MARINE TECHNOLOGY REPORTER

October 2014 www.marinetechnologynews.com

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Photo courtesy of the Maritime Aquarium at Norwalk

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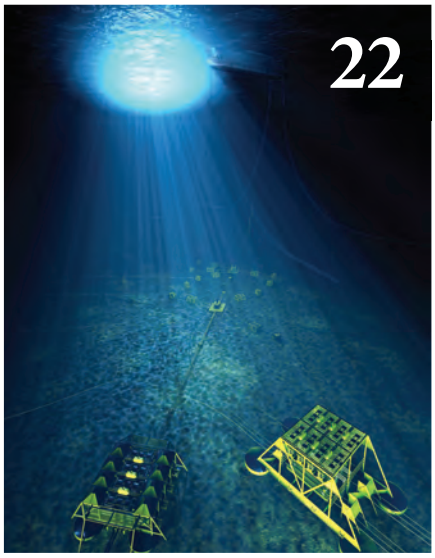

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Image: Glencore

The Authors in This Edition of MTR

Ned Lundquist

Lundquist

Edward Lundquist is a retired naval officer who writes on naval, maritime, defense and security issues. He is a regular contributor MTR. *p. 38*

Claudio Paschoa

Paschoa

Claudio Paschoa is Maritime Reporter & Engineering News' and Marine Technology Reporter's correspondent in Brazil. *p. 30*

Doug Whyte

Whyte

Doug Whyte is Managing Director of Hydro Group plc, an innovative subsea design and manufacturing group. *p. 26*

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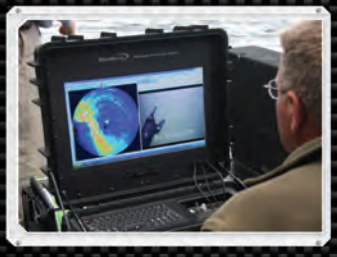

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NEW YORK
118 E. 25th St., New York, NY 10010
Tel: (212) 477-6700; Fax: (212) 254-6271

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

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

From coast to coast

For those of you unable to make it up to beautiful St. Johns, Newfoundland and Labrador, Canada, for Oceans 2014, you missed a strong event. The region's signature hospitality was on full display (ie. Kraken's hospitality night at the picturesque Quidi Vidi Brewery was as memorable as these types of events get) and the weather was cooperative. Beyond good food and good friends, St. Johns was a strong draw for the subsea industry elite, on hand once again for a few days packed with technical discussion and business dealings. Full details on the St. Johns cluster of companies serving this subsea industry is coming in the November/December edition of *Marine Technology Reporter*.

While the visit to St. Johns and Oceans was only a few weeks ago, it seems much further in the rearview mirror, as it was a part of a busy travel swing which had me out of my New York office for three out of four weeks. While it is important for me to get back to my desk to do my 'day job,' I always take a busy travel schedule as a good sign and business indicator. As I get this edition out the door I look forward very much to my next stop in just a few weeks to sunny San Diego for the **6th Annual Blue Tech & Blue Economy Summit**, scheduled for November 12-13, 2014 at the McMillin Companies Event Center in San Diego. If you don't know much about this meeting, or in fact much about the San Diego cluster of companies and organizations which all depend on the ocean for their livelihood, I invite you to turn to page 38 of this edition as our contributing editor **Edward Lundquist** fills 16 pages with overview of the San Diego Blue Tech economic engine, highlighting the people, the companies and the technologies that fuel the future. While there are many world regions that justifiably call themselves "tech clusters," I think you will find that San Diego, under the guidance of The Maritime Alliance, has kicked it up a notch in breadth and depth.

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(Photo: Teledyne TSS)

Working with Teledyne TSS Cable Trackers

A recent investment by DeepOcean in four pipe/cable tracking systems from Teledyne TSS is bearing fruit with the company putting them to work on a number of different subsea projects.

The company undertakes a wide range of subsea services that include survey and seabed mapping, subsea installation and intervention, inspection, maintenance, repair and decommissioning. The Teledyne TSS systems can be used for cable and pipe tracking which is essential for many of these tasks and DeepOcean is now making good use of their capabilities.

A newbuild cable lay vessel was recently chartered by DeepOcean from Maersk Supply Services, and the cable trackers will be used to support its work. The new ship will be involved with Interconnector projects as well as work in the oil, gas and renewable sectors.

"This next generation cable lay vessel, in combination with our survey and trenching capabilities, will enable us to bundle our services for customers in the offshore power cable and umbilical markets," said Tony Inglis, DeepOcean UK's managing director, said. "The versatile new vessel will be well suited for installation and burial projects using its 7,000 metric ton carousel from land-fall to deepwater and also in remote geographical locations."

Fugro Supports Technip

Real-time metocean data transmitted by a Fugro SEAWATCH Wavescan buoy is enabling energy industry construction company Technip to plan its operations more effectively.

Work is underway on Technip's largest UK North Sea contract to date. Located West of Shetland, BP's Quad 204 project involves replacing the existing Schiehallion production facility with a new, purpose-built FPSO (floating, production, storage and offloading facility) and installing new subsea infrastructure.

"BP specifically required reliable real-time wave height, wind and current data to manage their installation criteria thresholds," said Jonathan Ainley, Commercial Manager, Technip. "Access to these metocean data is also critical for vessel management and safe and efficient operational planning."

The SEAWATCH Wavescan buoy met the requirements. Manufactured by Fugro in Norway, the buoy is designed strong yet lightweight.

At 2.8m in diameter, with a counterweighted keel to prevent capsize, it is large enough to cope with the harsh North Sea conditions. A 3.5m mast supports the buoy's meteorological sensors and antennae, while a range of subsea sensors monitor oceanographic conditions.

In March, using the Fugro Symphony vessel, the Wavescan buoy was deployed in its designated position.

During its nine-month deployment its sensors will collect oceanographic and meteorological data for a comprehensive range of parameters including, air pressure, air temperature, current velocity/direction and water temperature.

Current profilers will be used in two locations (one just below the buoy and another further down the mooring) to build a current profile for the full water column depth. Wave data parameters to be measured include heave, surge, sway, direction, height and wave period.

The buoy transmits the data by satellite to Fugro, where it is presented in real-time on a website that uses a variety of pages and options, including a graphic format (to display current velocity/direction information for the full water column depth) and tabular data.

Falcon Helps Harness Offshore Wind

After Japan's 50 nuclear reactors closed following the Fukushima disaster, wind is now seen as an important alternative energy source. But in a crowded and mountainous country the search for sites must go offshore, with floating turbines the main option in the deep waters off the rugged coastline. It is at the southernmost tip of Japan that the Ministry of the Environment is trialing a turbine to determine the viability of floating wind turbines, in a bid to help replace the 30% of energy lost since the nuclear shut-down.

Sure-footed anchorage to the seabed is vital and a Saab Seaeye Falcon ROV is being used to check the integrity of the 400m of chain to mooring points 100m down. With many turbines to be installed at a depth of 100m or more, setting the anchor securely is vital for the safe location of these turbines offshore. Avoiding twists and entanglements of the 400 meter lengths of chain over a long period of time is also of vital importance, said

the research experiment group of the project. The Falcon, operated by Shibuya Diving, helped monitor the anchor holding test, and the analysis of anchor drag, as well as twist and entanglement. Shibuya Diving chose the Falcon because it could be deployed from a small workboat at a low operating cost and has a proven reputation amongst many different operators across the world for undertaking a wide variety of tasks.

It is small and easily manhandled, yet has the power to cope with strong currents around the anchorage while loaded with the hefty high-definition camera needed for the task. Although compact, the Falcon is known for performing precise work while carrying a heavy payload of cameras, sensors, sonar systems and manipulators. With more offshore turbine installations planned, Shibuya Diving intend developing a special work vessel from which to operate the Falcon.

Tritech Hammerhead

Tritech's high-resolution survey sonar is proving a strong tool in search and recovery operations.

Yorkshire and the Humber Police areas, through their regional underwater search and marine unit, have been using the Tritech SeaKing Hammerhead system to locate missing persons. The system was recently deployed at Snailsden Reservoir, in the peak district, South Yorkshire, England, where it enabled the team to locate the body of a missing person who was believed drowned. Prior to deployment of the sonar, the area was mapped using Tritech's StarFish 990F, a high-resolution side scan sonar system, to ensure the safety of divers entering the waterway; ultimately reducing the amount of time they had to be in the water, making the operation safer.

Send in the Hammerhead

Tritech's SeaKing Hammerhead sonar provides 360 degree scans of the search area, a geo-referenced plotter display and a built in compass ensures accurate marking and mapping of the search area. The SeaKing Hammerhead can be operated in two frequencies; 675 kHz for large area survey, up to a radius of 100m and 935 kHz for high-definition target examination at up to 40m radius.

"In our role, we are required to locate missing persons quickly and safely, often in nil-visibility conditions the images provided by Tritech's SeaKing Hammerhead and StarFish 990F were fantastic," said Sergeant Steve Birss, Yorkshire and the Humber Police marine unit. "The use of this equipment enables us to search larger areas in less time and then quickly guide the diver directly to the missing person. Using this equipment at Snailsden Reservoir reduced the search from weeks to hours, ultimately providing closure for the family concerned."

"In addition, Tritech's generosity when we were engaged in very high profile searches in York, North Yorkshire proved invaluable. Prior to our purchase

OceanServer Wins NUWC AUV Contract

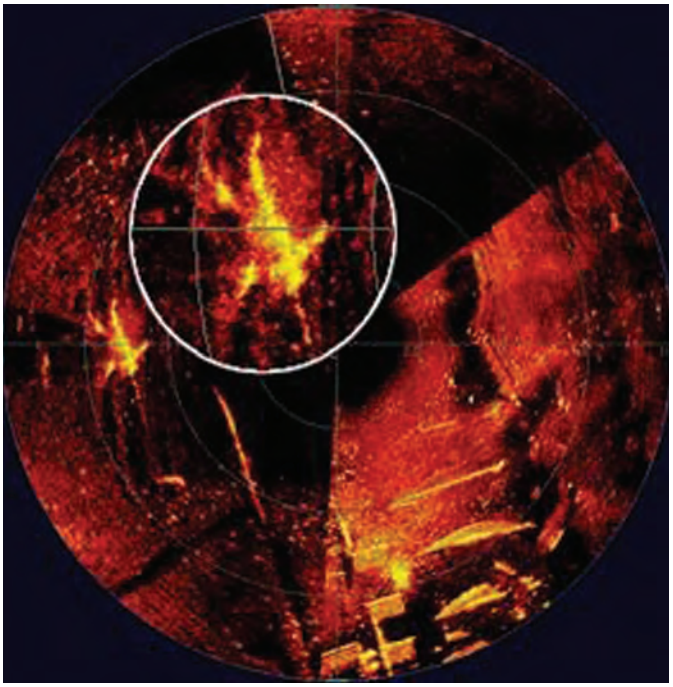
OceanServer Technology son a contract for one Iver3 AUV by the US Naval Undersea Warfare Center (NUWC) in Newport, RI, a system that will include several Iver3 options just released including the Rowe Technologies, Inc. (RTI) SeaPILOT 600 kHz Doppler Velocity Log with ADCP. RTI's SeaPILOT family of Doppler Velocity Logs (DVLs) represents some of the industry's newest and state-of-the-art acoustic Doppler technology.

The compact form factor and powerful electronics provide a versatile platform capable of producing precise bottom referenced velocity and/or current profile measurements for ROVs, AUVs, and other manned/unmanned submersibles. For vehicle navigation applications that require a custom fit like the Iver3, RTI provided four individual piston transducers along with compact electronics to facilitate repackaging into the AUV.

OceanServer's AUVs are single man-portable and feature simple point-and-click mission planning.

The latest generation of Iver3 AUVs will offer two different RTI DVL units in 600 kHz and 1200 kHz configurations.

and without any questions, a SeaKing Hammerhead was provided for our use at short notice; a StarFish 990F was also brought to the scene by a member of the Tritech team who offered to operate the equipment on our behalf in adverse weather conditions for many hours. We were very impressed by this customer service at a time when the help was needed most."



SeaKing Hammerhead image of a Diver, during a search at Hull Marina, at 10m range, 935kHZ frequency.

(L-R) PC Mark Breeze and Sergeant Steve Birss of Yorkshire and the Humber Police marine unit showcasing Tritech's SeaKing Hammerhead System.

Hawkes Innovates Again

From the shop of noted subsea vehicle designer Graham Hawkes come a new type of personal submarine, launched at the 2014 Monaco Yacht Show. DeepFlight Dragon is touted to be the most compact, lightweight personal submarine on the market.

The all-electric (zero emissions) vehicle was designed for ease of use from yacht or shore to explore the twilight zone down to 400 ft. (120 m). At 3,968 pounds (1,800 kg) and under 5 ft. (1.5 m) in height, it is less than half the weight of competing submarines and readily fits into existing yacht garages or deck areas.

Like all DeepFlight personal submarines, the Dragon is positively buoyant, meaning the craft automatically floats to the surface. And the Dragon is the first DeepFlight craft to use vertical thrust, thus enabling a hover capability.

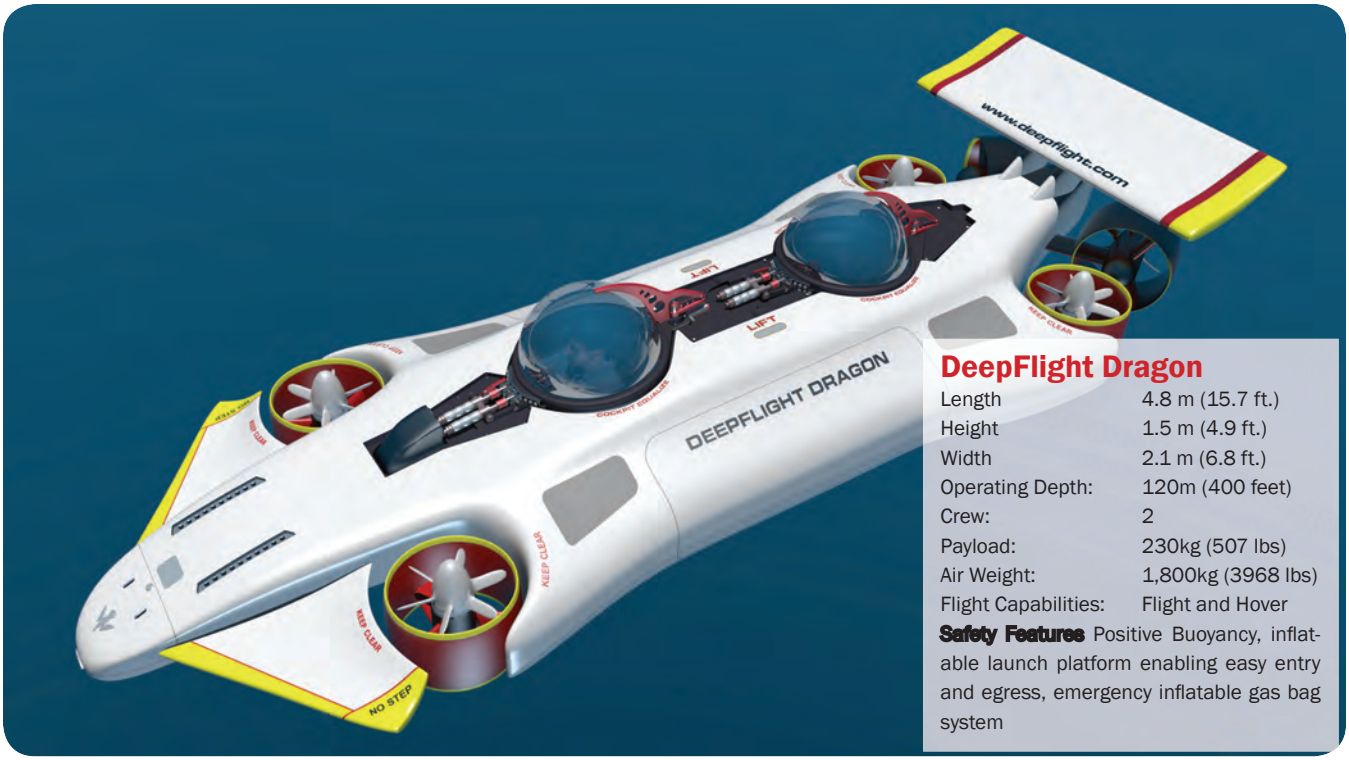
DeepFlight explained that the two-person Dragon is the only personal submarine which has enough power to rely solely on vertical thrust to dive, eliminating the complexity of the ballast and drop weight systems that other submersibles use to get heavy and sink to depth. This newest DeepFlight craft also offers the DeepFlight Dive Manager, a proprietary technology that monitors and manages critical functions, therefore eliminating the need for a professional pilot in a third seat.

"While humans have long dreamed of flying machines, we have actually realized this dream by building craft that fly underwater."

Graham Hawkes,
DeepFlight's Founder and CEO

DeepFlight has more than 45 years experience innovating the most advanced underwater craft, including its flagship craft, the DeepFlight Super Falcon. The DeepFlight Dragon makes a further breakthrough in introducing the power and onboard monitoring and management systems that enable people to pilot the craft themselves with minimal instruction, and to enjoy underwater flight with hovering capability. Owners of DeepFlight submarines include, among others, Sir Richard Branson; venture capitalist, Tom Perkins; and Red Bull Founder, Dietrich Mateschitz. DeepFlight recently delivered a DeepFlight Super Falcon to Laucala Island in Fiji, which is the second resort to own a DeepFlight submarine for guest experiences.

www.deepflight.com



DeepFlight Dragon

Length	4.8 m (15.7 ft.)
Height	1.5 m (4.9 ft.)
Width	2.1 m (6.8 ft.)
Operating Depth:	120m (400 feet)
Crew:	2
Payload:	230kg (507 lbs)
Air Weight:	1,800kg (3968 lbs)
Flight Capabilities:	Flight and Hover

Safety Features Positive Buoyancy, inflatable launch platform enabling easy entry and egress, emergency inflatable gas bag system

Maritime Robot on Mission South of England

The ASV C-Enduro embarked on a robotics mission along with six other unmanned marine vessels off the southwest of England. Selected to take part by the National Oceanography Center (NOC), C-Enduro is fitted with a range of meteorological and oceanographic sensors to collect scientific data about ocean processes and marine life.

The project coordinated by NOC is ambitious, as the vehicles were aiming to travel up to 300 miles in 20 days.

Communication with C-Enduro took place over satellite, conducted from a control station at ASV's new facility in Portchester. The exercise brought together a wide range of partners including scientists and engineers from research institutes and universities, commercials organizations, government agencies, as well as the MET Office and the Royal Navy. This vehicle is one of three C-Enduro vehicles designed and built by ASV in the past year. The concept was born out of an SBRI (Small Business Research Initiative) initiated by NOC's requirement for a long endurance USV for environmental research. Designed to be at sea for up to 90 days, C-Enduro is powered by a combination of wind power, solar power and a lightweight diesel generator.

Photo courtesy of Damen

Survey Vessel Delivered to Fugro N.V.

Fugro has taken delivery of the second of the three Fugro Offshore Coastal Survey Vessels (FOCSV) being built by Damen. The Fugro Pioneer is a compact, survey ship capable of undertaking a wide range of survey, monitoring and inspection operations.

The vessel is designed for a variety of survey and inspections duties including light geotechnical work, environmental baseline surveys, monitoring and inspection, and moon pool deployments. Diesel electric propulsion delivers excellent economy at all speeds.

Fugro Pioneer is the second of three survey vessels ordered by Fugro for delivery in 2014. Each will be operating in a different part of the world and so they have been adapted for the individual environments in which they will work. The operating company is a specialist in the acquisition of the full spectrum of survey data and so the vessels have been tailored to be adaptable for a wide range of tasks.

Fugro Pioneer is the second vessel to be built directly by Damen for Fugro.

HOS MPSV

DSS Contracts for Gulf ROV Work

Delta SubSea, LLC (DSS) entered into an agreement with a subsidiary of Hornbeck Offshore Services, Inc. (HOS) for the HOS Bayou, one of Hornbeck's recently built 300-class HOSMAX DP-2 multipurpose service vessels (MPSVs). The HOS Bayou will be equipped with two Delta SubSea Schilling HD 150 HP work-class remotely operated vehicles (ROVs) from DSS's fleet of ROVs. It is capable of performing inspection, maintenance and repair (IMR) of subsea oil installations and construction support in the Gulf of Mexico (GoM). In addition to IMR work, this vessel package is designed to perform a variety of deepwater services, such as SURF installation, decommissioning activities, drilling support and deepwater well intervention projects.

"The securing of the HOS Bayou is the culmination of 14 months of ambitious growth for Delta SubSea," said Scott Dingman, DSS's President – CEO. "With this first vessel, we have laid the foundation for our up and coming IMR vessel fleet, while advancing our vision of providing clients with best-in-class, full-service subsea solutions for their deepwater needs. We are very excited to be working with the team at Hornbeck Offshore and believe that this relationship will strengthen our already established position in the deepwater ROV market place."

The HOS Bayou has a maximum speed of 12 to 14 knots with fuel consumption of 208 gallons per hour and is equipped with a 150-ton MacGregor knuckle-boom crane with active heave compensation (AHC) and a maximum lifting capacity of 48 tons at water depths of 10,000 ft. The vessel also comes equipped with a 73-ft. diameter helideck and has 24 air conditioned/heated staterooms for 70-person berthing.

Navy to Christen Submarine

John Warner

Shipbuilders at Newport News Shipbuilding pull the bow flag tight on the Virginia-class attack submarine Pre-Commissioning Unit (PCU) John Warner (SSN 785) in preparation for the boat's Sept. 6 christening. The bow flag is about 30 feet in diameter and will be the centerpiece of the christening ceremony.

U.S. Navy photo courtesy of Huntington Ingalls Industries by John Whalen

Hybrid-Powered Research Vessel Christened

The Maritime Aquarium at Norwalk christened its 'green' research vessel on Friday, September 26 in preparation for launching a new era in examining, monitoring and teaching about Long Island Sound. The $2.7m research vessel, Spirit of the Sound, was christened and named during a ceremony at the Aquarium dock. Breaking a bottle on her hull was godmother of the boat, Astrid Heidenreich of Greenwich.

The boat is reported to be the first research vessel in the U.S. to run on hybrid-electric propulsion. Upon her launch in December, she will run virtually silently on electric power for the Aquarium's 2.5-hour public "study cruises" on Long Island Sound.

The 63-ft. all-aluminum catamaran will replace the Aquarium's 40-ft., 34-year-old diesel-powered trawler, R/V Oceanic. The new boat will have a climate-controlled indoor classroom and an outdoor research space. With more room inside and out, the new research vessel doubles the Aquarium's capacity for getting visitors out on the water – from 29 to 60 people per cruise.

R/V Spirit of the Sound's hybrid-electric propulsion system will reduce fuel consumption by an estimated 75%. Not just for students, the R/V Spirit of the Sound will be used for the Aquarium's public study cruises as well.

Initial public outings on the boat begin in mid-December with Seal Spotting Cruises, offered many weekends through mid-April. Even greater opportunities to experience the boat begin in May, with the Aquarium's 2015 season of Marine Life Study Cruises, during which crabs, mollusks, squid and a wide variety of salt-water fish are brought up out of Long Island Sound for examination.

Major contributors toward the new boat include: George and Carol Bauer of Wilton; The TK Foundation of Nassau, Bahamas; and the Per and Astrid Heidenreich Family Foundation of Greenwich. Bank of America is official sponsor of the boat's inaugural season.

Designed by Incat Crowther of Australia, Spirit of the Sound

Above: The $2.7m environmentally friendly research vessel, Spirit of the Sound.

(All photos courtesy of the Maritime Aquarium at Norwalk)

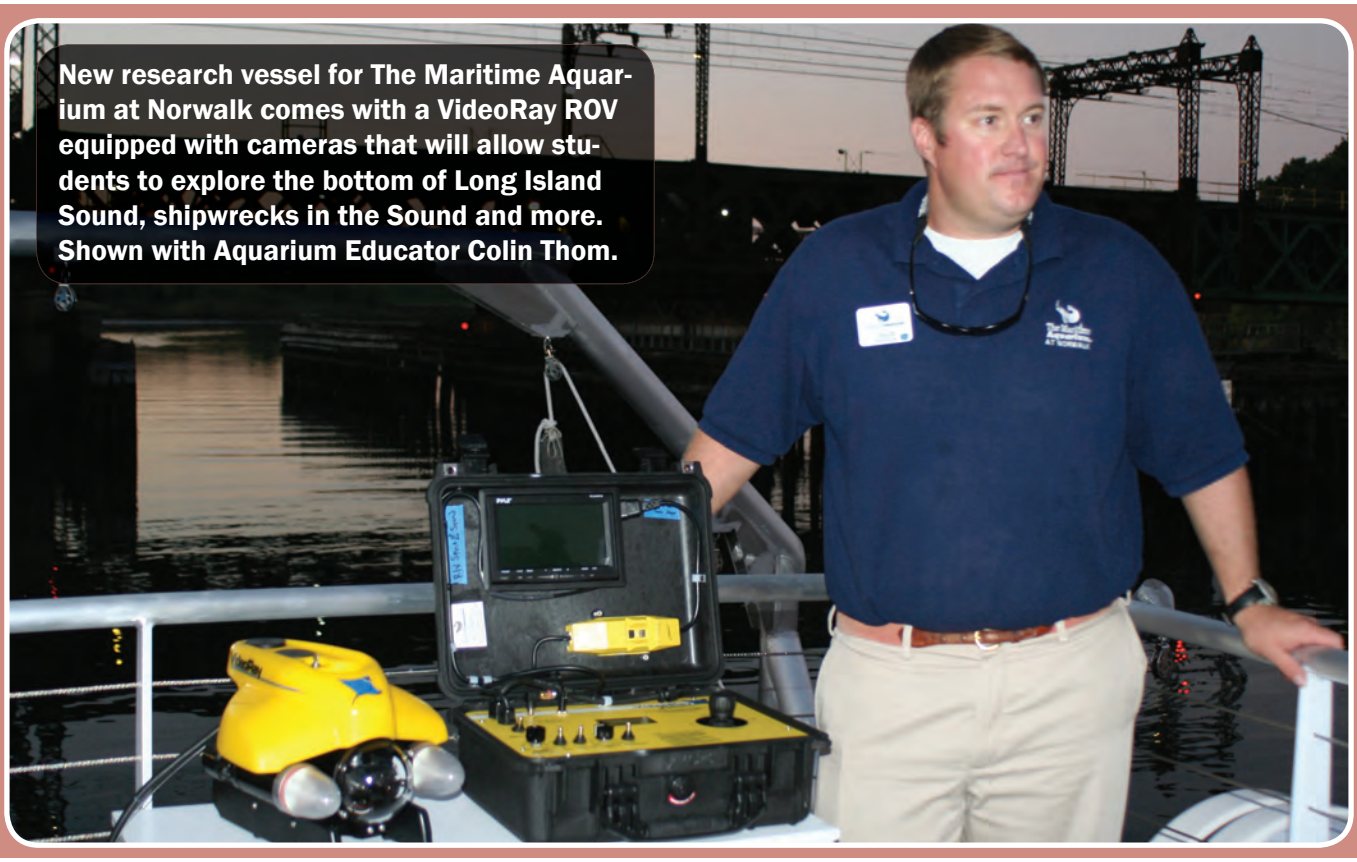
R/V Spirit of the Sound christened by her godmother Astrid Heidenreich on Friday, September 26, 2014. She is assisted by boat build project manager Robert Kunkel, Amtech.

Moment of unveiling name of The Maritime Aquarium's new boat: Research Vessel Spirit of the Sound by Aquarium staff, donors and supporters. From left, Cathy Hagadorn, aquarium educator; Per Heidenreich, donor; Robert Duff, state senator, Norwalk, Conn.; Harry Rilling, mayor, City of Norwalk; Carol Bauer, donor; and Astrid Heidenreich, donor.

Principal donors for new research vessel that will conduct Marine Life Study cruises, Seal Spotting cruises and more for The Maritime Aquarium at Norwalk. From left: Cathy Hagadorn, educator; George Bauer, donor; Per Heidenreich, donor, State Senator Robert Duff; Carol Bauer, donor; Norwalk Mayor Harry Rilling; and Astrid Heidenreich, donor.

is being built in Mamaroneck, New York, at the Robert E. Derecktor Inc. shipyard, with construction managed and integrated by Alternative Marine Technologies (Amtech). Her hybrid-electric propulsion system was made by BAE Systems Inc., Corvus Energy and Northern Lights Hybrid Marine.

Fundraising and planning was led by Per Heidenreich, founder of Norwalk-based Heidmar, Inc., a commercial tanker operator. Committee member Robert Kunkel, president of Amtech, is serving as the Aquarium's project manager for the boat's construction.



New research vessel for The Maritime Aquarium at Norwalk comes with a VideoRay ROV equipped with cameras that will allow students to explore the bottom of Long Island Sound, shipwrecks in the Sound and more. Shown with Aquarium Educator Colin Thom.

Floating Production Systems

What's New in October

By Jim McCaul

324 oil/gas floating production units are now in service, on order or available for reuse on another field. FPSOs account for 65% of the existing systems, 78% of systems on order. Production semis, barges, spars and TLPs comprise the balance. The oil/gas production floater inventory is the same as last month. There were no orders for additional production systems in September. Another 30 floating LNG processing systems are in service or on order. Liquefaction floaters account for 17%, regasification floaters 83%. No liquefaction floaters are yet in service – all 5 are on order. Total LNG inventory has increased by one unit since last month, the result of an order for an FSRU to be positioned in Dubai. DUSUP in September awarded Excelerate a ten year charter to provide/operate an FSRU in Jebal Ali. This will be a second FSRU in the port – the *Golar Freeze* is already operating as a regas terminal in Jebal Ali. An existing Explorer-class regas carrier will be modified to be able to produce 800 mmcf/d. Operation is to start in 2016. In addition, 102 floating storage units are in service, on order or available.

Floater Projects in the Planning Stage – 233 floating production projects are in various stages of planning as of beginning September. Of these, 58% involve an FPSO, 13% another type oil/gas production floater, 23% liquefaction or regasification floater and 6% storage/offloading floater.

Brazil, Africa and SE Asia continue to be the major locations of floating production projects in the visible planning stage. We are tracking 43 projects in Brazil, 49 in Africa and 40 projects in SEA – 57% of the visible planned floating production projects worldwide. Several large projects in Brazil and (less so) Africa will require multiple production units. Overall, up

Number of Floating Production and Storage Units In Service, On Order or Available for Reuse
(As of 1 October 2014)

	Total	Active	On Order	Available
Oil/Gas Prodution				
FPSO	216	163	36	17
Production Barge	10	8	2	0
Production Semi	48	41	2	5
Production Spar	22	20	2	0
TLP	28	24	4	0
Total	324	256	46	22
LNG Processing				
FLNG	5	0	5	0
FSRU	25	13	12	0
Storage Systems				
FSO	102	93	8	1

Breakdown of Planned Projects by Type Production System Required
(As of 1 October 2014)

Type System Required	Number of Projects
FPSO	135
OTHER FPS	30
FLNG	34
FSRU	20
FSO	14
Total	233

to 275 production floaters of various types will be required for the 233 projects we are tracking.

Around 15% of the 233 visible planned projects are likely to advance to the EPC contracting stage within the next 18 months. These projects typically have either entered the FEED phase, pre-qualification of floater contractors has been initiated or bidding/negotiation is in progress.

Another 48% of the visible projects are at a stage of development where the EPC contract for the production unit is likely within the next 18 to 48 months. The remaining 37% of projects are less advanced in planning, with the EPC contract likely 4 to 10 years out.

New Forecast of Production Floater Orders – We have just completed a detailed analysis of the outlook for production and storage floater orders over the next five years.

Utilizing our database of planned projects, we use a bottom up approach to establish the likely number of floating production projects to reach the investment stage between 2015 and 2019. Then we analyze the underlying business drivers likely to exist during this period – and assess how these drivers will likely impact the pace of investment decisions in project development starts. Having a large number of projects at the investment stage is certainly important. But ultimately, the field operator has to feel comfortable making the investment. The investment environment will determine whether projects go forward, get delayed or be considered non-starters.

In our report we examine 12 underlying business drivers that will influence the pace of investment in floating production project starts. Some of these are positive drivers. Some are negative. All have an impact on the number and timing of future production floater orders.

In the positive category are

- *oil and gas demand keeps growing as world output and population grows*
- *supply disruption keeps the focus on finding new sources of supply*
- *oil prices are holding around $100 – though prices have been weakening lately*
- *many more deepwater drillships/rigs are entering service*
- *the financial market is more open than several years back – capital cost is low*

In the negative category are

- *major energy companies have been cutting back on capital expenditures*
- *a lot more supply has suddenly come into the oil and gas market*
- *shale/tight oil and gas projects are competing for investment funds*
- *constraints in the supply chain are creating delays and overruns*
- *cost escalation is impacting the viability of deepwater projects*

Breakdown of Planned Projects by Location of Field
(As of 1 October 2014)

Project Location	Number of Projects
Africa	49
Brazil	43
SE Asia	40
GOM	24
No. Europe	24
Aust/NZ	16
Medit	10
SW Asia	10
Other	17
Total	233

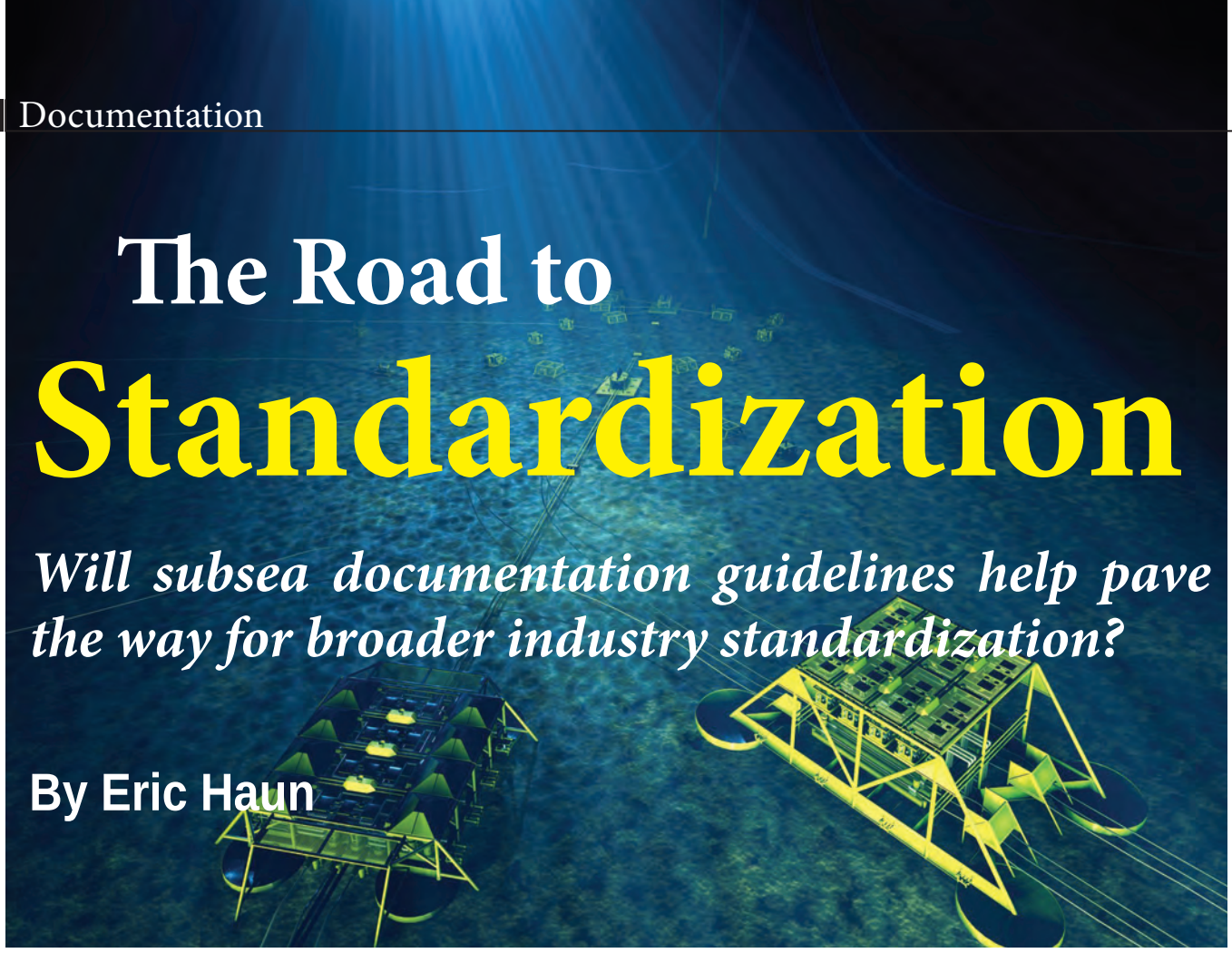
In the unknown category are

- *how competitive will deepwater be with shale oil supply*
- *will a black swan event impact the sector*

The result is a forecast of orders that reflects the growing number of projects in the planning pipeline and a future pace of ordering that reflects the uncertainty about underlying business conditions in which investment decisions are made.

The Road to Standardization

Will subsea documentation guidelines help pave the way for broader industry standardization?



By Eric Haun

Standardization is a buzzword in the subsea sector, but for many it remains a term shrouded by uncertainty. What exactly does the subsea market stand to gain from standardization, and how can it be applied to achieve optimum benefit? But despite the questions, there are several generally accepted notions: standardization can reduce overall costs and project timeframes across the industry; standardization requires industry-wide collaboration and it is something that must evolve over time. So, where to begin? A good place to start is with documentation.

The New Standards

DNV GL has joined forces with partners from the subsea space in hopes of creating industry standards for subsea documentation, an initiative that it says has been welcomed by the industry with wide participation from operators, EPC(I) contractors and suppliers representing all parts of the supply chain. The Joint Industry Practice (JIP) sets out to establish a DNV GL Recommended Practice (RP) aimed at initiating industry guidelines and recommendations required to document typical subsea products and systems, with an associated minimum set of documentation.

"The aim of this broad industry collaboration initiated by DNV GL and the Norwegian Oil and Gas Association is to develop a standardized set of subsea-system documents for designing, approving, manufacturing, verifying, operating and maintaining equipment," explained the JIP project manager Jarl S. Magnusson of DNV GL Oil & Gas Advisory.

DNV GL said the initiative's origins trace back to a project 2010 for which standardized documentation arose as a suggestion from one of several projects developed by the Norwegian Oil and Gas Association to spur standardization within the subsea sector. Now, the drive is ultimately toward simplified, standardized documentation practices for players across the sector, from equipment suppliers to oil majors.

Why address documentation?

As worldwide subsea projects become increasingly complex, so too has the documentation needed to ensure regulatory and operational compliance, meaning preparation and maintenance of relevant documentation has become even more time consuming, complex and costly to deliver. On top of that, requirements differ significantly between the major operators.

DNV GL explained that typical subsea project can involve more than 10,000 documents, with up to 80,000 in a complex project over a lifecycle of 30 years. To develop, maintain and verify the quality, security, accuracy and availability of documentation, operators, contractors and suppliers will often spend millions on document management, technical review and information management systems. Consequently, the lack of standardization can lead to misunderstandings, a reduction in quality and difficulty in handling approvals, distribution

DNV GL's documentation JIP, along with another on JIP forgings, will greatly improve delivery times, reduce cost and improve quality.

Torger Rød, SVP, Head of Subsea, Pipeline and Cessation Projects, Statoil

and availability. This further leads to increasing project lead-times and costs for both customers and suppliers.

"There are thousands of documents produced with any subsea project. This includes the design documentation, fabrication and assembly procedures, test procedure, installation procedures, material certificates, operating procedures and more," said Christian Markussen, subsea business development director at DNV GL Oil & Gas. "Each operator has its specific requirements to these documents in terms of naming convention, logos, document structure, numbering systems, etc. These requirements are not only passed down to the contractor, but also their sub-suppliers. Compiling all this documentation is very time consuming when each operator has its specific requirements."

Frankly, unnecessary complications lead to unnecessary costs; and for an industry that has seen costs skyrocket year after year, any opportunity to reduce expenses while improving efficiency must be welcome.

"The industry is realizing that something has to be done to reduce cost, and standardization is a key to achieving industrialization in the subsea industry," Markussen said. "So far each project has delivered essentially project specific equipment which requires a lot of engineering and prevents optimization of the design, fabrication and purchasing processes. The standardized documentation will allow a more streamlined work process which will free up engineering resources that can be used more productively."

Who benefits?

DNV GL believes subsea projects worldwide would benefit from an industry standard for subsea documentation. As well as improving documentation quality and assisting with on-time delivery, a standard should save suppliers, contractors and operators valuable engineering hours by reducing the need to define and review technical documents.

Markussen said operators are in position to gain most from standardized documentation as they will receive systems at a lower cost with typically reduced delivery times, while suppliers benefit in that they can optimize work processes and reduce wasteful work, also freeing up engineering capacity for productivity.

Jan Ragnvald Torsvik, Lead Engineer of Life Cycle Information at Statoil and co-chairman of the JIP, said, "Statoil is participating in this JIP because the RP has the potential to deliver a significant degree of standardization, efficiency and increased quality. This will be implemented in Statoil through updates of our technical requirements."

And many other companies are on board as well, demonstrating the wide range of support across the sector. JIP partners include: Aker Subsea AS, Centrica Energi, Det Norske Oljeselskap ASA, FMC TI, GDF SUEZ E&P Norge AS, Kongsberg Oil & Gas Technologies AS, Lundin Norway AS, Norwegian Oil and Gas Association, OneSubsea, RWE Dea Norge AS, Statoil Petroleum AS, Subsea7 and Subsea Valley.

Aker Solutions' Document Manager Julia M. Henriksen, said, "This JIP addresses the contractor's need for clear understanding of the key drivers of engineering hours when planning, producing and reviewing documentation. Standardization is critical in order to improve engineering ability to reach on-time delivery targets and ensure the controlled planning and execution of documentation delivery in projects while minimizing the amount of hours spent. Aker Subsea sees great potential in applying standard practice to the scope of subsea project documentation and plans to use the JIP recommendations in its own specifications."

Torsvik added, "All actors in the chain of delivery will gain on spending less time interpreting, understanding and reviewing documents and document requirements when we have a unified way to name equipment, name documents and establish requirement matrix for technical information."

Torsvik continued, "This will not necessarily reduce number of documents, but it will save a lot of hours on producing documents (because they are standard), understanding requirements (because they are standard) and reviewing documents (because they are as expected)."

Although the joint industry project (JIP) is still in its early stages, industry players have expressed that the documentation effort may be a big step toward reducing costs and timeframes, and driving standardization throughout the entire subsea arena. "The standardization of subsea documentation will be a crucial first step in reducing costs in the supply chain," said Arild Selvig, Director Sales and Marketing, FMC Technologies Subsea Eastern Region. "Standardization helps us mitigate increasing cost concerns in the industry. There are numerous benefits to standardization, including cost control, quality and timeliness."

Torger Rød, Statoil's Senior Vice President, Head of Subsea, Pipeline and Cessation Projects, said DNV GL's documentation JIP, along with another on JIP forgings, would greatly improve delivery times, reduce cost and improve quality. "For subsea solutions, [standardization] means defining a limited number of configurable standards that will cover the majority of types of subsea developments," Rød said.

"Standardization is much more than just delivering a standard product. It is about material selection, interfaces, functions, specification, work processes, installation and more," Markussen said. "Once the effect of standardization is realized, then it will be self-reinforcing."

Eliminating the Spread of Crude Oil Spills

A new method is now available to stop the disastrous spread of major oil spills in offshore areas. Until now spills of various sizes plagued the offshore oil industry for years along with the destruction of marine life. The new method involves a floating ring-like device called PROE ("Protection Ring Offshore Environment") that encircles the drilling rig. It has a curtain uspended vertically from the ring bottom that retains virtually all the oil spill. PROE is self-propelled and is submersible so it can "chase" oil spills if necessary. When not in use it can be submerged below marine surface traffic. It may also be divided into several parts in case the spill accumulates in several areas. Several million barrels of oil spill can be captured using PROE.

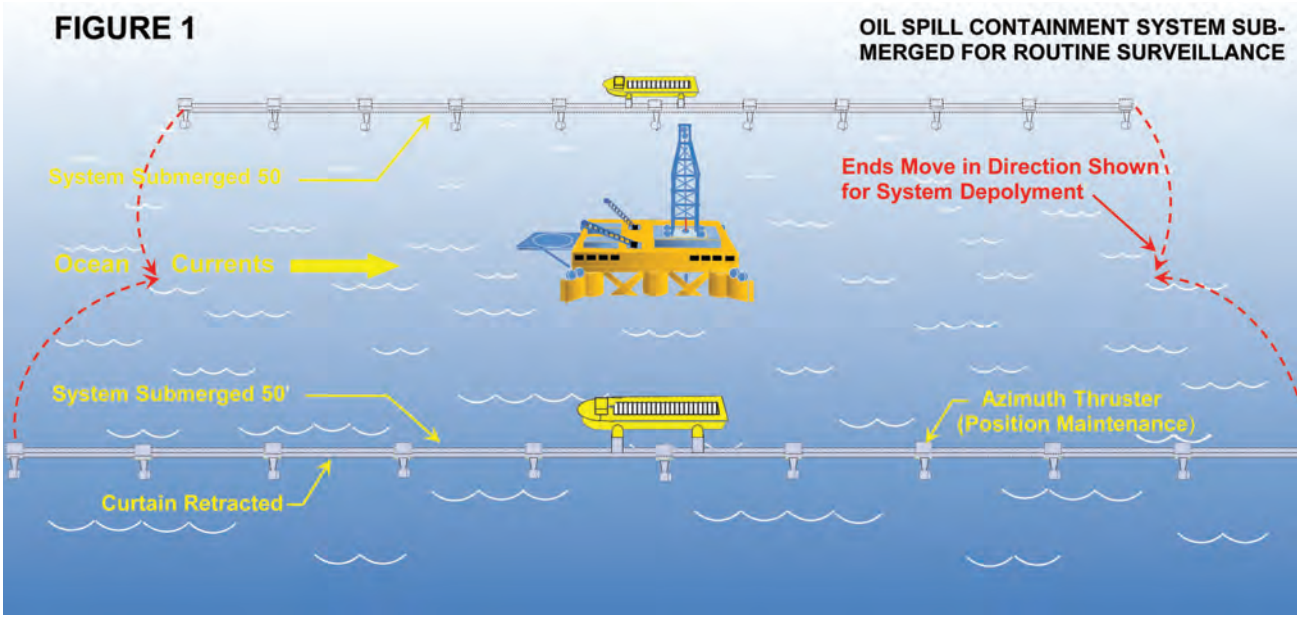
PROE was developed following the BP Macondo oil spill in the Gulf of Mexico, one of the largest offshore spills in history. An estimated 97% of the cost of this spill may be attributed to the damages from the uncontrolled spread of oil. It eventually covered an estimated 29,000 square miles or an area about twice the size of Denmark. A total of 206 million gallons of oil reportedly escaped from the damaged well at a rate of 2.5 million gallons per day. Few companies could withstand the economic impact of an accident of this size.

Several time consuming operations are necessary to stop the uncontrolled flow of oil from a well following an explosion or blowout. First, a great deal of time may be required to clean up the "train wreck" of collapsed pipe and other debris from around the well on the ocean floor. This must be done prior to attempting to shut off the escaping oil by capping the damaged well at the ocean floor. Another method of shutting off the escaping oil involves the drilling of adjacent "kill" wells which also may require a great deal of time. Unfortunately the spill continues uncontrolled during the time in attempting to shut off oil flow from the well by either method. Both capping and drilling were used to stop the Macondo accident, but this took 88 days.

So time becomes the most critical issue in stopping the oil spill. The Macondo accident did provide important information on timing and costs. This $42 billion spill cost an incredible $20,000,000 for each hour of discharge (or $333,333 per minute) over the 88 day period. The cost continues to increase based on recent reports. In addition to the critical time issue, the recovery of spilled oil is the second major problem. After applying virtually all of the oil spill recovery methods available to the industry, only about 17% of the spill was recovered or some 833,000 barrels of the 4,900,000 barrel Macondo total spill. Much of the recovered oil was in the form of an emulsion. The low recovery is no surprise since emulsions become heavier with continued weathering and sink far below the reach of skimmers and dispersants.

To provide adequate protection from the spreading of oil spills it is clear from past experience that the right kind of retainer equipment must be at the well site at all times during drilling and completion operations.

The American Energy Investment Group, a Houston independent oil company, is now implementing PROE, the oil

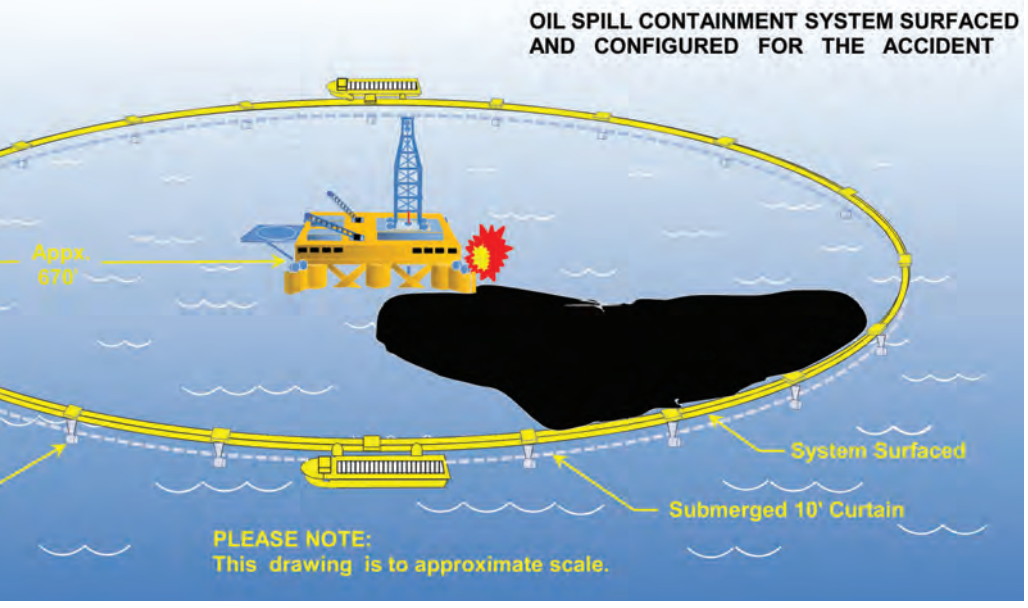


spill retainer system shown in Figure 1. American Energy is the developer and owner of the PROE patent which was issued in 7.5 months. PROE is pictured in the in the submerged surveillance position consisting of two linear parts pointing into the ocean current as shown. PROE is highly flexible since it is modular, self-propelled and submersible with a retractable retainer curtain. Thus, its size may be expanded or reduced, it can rapidly change location and, except for periodic testing, it remains submerged some 50 feet below marine traffic and weather. The retracted curtain during submergence substantially reduces current drag and compressed natural gas fuel usage.

Most important, PROE is assigned continuously to the rig during all drilling and completion operations. In the event of a blowout or other accident PROE is surfaced, the two ends are locked together to encircle the rig and the retainer curtain is deployed as shown in Figure 2. Set-up operations are estimated to require less than one hour. The azimuth thrusters provide the force necessary to move PROE into the correct position and maintain that location with the aid of GPS. Depending upon the circumference of the system and curtain height, PROE can contain in the order of about 2.5 to over 5 million barrels, which may be desirable despite the fact that oil and emulsion will be offloaded by tankers from PROE shortly after initiation of the blowout.

According the company, advantages of PROE include:

- ***Protection:*** Avoid the widespread destruction of marine life, terrible public relations and catastrophic, "company killer" costs for damages.
- ***Immediate Response:*** 24/7 surveillance at the well for immediate response. No delays due to travel time that might cost up to $20,000,000 each hour.
- ***Conservation:*** Reclaim the spilled oil since virtually all the oil will be quickly contained by PROE and removed by oil skimmers and tankers.
- ***Reduction of Insurance Costs:*** Very likely reduce the cost of spill liability insurance premiums.
- ***Modest Cost:*** PROE is estimated to be only about 5% to 6% of deepwater drilling costs, not considering the possible savings in spill liability insurance.



Changing Paradigm of Submarine Programs

Technology and dynamic mission profiles have driven change in the defense industry, Hydro Group Plc Managing Director Doug Whyte, explores the changing paradigm of submarine programs, an evolving market he has experienced first-hand, with over 30 years at the helm of his own innovative subsea design and manufacturing group.

My original business partner, Mike Redstone, previously worked for Vickers Slingsby which was involved quite extensively with the Ministry of Defense (M.O.D.). At that time, in the late seventies, close involvement with the M.O.D. was commonplace. In addition to central office, located at Abbey Wood, our main contact offices were Bath and D.E.R.A. at Portland – now all gone. The first submarine contract with which we were involved was the Vanguard Class SSBN which deployed the 16 Trident D5 missile system and it began trials in 1992. Hydro Bond Engineering and Hydro Cable Systems were involved with outboard cable and connector systems for the onboard degaussing units, following on with similar projects for its sister boats Victorious, Vigilant and Vengeance.

The modus operandi for UK submarines during the cold war was to run silent, run deep and to capture signal, noise and signature data from the enemy known as the "Take" and, of course, to deliver a nuclear strike from their unknown position somewhere near to Russia. The UK was ahead of its field in sonars, so most submarine platforms had cable and connector systems fitted.

Doug Whyte, Hydro Group Plc Managing Director

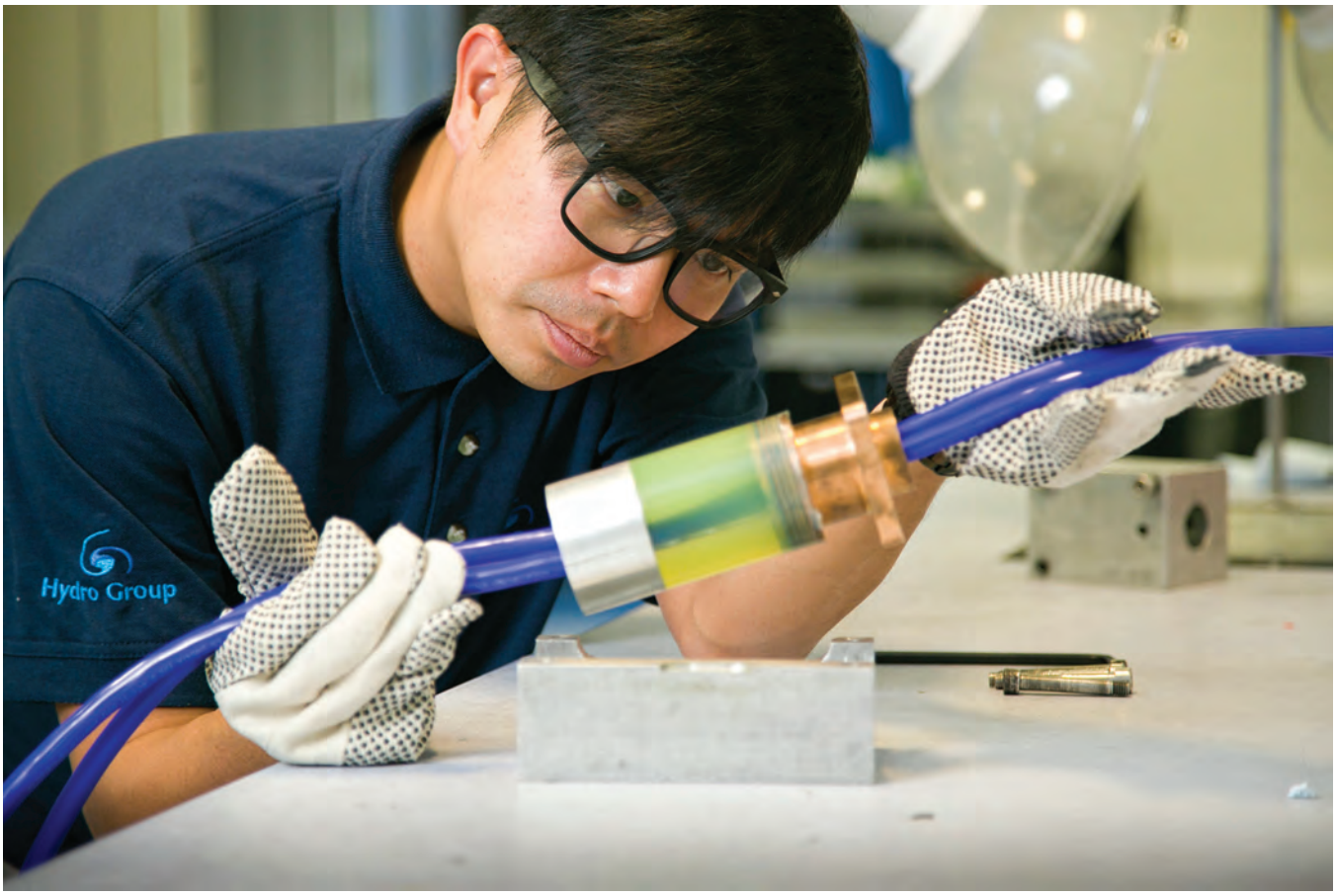
Sonar development has moved on at considerable pace and comprises more highly technical equipment, external to the hull, which requires cables and connectors that feed through the hull to the heart and operations of the boat. An example is periscopes, which are referred to as masts, which penetrated the hull of the submarine. Watch the old black and white war movies – when the Commander shouts "Up periscope!" and half of the Atlantic comes rushing in! Now, with advanced technology, the mast is external to the hull and all of the data and communications are fed via cables and connectors using fiber optics, which is Hydro Group's area of expertise. Today, mine counter measures, (MCMs) towed arrays, active and passive sonars and anti-surface ship missiles are necessary requirements of the new construction for modernization of current submarines in service, such as the UK's Astute fleet.

The Astute Class Submarine is currently the most advanced and powerful attack submarine ever operated by the Royal Navy at over 7500 tonnes submerged, capable of speeds more than 30 knots, powered by Rolls Royce PWR2 reactors. The duration range for deployment is only limited by the amount of food on board so it can stay at sea for months at a time. It is armed with land attack missiles and Spearfish torpedoes. Its sonar system 2076 is the world's most advanced and is fitted with Hydro Group's cables and connectors.

Bearing in mind the cost of the nuclear defense program, controversial as it is, the construction of a nuclear submarine is in the billions and the support services and duties around the world is in the millions. Submarines are continually being built to larger specifications (tonnage) and this is true for all counties around the globe which build them. So, it's essential that the equipment installed is designed, tested, and qualified to last its lifetime to ensure the boat's security and the men who work on it.

Hydro Group is involved in subsea engineering in the oil & gas and renewable energy industries and provides similar solutions and designed products which have synergy with those we produce for the defense industry. Our innovation is focused on the longevity of product where the installation has a life cycle requirement of 40 years.

Evolving technology and dynamic mission profiles have



Hydro Group Technician

Many other nations are looking to modernize their own fleet of submarines and a shift in procurement patterns is stimulating collaboration and consolidation in the market. The Asia Pacific region is one such significant growth area for the submarine market.

driven change in the industry. Underwater sensor and propulsion innovation have enabled extended subsea endurance and has broadened the operational scope of today's submarines. Mission profiles now include intelligence, surveillance and reconnaissance operations (ISR) and for the deployment of Special Forces on covert missions in hostile territory. The versatility of submarine operations is constantly adapting to meet the different types of global threat.

Many other nations are looking to modernize their own fleet of submarines and a shift in procurement patterns is stimulating collaboration and consolidation in the market. The Asia Pacific region is one such significant growth area for the submarine market. The jostling for power amidst a growing sense of hostility is fueling an arms race in the region and driving the need for submarine protection. Territorial disputes between counties are increasing and they are all primarily dependent upon maritime routes. South Korea is embarking on an indigenous program of submarine construction and, due to its commercial acumen of driving down costs, will also give the country a platform to sell and build boats to other countries.

Asia is expected to impact significantly on the submarine market over the next several years, with an estimated expenditure of $46 billion dollars, a figure matched by the whole of Europe on its submarine building programs. Currently the global market is dominated by America with 46% of all build, followed by Europe with 25%, Asia with 24% and Latin America with 5%. The Asia Pacific region has recovered from the global economic slowdown which is encouraging spending on defene and in particular submarines.

Hydro Group addresses diverse and in some cases rapidly changing markets, albeit the submarine programs move at a slower pace, the technological innovation developed is long

term in its planning and well in advance of future implementation. In order to keep pace with demand we work closely with our customers to understand their technology and business needs to engage at an early stage of the product design cycle. Cooperation in the design of solutions allows us to gain invaluable insight into the functional objectives and to address any specific technology opportunities. This minimizes product realization timescales.

Replacing the current Astute submarine fleet will be Successor, which will carry the U.K.'s strategic nuclear deterrent. According to Naval Forces, Successor will be the largest and most advanced submerged platforms operated by the Royal Navy and the design and construction will be the most technologically complex in the history of the U.K.

Successor will be built and equipped by BAE Systems. Hydro Group has been selected to design, develop and qualify a range of connectorized through-hull penetrators on the submarine fleet, which has been acknowledged by BAE as offering a highly innovative and cost effective penetrator solution to take the Successor fleet into the next decade. The project will engage a dedicated team of Hydro Group's engineers and the new technology requirements dove-tail with the Group's current extensive R & D program. The design and development of the new range of through-hull penetrators will be subjected to a process vigorously controlled by extremely onerous standards and testing procedures with a demanding set of electrical power and signal, radio frequency and optical requirements. The design must guarantee a cast iron capability for the system to perform its mechanical function in harsh or hazardous environments and to ensure that this can be achieved without limiting the electrical or optical performance.

A core aspect of the innovation for the new through-hull penetrators is the migration of inserts from Hydro Group's existing range of submarine dry mate connectors (SDMs), originally developed for the Astute Program.

The complimentary requirements of the subsea energy, defense, scientific and offshore renewables markets provide scope for Hydro Group to adopt and adapt appropriate processes that enhance the solutions and service provided to all subsea markets. Technological solutions for the Successor fleet will undoubtedly advance innovative research and development in other industries.

Continuous investment in our equipment, processes and facilities, together with our commitment to training and staff development all contribute to flexible and adaptable support to our customers and to providing active participation in a number of collaborative programs with them and other consortiums.

Technological advancement of submarines will continue to provide a business opportunity for Hydro Group, strategically focussed on the U.K.'s defense capability, and long term, around the globe.

Image courtesy of CGG

Broadband Seismic for Enhanced Pre-salt Imaging

By Claudio Pascoa

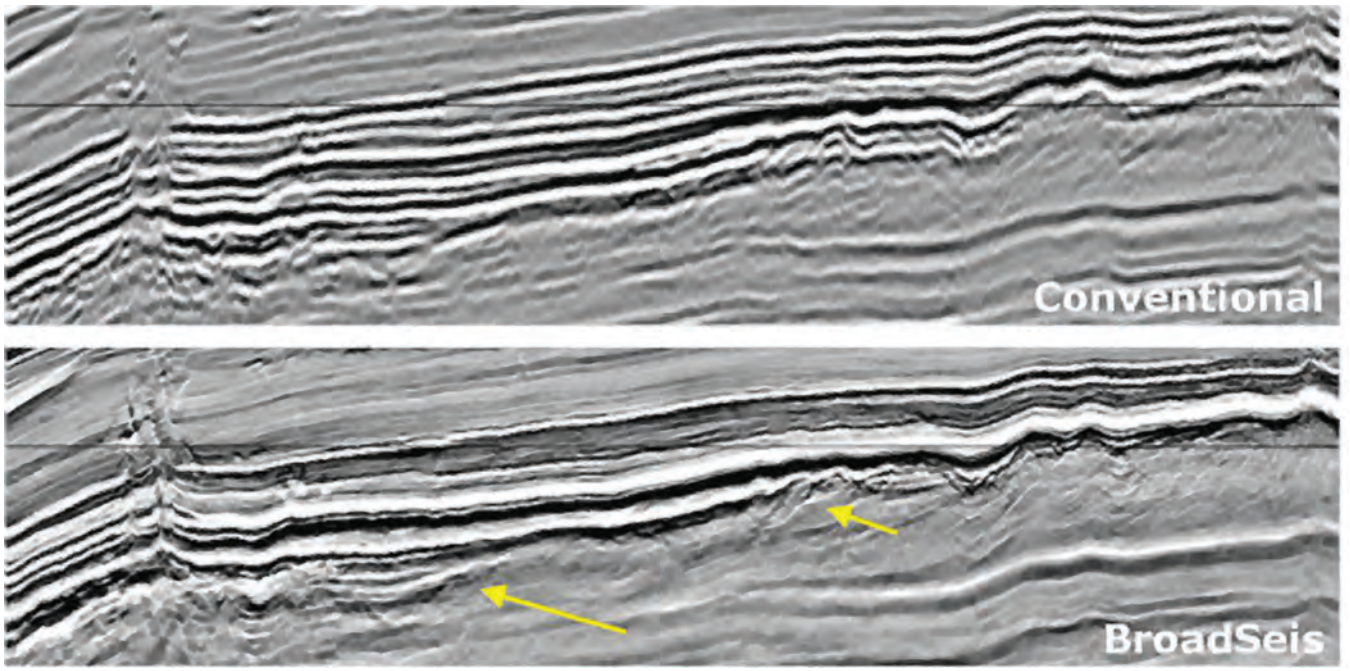
Along the last decade major improvements in the quality of subsurface mapping of geological formations containing complex salt bodies have taken place with the introduction of broadband seismic survey technology. Since the discovery of the Lula oil field in 2006, CGG's BroadSeis has been involved in the most important pre-salt discoveries. Marine Technology Reporter's Correspondent in Brazil, Claudio Paschoa gives us some insight on CGG's experience in shooting seismic of large areas along the pre-salt rich Santos Basin, with its trademark BroadSeis, 3D broadband seismic data acquisition system.

New PSDM 3D seismic reflection data acquired from the highly prolific Santos Basin provides comprehensive insight into, the evaporite architecture and potential pre-salt hydrocarbon reservoirs, allowing geologists to have a better understanding of these deepwater geological formations. "The pre-salt region runs from the south of the state of Bahia, to the north of the state of Santa Catarina, yet some remnants of the salt layer can be found further north, such as along the Sergipe/Alagoas Basin," said Luiz Braga Ph.D, VP – Director of Geomarket Latin America for CGG. Pre-salt reservoirs are always found in carbonate rock formations beneath salt layers and salt domes that can be up to 2,000 meters thick, which act as seals, above the salt lay complex and heterogeneous rock formations that can be as thick as the salt layer and all this under 2,000 meters of water or more. Acquiring seismic data that clearly shows the boundaries and composition of different layers during visualization is a daunting task for geophysicists and engineers alike.

Pre-salt Seismic Exploration

It is widely known be that early Petrobras seismic surveys in

Above: The Geo Coral, C-class vessel towing streamers.



Comparison of BroadSeis and Conventional seismic

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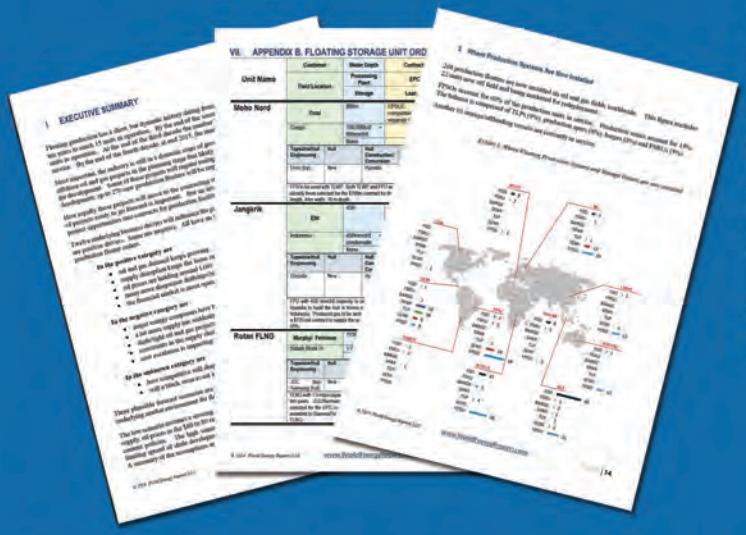

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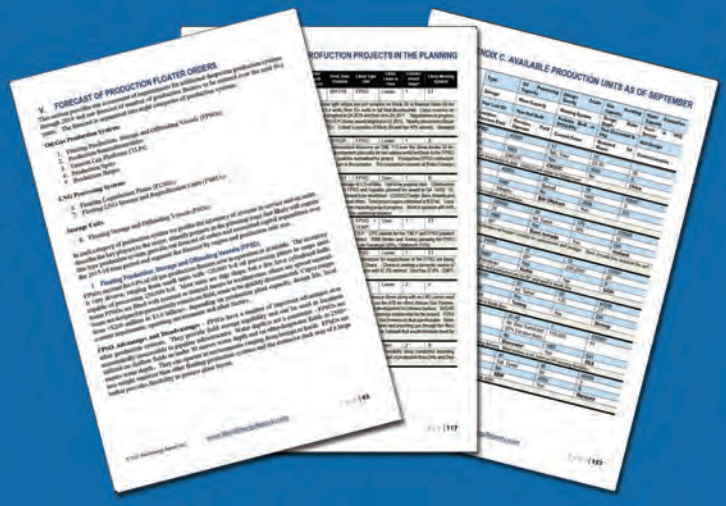

About IMA

Jim McCaul, Managing Director and founder of International Maritime Associates (IMA) has produced 50 multi-client industry reports on the floating production sector over the past 18 years. IMA's "floater reports" have been a widely cited reference source in the offshore industry, and our annual forecast of equipment orders has been widely referenced in investment presentations, industry publications and other consulting firm reports.

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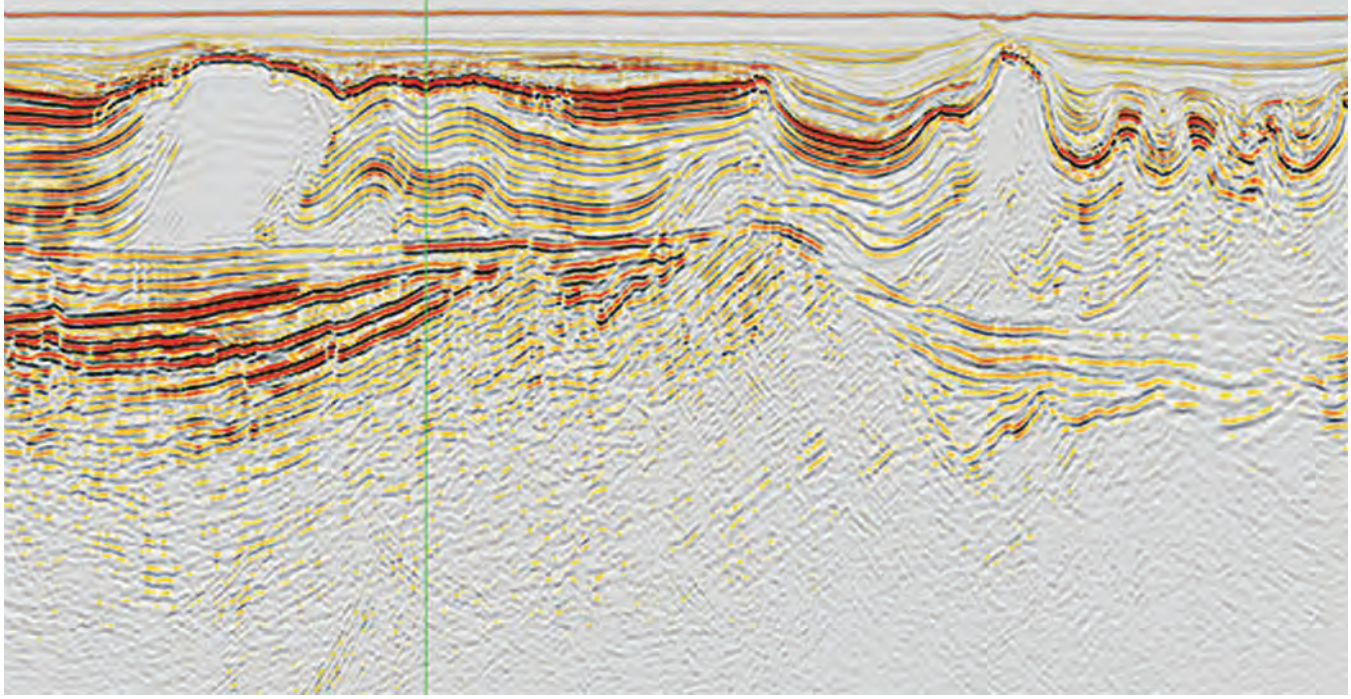
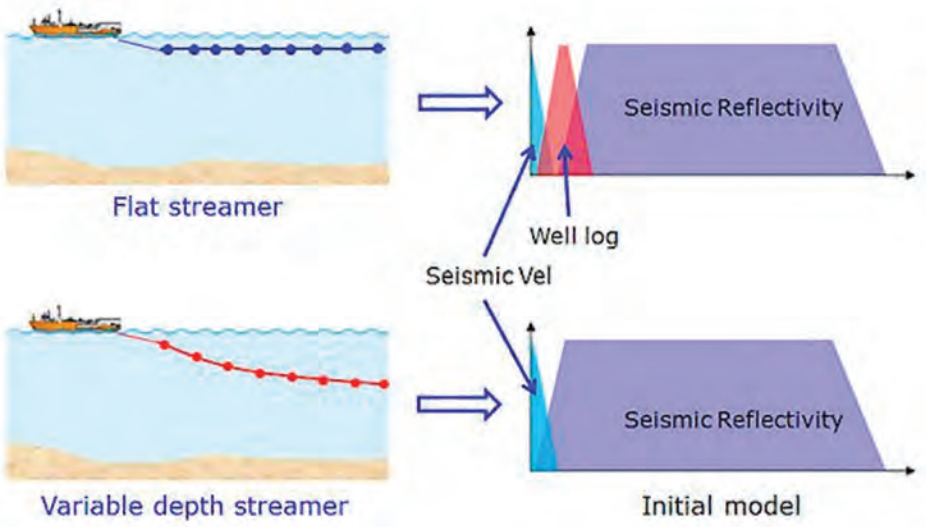


Reverse Time Migration section across the Lula (Tupi) discovery shows improved definition of base salt and termination of sediments against the salt flanks.

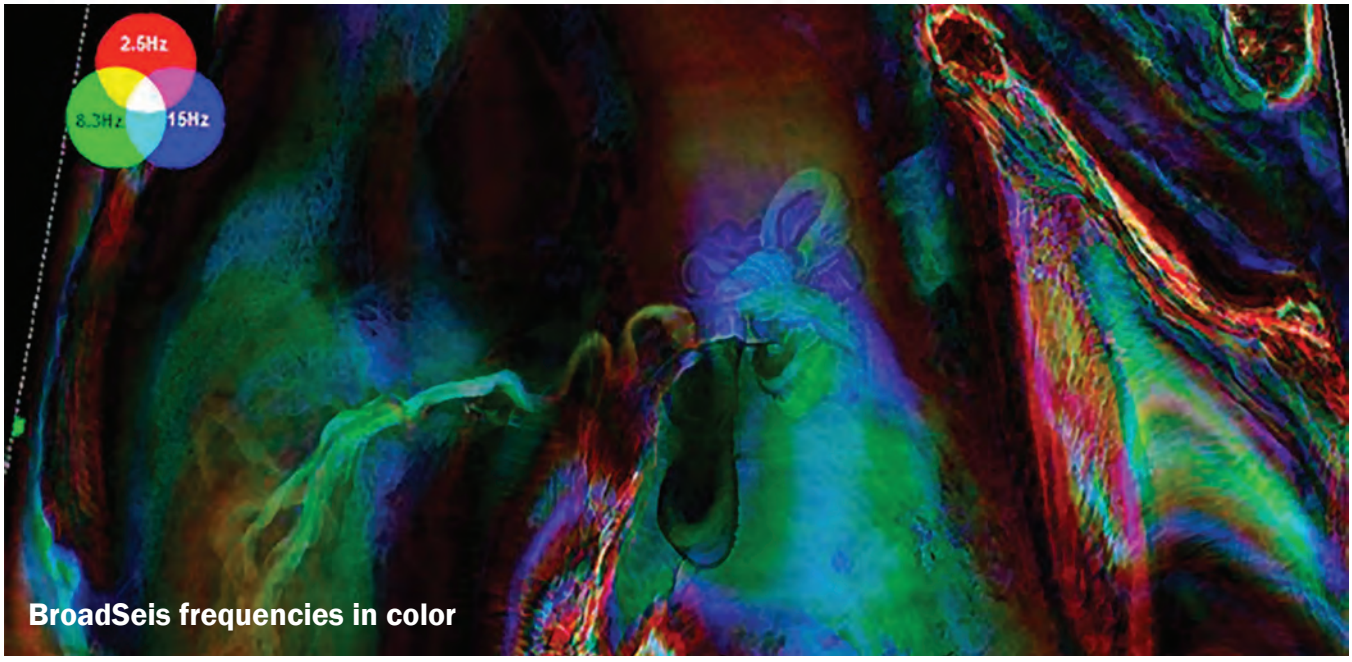
the Campos Basin targeted shallow water, pre-salt reservoirs. Several large plays were discovered between late 1970's until the early 1980's in pre-salt fractured basalts, sandstones, and coquinas, with coquinas being the primary reservoir. However, with the discovery of super giant fields in post-salt, Upper Cretaceous and Tertiary large scale, turbidite sandstones, the sub-salt system was largely ignored until around 2004.

"It was generally believed by Petrobras geoscientists that the sub-salt rocks were too compacted to be good reservoirs," said Dr. Marcio Mello, President of High Resolution Technology and Petroleum (HRT), in 2008. The early seismic pre-salt data acquired offshore Brazil, which showed traces of the salt layers actually excited other geologists in the know, with the possibility of large, thick pockets laden with hydrocarbon and source rocks being trapped under these salt seals, which proved to be the case, but the quality of seismic data was not good enough to form a clear picture of the reservoirs. The technology at the time did not allow for much deepwater exploratory drilling and it would take almost a decade for the first deepwater wells to be drilled offshore Brazil and these were targeting post-salt prospects. Only after the turn of the century did seismic surveys begin to deliver higher quality data needed for deepwater pre-salt formation analysis, and only around 2004-2005 was the Broadband technology first applied to seismic surveys in the Santos Basin, which led to the discovery of the Lula field (at the time named Tupi). By then the quality of the seismic data allowed, Petrobras and partners to confidently commit to the hugely expensive drilling of the first pre-salt pilot well.

Before the discovery of the Lula field conventional wisdom had it that most of the big, easily located fields known as "elephants" had already been discovered and the only fields left were smaller and more difficult to find. This historic discovery is located in Block BM-S-11 in the Santos Basin, 190 miles (305 km) offshore, lying below 2,000 meters (6,600 ft.) of water and 5,000 meters (16,000 ft.) of salt, sand and rock layers. In 2006 Lula was ranked as one of the 50 largest fields in the world, yet it is well known that its volumes of recoverable oil have been surpassed by the Libra field and by a few other Brazilian supergiant discoveries as well. It is important to note that Libra is located within the same Block BM-S-11 as Lula. Other significant discoveries have been made within an approximately, 50 mile (80 km) radius. Another good example within this radius, is the third well (informally known as Carcará), drilled in the Bem-te-vi field's Evaluation Plan (PAD). It is located in Block BM-S-8, and identified a significant pre-salt column of at least 471 meters of light oil of 31° API. Pressure data obtained indicate that the reservoirs under these three wells are interconnected. As yet, there has been only speculation on the recoverable volumes of this reservoir, with some saying it may be the biggest yet. All of these reservoirs were located, using CGG's BroadSeis seismic acquisition technology. Between the years 2001-2002, a unique 20,000-sq. km, 3D seismic survey over the blocks covering the Lula discovery was acquired by CGG as a multi-client survey. In 2008 a test area covering the discovery was reprocessed using CGG's advanced Reverse Time Migration, which significantly enhanced the image of the reservoir beneath the salt. The test was performed on CGG's multi-client library, and based on its success CGG reprocessed the overall survey, which led to other significant enhanced reservoir images that are now recognized as high volume reservoirs, true "elephants." The 3D seismic data acquired by CGG was the key factor in revealing the pre-salt potential in the Santos Basin. With the Cluster Survey covering the major Lula, Carioca and Jupiter discoveries, whilst a 16,000 km 2 Cluster extension Survey covers an area with predominantly unlicensed acreage with significant reservoirs, which are mostly now part of the Oner-



Variable depth streamer



BroadSeis frequencies in color

ous Transfer of Rights Agreement, between Petrobras and the Union (Brazilian Government).

BroadSeis Technology

CGG's BroadSeis technology is based on a marine broadband seismic data acquisition system, combining the use of sensitive low-noise Sercel Sentinel streamers configured to optimally curved, variable-depth, streaming profiles, with an average depth of over 40 m, and 3D de-ghosting. The combined use of the optimized Sentinel streamers and very deep and stable towing has delivered an excellent signal-to-noise ratio at the lowest frequencies (down to 2.5 Hz). The development of this unique broadband seismic data acquisition system, has been a key factor in enhance deep, pre-salt imaging, and also to highlight layering and facies variations. "The optimally curved streamer profile provides excellent receiver ghost notch diversity, for de-ghosting the data and accessing the widest bandwidth possible. This results in a clean, sharp seismic wavelet, with minimal sidelobes. This, along with Reverse Time Migration imaging technology has greatly improved the resolution of events and allowed geologists to more easily recognize and interpret the geological features that identify the location of potential hydrocarbon reservoirs. After the discovery of Lula, subsequent discoveries confirmed that the Lower Cretaceous carbonate reservoirs have been established within the upper synrift and post-rift layers, singling out these layers as the most probable locations of any pre-salt reservoirs in the Santos Basin," said Luiz Braga, while explaining how BroadSeis worked. Another CGG seismic asset is StagSeis, which is a full-azimuth, ultra-long offset broadband solution to provide the best images beneath complex overburdens, such as found in the pre-salt, to reduce exploration risk.

Pre-salt Characterization

Within the pre-salt, a number of mega-sequences can be identified, with the oldest being a highly faulted, pre-rift basement. These basement blocks impart a major influence on the deposition of pre-salt reservoirs. Lacustrine shales and mudstones make up the highly prolific source rock. Directly above are thick, syn-rift sediments, consisting of a lower and upper sequence. These sequences can be differentiated easily from each other, due to the changes in sediment character and orientation of sediments, along with the termination of extensional faults at the base of the post rift. The upper syn-rift is important for petroleum exploration in the northern Santos basin, as it provides the main carbonate coquinas reservoir for Franco and Libra fields. The boundary between the upper syn-rift and post-rift sequence is marked by an erosional unconformity that represents a major change in depositional environment. This uncorformity indicates a change from an active rift environment to a period of thermal subsidence. During this phase, non-marine microbial carbonates were deposited, with build-ups forming above faulted basement highs. These post-rift sediments can be identified by uniform, parallel reflectors, along with aggradational build-ups. Recognition of this sequence is key to establishing potential reservoirs of non-marine carbonates, as observed in Lula field. All pre-salt reservoirs are sealed by a thick sequence of evaporates, that extend laterally across the basin. These evaporites consist of deformed halite, inter-bedded with autochthonous anhydrite and clastic sediments of Aptian age.

This year CGG has started acquiring a large BroadSeis 3D multi-client survey program in the deep and ultra-deepwaters of the Espírito Santo Basin, with the project receiving large prefunding from major industry players. The Espírito Santo Phase III survey will cover an area of over 9,500 square km. The high-end BroadSeis data is being processed at CGG's powerful subsurface imaging hub in Rio de Janeiro through advanced PSDM workflows in order to meet the specific imaging challenges of the Espírito Santo Basin pre-salt plays. During the announcement of the Espírito Santos project in May, Jean-Georges Malcor, CEO, CGG, said: "We are delighted to conduct this new multi-client project in the Espírito Santo Basin where CGG's recognized broadband imaging solutions will help to further unlock the fantastic potential of this basin. This program will add to the recent success of our broadband technology in the Santos Basin where CGG owns the largest 3D multi-client seismic library." This new survey in the Espírito Santo Basin, has Brazilian geologists who specialize in pre-salt mapping excited, as there are true possibilities of large reservoirs being uncovered due to the broader bandwidths and sharper wavelets used in by the BroadSeis technology. "The most significant portion of the salt layer, where the great lakes were formed during the separation of the continents can be found in the Espírito Santo Basin," said Luiz Braga. With this fact in mind, it is not unreasonable to consider the possibility that other giant or even supergiant reservoirs may still be discovered off Esrírito Santo, with the eastern and southern sectors of the basin, the deepwater portion bordering the north Campos Basin being especially promising,

Broadband seismic data gives the following benefits on the South Atlantic Margins:

- ***Overall genuine formation signature: no side-lobes and sharper central peak.***
- ***Strong basis for reservoir characterization and pre-stack seismic inversion.***
- ***Low frequencies penetrate deeper to help imaging trough salt bodies and interpret deep syn-rift fault blocks to better understand pre-salt plays.***
- ***High frequencies allow for high-resolution shallow imaging and subtle facies variations in the post-salt turbidite plays.***

San Diego

Where it's good to be "Blue"

As San Diego's Blue Tech Economic Engine shifts into high gear *MTR* profiles several San Diego companies, organizations and executives that both benefit from and contribute to the growing maritime and marine technology cluster.

All stories by Edward Lundquist

Blue Tech Economic Engine Shifts into High Gear

San Diego's "Blue Tech" cluster is making waves. And like a high tide, the powerful "Blue Economy" is raising a lot of boats. What is the "Blue Economy?" It has been defined as the sum of all economic activity having to do with oceans, seas, harbors, ports and coastal zones. San Diego's "Blue Economy" includes a growing cluster of maritime-related companies and organizations across 16 industry sectors including fish farming, desalination and clean water technology, subsea exploration, biomedicine, defense, marine recreation and ocean observation.

San Diego has a significant defense presence, particularly with the Navy and Marine Corps. There are major defense and academic research facilities such as the Navy's Space and Naval Warfare Command (SPAWAR), and the University of California – San Diego's Scripps Institution of Oceanography.

There are many factors that contribute to the success and cohesion of this commercial community. First and foremost is the ocean, itself. The cluster of both suppliers and customers mean that buyers, sellers and users are in close proximity with each other to facilitate collaboration. San Diego is an area with a number of world-class universities and research organizations, and has a deep pool of available and qualified talent.

U.S. Navy photo by John F. Williams

Crew aboard the Office of Naval Research (ONR)-sponsored research vessel (R/V) Melville retrieve a wave buoy during an at-sea demonstration of the Environmental & Ship Motion Forecasting (ESMF) program.

Location is Everything

Marine technology companies, large and small, benefit from the Blue Tech cluster. San Diego-based SIDUS Solutions has 15 employees and definitely sees itself as part of the Blue Tech Community.

According to Leonard Pool, managing director for SIDUS Solutions, being located in the San Diego Blue Tech community has real benefits. "San Diego is a unique community that has grown since the mid-50s to specialize in subsea applications, initially for military activities. It is due to this history, the available access to local community colleges, along with the coastal environment that we selected San Diego to be our home."

"The largest advantage is the ability to be close with our peers," Pool says, "and the ability to go surfing on the weekends."

SIDUS designs and manufactures security and surveillance systems for subsea and hazardous areas, and offers engineering and technical services for custom projects and integrated systems. SIDUS' main office is located in San Diego, where all engineering and manufacturing are performed. "We also maintain a sales office in Houston, Texas to help support our oil and gas customers. In addition we have a partnership with a company in the Netherlands," says Pool.

Defining the Blue Community

Michael Jones of The Maritime Alliance (TMA) in San Diego says we don't know just how big the ocean and maritime technology industries are in the U.S. TMA has worked with partners on several studies to understand BlueTech companies and organizations in San Diego and their importance to each other and the regional economy.

Jones says San Diego is not alone in studying and developing its Blue Economy. TMA is collaborating with a number of U.S. and international organizations to promote the Blue Economy and BlueTech including the Center for Scientific Research and Higher Education (CICSES) of Ensenada, Mexico; OceansAdvance Inc. in St. John's, Canada; the Maritime Innovative Territories International Network" (MiTiN) in Brest, France; and the University of Southern Mississippi. In 2013, the U.S. Integrated Ocean Observing System (IOOS) program office at the National Oceanic and Atmospheric Administration (NOAA) contracted with ERISS Corporation to work with TMA on a multi-year study to articulate the economic impact of the ocean observation sector in the U.S. According to Zdenka Willis, the **U.S. IOOS** program director, IOOS data and information fuels ocean industry with knowledge that determines business operations. "Shellfish growers rely on ocean acidification data to know when to take action to protect crops. Shipping companies check ocean currents, wave heights, and

bridge clearance data to know when it is safe to deliver goods. This study will begin to quantify our economic benefits with facts, figures, company names and more."

Observing Impact

According to Steve Talley, PhD, project manager for the ERISS study, the effort lies in looking at who is taking IOOS ocean observation data, adding value to it and/or using it to create a product. Talley said that many people use the datastream — from oil and gas companies planning deep ocean exploration to people creating windsurfing forecast smartphone applications — and don't even realize where it comes from.

"We want to learn about who is using the data, and what they are doing with it," said Tally. "We want to know what the barriers may be in the way of people making full use of the data, and if users know how to fully understand the data."

Tally says the assumption is that many people are using the IOOS data for economic benefit, and the study wants to determine the impact of that. "Who is using the data, and is it doing any good?"

Ocean observation is a sub-sector of Blue Tech, and includes manufacturers, service suppliers and intermediaries. These companies may not be exclusively working in ocean observation. There are big companies, but the majority have less than 20 employees.

"We want to get recognition of the impact of this 'cluster,' and show people that ocean observing is a huge economic boon to grow business to create revenue," Tally says.

"We also want to find out if we can help business expand if they were able to interact better with IOOS. We may need to educate people, and establish a training center," he says.

The project has taken off. What was originally going to be a three-year study is being compressed into two years because people are so anxious to see the results.

"We can't do a complete technical economic impact report. Our study is more of an economic profile. But it will be a very informative report," Tally says. "It may lead to a follow-on project."

(For information on the study: http://www.usworks.com/usioos/)

Blue Voice

The Maritime Alliance will host the 6th annual BlueTech & Blue Economy Summit and Tech Expo on Nov. 12-13 in San Diego to focus with public and private sector executives on an array of topics important to the growth of the Blue Economy. The Gala Dinner and Award Ceremony on the evening of Nov. 12 will focus on OceanSTEM (science, technology, engineering and math related to the oceans), maritime workforce development and the creation of a national Blue Voice.

For information on the Expo, turn to page 52 & 53

The Summit will also examine coastal and marine spatial planning (CMSP) efforts to identify the best use of the ocean's resources. CMSP is a comprehensive, adaptive, integrated, ecosystem-based, and transparent planning process for current and projected uses of the maritime environment. It is based on sound science and integrates ecological, economic, and social information to inform management and regulatory decisions, reduce conflicts, and facilitate compatibility among projected uses, while sustaining the State's marine ecosystem and resources for present as well as future generations.

"We are promoting San Diego as a site for CMSP, but there is no current process underway," Jones says.

The U.S. Small Business Administration announced on Sept. 30 that it was supporting a new regional innovation clusters, to include a Marine Industries Science and Technology (MIST) cluster along I-10 Corridor including Louisiana, Mississippi, Alabama, and Florida. The MIST cluster will focus on the Stennis Space Center's ecosystem of world class marine technology research, the highest concentration of oceanographers in the world, and a broad consortium of federal and state partners to provide targeted support for the creation and growth of small businesses involved in "blue technology."

From the Desk of Greg Cox:

An in-depth conversation with Greg Cox, a member of the San Diego County Board of Supervisors and California Coastal Commission and a key proponent of the San Diego Blue Tech Cluster.

Greg Cox has been a member of the San Diego County Board of Supervisors since 1995, where he oversees a regional government with a $5.08 billion budget and 17,000 employees. He represents the First District, which extends along the Pacific Ocean and the popular beaches along Coronado to the coastal community of Point Loma. At the heart of the district lies San Diego Bay, a 23-square mile resource for commerce, ecology and recreation. He is currently serving a 4-year term on the California Coastal Commission.

Describe the "Blue Tech Community" and "Blue Economy?"

San Diego's maritime industry and related economic activity comprise the regional "Blue Economy" that was recognized in the 2012 San Diego Maritime Industry Report as an economic powerhouse. It includes everything from shipbuilding to underwater robotics, from desalination technology to aquafarms. It even includes our new open-air, dockside seafood market that is providing San Diego's commercial fishermen a way to sell directly to the public and support their families. Essentially, if it's wet, it's blue.

Why is Blue Tech important to the San Diego area? And to California?

San Diego, and California, is the perfect host for our Blue Economy. We have maritime cities located at the strategic "pivot point" for the Pacific and San Diego has the largest concentrated maritime technology cluster in the U.S. and probably in the world. It represents the "Next Big Thing" for our region and we will be actively supporting its development. Blue Tech represents a diversity of jobs from blue-collar manufacturing to PhD level research. This industry tackles our greatest challenges like drinking water, conservation, atmospheric research, and sustainable food and provides solutions that will benefit the rest of the country. San Diego is a hotbed of economic activity and our highly educated workforce is able to keep that going.

What is the size, magnitude and scope of the San Diego Blue Tech cluster?

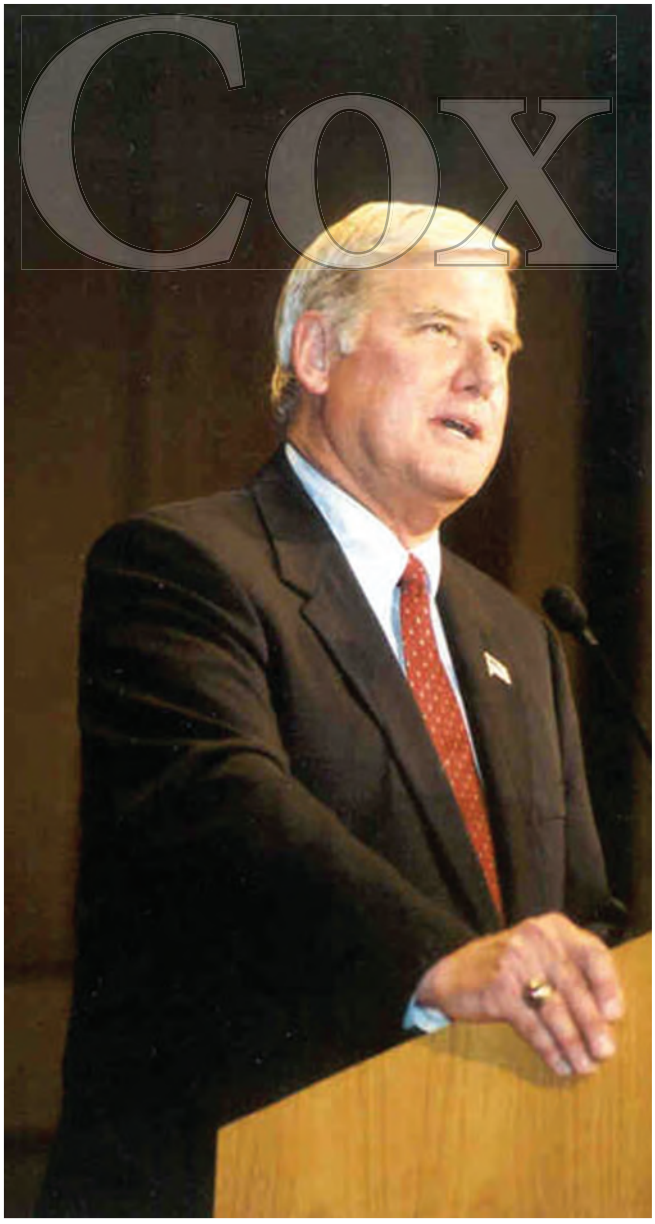
It includes more than 1,400 companies producing over $14 billion of annual direct sales and a workforce of almost 46,000 spread across an array of traditional and technology-oriented sectors.

Why has this cluster grown here in San Diego?

The Blue Economy is anchored in our naval heritage. The Navy attracted the talent, the manpower and the companies that produce the technologies that drive innovation including BlueTech. Now, San Diego's BlueTech cluster represents the next big thing for our regional economy as BlueTech companies continue to develop and export products and technologies. Our location at the far southwest corner of the United States, bordered by the Pacific Ocean to the west, Mexico to our south, a desert to our east and a marine base to our north, creates a unique ecosystem that fosters innovation to address society's biggest challenges. Technologies like water desalination, underwater robotics, alternative energy and sustainable aquaculture are firmly rooted in San Diego. There is also an incredible group of organizations and leaders who are working together to nurture this Blue Economy — the County and City of San Diego, the San Diego Chamber of Commerce, the San Diego Regional Economic Development Corporation, the San Diego Maritime Alliance and the San Diego Association of Governments.

What advantages do Blue Tech companies have by being located here?

We have the largest concentrated maritime technology cluster in the U.S. and probably in the world and we have a commitment from government, businesses and community



leaders to support and develop our Blue Economy. San Diego is a strategic military base as we focus more on security concerns in the Pacific, and we have the largest concentration of military personnel in the world. We have a highly educated workforce thanks to leading universities and research institutions. We have the Scripps Institution of Oceanography; a world-renowned oceanographic research institute.

How can someone engage in the San Diego Blue Tech cluster?

Get involved with The Maritime Alliance. They have been the main driver of our civic conversation about the Blue Economy and they have the resources to help local companies.

Margaret Leinen, Director, Scripps Institution of Oceanography, UC San Diego, shares her insights with MTR regarding the internationally regarded institution and it's Southern California roots.

Can you share with MTR the history of why you are located here in the San Diego area?

The story of Scripps Institution of Oceanography started early in the 20th century when UC Berkeley biologist William Ritter visited San Diego and connected with the Scripps family, which supported a vision of creating a scientific hub that would investigate the ocean and life in it. Their collective hope was that these investigations would eventually add knowledge of great value to the world. This collaboration kick-started an era of exploration and discovery that continues today. Scripps has become one of the most important education and research centers for understanding and protecting the planet and its researchers travel to all corners of the earth and oceans. But although Scripps's research is global, its roots remain local and intricately connected with the San Diego maritime industry and "blue economy."

So specifically, what are some of the advantages that you have by being located here?

Scripps is in a perfect position in San Diego, not only by being part of UC San Diego in La Jolla, but through our ability to foster close links to the Navy, scientific collaborations with the Office of Naval Research and NOAA's Southwest Fisheries Science Center, and maritime businesses. The Scripps Nimitz Marine Facility, based in the heart of the maritime community in Point Loma, is home to our four research

vessels and the research platform FLIP, as well as the future base of Research Vessel Sally Ride, currently under construction. Our Nimitz pier is currently being renovated, and it is vital that our ships are able to relocate to temporary berths nearby, which is possible using Port of San Diego facilities.
The strength and rapid expansion of marine-related businesses in the San Diego area provide key advantages for us. These range from maritime employment and support for our ship facilities, which pump nearly $30 million per year directly into the maritime economy, to linking with marine businesses for ocean exploration. Engineers at Scripps are able to create innovative new instruments at our Marine Science Development Center, and then contract with machine shops throughout the community to take advantage of the strong local high-tech manufacturing sector. Scripps routinely connects with maritime experts around the San Diego area to leverage their skills and expertise.

Do you see yourself as part of the "Blue Tech" community here?

Absolutely. At Scripps, we are strengthening alliances with the private sector to play a stronger and more vibrant role as part of the rapidly growing marine economy. The ocean historically has been the lifeblood of the San Diego region.

Scripps receives support from our maritime neighbors and gives back in many ways; for example, our Coastal Data Information Program (CDIP), which has been a vital component of the California coastline for nearly 40 years. A network of CDIP ocean buoys positioned at key locations transmits data crucial not only for science, but for coastal management, wave forecasting, and maritime navigation.

Are there advantages by being part of this Blue Tech cluster? Explain.

Scripps is tackling some of the most challenging issues facing our planet today, from air and water pollution to climate change, natural hazards and finding new medicines from the sea to treat modern diseases. It takes a broad spectrum of supporting organizations in the maritime sector to support us in these investigations and help us find solutions. Not only do we have leading marine scientists, but we also train the next generation of ocean and earth science leaders. Being based at the heart of a dynamic blue tech sector supports these efforts and ensures that these students have the necessary capabilities at hand.

Making Connections

Teledyne Impulse Knows about Making Connections in San Diego's Blue Tech cluster

Teledyne Impulse designs and manufactures high-reliability electrical and optical interconnection systems and connectors for a broad range of harsh environment applications. According to General Manager, Ray Hom, the company's products are proven performers in the most demanding applications, which include oceanographic exploration, defense, oil and gas production, nuclear systems, and spacecraft and launch vehicles. Teledyne Impulse is a market-focused business unit of Teledyne Oil & Gas, an alliance of Teledyne Technology companies delivering engineered solutions for monitoring, sensing and interconnect applications.

"Teledyne Impulse delivers high-reliability engineered solutions for interconnect applications," says Hom. "We address the current and future needs of the oceanographic, defense, and renewable energy markets through advanced technologies and world-class support. A variety of interconnect solutions and value-added systems are provided that guarantee reliable operation in all ocean environments — 'from the surface to the sea floor.' Teledyne Impulse uses a scientific approach to reliability engineering in the design and manufacture of complete technology solutions." The foundation of these capabilities is Teledyne Scientific Company, a world-class materials science research laboratory with depth and experience to develop the technologies required for the most demanding subsea applications. "We provide a large variety of standard or custom designed solutions—from miniature dry-mate instrumentation connectors to subsea power and fiber optic wet pluggable connectors to suit any application or environment," says Hom. "We also design and develop complex encapsulation and molding solutions for subsea components."

"Our customers include companies that manufacture or use instrumentation, vehicles or systems that go subsea. We support original equipment manufacturers, research organizations, oil and gas companies and end users that operate products underwater. We design and manufacture the interconnect solution that forms a pressure proof barrier between the instrument's electrical housing and the ocean outside to allow for the transmission of data. We may not be the most expensive component on an instrument, but our solutions are essential for successful performance of our customer's products. For mission-critical systems, failure is not an option," Hom says.

Hom says customers can leverage a broad range of expertise, which leads to advances in low to high power interconnection, high data rate, fiber, optic and hybrid interconnection, and encapsulation/molding techniques. "A staged-gate new product development approach, together with rigorous reliability and qualification testing results in the production of high performance solutions validated through science."

It's no surprise that Teledyne Impulse benefits from being a part of San Diego's Blue Tech community. Many companies that serve the oceanographic industry are located in the San Diego area. It is convenient for manufacturing, customers, and supplier relationships as we serve and understand the oceanographic industry.

Hom says the proximity to local businesses help get orders processed faster. And face-to-face communication can often be the best way to arrive at a solution. "When a customer needs something custom made for a special application, there's a real benefit to being able to stop by, and sit down with the engineers and resolve the problem there and then."

"We work closely with customers to identify challenges and provide application-specific solutions. We use these opportunities to introduce new materials and technology, which result in the highest reliability products," says Hom.

"We do business with suppliers that understand the level of quality and reliability we need.

"There's also a big benefit of being near the ocean," he says.

"Making products for subsea is not a trivial endeavor," he says. "You have to know what you're doing and have others around who know what they're doing. We have that here in San Diego."

"We started as a small family owned business in San Diego because it is strategically located near Scripps Institute. We have worked closely with Scripps developing technology and solutions for various research projects since our business started.

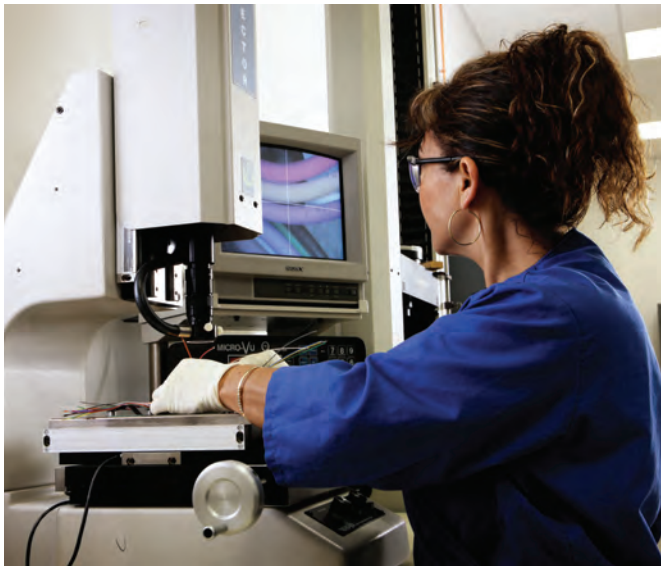
"With the new technology and products we provide and the jobs it creates in San Diego we see ourselves as contributing to the Blue Tech community now and even more in the future," Hom says.

Hom says San Diego's Blue Tech companies in the high tech maritime manufacturing and services industry that contribute towards the economic activity of oceans, seas, harbors, ports and the coast, have become a community characterized by teamwork, and everyone working towards the same goal. "We all strive to improve the maritime community meanwhile creating jobs and opportunities."

The skilled, educated workforce in and around San Diego provides an excellent pool of qualified talent for Blue Tech companies. "A number of our employees used to work for our customers. We look for people who understand and have experience in Blue Tech, and are aware of the challenges in the subsea environment. Having the Blue Tech cluster really helps." Business is good, Hom says. "Over the last ten years we have grown every year. Even through the recession we've had double-digit growth. We're in a good strong sector, and we're doing well. "

What's the next big thing? Hom says the challenge is to make systems that can go deeper and last longer, and improving reliability is always a goal.

Hom says Teledyne's heritage in aerospace has been helpful in building a company that serves the subsea sector. "There are a lot of similarities in terms of requirements. In some cases, the subsea environment is more challenging than outer space."



Ocean Aero

Ocean Aero is all about Ocean Observation

Ocean Aero is a small, new San Diego-based unmanned maritime systems company that has big plans to provide both a product and service to solve a very difficult problem – ocean observation.

"Ocean observation is being able to monitor or sense the environment above, on-top and below the surface of the water. Ocean Observation has been, until recently, largely done by manned vessels which have significant endurance and finical limitations. These limitations transfer immediately to the variety of people who are trying to observe the oceans. We break those people into three groups: scientists; commercial operators and government."

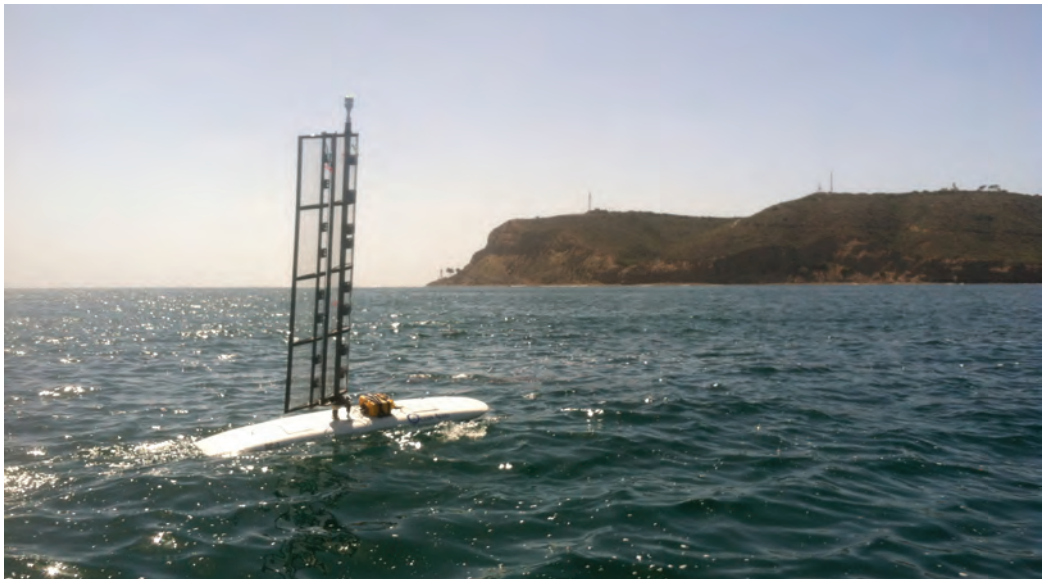
Patten describes the scientists as being all types who have a need to learn more or understand the ocean environment. The commercial operators includes anyone who is operates a part of their businesses at sea, such as fisheries, telecom and oil and gas. Government is a broad area that includes everyone from NOAA (National Oceanographic and Atmospheric Administration), the Environmental Protection Agency (EPA), all the way to the military and intelligence community and quite a few organizations in between.

We are developing a game changing unmanned maritime robot that will be able to operate on and under the surface of the ocean. Our "Submaran" vessel gives our customers the ability sense and observe the oceans both on the surface and beneath the surface—for months at time."

On the surface, the Submaran uses wind propulsion with auxiliary electric motors, giving it a speed of up to 6 knots. Underwater it becomes a buoyancy changing glider with a jet drive. Our small maritime robot will be able to autonomously operate at sea for six to nine months initially, both on the surface and down to 200m. It can easily be launched by two people from a variety of locations, such as a pier, ship and even an aircraft. What we are doing is revolutionary," says Patten. "It has never been done before."

Patten says the Submaran's unique capabilities will allow operators to get into and remain in areas of the oceans that would be extremely difficult —if not impossible— and cost prohibitive for manned vessels. "In addition there is an aspect of what are doing that we will discover more capabilities for customers that we are unaware yet."

"Right now we are a developmental company. We will be transitioning Submaran in about 12 months. We will be offering a Submaran product for sale as well as the associated support services. In addition we will be offering a "system as a service" for those organizations that do not want the capital investment but need to the data that we can gather with the vessel," he says.



On the surface, the Submaran uses wind propulsion with auxiliary electric motors, giving it a speed of up to 6 knots. Underwater it becomes a buoyancy changing glider with a jet drive.

The Teledyne Connection

Teledyne Technologies recently invested in and entered into a strategic partnership with Ocean Aero.

"The investment in Ocean Aero further broadens Teledyne's portfolio of marine technologies and autonomous systems," said Robert Mehrabian, chairman, president and chief executive officer of Teledyne. "Ocean Aero's planned unmanned underwater/surface vehicles, powered by wind and solar, complement Teledyne's battery-powered Gavia AUVs and market-leading autonomous gliding vehicles using buoyancy-based propulsion."

"With this investment and partnership comes quite a few tangible advantages but it also comes with great intangible benefits," Patten says. "The fact that a global leader, like Teledyne has invested in Ocean Aero, is large vote of confidence for what we are doing and what we are capable of. Teledyne has been great partner that is helping us take our concept and making it a reality."

Being in San Diego and part of the growing ocean technology sector has distinct advantages, says Patten. "With what we do we need access to the oceans which obviously San Diego allows you to do. But more importantly San Diego gives us access to other like-minded complementary companies whom we can partner with."

"There is also a significant market for what we do," he says. "San Diego has a large and diverse Navy presence in addition to the other government entities that have a need or mission on the seas. Moreover, there are other market participants like Scripps Institute of Oceanography, UCSD, USD and SDSU – all of whom have needs in the ocean."

As an added bonus, Patten says San Diego is also a great place to live.

"We definitely feel we are part of the Blue Tech and Blue Economy here in San Diego," Patten says. "What we do is all about the oceans and helping understand to them better."

Seeing Under Pressure

Rayotek & Safer Viewing of Hostile Marine Environs

According to Bill Raggio, Rayotek Scientific isn't specifically a maritime company, but it definitely is part of San Diego's "Blue Economy." "We're both an engineering company and a sapphire and glass manufacturer. We makes specialized glass for windows and sight windows, diffusers, pressure vessels, hydraulics and boiler systems, submarine periscopes and camera covers," says Raggio, Rayotek's chief technology officer.

"Spacecraft and submarines both require windows that can take extremely hostile environments and that's why we are the only company in the U.S. that makes the windows for the Orion spacecraft. We also make protective domes for cameras and human occupancy vehicles to withstand harsh environments and high pressures, such as the bottom of the Mariana Trench."

Sight glasses provide the opportunity to look into pressurized systems. "One of the most reliable instruments are our own eyes, and sight glasses allow us to view into extreme pressure environments safely, be it a hydraulics system or the deep sea," says Raggio.

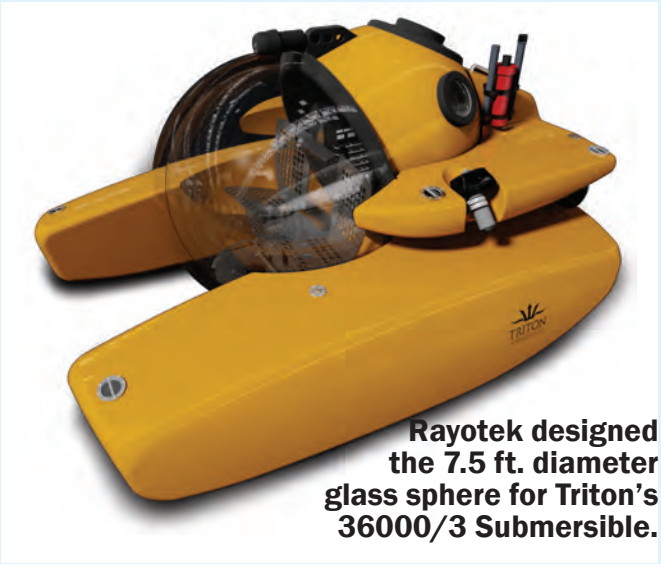
Raggio says Rayotek is an engineering company specializing in developing new technologies to support better, safer viewing of hostile marine environments from deep sea drilling operations, mining and oceanographic research. Sapphire is actually a common material used much like glass, and found in supermarket scanners and cell phone camera windows as well as missile guidance windows and periscopes

"We use a lot of sapphire," Raggio says. "We create it synthetically. It's one of the strongest and most scratch resistant optical materials next to diamonds, and many times stronger than glass."

"Because we are also an engineering firm, we can engineer special windows for any application," Raggio says. "We don't just make the part, we engineer a solution. We help NASA make windows safer for their spacecraft."

Rayotek products are used in many industrial applications, to include commercial refrigeration and heating systems, and compressors for the petroleum and natural gas industries. The company provides sight windows for furnaces and incinerators, and windows for surface vehicles that must endure extremely hostile environments.

The military is a big end user, as well. The company makes sight windows for aircraft hydraulics, lens covers for sensors, mirrors for missile systems, AINS windows for star navigation and lighting components for aircraft like the F-16.



Rayotek designed the 7.5 ft. diameter glass sphere for Triton's 36000/3 Submersible.

The company has many academic and research customers. Rayotek makes observation windows for pressurized tanks and vessels used for scientific analysis and testing. It's also a major supplier to the oil and gas industry. "We provide downhole camera and pressure windows for Petroleum wellbores."

Raggio says it's important to choose the right material for a specific application. There are significant differences between glass and crystalline materials such as sapphire and diamonds.

When tolerances such as flatness are very tight and temperatures are high, the choice of a crystalline material is superior to glass because it will maintain its shape at higher temperatures, he says. Sapphire is colorless and optically clear, and can be grown into shapes such as sheets, ribbons, domes and tubes with very smooth surface qualities, high purity and optical translucence. The company also works with borosilicate glass, fused quartz and fused silica, and the more common soda lime glass. Raggio says San Diego is a high tech town. "It's a good place to bring talent; everybody wants to live here!" Raggio says Rayotek is part of the "Blue Tech" community, but not nearly as much as it could be. "The Blue Tech economy is large, yet still under appreciated and for Rayotek relatively untapped. We have many opportunities to gain more business for Rayotek, but also to bring more Blue Tech business into San Diego at large by getting the word out of what the San Diego Blue Tech community has to offer."

"We are part of the blue economy," Raggio says. "We see potential to grow with our blue partners. They may not represent large volumes, but they are definitely high end, high tech, and very cool."

SeaBotix

Mini-ROVs sized just right for a Niche Market

SeaBotix President Timm says his company makes mini-ROV systems with a pedigree of underwater expertise.

"There are many areas that are either too deep or too dangerous for divers," says Timm. "Our vehicles give the user the capability to carry a suite of sensors into these locations to inspect, survey, document, cut entanglements and retrieve objects. Also our systems give our customers a significant cost advantage over splashing a commercial dive team in the situations that are safer and shallower."

SeaBotix has about 70 employees, with about $21m in revenue for FY14. Business is good, and SeaBotix has a strong market position, but Timm says the marine technology companies in the area are even stronger as a group. "We can have more influence over government policy and support from the local higher education system in San Diego. Exposure to the general public which can ultimately lead to a better field of potential employees to support our growth. Often times there is a strong synergy between different maritime technologies which we can utilize to increase our market exposure and recognition in the international market."

Timm will admit that his products could be made just about anywhere. Even with some less than desirable aspects of the business climate in the state of California, San Diego's attributes make this the place to be.

"The work force we have is awesome," he says. "They are very strong when it comes to advanced technology. And we've got the cluster of other companies to draw on for expertise."

Standard robotics are a hot commodity today, and there are plenty of people who are familiar with it and can bring something to the party, Timm says. "But once you apply robotics to the maritime environment, everything becomes more challenging. We have to deal with extreme pressures, corrosion, properly sealing up enclosures and vehicles and using electricity in salt water. Material science becomes critical. We need hard anodized aluminum components with smooth O-ring sealing surfaces. We need people who are familiar with all the processes to make these parts for use in the subsea environment. We deal with machine shops that are familiar with our requirements. These are differentiators. And we keep our supply base very local."

"We start early in the process to work with our suppliers. We're experts in subsea equipment, and our suppliers are the experts in products and machining the parts we use. Together we create a high-quality, cost-effective process to manufacture the parts we need, from injection molded plastics to printed circuit boards," says Timm.

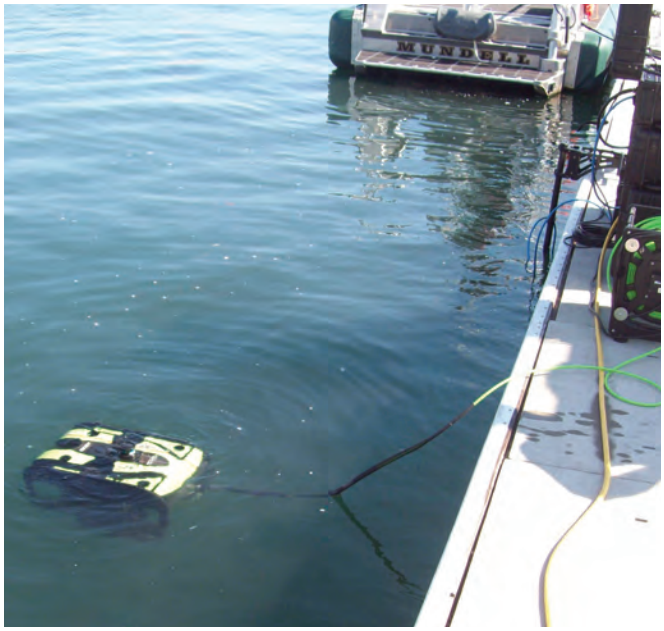


Photo: Edward Lundquist

"All of our vehicles are made to order," says Timm. "All are custom-configured, because customer requirements differ."

"Aqua culture is a big market for us," says Timm. "Using an ROV to look at the mooring lines and netting every day is a lot more cost effective than a three-person diving team and a boat going out to inspect the nets each day."

Timm says there is a strong base of maritime technology in the San Diego area anchored by Scripps Institute of Oceanography and the Navy's Space and Naval Warfare command (SPAWAR). There is excellent weather to support on the water testing year around, and deep water access for testing and training within a couple of hours offshore.

"The Navy and Coast Guard are huge customers for us," says Timm. "We work with them day in and day out."

The Teledyne Connection

On Sept 3, 2014, it was announced that Seabotix parent company, Bolt Technology, was being acquired by Teledyne Marine.

"Bolt will broaden our rich portfolio of marine instrumentation with a number of highly complementary products," said Dr. Robert Mehrabian, Chairman, President and Chief Executive Officer of Teledyne. "Bolt's geophysical acoustic sources will fit well with our existing hydrophone arrays, which listen for the echoes from these sound sources. Bolt would also bring unique connector technology, products and customers to our subsea interconnect businesses. Finally, SeaBotix expands our marine systems business by adding inspection-class ROVs to our autonomous underwater vehicles (AUVs), while also providing more platforms to use our extensive line of marine sensors."

6th Annual
BlueTech & Blue Economy Summit

"Promoting Sustainable, Science-Based Ocean & Water Industries"

November 12-13, 2014, in San Diego, CA
McMillin Companies Event Center, San Diego, CA

http://themaritimealliance.org/2014/07/6th-annual-bluetech-summit/

Wednesday, November 12

Ocean Observation + OceanGIS » Sustainable Development

8:30 – 8:45 **Welcome –** Marine Spatial Planning, OceanSTEM & a Maritime Vision for San Diego
Michael B. Jones – President, The Maritime Alliance

8:45 – 9:30 **Welcome to San Diego & Keynote Introduction**
Bob Nelson – Chairman, Board of Port Commissioners, Port of San Diego

Keynote: Economic Impact of Ocean Observing Programs – Growing the Ocean Enterprise
Speaker: Holly A. Bamford, Ph.D.– Assistant Administrator, National Ocean Service, NOAA

9:30 – 10:30 Panel 1: Coastal Intelligence – Underpins Sustainable Development

Moderator: Zdenka Willis – Director,U.S. IOOS Program Office, NOAA

Panelists: Jim Dufour – Managing Director, MRV Systems
Tom Jacobsen – President, Jacobsen Pilot Service, Inc.
Julie Thomas – Executive Director, SCCOOS
Dawn Wright, Ph.D. – Chief Scientist, Esri

11:00 – 12:00 **Panel 2: *The National Ocean Policy, MSP and Sustainable Ocean Development***

Moderator: Sandra Whitehouse – Senior Policy Advisor, Ocean Conservancy

Panelists: Catherine Kuhlman – Deputy Secretary for Ocean and Coastal Policy & Executive Director, California Ocean Protection Council

Bradley Moran, Ph.D. – Professor of Oceanography, University of Rhode Island & Program Director, Division of Ocean Sciences, National Science Foundation (and former Acting Director, National Ocean Council)

John Stein, Ph.D. – Federal Co-Lead West, Coast Regional Planning Body & Director, NOAA Northwest Fisheries Science Center

1:00 – 1:30 ***Featured Speakers: Doing Ocean Planning***

Speakers: Will McClintock, Ph.D. – Project Scientist, Marine Science Institute, UCSB
Eric Poncelet – Vice President/Senior Mediator, Kearns & West

1:30 – 2:30 Panel 3: Large Floating Ports (& other floating infrastructure)

Moderator: Hank Glauser – Principal Investigator, Lawrence Livermore National Laboratory

Panelists: Kas Ebrahim – Commercial Manager, Fugro Pelagos

Tom O'Brien, Ph.D. – Director, Center for Intl. Trade & Transportation (CITT), CSU Long Beach

Marco Pluijm – Manager, Port & Marine Infrastructure Sector, Bechtel International

2:30 – 3:30 Panel 4: AIS,E-Navigation & the Marine Highway – Technology & Practice

Moderator: Capt. Kipling Louttit – Executive Director, Marine Exchange of Southern California

Panelists: Jonas N. Olsen – Fleet Management Business Unit Manager, McMurdo Group
Capt. Sam Pecota – Chair, Department of Marine Transportation, California Maritime Academy
Dean Rosenberg – Director-Products,

	PortVision/OCS (subsidiary of Oceaneering Intl.)
4:00 – 5:15	Panel 5: View from the Top
Moderator:	Gregory Trauthwein – Editor & Associate Publisher, Marine Technology Reporter and Maritime Reporter & Engineering News
Panelists:	Brett Andrews – President, Hydranautics William Kikendall – President, Teledyne Marine Sensors and Systems Casey Moore – President, Sea-Bird Electronics Chris Ward – Vice President, Xylem Analytics
5:00 – 5:30	Closing Address: "The California Ocean Economy"
Speaker:	The Honorable Jerry Brown - Governor, State of California (invited)
5:30 – 6:30	Reception among exhibitors
6:30 – 9:00	6th annual Maritime Gala Dinner & Awards Ceremony

"Blue is the new Green – Promoting OceanSTEM, Maritime Workforce Development and a national Blue Voice"
Speaker: Richard W. Spinrad, Ph.D. – Chief Scientist, NOAA

Thursday, November 13

Promoting Sustainable, Science-Based Industries in the Blue Economy

8:30 – 8:35	Welcome & Introduction – Promoting Maritime Innovation &Blue Jobs Michael B. Jones – President, The Maritime Alliance
8:35 – 9:00	Promoting the Blue Economy
Speaker:	The Honorable John Podesta – Counselor to President Obama (invited)
9:00 – 10:00	Panel 6: Maritime Clusters Roundtable – Promoting the Blue Economy
Moderator:	Michael B. Jones – President, The Maritime Alliance
Panelists:	Monty Graham, Ph.D.– Chair, Dept. of Marine Science, Univ. of Southern Mississippi Ian McFadzen – Head of Marine Innovation Centre (MARIC), Plymouth University (UK) Barry Snow – Executive Director, OceansAdvance Inc. (St. John's, NL, Canada)
10:00 – 11:00	Panel 7: Developing Sustainable, Deep Ocean Industries
Moderator:	Lisa Levin, Ph.D. – Director, Center of Marine Biodiversity and Conservation (CMBC), SIO/UCSD& Member Deep-Ocean Stewardship Initiative (DOSI)
Panelists:	Cynda Maxon – President, Maxon Consulting Kathryn J. Mengerink, J.D., Ph.D. – Senior Attorney & Co-Director, Ocean Program, Environmental Law Institute
11:30 – 12:30	Panel 8: Innovative Technologies & the Future of Aquaculture and Fisheries
Moderator:	Mark Drawbridge, M.S.– Senior Research Scientist, Hubbs-SeaWorld Research Institute
Panelists:	Phil Cruver – President, Catalina Sea Ranch Greg Dale – Regional Manager, Coast Seafoods; Commissioner for Humboldt Bay Harbor District; and past President of CAAquaculture Association Anson "Tuck" Hines – Director, Smithsonian Environmental Research Center
1:30 – 2:30	Panel 9: Innovation in WaterTechnologies
Moderator:	Gary Eaton – Director of Operations & Maintenance, San Diego County Water Authority
Panelists:	Andrew Barnard – Vice President R&D, Sea-Bird Scientific Craig Bartels – Vice President Technology, Hydranautics Rob Ellison – Chief Technology Officer, Xylem
3:00 – 4:00	Panel 10: Maritime Robotics & Maritime Domain Awareness
Moderator:	Gary Davis – Director, Maritime C4I at SPAWAR Systems Center Pacific (SSC Pacific)
Panelists:	Rob Cornick – Senior Programme Manager, Seebyte (subsidiary of Bluefin Robotics) Sean Newsome – Global Business Development Manager, SeaBotix Capt. Eric Patten (USN ret.) – President, Ocean Aero
4:00 –5:00	Panel 11: Testbed Opportunities in the San Diego region& around the World
Moderator:	Helmut H. Portmann – Director, National Data Buoy Center, NOAA
Panelists:	Adam Corney– Marine Commercial Director, Plymouth University Geraint R. West– Head, National Marine Facilities, National Oceanography Centre (UK) Zdenka Willis – Director, U.S. IOOS Program Office, NOAA
5:00 – 5:30	Final session: Where do we go from here? An end-of-conference moderated dialogue with attendees about next steps to promote collaboration, the Blue Economy, maritime workforce development, BlueTech clusters, and the creation of a national & internation al Blue Voice to promote sustainable, science-based ocean & water industries.

Woodcock

Gray

Jones

Ng

Woodcock Honored

Bibby Offshore was recognized at the 2014 Northern Star Business Awards winning in the categories Commitment to People Development and Outstanding Contribution to the Energy Sector. Bibby Offshore's Chief Executive Howard Woodcock said, "We are extremely proud to have won in both categories we were shortlisted for at this year's Northern Star Business Awards. It is recognition of everyone at Bibby Offshore's dedication to achieving our goals."

ROVOP's Gray Awarded

The managing director of ROVOP received industry recognition after being named as the UK's EY Entrepreneur of the Year 2014 for international business growth. Judges singled out Steven Gray for his outstanding achievement in building an organization that has experienced exceptional global growth since its inception in 2011. The judges remarked that "Steven maximized his background in law and banking to become a true entrepreneur."

Turnover at ROVOP has rocketed to a current rate of $40.4 million, with significant expansion still to come on the back of new contract wins, while the company has surpassed its goal of increasing its team to more than 130 people and continuing to attract new talent.

The company has invested $58 million into its continually-expanding fleet of ROVS and also established its own ROV Academy to ensure a supply of competent offshore personnel.

Harkand's Rhodes Named

David Rhodes, Harkand's global head of remotely operated vehicles (ROV) was announced as the new vice chairman of a global offshore, marine and underwater engineering trade association's ROV committee. Rhodes has been voted in by fellow members of the International Marine Contractors Association's (IMCA) Remote Systems and ROV Division Management Committee.

Jones Leads NCE in Alabama

Noise Control Engineering, LLC (NCE) opened a new office in Mobile, Ala. The office will be staffed by **Nathan Jones**, a Senior Engineer with more than 10 years of experience at NCE. Jones will have access to and be supported by the full staff of NCE's Billerica, Massachusetts headquarters.

Ng Joins NCE

Noise Control Engineering, LLC (NCE) has hired Dr. Kam W. Ng, formerly the Deputy Director of Research at the Office of Naval Research, as its new Director of Business Development. Dr. Ng brings expertise in the areas of Acoustics and Noise Control, Signal Processing and Fault Detection, Smart Materials, Active Nonlinear Control and Science and Technology Management.

McCudden Joins Nautronix

Nautronix said that Thomas McCudden has been appointed as the company's Global Sales Manager for NASNet and will be responsible for developing awareness and worldwide sales of NASNet positioning technology. .

Finlayson Joins CTI

Chesapeake Technology, Inc. (CTI) appointed David Finlayson as chief scientist. Finlayson is an expert in acoustic remote sensing and seafloor mapping technologies and will be working directly with cofounder and CTO, John Gann, to optimize algorithms and develop new apps for broadening SonarWiz use cases, CTI said. He earned his Ph.D. from University of Washington and joins CTI with eight years as a hydrographer for USGS, and five years as a sonarman for the USN.

NSRI Senior Appointments

A recently launched initiative aiming to coordinate research and development activities within the U.K.'s subsea oil and gas sector has appointed a chairman and project director. Peter Blake, Subsea Systems Manager at Chevron's Energy Technology Company, has taken up the role of chairman of the National Subsea Research Initiative (NSRI), and Dr. Gordon Drummond, Technology Manager at Subsea 7, joined as project director. Other NRSI board members are Neil Gordon - Subsea UK, Paul White – GE Oil & Gas, Paul Charlton - PDL Solutions, Jason Tisdale - Fugro, Professor Albert Roger - University of Aberdeen and John Mair.

Rhue Joins Hydroid

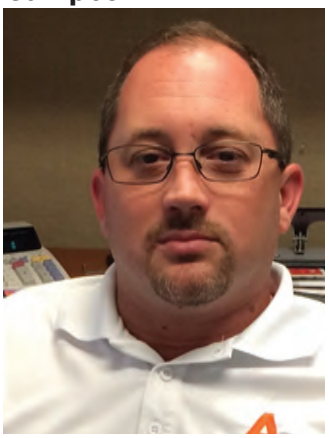
Hydroid said Kaitlyn Rhue is the newest addition to its sales and marketing team, taking over the duties as Market-

McCudden

Finlayson

NSRI: Drummond, Mair and Blake

Campbell



McKay

Hydroid's impressive new facility

ing Manager. Rhue will help to align the company for future growth and expand its presence in the Marine Robotics market.

Aqueos Names Campbell

Aqueos Corporation, a provider of subsea services to the Gulf of Mexico and Pacific Coast, announced the appointment of Richard Campbell to the position of Project Manager.

Cortez Subsea Appoints McKay

Cortez Subsea appointed a new operations director, as the company looks to expand its scope internationally. Tony McKay has joined the company at a time of rapid growth as demand for its services is expected to increase following U.K. patent approval of their Modular Pipelay System (MPS). McKay was recently successful in turning Topaz Oil and Gas Limited in UAE from a loss making company into a profit generating business.

Hydroid's New Facility

Hydroid, Inc. officially opened a new, state-of-the-art manufacturing and applied research facility in Pocasset, MA. The eco-friendly facility, located at 3 Henry Drive, is 40,000 sq. ft. and houses the company's engineering, manufacturing and quality assurance operations. The building includes a 20-ft. testing pool, a 6,000m rated hyperbaric test chamber and a 289 kW solar array. A grand opening event was hosted by Hydroid President, Duane Fotheringham, on October 3rd, an event was opened by Congressman William Keating (D-MA9) and Kongsberg CEO Walter Qvam.

"This building signifies a new chapter for Hydroid as we continue to cement ourselves as a leader in the global marine robotics industry," said Fotheringham. "Hydroid's rapid growth over the past few years has led to the expansion of both our staff and business, and this building enables us to consolidate our operations under one roof." The new facility is expected to accommodate 41 new jobs in 2014 to meet the needs of the company's growing business. The company plans to build an additional 15,000 sq. ft. administration building in 2015.

C&C Selects HYPACK

HYPACK, Inc. said that C & C Technologies has selected HYPACK 2014 as the standard solution for its Marine Construction Survey Division's anchor handling and positioning applications, starting the Q4 2014.

The new anchor handling routine in HYPACK 2014 will allow both the main vessel and anchor handling vessel (tug) operators to graphically display the status and location of anchors and their cables, track their movement and deployment, and send the anchor locations to the anchor handling vessel operators.

New Subsea Company Formed

Xodus Group, Saipem and Chiyoda join forces on new subsea company

New company will rival largest subsea engineering firms for a share of the global market

International energy consultancy Xodus Group announced the launch of a global subsea engineering company in partnership with major oil and gas contractor Saipem and mid and downstream oil and gas giant Chiyoda Corporation.

The new organization plans to challenge the largest tier one subsea engineering companies for a share of the global market. It will be headquartered in London and have a presence in several cities across Europe, Africa, the Americas, Middle East and Asia Pacific including eight dedicated engineering centres in priority energy locations.

Xodus Subsea engineering services will take a unique approach to technical subsea challenges by bringing together Xodus Group's front end engineering capability, Saipem's turnkey Engineering, Procurement, Construction and Installation expertise and Chiyoda's experience in managing large scale international projects. The company will offer a wealth of technical subsea expertise and also have access to more than 1,000 multi-discipline engineers through the partner companies.

"The launch of Xodus Subsea marks a new era of subsea engineering support to the global oil and gas industry," said Colin Manson CEO of Xodus Group. "For the first time operators can choose a subsea engineering company that is backed by world leading contractors without being exclusively tied to them. We have the global reach, capability and technical prowess to support the world's largest and most complex subsea projects. We offer integrated subsea services to minimize project risk and deliver the best technical results."

"Because of the unique way the company is set up, it will pass on the benefits of being able to evaluate and select suitable technology early in the decision-making process without being constrained by convention or ownership.

The aim is to create clever engineering coupled with accurate, dependable cost estimates that clients can use to make informed decisions."

Xodus Subsea engineering services cover field development, projects including FEED and detailed design, and lifecycle consultancy with a focus on working with partners to support the development of new technologies. The company provides extensive knowledge in deepwater engineering, pipelines, trunklines and export systems, riser systems, subsea processing and enhanced oil recovery (EOR). Matt Kirk, Americas' regional director for Xodus Group will take up the new position of Xodus Subsea managing director with other key positions in the leadership team being filled by managers from all three companies.

CTG Acquires MSI

Channel Technologies Group, LLC, a manufacturer of piezoelectric ceramics, transducers and complex sonar and navigation systems used in the defense, medical and energy industries, today announced it has acquired Materials Systems Inc. located in Littleton, MA. MSI will become a wholly-owned subsidiary of CTG. Terms of the transaction were not disclosed. CTG is a portfolio company of Blue Wolf Capital Fund II, L.P.

Sonardyne Receives Queen's Award for 6G

Sonardyne International Ltd. has been formally presented with the Queen's Award for Enterprise by the Lord-Lieutenant of Hampshire. Dame Mary Fagan presented the Award in the Innovation category for Sonardyne's Sixth Generation (6G) product platform during a visit to the company's head office and manufacturing facilities in Yateley, Hampshire.

Kongsberg Subsea Photo Contest

All users of Kongsberg Maritime subsea cameras are invited to submit their best underwater still photos, SD or HD videos for a chance of winning an iPad, an iPod or Digital Camera, with the added incentive of the possibility of images being selected for use in Kongsberg Maritime promotional material. Entries can be submitted on the competition's homepage **http://bit.ly/1zyfkmp**

The 10 Highest Paying Oil & Gas Contract Jobs

Australia once again tops the list of the 10 highest paying jobs in oil and gas released by Swift Worldwide Resources, but Nigeria is a new country on the list that ranks just below the returning leader. The list was compiled by analyzing Swift's 250 contract positions in the oil and gas industry in 30 locations across the globe, for a total of 7,500 total jobs. Countries that are represented for the first time include Nigeria, Venezuela and Angola. No jobs in the U.S. cracked the list of highest paying this year. The complete list of the "Ten Highest Paid Contract Jobs in Oil and Gas" is as follows:

- Completion Manager in Australia: up to $3,075 per day
- Drilling Manager in Australia: up to $2,942 per day
- Drilling Manager in Nigeria: up to $2,844 per day
- Project Services Director in Nigeria: up to $2,817 per day
- Drilling Manager in Iraq: up to $2,766 per day
- Completion Manager in Venezuela: up to $2,715 per day
- Project Manager in Iraq: up to $2,700 per day
- Subsea Manager in Australia: up to $2,692 per day
- Drilling Manager in Angola: up to $2,631 per day
- Completion Manager in Iraq: up to $2,624 per day

Oceanica Orders Two ROVs

Oceanica, the long established Brazilian subsea engineering company, has ordered two Saab Seaeye Falcon ROVs for its expanding operations with Petrobras.

Acteon Acquires UTEC Survey

Acteon acquired UTEC Survey, an independent survey services business. UTEC offers technology solutions to gather, process and manage data that supports informed decision-making across the entire life of a subsea field. Revenues were more than $84 m in 2013.

PMI Opens in Louisiana

PMI Energy Services opened a shorebase in Morgan City, Louisiana, focused on supporting shelf, coastal and inland waters production and drilling activities.

iSURVEY Wraps Contract

iSURVEY Offshore Ltd, a provider of survey and positioning services to the global oil and gas, offshore renewables and telecommunications markets, has completed a contract with Bibby Offshore's ROV division worth more than $700,00.

AXYS Deploys in Europe

AXYS Technologies Inc. (AXYS) announced the WindSentinel platform ordered by EDP Inovação (EDPi) has been deployed off the coast of Portugal near Viana do Castelo.

Image: Kongsberg Maritime

Kongsberg Maritime 3D Monitoring

Kongsberg Maritime launched a new solution for the detection of scouring, corrosion, deformation and marine growth, which can destabilize wind turbines and underwater structures. The new K-Observer system, which is part of Kongsberg Maritime's Modular Subsea Monitoring Network (MSM), is designed to provide accurate, remote hydroacoustic 3D monitoring using the Dual Axis Scanning Sonar (DAS) to continuously monitor the seabed and the substructure.

The 3D point cloud data created by the DAS is logged and transmitted to shore via the telemetry infrastructure of the K-Observer System (cabled, wireless or satellite) installed on the turbine. The system is designed for long-term installations and performs fully autonomously, from sensor control, data acquisition, to data processing, presentation of results and issuing of alarms (e.g. by text message or email).

K-Observer scans and interprets the condition of the seabed around the base of the structure (scouring and sediment displacement), as well as the state of the substructure itself (deformation, marine growth and corrosion) so people on shore can initiate immediate action or preventative maintenance if required.

www.km.kongsberg.com

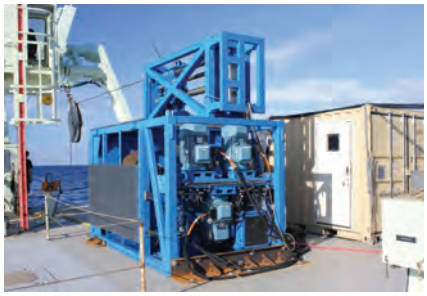
Subsea Camera with Optical & Digital Zoom

The SS465 IP Color Camera with clear optical zoom is designed to ensure high resolution images, installation ease and immediate data storage and retrieval, its manufacturer SIDUS Solutions said. The camera features full 1080i high definition ensures crisp and pristine images. Power over Ethernet (POE) allows for immediate installation, and the onboard memory card slot for recording can save bandwidth and add data handling versatility. This network-ready camera encourages diversity of use and is capable of withstanding extreme environments and temperature ranges this device delivers performance and sustainability. 10x optical zoom and 12x digital zoom, auto zoom presets, power over Ethernet, 1080i resolution, video motion detection, gate keeper functionality, impressive temperature operating range. Due to the large size format image - the user has the opportunity to pan and tilt around a zoomed in display.

www.sidus-solutions.com

Woods Hole Selects Rapp CTD Winch

Rapp Hydema provided Woods Hole Oceanographic Institution (WHOI) a CTD winch for its new research vessel R/V Alucia, which is being managed and financed by Beta Maritime. Rapp's TBW-520E-T90 winch accommodates 7,000m of .322 Rochester Fiber-Optic cable, plus 100 ft. of 2.25-in. synthetic tether. It has Active Heave Compensation (AHC) set for optimal use at 3000m of deployed line. Rapp's unit is compliant with UNOLS' Research Vessels Safety Standard Appendix B: Overboard Handling Systems Design Standard, a rigorous requirement that is only now in the process of implementation fleet-wide. The Rapp winch develops five tons of line pull in Speed Step 1, on the bare drum, while retrieving at 60m/min. Despite the presence of Active Heave Compensation, the Rapp winch has a power requirement of 70 kW with 3000m of line deployed. Rapp's electrically-driven, electronically-synchronized T90 level wind—popular in various other research vessel applications—is also used.



www.rappmarine.com

Underwater Housing from Gates

Gates Underwater Products announced the launch of its new ALEXA underwater housing. The Gates ALEXA housing comes in two versions: ALEXA XT housing for the Arri Alexa EV (classic) and Alexa XT cameras; and the ALEXA XT PLUS housing for the Alexa XT Plus camera. Each housing version was designed for ideal control layout, making underwater operation easy.The ALEXA housing is backed by Gates' service, two-year renewable warranty and factory direct support. The ALEXA Housing, available from Q4 2014, will support Arri Alexa EV, XT and XT Plus camera models.

www.gateshousings.com

Image: Gates Underwater Products

Image courtesy of Bowtech

Bowtech Lamp Range Extended

Bowtech Products Ltd., a producer of subsea vision systems, announced the arrival of the LED-S-Series lamp, a smaller, 10,000 lumen version of its 20,000 lumen LED-V-Series underwater floodlight. The LED-S-Series lamp has been designed to offer a smaller, lighter and lower lumen output than its LED-V-Series using the same technology. Outputting up to 10,000 lumens with a beam angle of 80 degrees in water (narrower angles are available) the lamp is suitable for illuminating large areas for HD viewing tasks. Manufactured in corrosion resistant hard anodized aluminum with an acrylic window, the lamp is rated to operate at 6,000m ocean depth. The LED-S-Series lamp is available as either 100-120Vac or 130-150Vdc, with a selection of connectors and connector positions available.

www.bowtech.co.uk

Hydro-Lek Manipulators on Italian Navy ROV

Hydro-Lek delivered two five-function manipulators to Italian ROV manufacturer, Ageotec, for the Italian Navy for submarine research and rescue. The manipulators are fitted onto a Pegaso ROV system which also includes a motorized winch, silenced diesel power generator as well as a USBL and sonar system. Ageotec were selected by COMSUBIN (the Italian Navy's diver unit) to provide an open frame ROV system for visual and instrumentation research, objects recovery and underwater rescue. The system accomplished its first mission in April and is now fully operational. With a lift capacity of 40kg, the Hydro-Lek HLK-HD5 is a rugged work class five-function arm and incorporates a continuous jaw rotate assembly and three hydraulic cylinders. Constructed from 316 stainless steel, HE30 aluminum and high density polyethylene, the HLK-HD5 is designed for the smaller ROV for heavy duty underwater tasks.

www.hydro-lek.com

Contact Rationalizing and Map Corrections Software

Chesapeake Technology Inc. (CTI), a producer of real-time sonar acquisition and GIS based processing software for seafloor mapping, announced two new capabilities that it claims will allow users to better organize sonar contacts and improve sonar mosaic accuracy. New Contact Rationalizing, available on SonarWiz version 05.06.0052, is designed to allow a user to combine contacts into a single merged target with an average position. Also available with a software update is the Map Corrections feature. Similar to the Contact Rationalizing tool, it allows users to select a common target on separate sonar files and calculate the offset between an average position. The Map Corrections tool goes an additional step by then applying the offsets to the sonar files' navigation thereby improving the accuracy and image of the sonar mosaic.

www.chesapeaketech.com

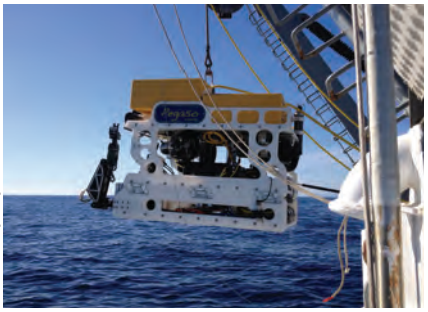


Photo courtesy of Hydro-Lek

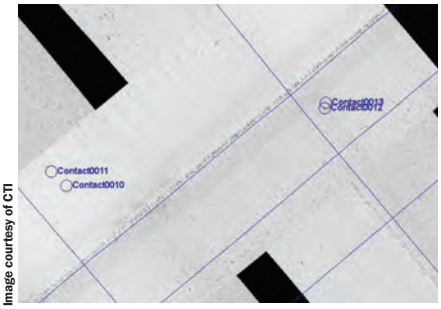


Image courtesy of CTI

Ellipse-N model with integrated GNSS receiver

Image: SBG

SBG Miniature Inertial Sensors

SBG Systems released the Ellipse Series, a new product range of miniature inertial systems replacing the IG-500 Series. For the same budget, customers benefit from higher accuracy, advanced filtering and features inspired from high end inertial navigation systems. This new series of miniature inertial systems benefits from a new design, new sensors, new capabilities and new algorithms. Weighting from 45 grams, Ellipse sensors are designed to be flexible. The Ellipse-A model provides 3D orientation and heave. For navigation, users can connect their own GPS with the Ellipse-E, or use the internal one by choosing the Ellipse-N model. The amazing Ellipse-D completes this state-of-the-art miniature sensor family. This model is a little larger than the rest of the series because it integrates a Survey-grade L1/L2 GNSS receiver with two antennas for unmatched heading and position accuracy. ITAR Free Ellipse A, N, E models are available for order. The Ellipse-D model will be available on Q1 2015.

www.sbg-systems.com

Editorial Calendar

MARINE TECHNOLOGY REPORTER

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

MTR Marketplace

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Subsea Defense

Doug Whyte, Managing Director of Hydro Group plc, shares with *MTR* his insights regarding the changing paradigm of global submarine programs. **See story page 26.**

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EvoLogics GmbH
Ackerstrasse 76,
13355 Berlin, Germany
tel.: +49 30 4679 862-0
fax: +49 30 4679 862-01
sales@evologics.de
evologics.de

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