ShipSecure maritime cybersecurity platform a full suite of CISCO services. ShipSecure is a multilayered security management system designed to protect, monitor and control the global fleet security network from a single management portal. The company says CISCO’s latest threat intelligence cloud-based services help deliver an end-to-end maritime cybersecurity platform with next-generation IPS/IDS firewalls for customers.

Aquabotix Announces Key Korean, Norwegian Partnerships

Korea Institute of Geoscience and Mineral Resources purchased an Aquabotix hybrid vehicle for ongoing geoscience and energy research. Aquabotix also formed a GPS integration partnership with Norwegian technology supplier Water Linked AS to integrate its underwater GPS system with the Endura ROV to enable greater underwater positioning across a wide range of applications, including hull inspections and fish farm exploration.

Shark Detection and Alert System in Development

Smart Marine Systems Ltd. is developing Clever Buoy—an ocean monitoring platform that specializes in detecting large marine life using sonar and identification software systems to relay critical information to authorities responsible for beach safety. Shark attacks on the Pacific Coast have been on the rise, with 2017 numbers almost double 2016. Finding a solution that doesn’t cause environmental damage or pressure on threatened species has been an ongoing challenge.

Hawaii-Based Company’s Software Installed on Prysmian Group Vessel

The MakaiLay cable deployment control software was commissioned on the cable-laying vessel *Giulio Verne* by the Prysmian Group of the energy and telecom cables and systems industry. MakaiLay’s power-cable module will be used by *Giulio Verne* when it starts working on the North Sea Link installation, a subsea power cable interconnector between Norway and the U.K. that will be the world’s longest upon completion in 2021.

KVH Satellite Partner to Invest \$4.5 Million To Push Development of Marine Broadband

KVH Industries announced that its longtime partner SKY Perfect JSAT Corp. (SJC) will invest \$4.5 million in KVH to help deliver next-generation maritime broadband services. KVH and SJC intend to collaborate on value-added services in the area of shipping digitalization and improved broadband access at sea. KVH’s mini-VSAT BroadbandSM service is the market share leader in maritime VSAT worldwide, according to KVH.

Savannah Harbor Expansion Reaches Critical Milestone

The U.S. Army Corps of Engineers has completed outer harbor dredging at the Port of Savannah, marking the midpoint of the Savannah Harbor Expansion Project (SHEP). The first half of the project deepened the outer harbor to 49 ft. at low tide. The inner harbor channel will be expanded from its current low-tide depth, 42 ft., to 47 ft. Deepening the harbor will allow Neo-Panamax vessels to take on heavier loads and transit the Savannah River with greater scheduling flexibility.

HydroComp Joins Green Marine To Design Quieter Ships

HydroComp has joined Green Marine, a North American environmental certification program designed to strengthen sustainability in the marine sector. HydroComp specializes in applied methods for a variety of mission-critical performance indicators, including energy consumption and audible propeller noise with notable work in underwater radiated noise. The group plans to focus on quieter ship design to mitigate the impact of underwater radiated noise on marine mammals.

IMCA Issues Jones Act Update On Gulf of Mexico Vessels

The International Marine Contractors Association (IMCA) has updated the U.S. Gulf of Mexico vessel data associated with its study "Marine Construction Vessel Impacts of Proposed Modifications and Revocations of Jones Act Letters Related to Offshore Oil and Natural Gas Activities" submitted to the U.S. Customs and Border Protection agency last year. This supplement focuses on the Gulf of Mexico vessels of interest to IMCA's members and can be found at www.imca-int.com/jonesact.

Steel Tariff Could Hurt US Shipbuilders And Increase Taxpayer Dollars for Navy

The *Maritime Executive* reported a growing debate around U.S. President Donald Trump's plan to impose tariffs on steel imports, noting that the tariff may have negative effects for defense shipyards like Newport News. The report quoted lawmakers expressing concern about steel tariffs that increase the cost of building Navy ships and, therefore, taxpayer costs. Of note is a warning from the director of the Center for American Seapower, Seth Cropsey, who says "protectionism" that affects the cost of American defense goods is a "matter of concern." Canada's minister of foreign affairs said trade restrictions are "unacceptable" between NATO and NORAD allies.

Global Diving Leaders Earn Roles in Global Associations

Global Diving and Salvage Vice President of Operations Daniel Pierson has been re-elected to the Association of Diving Contractors International (ADCI) board for a new three-year term. In addition, Global Vice President of Casualty and Emergency Response David DeVilbiss has been elected as the new American Salvage Association (ASA) vice president. **ST**



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Virtual Buoy System



NaviSuite Perio allows harbor authorities to replace marker buoys with virtual buoys managed via a software interface. Virtual buoys are displayed to AIS users as actual buoys at a given location in the water to mark channels, wrecks and construction. EIVA a/s.

Marine Drafting Software

The latest release of the ShipConstructor software has improved revision and task support for modifying structure parts, easy import and

export of operations in the EnterprisePlatform software, and offers multiple new features for ShipConstructor subscribers. SSI.

Metal Thickness Gauge

Multigauge 6000 is an ultrasonic metal-thickness gauge designed for mounting onto drones for high-level inspections. It transmits real-time measurements wirelessly up to a distance of 500 m, and a single crystal probe ensures accurate readings on curved surfaces, such as storage tanks and pipelines. Tri-
tex NDT Ltd.

Design Support Software

PrimeShip-HULL version 5.0.0 includes IACS Common Structural Rules for Bulk Carriers and Oil Tankers (CSR BC & OT). The calculation report function is now a

stand-alone system, and the prescriptive calculation software includes an enhanced 2D CAD data-linkage function. ClassNK.

Multifunction Lights

Dual-color Sea Hawk-XL lights use three rows of LEDs and a unique ceramic thermal polymer housing that directs heat away from internal components for an exceptionally long service life. The housings, available in black or white, feature IP 67 sealed construction and a 316 stainless steel mounting bracket. Hella marine Inc.

Replacement Pumps



Replacement pumps for Yanmar models are built from cast bronze and have nonmagnetic shafts and corrosion-resistant fittings and O-rings. Brass inserts are made from a wax-infused blend that resists salt, oil, chemicals and extreme heat. JMP Marine LLC.

Geophysical Software

New releases across the spectrum of oil-field production solutions include: Jason 9.7.1 for advanced geostatistical reservoir characterization; HampsonRussell 10.3 for interpretation and analysis; and the PowerLog 9.7.1 petrophysical solution for well log analysis. CGG.

NOx Control Chemistry

BIONOX SOLVER for scrubber systems has nitrogen dioxide reducing agents with more than 33% greater efficiency. Applications include removal of nitrogen dioxide emissions from catalyst calcining and silicon wafer and circuit board etching. Bionomic Industries Inc.

Intelligent Underwater Winch

The MERMAC U intelligent electric winch comes in two sizes and controls deployment of oceanographic equipment by raising and lowering a buoy at pre-defined intervals and

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speeds and to set depths of up to 3,000 m. MacArtney A/S.

Diving Equipment Manager

This cloud-based maintenance system helps diving companies manage equipment and adhere to certification guidelines by providing a real-time overview of equipment. Unique Equipment Manager provides manufacturing and contractor documentation and can be implemented across multiple geographies. Unique Group.

Joint-Free Sealing Materials



FlexiMold large diameter joint-free seals are now available in perfluoroelastomer (FFKM) materials engineered for oil and gas applications. FFKM materials have outstanding chemical resistance, mechanical performance under pressure, thermal properties and unrivaled RGD (rapid gas decompression) resistance. Trelleborg Sealing Solutions.

Inertial Data Processing

Qinertia post-processing software handles inertial data through a tight coupling algorithm for INS/GNSS fusion. It allows creation of a virtual base station with access to offline RTK corrections from more than 7,000 base stations located in 164 countries. SBG Systems S.A.S.

Sound Velocity Probe

SWiFTplus combines wide-range turbidity observations with survey-grade sound speed, temperature and pressure sensor technology. It has Bluetooth connectivity and an integral GPS module to geolocate each profile. Valeport Ltd.

Electronic Chart Updates

Using Challenger software, mariners can manage onboard holdings and receive updates for Admiralty paper charts and publications, AVCS, ADP and e-NP digital products via web sync or email. Poseidon Navigation Services Ltd.

Cloud-Based Ship Management

Hanseaticsoft's Cloud Fleet Manager centralizes data and makes it available across the complex of ship management for teams spread around the world working both on-shore and on board vessels. It allows digitalization of vessel audits in real time and includes more than 25 applications. Lloyd's Register.

Bathymetry Module Licensing

SonarWiz bathymetry and magnetometry post-processing is available through a stand-alone license. Add-ons include side scan, sub-bottom profiling and single beam, or bathymetry and magnetometry can add on to existing licenses. Chesapeake Technology Inc.

ENC Bathymetry Plotter

The new version of the ENC Bathymetry Plotter allows data clipping to create a smaller subset for further processing. It can also create S-57-relevant information about associated zones of confidence, survey techniques and survey dates. SevenCs GmbH.

Easy-Install Antennas

Glomeasy antennas are available in 3-, 4- and 8-ft. lengths with waterproof FME for mobile equipment. VHF, AIS, FM and DAB antennas rotate freely when threading to avoid shearing or damage during install. Glomex Marine Antennas USA Corp.

Autopilot System

NavPilot 300 is designed for center consoles with outboard engines and drive-by-wire systems. It has a single-DIN, 4.1-in. color LCD and Bluetooth-enabled gesture controller that allows vessel steering within 10 m of the helm through "point-and-shoot." Furuno USA Inc.

Waterproof Speaker

The WOW-SOUND Bluetooth speaker runs for 50 hr. on a single charge. It features four 2-in. active speakers spaced evenly around the circumference of the system and one 4-in. passive radiator on top with a 360° LED light. WOW Watersports. **ST**



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Gangway System for Arkona Offshore Wind Farm

Vroon Offshore Services and Ampelmann have joined forces to deploy a walk-to-work (W2W) solution for the Arkona offshore wind farm in the German Baltic Sea. Vroon's VOS *Stone* vessel, the newest addition to its offshore support fleet, will be mobilized with an Ampelmann A400 gangway system.

The gangway, launched in 2017, will be utilized for the first time for W2W operations during array cabling work and commissioning of the Arkona offshore wind farm. The project should finish by September.

Half-Scale WEC Testing at EMEC

CorPower Ocean has successfully installed its half-scale C3 wave energy converter (WEC) at the European Marine Energy Centre (EMEC) in Orkney, Scotland.

The C3 point absorber was installed at EMEC's Scapa Flow scale test site in collaboration with local marine contractor Green Marine (UK) Ltd. The device was towed to site and the surface-operated install sequence was successfully performed from a vessel.

The C3 WEC was connected to a floating microgrid unit provided by EMEC.

The microgrid has been designed to allow the C3 device to behave as if it were grid connected by providing a stable voltage and frequency reference, simulating the impedance of a typical grid connection, absorbing power from the device under test and providing power to auxiliary systems.

This ocean deployment is looking to prove off-grid operations to address market segments such as islands, offshore installations or remote coastal locations.

Marine Renewables Legislation in Nova Scotia

The government of Nova Scotia has proclaimed the Marine Renewable-energy Act, a major milestone for Canada's marine renewable energy sector. It provides a framework for the governance and development of marine renewable energy resources, including tidal, wave and offshore wind energy. Key features include the designation of areas of priority for development, as well as a licensing and permitting regime.

A demonstration permitting program is now open, allowing proponents to seek up to 5 MW for demonstration of a project. The program has a cap of 10 MW and requires all applicable permits and approvals in place.

Kraken in Germany Wins Support for Offshore Wind

Kraken Robotics Inc.'s German subsidiary, Kraken Robotik GmbH, was named a winner in the Carbon Trust's Offshore Wind Acceleration program.



Ocean Sensor Systems

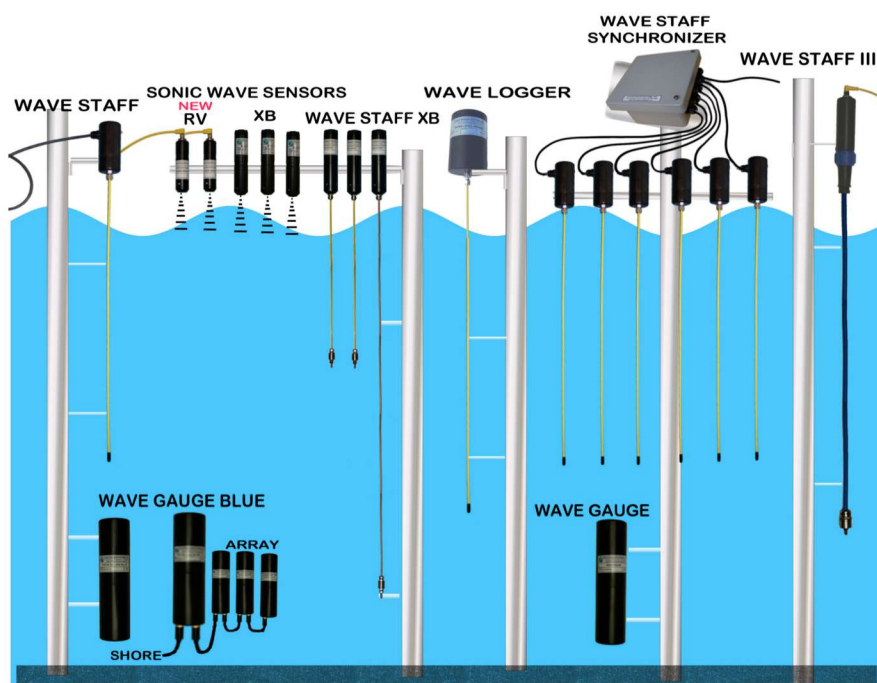
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tor (OWA) competition, an R&D program funded by nine leading offshore wind developers and the Scottish government to reduce the cost of offshore wind energy. Kraken Robotik was among four companies selected in the competition.

Kraken will receive hands-on mentoring and advice from the OWA industry partners, which collectively represent more than 75 percent of the European offshore wind market, as well as a potential opportunity to demonstrate its SeaVision 3D underwater laser imaging system on installed foundations at a fully operational wind farm in Europe. The aim of the competition is to help advanced technologies access the large emerging market and become part of the normal subsea inspection strategy for offshore wind developers.

AUV Docking Station for Offshore Wind Inspection

Modus Seabed Intervention is developing an innovative approach to enable AUVs to remain at off-

shore wind farm sites without a support vessel. The move could shave £1.1 billion from the operating cost of Europe's offshore wind farms and would be a world first in the sector.

Modus Seabed Intervention, in partnership with Osbit Ltd. and the Offshore Renewable Energy (ORE) Catapult, is trialing an AUV docking station to enable vehicle recharging, upload of acquired data and download of mission commands.

The use of AUVs to survey and inspect offshore wind farm subsea infrastructure is a relatively new cost-efficiency measure in this sector. In addition to the estimated £1.1 billion savings across the current 11-GW offshore wind farm fleet over the next 25 years, the scheme will also significantly reduce the need for staff to work in often hazardous environments.

The Autonomous Vehicle for the Inspection of offshore wind farm Subsea Infrastructure (AVISIoN) project has received funding from Innovate UK for further development, testing and demonstrations

of Modus's existing hybrid AUV capability and docking station. Testing will take place at ORE Catapult's National Renewable Energy Centre in Blyth, Northumberland.

Deep Green Tech Nearing Utility Scale

The gravity base structure foundation for Minesto's first commercial-scale installation of its Deep Green technology has been delivered, marking significant progress toward the first installation in Holyhead Deep. Preparation for offshore testing is in its final stages. Minesto's DG500 project involves installing and demonstrating Deep Green, which produces electricity from ocean currents, at utility scale at the Holyhead Deep site off the coast of northwest Wales. Offshore installation of the 500-kW device and the surrounding test setup infrastructure is to start in April, with system functionality and capacity tests to be conducted in the second quarter. The aim is to generate electricity in the third quarter this year. **ST**



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Retrofit Advances LNG Fleet Communications

Elcome International has completed a satellite communications retrofit program for a major fleet of LNG tankers providing broadband data and voice services. The company decommissioned the existing VSAT systems and installed new SAILOR 900 antennas and below-deck systems on 40 ships within four months, without disrupting the sailing schedules.

The scope of work included system design, site survey, system integration, hardware and software installation, commissioning, training, project management and airtime for the ships' VSAT, Fleet Broadband and Inmarsat-C systems. In addition, Elcome is managing worldwide shipboard service for the fleet. To that end, Elcome has established a network operations center at its Dubai headquarters for first-line

customer support and will also provide shore-based maintenance under a separate yearly contract.

Elcome has created three independent networks on each ship for corporate traffic, crew welfare voice and Internet connections, and machine-to-machine data transfer of performance data from shipboard sensors.

The retrofit solution was developed with satellite service provider Global Eagle and VSAT antenna manufacturer Cobham SATCOM.

LiFT Battery Delivery for New Dry Combat Submersible

General Atomics Electromagnetic Systems (GA-EMS) has delivered the first shipset of Lithium-ion Fault Tolerant (LiFT) batteries for the U.S. Special Operations Command's (USSOCOM) new dry combat submersible (DCS), a long-endurance delivery vehicle capable of

transporting personnel in a dry environment. GA-EMS is under contract with Lockheed Martin Corp. to provide LiFT batteries to power the DCS propulsion and internal support systems. LiFT's modular design and single-cell fault tolerance should prevent uncontrolled and catastrophic cascading lithium-ion cell failure, improving the safety of personnel and platforms while keeping power available for high mission assurance. The flexible architecture of the battery system can be configured to meet the most demanding needs of manned and unmanned underwater vehicles.

Comms Access Beyond Cell, Wi-Fi Range

The popular mazu and mSeries system from SkyMate now works in conjunction with Raymarine, enabling boaters to pull up satellite data on their multifunction display (MFD). mazu features such as email and SMS texts, SOS transponding, weather forecasts and more can now be opened directly on a Ray-



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marine MFD. The mSeries system can still be used with the mazu iPad app, which provides users with an enhanced dashboard.

Cruisers and offshore fishermen now have more ways than ever to stay connected when outside of cellular and Wi-Fi coverage. mazu gives boaters access to reliable global satellite connectivity using the Iridium network. mazu is a data-only system that can be linked to using any device with a browser.

Furukawa Batteries Now Certified for Sea

Eco Marine Power (EMP) has formally certified The Furukawa Battery Co. Ltd. of Japan as a supplier of batteries for use on ship and marine structures. The certification covers a range of battery technologies, including the hybrid valve-regulated lead-acid (VRLA) UltraBattery.

The certification process included obtaining approval from ClassNK for each battery type, an inspection of the Furukawa Battery production center at Imaichi Plant at Nikko, Japan, and a review of the relevant quality standards and certifications, including ISO 9001 and ISO 14001. EMP also assessed how Furukawa Battery recycles returned batteries as part of a sustainability review. The batteries covered by the EMP certification are the: FC-38-12, UB-50-12, FCP-500 and FCP-1000.

International Distribution For ROV3D Recon DVR

Seatronics, an Acteon company, and Whitecap Scientific, developers of the ROV3D Recon DVR, announced a global distribution agreement that will see Seatronics invest in ROV3D Recon DVR rental units for its Aberdeen (U.K.), Houston (U.S.), Singapore and Abu Dhabi (U.A.E.) offices. The ROV3D Recon DVR allows any ROV with two cameras to generate measurable 3D point clouds of subsea structures and assets during routine operations.

Electronic Certificates Grow in Popularity

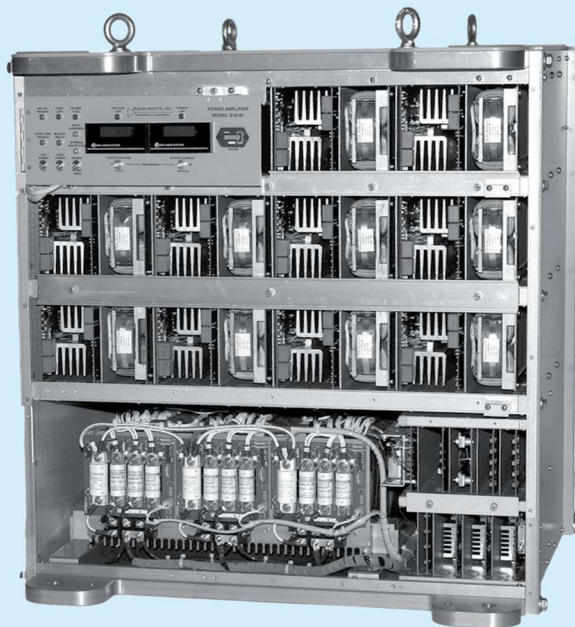
With the introduction of IMO-compliant electronic class and

statutory certificates, DNV GL took classification into new territory. Just four months after the launch of this new service, more than 50,000 certificates have been issued. Many owners have opted not to wait for their first scheduled survey to shift vessels to the new certificates and have asked to move their whole fleet onto the new system. Digitally signed electronic certificates now represent nearly 80 percent of all

certificates issued by DNV GL. Certificates are published on DNV GL's customer portal immediately after an onboard survey is completed. All relevant parties can access the latest certificates anywhere in the world. Customers can share access to their certificates with stakeholders (charterers, ports, flag administrations, insurers) by using temporary access codes, reducing the administrative burden on the shipowner. **ST**

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Documentary Shows How Zebrafish Help Humans

"Zebrafish: Practically People, Transforming How We Study Disease" is a new documentary about the common aquarium fish that may be the key to solving some of the most prevalent and devastating human diseases. The film can be viewed at Zebrafishfilm.org.

In her directorial debut, Jennifer A. Manner, CEO of ZScientific LLC, shows the unprecedented benefits of zebrafish as an effective biomedical research model and calls for additional funding to support the vital work of zebrafish research. This research has advanced the understanding and treatment of cancer, diabetes, addiction, Alzheimer's, heart disease, Parkinson's, epilepsy, autism and rare genetic diseases.

Zebrafish have most of the same organs, tissues and cells as humans, and because they are small and

transparent, they facilitate study of the behavior of cells within the context of the entire organism.

Polar Code Now Part Of Canadian Law

Transport Canada has introduced new Arctic Shipping Safety and Pollution Prevention Regulations that incorporate the International Code for Ships Operating in Polar Waters (the Polar Code) into Canada's domestic legislation.

The Polar Code addresses the hazards of certain vessels that operate in the Arctic and Antarctic. The Polar Code and Canada's new regulations include a variety of safety and pollution prevention measures, including those related to vessel design and equipment, vessel operations and crew training. Canada played a key leadership role in developing the Polar Code at the International Maritime Organization.

Phytoplankton Levels Monitored by Satellite

Ocean food resources are most volatile in areas that hold most of the world's marine resources, a new study has revealed. The University of Reading study provides the first ever estimate of the nutritional value of phytoplankton—organisms at the base of the food chain that allow ocean ecosystems to thrive—across the world's oceans throughout the year. These estimates can be made using only satellite images.

The research shows that the most significant spatial and seasonal contrast in the nutritional value of phytoplankton is seen in coastal areas, represented by 22 coastal provinces, such as the North-East Atlantic Coastal Shelves and the South China Sea. Coastal areas provide most of the world's marine economic resources, including commercial fish stocks.

The dramatic spatial and seasonal variation in the nutritional value of phytoplankton in coastal areas may make them vulnerable to fu-

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ture environmental changes, such as global warming.

Phytoplankton energy value was calculated using satellite images taken by the European Space Agency between 1997 and 2013 that indicate where blooms of chlorophyll-containing phytoplankton are, as the color of the ocean is altered by the light absorption.

The nutritional value of phytoplankton was found to strongly differ depending on its type, location and time of the year; at its highest in September and lowest in June. The highest annually averaged surface concentrations of nutrients are over the Northeast Atlantic Coastal Shelves, whereas the lowest concentrations were seen in the North Atlantic Tropical Gyral and in North Pacific Subtropical Gyre West.

Satellite-Derived Bathymetry Supports Aquaculture

BMT is using satellite-derived bathymetry (SDB) from TCarta as a critical data set in the selection of new fish farming sites in the Arabian Gulf. BMT is performing the site selection work on behalf of Environment Agency – Abu Dhabi (EAD).

Aquaculture development is emerging as a major market for highly accurate bathymetric data products.

As a primary input for the modeling phase of the project, BMT obtained 5-m-resolution SDB products from TCarta for the waters around Delma. BMT also used TCarta Marine Habitat Maps, which differentiate the surface compositions of the seafloor around the island in waters to approximately 10 m deep.

Maritime Scholarship At Texas A&M, Galveston

Bouchard Transportation Co. Inc. of Melville, New York, is giving a new scholarship to Texas A&M University at Galveston: the Morton S. Bouchard Jr. Memorial Scholarship, named in honor of Bouchard Transportation's former president and CEO, father of Bouchard Transportation's current president and CEO, Morton S. Bouchard III.

"The scholarship is in memory of Mort Bouchard Jr.'s passion for the

maritime industry, and his belief to always give back and support others," said Bouchard III.

Four scholarships are available per year for a period of five years.

The scholarships are offered to full-time marine transportation students in good standing, with demonstrated leadership skills.

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contracts

Winterthur Gas & Diesel Ltd., Winterthur, Switzerland, signed an agreement to integrate its digital engine diagnostic system (EDS), which provides continuous, intelligent diagnostics of engine and component performance, with the HHI INTEGRICT Smart Ship Solution. Hyundai Heavy Industries.

Dualog, Tromsø, Norway, won a major contract to install and upgrade email capability on 160 vessels worldwide. Work has already started on the project with more than 100 vessels being equipped in just three months, and installation work on the remainder is underway. Teekay.

TWMA, Aberdeen, Scotland, has secured a six-figure contract for the span of three months to provide at-source drilling waste management at the Orlando Field in the U.K. North Sea. The company will use its EfficientC and TCC RotoMill technology to allow processing of the drill cuttings offshore at source. Decipher Energy.

Seatools, Numansdorp, Netherlands, has won a contract for development and delivery of a remote offshore monitoring system for a Dutch nonprofit that is developing advanced technologies to rid the world's oceans of floating plastic. The monitoring system will be used to gain real-time insight into the performance of the first-ever ocean cleanup system, which will be deployed during trials starting later this year on the U.S. west coast. The Ocean Cleanup.

Inmarsat, London, England, signed an agreement for enhancements to its FleetBroadband service, with design and manufacture of a new generation of terminals that will support the existing I-4 network alongside the major advances coming with its sixth-generation satellite constellation, the first of which is scheduled for launch in 2020. Intellian Technologies Inc.

WFN Strategies, Sterling, Virginia, has been awarded a contract to provide cable route survey support for the proposed Eastern Arctic Undersea Fibre Optic Network (EAUFON) submarine telecoms cable system. EAUFON is a planned submarine cable with landing points at multiple communities in Canada's Nunavut region intended to be ready by 2020. Kativik Regional Government. **ST**

meetings

MAY

May 2-3—Nor-Shipping, Oslo, Norway. +45 40190234, sf@nor-shipping.com or <http://nor-shipping.com>.

May 15-17—Europort Romania, Constanta, Romania. +31 10 2933250, info@europort.nl or www.europort.nl/about-europort/europort-exports/europort-romania.

May 16-17—Unmanned Maritime Systems, London, England. +44 (0) 207 827 6020, nboumediene@smi-online.co.uk or www.umsconference.com/seatechnologywl.

May 23-24—Deep Sea Mining Summit, London, England. 206-582-0128, sean.collins@iQ-Hub.com or www.deepsea-mining-summit.com.

May 23-24—Fisheries Management in Estuarine and Coastal Waters, Lancaster, England. info@ifm.org.uk.

May 28-31—OCEANS '18 MTS/IEEE Kobe/TechnoOcean2018, Kobe, Japan. maki@iis.u-tokyo.ac.jp or <http://oceans18mtsieeeekobe.org>.

May 28-June 1—Ocean Microstructure Glider Workshop, St. Georges, Bermuda. jeremy@rocklandscientific.com or <http://bit.ly/2BTDF1S>.

May 30-June 1—GreenTech, Vancouver, Canada. info@green-marine.org or www.green-marine.org/greentech.

JUNE

June 4—BlueTech Expo, Washington, D.C. 202-389-9009, rich.lawson@ios-tia.org or www.bluetechexpo.org.

June 5-7—Capitol Hill Ocean Week, Washington, D.C. 301-608-3040 or <https://capitolhilloceanweek.org>.

June 11-13—Global Offshore Brazil Summit, Rio de Janeiro, Brazil. 281-491-5900, Exhibits@questoffshore.com or www.globaloffshorebrazil.com.

June 12-14—International Conference on Ocean Energy, Cherbourg, France. s.peux@bluesign.events or <http://icoe2018normandy.eu>.

June 17-22—International Conference on Ocean, Offshore and Arctic Engineering, Madrid, Spain. 778-338-4142 or www.oma2018.com.

June 18-20—ASNE Technology, Systems & Ships, Washington, D.C. 703-836-6727 or www.navalengineers.org/Symposia/TSS2018.

June 19-21—CLEAN PACIFIC, Portland, Oregon. 713-343-1891, cdavie@accessintel.com or <http://2018.cleanpacific.org>.

June 26-28—UDT, Glasgow, Scotland. team@udt-global.com or www.udt-global.com.

JULY

July 3-5—Seawork International, Southampton, England. info@seawork.com or www.seawork.com.

July 5-6—Oil Spill India, New Delhi, India. ravi@itenmedia.in or www.oilspillindia.org.

July 17-19—Multi-Agency Craft Conference, Baltimore, Maryland. 703-836-6727 or www.macc2018.org.

For more, visit <https://seatechnologymagazine.com/meetings>. **ST**

people

Larry Mayer, director of the Center for Coastal and Ocean Mapping and Joint Hydrographic Center at the University of New Hampshire, has been elected to the National Academy of Engineering for development of techniques and technologies for coastal, Arctic and ocean floor mapping. Mayer has a broad background in marine geology and geophysics, with research in sonar imaging, remote characterization of the seafloor and advanced applications of 3D visualization to ocean mapping.



EBL Products appointed **Russell Petrucci** as director of business development. Petrucci has 34 years of experience, including: piezoelectric and optical materials and transducer design and manufacturing; product and account management; and business development in the medical, industrial, power ultrasonics, and oil and gas industries.

Virginia Governor **Ralph Northam** has named **Matt Strickler** as Virginia's next secretary of natural resources. He will oversee the departments of Conservation and

Recreation; Environmental Quality; Game and Inland Fisheries and Historic Resources; the Virginia Marine Resources Commission; and the Virginia Museum of Natural History.

Phoenix HSEQ Manager **Preeti Mehta** has joined the working committee on measuring barrier strength for the Center for Offshore Safety. Mehta is an experienced HSE leader with more than 17 years of regulatory, risk management, project management and HSE management systems knowledge.

The Society of Naval Architects and Marine Engineers (SNAME) appointed **Eugene Sanders** as its new executive director. Sanders spent the past 36 years in upper management roles at for-profit and nonprofit associations.

NAVTOR appointed **Anders Holme** as chief technology officer. Holme is a veteran of many companies, including IBM, NOV, Aker Solutions and Lyse. Holme brings a wealth of business and software expertise and will manage teams working across offices in Egersund, Norway; Singapore; Japan; Sweden; Russia; the U.S.; and the U.K.

Teledyne Optech announced **Michael Perdue** as its new director of customer service. For the last seven years, Perdue served as field operations manager for Airborne Imaging, a Canadian LiDAR service provider, where he led specialized aerial LiDAR survey projects. **ST**

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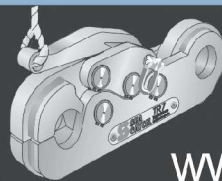


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Natalie Desty is the workforce development director for The Institute of Marine Engineering, Science and Technology (IMarEST), www.imarest.org, the international professional body and learned society for all marine professionals. IMarEST is the first Institute to bring together marine engineers, scientists and technologists into one international multidisciplinary professional body.



Despite various continuing initiatives, maritime employers are still faced with two key issues: lack of women and the skills gap. With female diversity in maritime falling well below the 10 to 12 percent engineering average and a shortage of candidates, despite rising requirements, we must do something different. If we keep recruiting in the same talent pools, we will keep getting the same results.

The solution? Make 2018 the year of the returnship.

A returnship is basically an internship for experienced workers who want to go back to work after a long break. Despite success in other sectors, returnships are unfortunately rare in engineering, none more so than in the maritime sector. Maritime, like the majority of engineering, really needs to improve its image to attract a diverse workforce.

A 2015 survey by the Women's Engineering Society (WES) found that 70 percent of women in STEM are anxious about taking a career break; 60 percent of STEM women reported barriers in returning to work after a career break; 20 percent of STEM women said employers are not supportive of working mothers; 18 percent said colleagues aren't supportive either; and 57 percent of women give up their membership of professional bodies before the age of 45, compared to 16 percent of men.

However, maritime is also a sector that is continually innovating. In just the last five years, it has seen huge and unprecedented development in autonomous innovation. But what about progress in recruitment and employee diversity?

Returner programs are designed to attract and enable diverse candidates who are "lost" to traditional recruitment methods. A CV gap is often an insurmountable barrier to recruitment, viewed as a major technical skills and knowledge gap. It can also lead to would-be returners losing confidence in finding a way back to work. That means a huge amount of talent and investment in people is wasted. Returner programs provide a link to this lost talent and attract those candidates wishing to transfer their engineering skills between industries, in the process building a more flexible and responsive workforce for both employee and employer needs. It also bypasses recruitment biases so ingrained in our standard recruitment processes that alienate those with a CV gap or who require a flexible working situation.

Alarmed by the number of "lost women" uncovered by research for its 2016 annual report, the Women and Work APPG report recommends that employers with 250 or more employees should consider putting in place paid returner programs with guaranteed training, advice and support.

Similarly, the 2016 PWC report "Women Returners" recommends: recruiters and employers reassess how they evaluate a candidate's potential and work to address the negative bias towards CV gaps; returnships as a route back to mid-to-senior-level engineering roles, with transitional support to upskill and support returnees; and increasing the availability of part-time and flexible opportunities in professional roles to widen the talent pool that businesses can access. The report

states many statistics that substantiate the very real business need to re-engage lost talent: around 427,000 highly technically skilled female professionals who are on career break want to return to the workforce in the future; three in five professional women returning to the workforce are likely to move into lower-skilled or lower-paid roles, experiencing an immediate earnings reduction of up to a third; 29,000 women who return to the workforce on a part-time basis will be underemployed; two-thirds of professional women could be working below their potential when they return to the workforce; addressing the career break penalty could boost female earnings by £1.1 billion annually; the multiplier effect from the higher earnings and spending power of these women generates additional gains to the U.K. economy of £1.7 billion; and business action, including combating the negative bias towards CV gaps, increasing the availability of part-time and flexible opportunities and helping women transition back to work, can help address the career break penalty.

In direct response to this loss of talent, The Institute of Marine, Engineering, Science and Technology (IMarEST) and WES launched STEM Returners, www.stemreturners.com, in November 2017, a paid 13-week employment placement for professionals returning to work after a career break or looking to transfer between sectors, with the possibility of ongoing employment at the end of the program. The program provides confidence building, training, career coaching, networking opportunities and peer support. The goal is to challenge industry to think differently about CV gaps and flexible working. Wärtsilä, Dstl, ATLAS ELEKTRONIK and Babcock have already signed up, creating opportunities for overlooked talent that deserves more attention. **ST**

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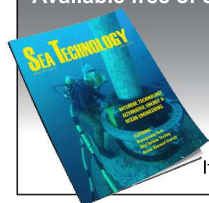
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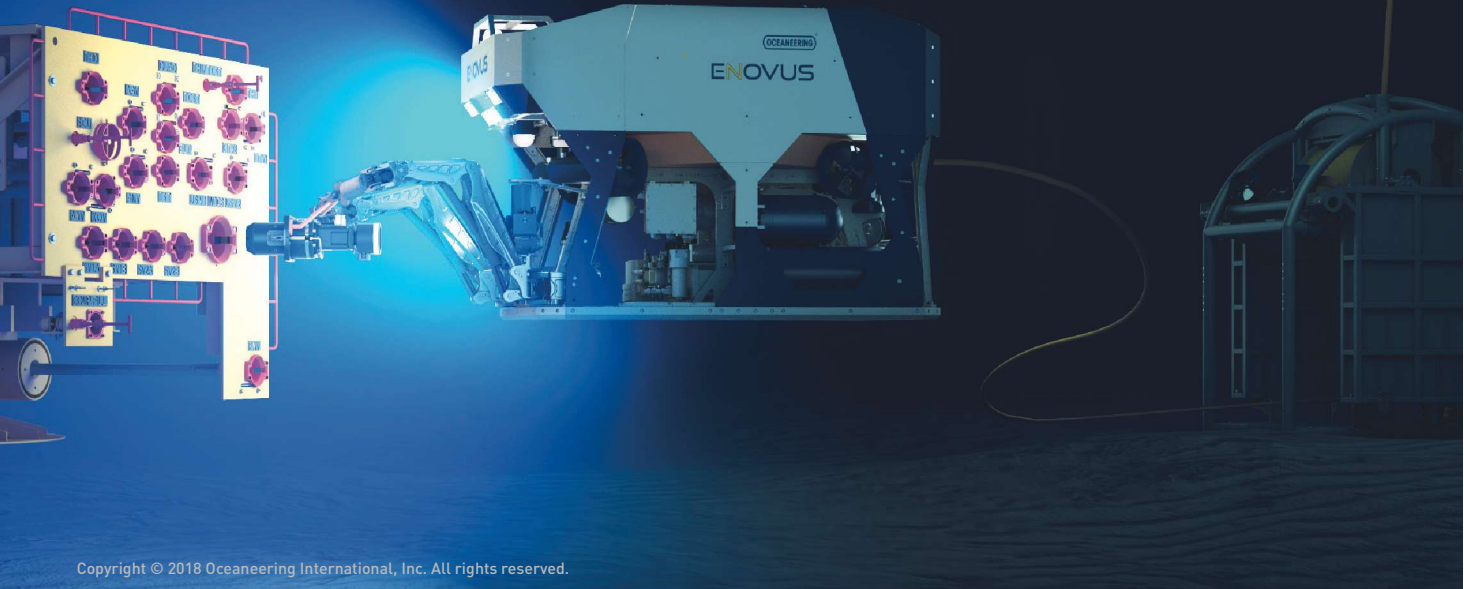
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