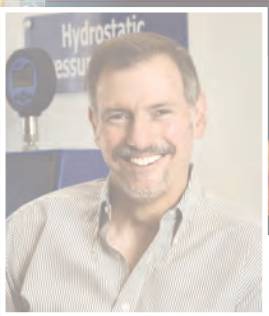
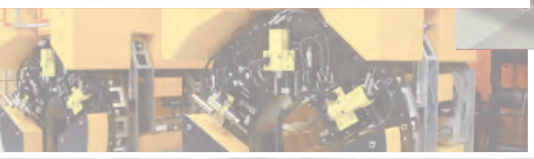
MARINE TECHNOLOGY REPORTER

July/August 2014 www.marinetechnologynews.com

MTR100





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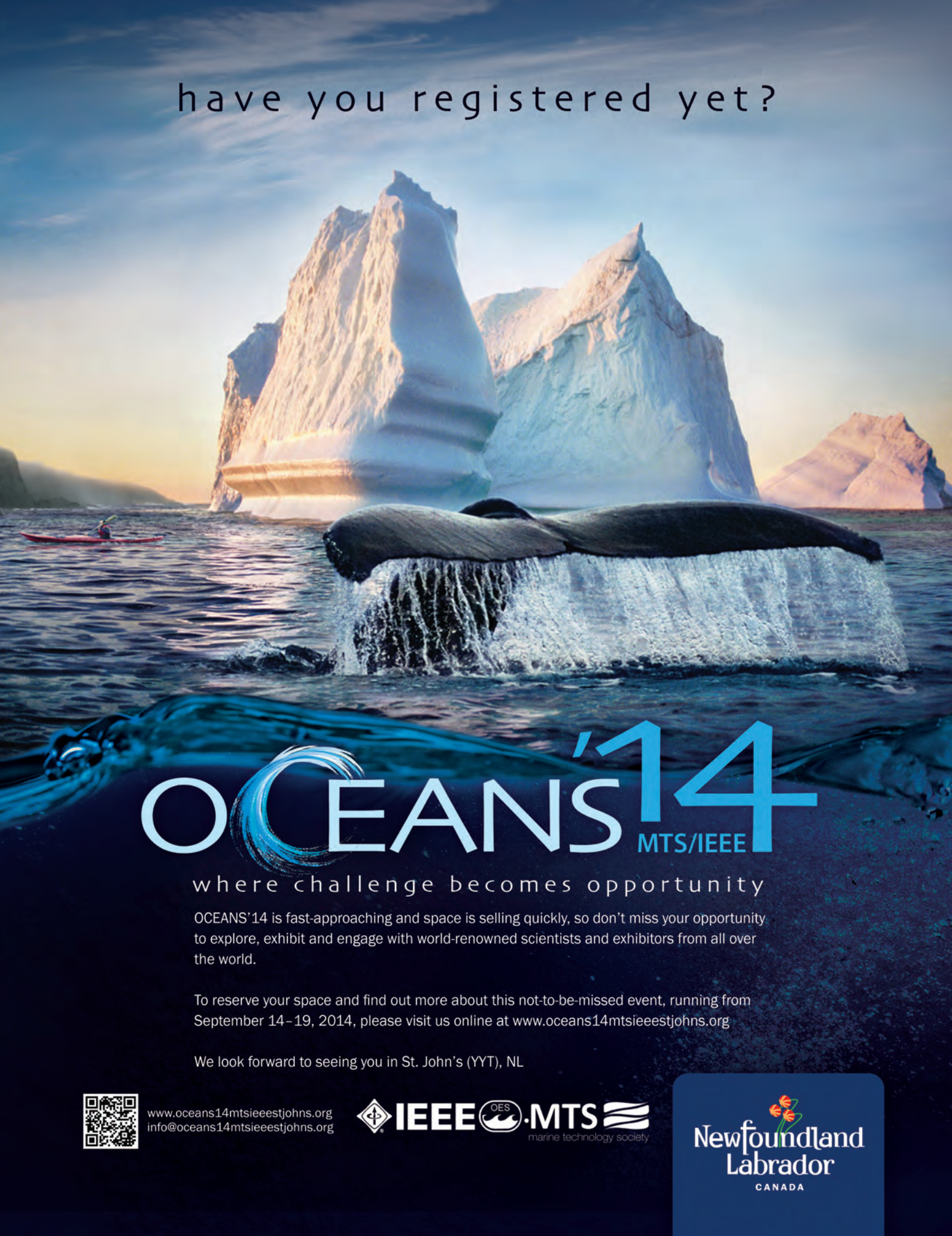
The 9th Annual

MTR 100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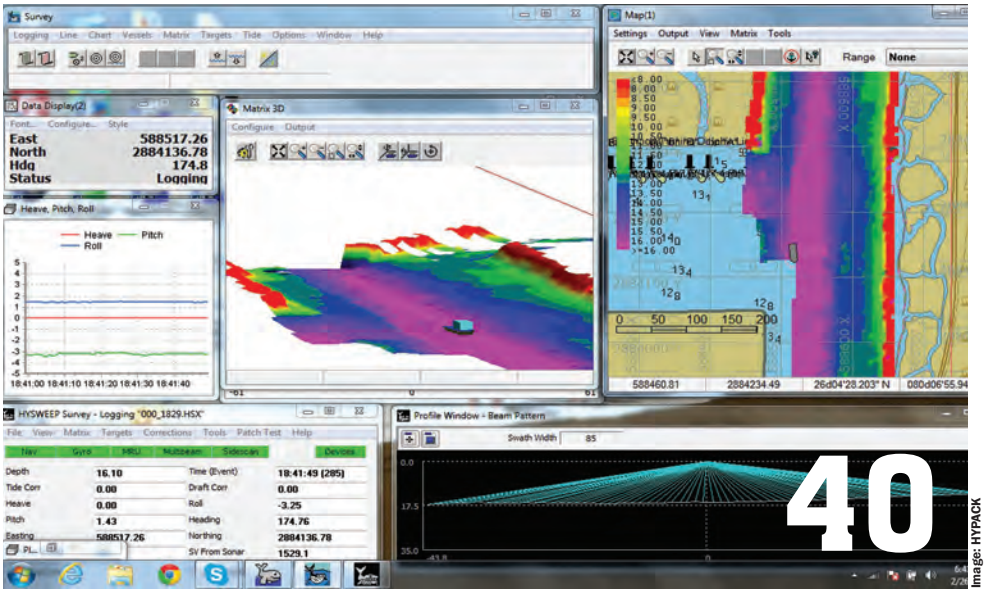

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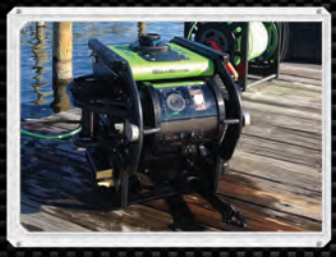

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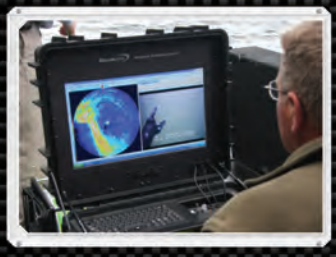

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We are honored once again to present to you insights on 100 leading and innovative companies serving the subsea sector courtesy of our ***Ninth Annual MTR100***. In the interest of full disclosure, I must admit that I have a true love/hate relationship with the MTR100 as it undoubtedly is the single biggest recurring editorial project of the year that commands much work and attention. That said, it is truly encouraging to see the evolution of the MTR100 edition, from the inaugural July/August 2006 edition to this year, when we received a record number of applications from around the globe. As always, I'm interested to hear your insights and comments on the work that we do, and I hope you, as did our entire editorial staff, find a few items within that are new and enlightening.

This edition of the MTR100 is slightly different from previous editions, as in the center of the magazine we present three overview features highlighting 24 of the 100. Starting on page 44 is "Getting Defensive," which discusses an amazing new conference set to debut in September in Newport, RI called **Defense Innovation Days**. Organized by the Southeastern New England Defense Industry Alliance (SENEDIA), the conference is bringing together a veritable "Who's Who" list of leaders in the subsea sector for three days of conference, meetings and social events addressing innovation from the technology perspective, the war fighter perspective and the unmanned vehicle perspective. For complete details and the complete list of speakers, visit: **www.defenseinnovationdays.com**.

"The Norway Way" starts on page 50 and offers insights on this unique and longstanding subsea industry cluster. We dispatched Eric Haun to traverse the rugged west coast of Norway earlier this year, and he delivers information on a dozen companies, from corporate behemoths to small engineering firms.

Finally, I'm looking forward to seeing many of you at **Oceans 2014** in St. Johns, Newfoundland and Labrador, September 14-19. (**http://www.oceans14mtsieeestjohns.org**). If you have never had the pleasure to visit St. Johns, I highly recommend you make the effort to visit for Ocean 2014, as I'm betting you will not only see an incredible exhibition, but also enjoy some signature St. Johns hospitality.

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CEO/President: Matt Mullett
No. of Employees: 48

All American Marine's research and survey catamaran hull designs feature hydrofoil-assist technology that provides for shallow draft, enhanced sea keeping ability, and improves speed and fuel economy. AAM vessels are designed to reach the work site quickly, without crew fatigue, and provide a stable platform to ensure safe and accurate data collection.

The hull form of AAM's research and survey vessels is a semi-planing type catamaran hull that employs a combination of symmetrical and asymmetrical sponson shapes, combining the attributes of both shapes in one hull. The symmetrical bow-section ensures directional stability in short swell conditions and following seas, while the asymmetrical amidships and aft sections ensure softness of ride and reduced wetted area which enhances comfort and economy. The catamaran hull has a high tunnel ceiling with a large opening between the sponsons, which allows free movement of wind-waves without slamming on the wet-deck. Also, horizontal steps on the inside of the tunnel walls act both as chines to deflect green water from the hull surface, and to break up the solid water into spray. The combined effect of these features produces a hull with low resistance, low vertical accelerations, and excellent performance.

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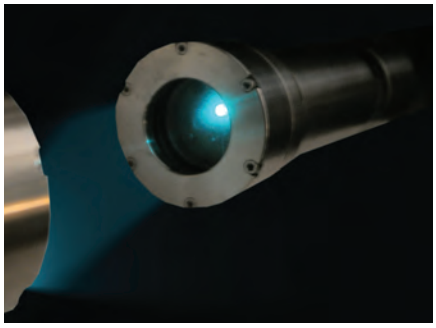
http://www.aquatecgroup.com
CEO/President: Andy Smerdon
No. Of Employees: 12

Aquatec Group are creators of instruments, services and solutions for measurement, monitoring and communication underwater. It provides solutions for all water environments, including offshore structures and pipelines; oceans, estuaries, rivers and lakes; and



Applanix

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W: http://www.applanix.com
President: Steve Woolven
No. of Employees: 100

The Case: Applanix offers a complete portfolio of products and solutions to support hydrographic surveying, a leader in robust, reliable, and repeatable positioning and motion compensation solutions for marine applications.

The Company

Applanix, a wholly owned subsidiary of Trimble, develops, sells and supports advanced products and scalable solutions for the geospatial industry that maximize productivity through Mobile Mapping and Positioning. Applanix designs, builds, delivers, and supports a complete portfolio of products and solutions for the hydrographic survey industry.

The Tech

Applanix' POS (Position and Orientation System) technology was originally developed and rigorously tested as part of an extensive military project. This proven technology has been enhanced, customized and packaged to yield an off-the-shelf commercial product, uniquely suited to the requirements of precision marine motion sensing, hydrographic surveying and charting called the POS MV. POS MV is a user-friendly, turnkey system designed and built to provide accurate position, heading, attitude, heave, and velocity data of your marine vessel and remote sensing equipment. With over one thousand systems deployed worldwide, POS MV is field-tested and proven in all conditions. POS MV blends GNSS data with angular rate and acceleration data from an IMU, and heading from GPS Azimuth Measurement System (GAMS) to produce a robust and accurate full six degrees-of-freedom position and orientation solution. POS MV comes in 3 models:

- POS MV WaveMaster
- POS MV 320
- POS MV Elite

POS MV 320 and POS MV WaveMaster are designed for use with multibeam sonar systems, enabling adherence to IHO (International Hydrographic Survey) standards on sonar swath widths of greater than ± 75 degrees under all dynamic conditions. POS MV Elite offers users the highest degree of accuracy in motion measurement for their marine applications.

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marine mammals and fisheries. It was founded in 1990 as a consultancy in oceanographic instrumentation design.

In the offshore energy sector, Aquatec caters to four key areas in the offshore energy sector: cathodic protection and monitoring, hydrotest, leak detection and Metocean.

In the oceanographic and environmental markets, stand alone products include instruments to measure temperature and depth (with logging, near-real time or real time reporting), a comprehensive range of suspended sediment loggers and profilers (optical and acoustic), and marine mammal deterrents for fishing and construction (targeted at porpoises, dolphins and similar toothed whales). Aquatec design custom products and systems, and offer consultancy and rental services.

In the research sector Aquatec maintains strong links with universities and research institutions around the world, and is a prominent partner in collaborative research, complementing its internal, market-led product research and development program.

AXSUB Inc.

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CEO/President: Eric Gaudreau
Vice President: Lus Garand
Sales Manager: Aron Tullpian
Engineering Director: Yan Levesque
No. Of Employees: 6

AXSUB has been in business for just three years but has left its mark, becoming a supplier for the commercial diving and hyperbaric industries in Canada and with exported products to more than 30 countries. Its systems allows diving companies to achieve depth monitoring required by the Norsok Standard U-103 (Section 8.4.2).

Hyperbaric and Subsea Environments Data Acquisition Systems: Over the last 10 years, the team has designed several different types of monitoring systems for the Underwater and Hyperbaric Industry.

It is capable of developing custom systems in a short period of time related to: Diving and Hyperbaric systems; Tunneling; Equipment performance test beds; Marine and Aquatic Biology. AXSUB is a Manufacturer of Diving Equipment such as Digital Video Recorders, Low voltage LED Lamps, Underwater Cameras and Electronic Depthmeter. AXSUB is a distributor of: Amron International; NUVAIR (compressors & analyzers); Birns Aquamate (underwater connectors); Northern Diver (diver's gears); Cygnus (Ultrasonic Thickness Gauges); and Subsalve (lift bags).

AXYS Technologies Inc.

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W: http://axystechnologies.com/
CEO/Presdient: Terry Tarle
Engineering Director: Reo Phillips
No. of Employees: 40

The Case: AXYS has been designing, manufacturing, deploying and servicing marine buoy systems for more than 40 years. It provides systems designed to acquire real-time environmental data tailored to their specifications. AXYS is an international leader in marine environmental technologies with more than 600 meteorological and oceanographic systems built and deployed worldwide.

The Company

The AXYS story began with marine consulting contracts to Environment Canada for wave studies in 1974 and was followed by the design of several marine technology devices in the 1980's that led to an opportunity to design, manufacture, install and service Canada's Marine Weather Buoy Network. In the early 1990's, AXYS began producing marine technologies in collaboration with the National Research Council (NRC). Two of the main outcomes were the TRIAXYS directional wave buoy and the next generation WatchMan500 controller processor.

The Tech

The AXYS WindSentinel is reported by the company to be the world's first wind resource assessment buoy capable of accurately gathering wind data at turbine hub-height and across the blade span. The AXYS WatchMan500 controller was designed as the next generation of payload for marine systems to provide desktop to sensor monitoring and control, including dynamic onboard control and data storage capabilities. This controller is a solution for any application requiring data monitoring, collection, control, processing, or remote system management. AXYS now provides full data hosting and management services. These services range from receiving and hosting buoy data on a publicly displayed website, to sending detailed monthly reports on data throughput from buoys or other monitoring stations.

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W: www.caldive.com
CEO/President/Chairman: Quinn J. Hébert

Since 1975, Cal Dive International has not only provided quality vessel management around the world, but has also focused on the continual education and training of their employees to ensure safety remains a top priority. This attitude comes about from its mantra, "Say what you do, do what you say". Its services include manned diving, derrick, pipelay, and pipe burial services offered to oil and gas producers of any size. Its fleet of saturation diving vessels and systems is one of the largest in the world.

Cal Dive reported a better first quarter to start 2014 than in 2013. President Hébert cited a higher level of activity in Mexico as the reason for this, and that it is expected to continue throughout the rest of the year. Weather played an important factor in the amount of sales that were made. The president also reported that there has been continued improvement in the Gulf of Mexico, Sea Horizon was greatly utilized in Southeast Asia, and three platforms were installed off the coast of Ecuador.

C & C Technologies

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W: www.cctechnol.com

Thomas and Jim Chance formed C & C Technologies in 1992 to advance survey technology, just like their father. The company was the first to offer commercial AUV survey services to the offshore industry. Since then, it has continued to advance this technology. Along with its sister company Autonomous Surface Vehicles, Ltd., C & C offers unmanned surface vehicles for both the military and commercial markets.

C & C has developed a cutting edge surveying instrument, the C-Surveyor VI. The device combines a proprietary camera system, laser, upgraded multi-beam, geo-chemical suite of sensors, and "Auto Pipeline Tracking." With this new surveyor, a full inspection can be completed with just one pass over the top or either side of the pipe. It can also give detailed span measurements and detect potential leaks.

Caley Ocean Systems

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CEO President: David Cooper
No. of Employees: 50

Caley has delivered to leading projects such as WHOI's new Alvin submersible LARS based on an upgraded Caley A-frame first built more than 30 years ago; A-frame and winches for Geological Survey of India's new research vessel;

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W: http://www.jwfishers.com
CEO/President: Jack Fisher
Sales Manager: Christopher Combs
Engineering Director: Deane Cahoon
No. of Employees: 20

The Case: For more than 40 years JW Fishers Mfg has specialized in the design and manufacture of high-tech, reasonably priced underwater search equipment. Its side scan sonars, underwater metal detectors, ROVs, and magnetometers are in use by commercial diving companies, public safety dive teams, government agencies, police and military units worldwide.

The Tech

JW Fishers has continually evolved its underwater search systems. Fishers designs and manufactures all of its underwater search systems at their factory in East Taunton, Mass. Its line of equipment includes hand-held and boat-towed metal detectors, hand-held and boat-towed magnetometers, underwater video systems, ROVs, side scan sonars, scanning sonars, acoustic pingers and receivers, and pipe and cable locators. Fishers continues to expand its line of acoustic systems with the recent addition of transponders and an interrogator. These devices are used to mark the location of underwater objects or oceanographic instruments. The key advantage of the transponder is its ability to lie silent on the ocean bottom using almost no power until activated by the interrogator to begin transmitting a signal. The newest acoustic products to be added are low frequency pingers. Available in both single and multifrequency versions, the low frequency pinger can be detected at a distance of 3 to 6 miles, compared to a few thousand few for standard pingers. The company is also constantly updating and improving the software used with its sonar systems and boat-towed detectors, adding new features and capabilities, and making the equipment easier to use and more powerful.

Another new product is the CMS cable management system which makes it easier to handle long cables.

Caley A-Frame

and deepwater handling systems for loads in excess of 950t at depths of 1,300m.

The Company

Caley Ocean Systems has a strong international reputation with an experienced engineering team and dedicated manufacturing facilities. Caley Ocean Systems' services includes marine and offshore handling systems development, design consultancy, professional project management and engineering services. In addition to systems design facilities including 3D modelling and Finite Element Analysis, Caley has a large manufacturing facility. Covering more than 25,000 sq. ft., the high bay, multi-function workshops include two 2 x 40 ton overhead cranes.

The Tech

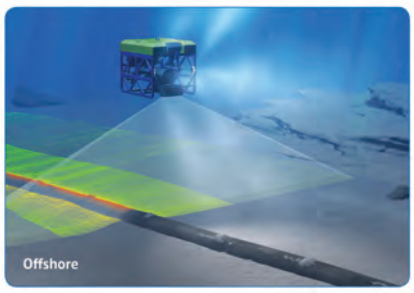
Caley Ocean Systems is all about offshore handling systems including: A-frame and winch systems, rigid inflatable rescue boats and workboat davit systems, bespoke oil and gas deployment systems; ROV, AUV and dive bell handling systems, and cable laying carousels and spoolers. A-frame and winch systems range from submersible and submarine rescue vessels LARS including several systems in continuous service for over 30 years, through to oceanographic tool deployment to 10,000m, and deepwater lowering systems for subsea processing systems weighting in excess of 950t to 1,300m water depth. Caley offers a range of dive handling solutions, fully certified by leading certifying authorities and compliant with IMCA guidelines. It also supplies bespoke handling systems for ROV and AUV for water depths over 4000m.

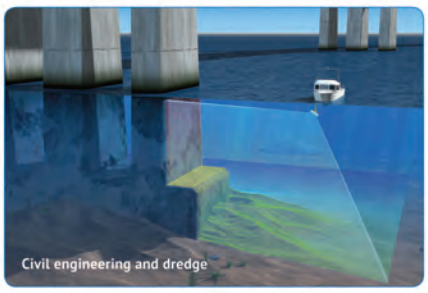
Teledyne Marine Acoustic Imaging Group

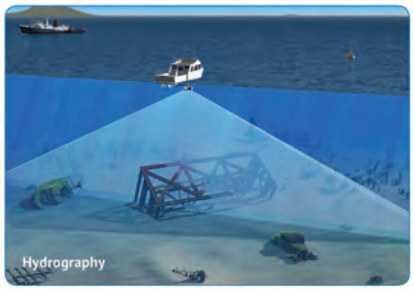
Kim Lehmann, President, Teledyne Marine Acoustic Imaging Group and Teledyne RESON Group

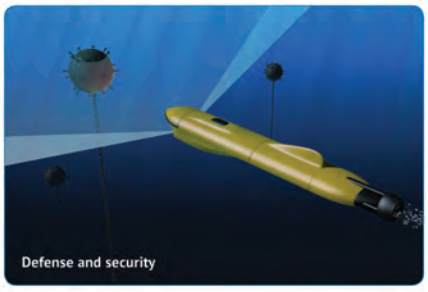
Which companies are included in your group? Site an example of your group collaboration.

Teledyne RESON, BlueView and Odom Hydrographic are part of the Teledyne Marine Acoustic Imaging Group (TMAIG). With more than 35 years of experience, the group develops some of the world's most sophisticated sonar technology and offers one of the strongest collective product portfolio in the market for subsea acoustic imaging and Multibeam Echosounder solutions. TMAIG has manufacturing, research & development, sales and after service functions at the headquarters in Denmark as well as in Holland, U.K. and the U.S. It also has sales offices in Singapore and Shanghai and supports local sales through a network of distribution partners in more than 47 countries. TMAIG offers sonar solutions in a variety of application areas including offshore, hydrography, civil engineering and dredging as well as defense & security.









The Engineering Services department has more than 40 engineers and hydrographic surveyors focused on providing close support to its customers globally. It operates service centers out of six worldwide locations and has extended its closeness to its customers with a global network of service partners.

Can you discuss technology advances in the group in the past 12 months.

Teledyne BlueView successfully launched a number of innovative new products around the 2D forward looking and 3D scanning sonar product lines, particularly the new dual frequency forward looking sonar "M900-2250-130" which offers a broad field of view at both

long range and very short range with video-like acoustic images useful for applications such as support of detailed operations with manipulators on ROVs.

Teledyne RESON launched the second generation of its compact Multibeam Echosounder for shallow water surveying, the SeaBat T20-P. With this release the versatility of the system is improved by supporting double the cable length (100m.) to wet-end sensors, and simultaneous Dual Head data collection for very wide-swath surveying requirements.

What are some of the market trends driving the group today?

The market for Multibeam Echosounders are competitive and customers expect constant improvements in functionality and improved cost efficiency in operations. Especially in the offshore sector, demand for mature and ruggedized solutions are driving new technology and solutions for forward looking imaging sonars, software solutions to support operations and equipment to support a steady move to exploration at still deeper waters.

Another growth area is around Infrastructure monitoring and repair works at offshore constructions, and here the combined solution offering between Teledyne BlueView, RESON and Odom are suited to challenges in this field.

Last but not least, the expectation is further consolidation in the industry – and a consolidation where Teledyne is playing a leading role.

Teledyne BlueView's new dual frequency forward looking sonar M900-2250-130

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CTO: Sheldon Rubin
No. of Employees: 65
Sq. Footage: 17,500, Mfg. facility
Annual Sales: $18 million+

The Case: SeaBotix is a pioneer in the development and manufacture of capable underwater observation class ROVs, responsive to demanding and diverse professional applications. Little Benthic Vehicles offer a high level of performance, versatility and intuitiveness proven by over 1,100 operators worldwide.

Company Profile:

SeaBotix is a manufacturer of underwater MiniROVs (Little Benthic Vehicles) that perform a multitude of tasks including but not limited to: maritime security, search and recovery, hull and pipeline inspection, hazardous environment intervention, aquaculture and beyond dive-restriction oceanographic research.

Founded on years of research, development and underwater industry experience, SeaBotix seeks to deliver evolutionary advancements to a diverse suite of MiniROV systems providing a wide range of capable MiniROVs. SeaBotix staff is factory trained and globally experienced for in-field operations. Training and support are offered at the SeaBotix 17,500 sq. ft. design and production facility in San Diego. The facility includes dock, boat launch and separate waterfront classroom with direct access to the harbor and open water. Training, service and repair for all products is provided from this facility but also worldwide, through an established full service distribution network or by sending a factory authorized technician directly to the preferred customer site.

Technology Profile:

SeaBotix MiniROVs are extremely maneuverable, 1 or 2 person portable, yet large enough to carry a complement of sensors, such as sonar, on a stable, controllable and precise platform. All systems are designed for harsh underwater environments, field proven to extreme conditions including -20oC (-4oF), globally operated by the world's foremost armed forces and offered with a 2-year limited manufacturer's warranty.

SeaBotix has been manufacturing observation class MiniROVs for more than 13 years. The Little Benthic Vehicles (LBV) line of observation class ROVs provide a diverse suite of systems in a multitude of industries such as military, police, commercial, scientific, aquaculture, hydro and more.

SeaBotix continues to be on the leading edge with tethers, thrusters, video systems and emerging technologies such as: the LBC/vLBC Crawler System, Containerized Delivery System, and the SmartFlight Automated Navigation System. The SeaBotix product line ranges from the shallow water LBV (Little Benthic Vehicle) systems to the vLBV (vectored Little Benthic Vehicle) system with up to 10 thrusters and capable of depths of 4,000 m (13,000 ft). The LBC (Little Benthic Crawler) provides stability on ship hulls and infrastructures.

Innovations:

- **vLBV** – vectored Little Benthic Vehicle – vectored MiniROV with six powerful brushless DC thrusters that provide equal power in all directions.
- **CDS** – Containerized Delivery system – rapid-response, fully self-contained, single-point pick system capable of operating ROVs, marine sampling devices, sonar systems and many other marine technologies up to 4,000 m deep.
- **LBC & vLBC** – Little Benthic Crawler – a system approach to ship hull inspections and infrastructures – includes a crawler attachment with Vortex Generator that creates over 28 kgf (62 lbf) of attractive force for stability.
- **Tether** – Ultra-low drag strong tether with 8.9 mm (0.35 in) nominal diameter and 100 kgf (220 lbf) working load.
- **SmartFlight Automated Navigation System** – Employs sensor fusion technology that minimizes hardware dependency while providing a full suite of automated features for the vLBV.

The Case
ACSA is the manufacturer of the SeaExplorer glider, an underwater vehicle dedicated to monitoring and collection of environmental data. Since November 2013, the SeaExplorer holds the world record of endurance for multi-sensor UUVs with rechargeable batteries.

The Profile
ACSA, located in the South of France, is a company specialized in underwater robotics and acoustic positioning systems. In 2007, ACSA joined ALCEN Group, which in 2012 recorded sales of $326.5m. Today, ACSA provides both off-the shelf products and on-demand R&D. Its product range includes underwater robotics and positioning systems, led by the SeaExplorer glider. ACSA acoustic positioning GPS systems (GPS Intelligent Buoy) are used to position and track ROVs, divers and AUVs. In addition to physical products, ACSA engineers have an expertise in designing complex underwater systems requiring the following technical skills: acoustics, robotics, electronics, signal processing, hyperbaric mechanics, hydraulics and hydrodynamics.

The Tech
- ACSA's SeaExplorer is a glider with an advanced design capable of conducting a variety of long endurance missions. It is a tool that gathers near real-time data for ocean observation and monitoring for scientific, defense and security and offshore applications.

- The ACSA GIB portable underwater GPS tracking system is in use worldwide to provide positioning and tracking for divers, ROVs, AUVs and submarines. The system provides meter to decimetre accuracies, independent of the location. In addition, real-time D-GPS and depth data can be provided without the use of a dedicated vessel, thereby reducing mission costs considerably.

- The Detector-1000 is a designed to be an efficient, long range acoustic detection system for locating acoustic pingers.

BIRNS, Inc. - Celebrating 60 Years

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W: www.birns.com
CEO: Eric Birns

The Case: BIRNS, Inc. is an ISO 9001:2008 certified global leader in the design and manufacturing of high performance connectors, custom cable assemblies and lighting systems. 2014 marks the company's 60th anniversary of serving the industry and providing technologically advanced solutions trusted in some of the planet's most demanding environments.

BIRNS has supported the deep submergence oceanic community with products that deliver everything from faster, more robust communication to brilliance in the murky depths. The company's contributions in the marine market began in the 1950s when it was asked to develop subsea systems for the US Navy for the highly classified Polaris underwater missile ejection project and later for Sealab. Today BIRNS is relied upon to provide powerful lighting solutions, from halogen to LED, as well as unique technologies like the BIRNS Titan, an intensely bright 4,000W, 380,000 lumen hydrargyrum medium-arc iodide (HMI) lighting system created for the Costa Concordia salvage project. In 1990, BIRNS launched its Connector Division in answer to increasing customer demand. BIRNS' high performance connector lines quickly garnered major popularity, and the company went on to engineer highly successful lines like the 6km rated BIRNS Millennium range. These miniature, high-density metal shell connectors set the benchmark for elevated bandwidth delivery, and feature configurable inserts for both high (= 3.6kV) and low (= 600 V) voltage. BIRNS now leads the industry in fiber optics, with typical loss for cable assemblies of <.5 dB. The company specializes in cable assemblies integrating Electro-Opto-Mechanical (EOM) capabilities, which deliver huge amounts of power, data and signal, and provide load strengths of >50,000 lbs. Recently, BIRNS was called upon to develop a set of ABS certified fiber optic penetrators for a manned submersible. The robust penetrators were custom overmolded and featured low insertion loss of < .2dB and high return loss of >35dB. The certification for optical penetrators was new territory for ABS, so the organization worked with BIRNS to develop rules for witnessing the testing of the new design.

Catalina Sea Ranch

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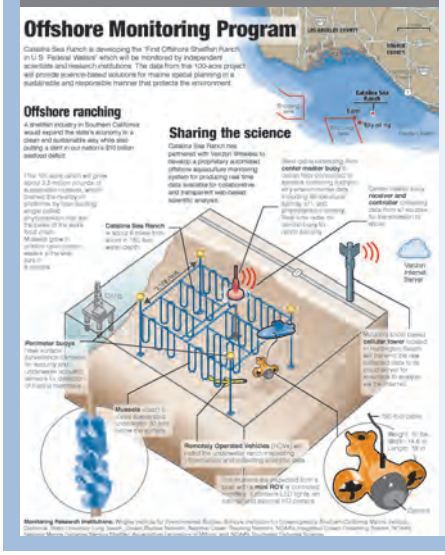
T: +1 562 544 7410
E: phil@catalinasearanch.com
W:www.catalinasearanch.com
CEO/President: Philip Cruver
No. Of Employees: 6



The Case: Catalina Sea Ranch is developing the "First Offshore Shellfish Ranch in U.S. Federal Waters" which will be monitored by independent scientists and research institutions.

Catalina Sea Ranch, LLC, headquartered at Terminal Island in the Port of Los Angeles, California, has secured the first permit for offshore aquaculture in U.S. Federal waters from the U.S. Army Corps of Engineers, which was unanimously approved by the California Coastal Commission. This 100-acre project will produce 2.5 million pounds of sustainable shellfish grown 30 ft. under the water surface six miles offshore Huntington Beach, California. This venture also supports the goals of the National Oceanic and Atmospheric Administration (NOAA), establishing a framework to allow sustainable domestic aquaculture to contribute to the U.S. seafood supply.

Catalina Sea Ranch's monitoring program, employing Verizon's wireless network and cloud services for transmitting scientific data, will commence during the summer of 2014. The following research institutions will be analyzing the data:

The Wrigley Institute for Environmental Studies, Scripps Institution for Oceanography, Southern California Marine Institute, California State University Long Beach, Ocean Studies Network, National Ocean Tracking Network, NOAA's Integrated Ocean Observing System, NOAA's National Marine Fisheries Service Shellfish Aquaculture Laboratory in Milford and NOAA's Southwest Fisheries Science Center.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From
the surface to
the seafloor, the
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companies deliver the
products, technology, and
talent you demand to
get the job done.
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www.teledynemarine.com

DeepSea Power & Light

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W: www.deepsea.com
CEO/President: Mark Olsson
Engineering Director: Eric Chapman
No. of Employees: 40

DeepSea Power & Light is a U.S. company with 30 years of experience manufacturing underwater lights, cameras, batteries, and lasers for deep diving submersibles, ROVs, AUVs, offshore oil, and commercial divers. It was founded in 1983 with the goal of providing high quality, innovative products to the oceanographic community. Initially manufacturing deep water power systems, the company's expertise and product line has grown over the years to include a wide range of underwater video and lighting systems.

The Tech

DeepSea Power & Light is a global leader in underwater lighting, video, and power systems for the oceanographic community. All of DeepSea Power & Light's standard products are rigorously designed to perform in the harsh marine environment, from wet/dry surface applications to full ocean depth deployments.

Franatech GmbH

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W: http://www.franatech.com
CEO/President: Björn Ove Skjeie
No. Of Employees: 13

CTO/Founder Michel Masson is a pioneer in underwater gas sensors, receiving in 2002 the Schmidt-Röhmhild Technology Award for the first practical underwater methane sensor. Since then Franatech has broken ground regularly, e.g. with the first underwater gas sensor based on Tunable Diode Laser Spectrometry, leading as early as 2008 to first users publications. Franatech products have been sold in 25 countries, and have been cited in more than 35 users scientific papers.

The Profile

Franatech is a company specialized in development, production and supply of underwater sensors for dissolved gases; a leader in underwater methane monitoring and detection technology. Franatech disposes of a fully equipped laboratory for sensor calibration and tuning. It can simulate various deployment conditions and dispose of an own pressure test chamber. Electronic laboratory and mechanical workshop complement our capacity. Most of our R&D work is done directly under client contract.

IP Subsea

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W: www.ipsubsea.com
CEO/President: Cliff McDougall
Engineering Director: John Hennage
No. of Employees: 8

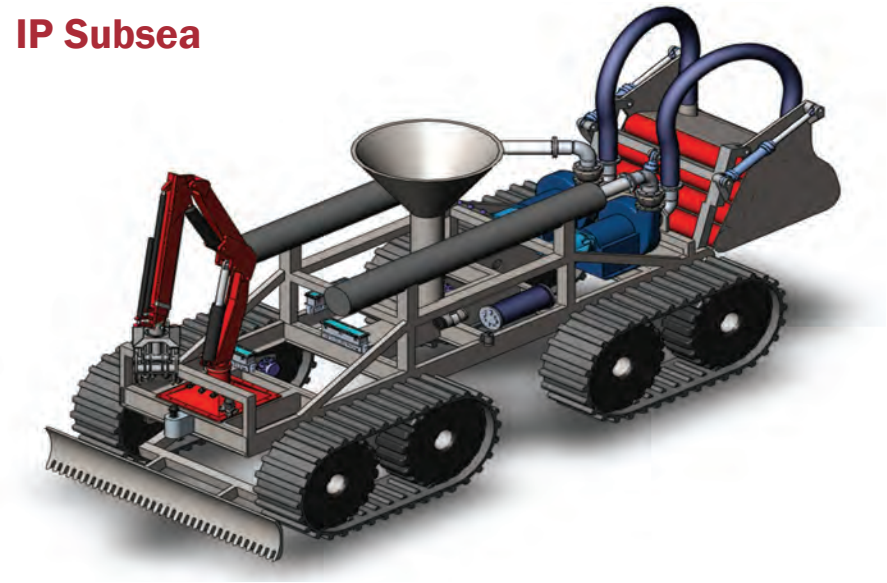
There is another "Gold Rush" underway in the waters off Nome, Alaska. The well-known placer gold deposits extend into the sea where the commercial mining backhoes are limited to 30 ft. water depth.

Meanwhile, port and harbor dredging costs are skyrocketing worldwide while conventional dredging technology lags in adopting established remotely operated vehicle (ROV) technology and best practices from the telecom, oil and gas and renewable energy industries.

The Tech

IP Subsea's remotely operated dredge is a versatile 1000hp platform to perform subsea mining and dredging as well as additional survey and imaging services. The unique design offers precise vehicle positioning and control while working submerged for long durations to continuously dredge through various seabed conditions.

IP Subsea



Battelle

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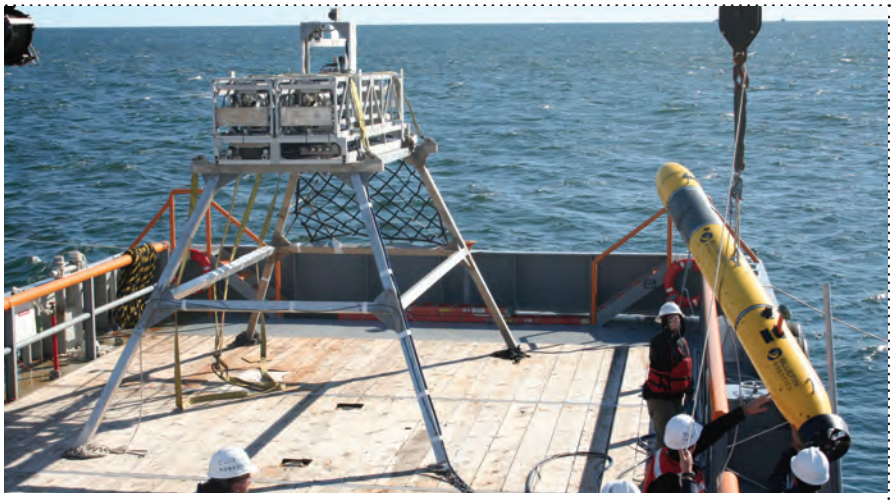
E: delaneyk@battelle.org
W: www.battelle.org
CEO/President: Jeffrey Wadsworth
GM: Fred Byus, RDML, USN (Ret.)
Sales Manager: Rich Granger
Number of Employees: 85
Annual Sales: $20 million



The Case: Battelle's Maritime Systems group provides customized hardware development, engineering services, product manufacturing and support. It can bring purpose built solutions to the most difficult technology challenges in the maritime environment especially addressing submersibles, persistence, life cycle engineering and sensors.

The Company

At major technology centers and national laboratories around the world, Battelle conducts cutting-edge research and development, designs and manufactures products, and delivers critical services for government and commercial customers. Battelle, the world's largest independent research and development organization, is headquartered in Columbus, Ohio. Founded in 1929, Battelle operates in three broad areas: National Security; Energy, Health and Environment; and Laboratory Management. It offers a full service line of products and system development to enhance the efficiency and affordability of maritime operations. It provides engineering solutions and systems for maritime and underwater applications. Its high-speed data communicators, oil spill detection and tracking systems, and autonomous sensor systems are just some of the maritime technologies that will help provide safe, accurate exploration and monitoring in harsh environments. A wholly owned subsidiary of Battelle, Bluefin Robotics, manufactures unmanned undersea vehicles (UUVs).

The Tech

• ***Submersibles:*** Battelle's strengths are technology development and fielding customized systems. The company leverages extensive experience in engineering undersea vehicles and subcomponents to offer nearly limitless possibilities for undersea vehicles, including greater depth, larger battery size or any number of specialized reconfigurations. The advanced capabilities of our Proteus Dual-Mode Undersea Vehicle platform also enable increased autonomy and endurance for longer and more complex missions.

• ***Persistence:*** Battelle's UUV Docking and Recharging Station (UDRS) keeps submersibles at depth longer and reduces turnaround time to extend underwater mission performance for safer, more efficient and more discreet operations.

• ***Life Cycle Engineering:*** Battelle aims to help keep costs down by providing technology refreshment throughout a system's lifecycle and extending system maintenance cycles to maximize long-term investments and reduce total ownership cost of maritime technologies.

• ***Sensors:*** Battelle designs, manufactures, produces and distributes ocean sensors for a variety of commercial and military applications. Sensors such as Battelle's Seaology pCO2monitoring system have been used by National Oceanic and Atmospheric Administration (NOAA) since 2009 to support its Global Ocean Observing System (GOOS) and measure CO2 in maritime environments.

Testing Capabilities:

Battelle-owned and –operated-facilities for maritime and subsea research are located at six primary locations and include a variety of testing capabilities, including:

• ***Columbus, OH***—Research pool; pressure chambers to 30,000 psi; wet and spectroscopic analytical chemistry laboratories; shock, vibration and fatigue testing; electronics, electro-optics and software laboratories. Class 100 clean room. High energy testing (explosives and ballistics) at our High Energy Research Laboratory Area (HERLA)

• ***Duxbury, MA—***Environmental monitoring, water quality, ultra-trace analytical chemistry laboratories; hydrocarbon forensics

• ***Quincy, MA—***Test fixtures, testing tanks and specialized equipment

• ***Sequim, WA—***Oceanographic modeling, marine toxicology, environmental monitoring; Class 100 clean room

• ***Daytona Beach, FL—***Corrosion and coatings testing

• ***Dublin, OH—***Specialized, low to medium volume, 65,000 sq. ft. manufacturing facility

Cygnus Instruments, Inc.

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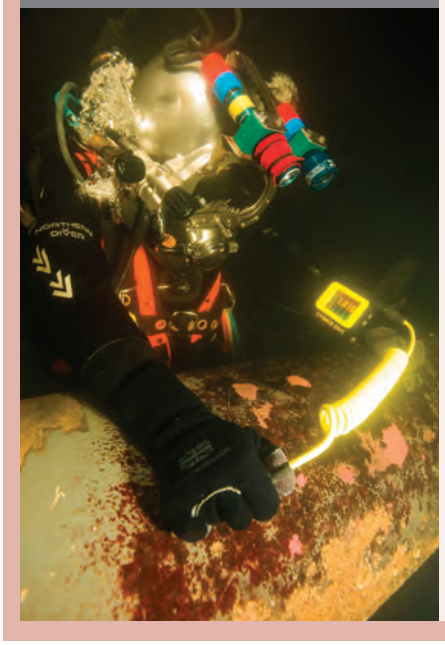
E: sales@cygnusinstruments.com
W: www.cygnusinstruments.com
CEO/President: Rod Sanders
No. of Employees: 35



Cygnus was founded by a marine surveyor who specialized in the inspection of large oil carriers, when it was felt that there was a need for an accurate digital ultrasonic thickness gauge where coating did not have to be removed and accurate, verified measurements were obtained. The multiple echo technique, used with oscilloscopes (flaw detectors), was first digitized by Cygnus and introduced in 1983. In 1985 an underwater version was introduced worldwide. In 2012 a new diver hand held version was introduced called the DIVE. This gauge is worn on the diver's wrist/forearm and features a large LED display, data logging, waveform presentation, helmet mounted display and topside data logging or topside display with video overlay option.

In mid-1990's Cygnus offered circuitry to be mounted on large work class ROV's to perform thickness testing. By 2000 Deepwater and Shallow Water units tested to 1,000 and 3,000 meters were introduced for workclass ROV's. In 2005 the Mini ROV system was introduced for the smaller observation ROV's. In 2009 the Deepwater and Shallow Water units were increased to 2,000/4,000 meter depth ratings. Cygnus has been in the forefront of design and technology to serve the need for subsea inspection by ROV's on offshore platforms and subsea piping.

The Tech

All Cygnus gauges employ the Multiple Echo Technique. This technique first developed in the 1950's for use with the oscilloscope type gauges called flaw detectors. In 1983 Cygnus introduced the first digital multiple echo thickness gauges. The gauge operates by matching the timing of two consecutive backwall echoes to verify that the sound has in fact come from the same backwall. When the timings match exactly, the gauge displays a measurement.

EdgeTech

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E: info@edgetech.com
W: www.edgetech.com
CEO/President: R. Jablonski
Number Of Employees: 100

The Case: EdgeTech is a manufacturer of underwater technology solutions known for its: side scan sonars, sub-bottom profilers, bathymetry systems, AUV and ROV-based sonar systems, USBL systems, transponder beacons, deep sea and shallow water acoustic releases, and customized underwater systems.

EdgeTech designs, manufactures, sells and supports a variety of standard and engineered-to-order underwater sonar systems including side scan sonars, sub-bottom profilers, bathymetric, combined and modular systems. The systems are available in a range of configurations for towed, deep towed, AUV, ROV, ROTV and custom platforms providing underwater imaging. Additionally, EdgeTech provides USBL acoustic tracking and positioning systems, transponder beacons, deep sea acoustic releases, shallow water and long life acoustic releases, motion reference units (MRU), underwater acoustic command and control systems and custom-engineered acoustic products. EdgeTech is known for its high resolution sonar imaging and underwater technology. In addition to a wide range of Acoustic Releases and USBL systems, it offers commercial-off-the-shelf and custom-engineered sonar systems. These systems include side scan sonars, sub-bottom profilers, bathymetry systems, AUV and ROV-based sonar systems, combined and customized solutions.

Most recently the company launched the 6205 Combined Bathymetry and simultaneous Dual-Frequency Side Scan Sonar. The new product offering is the next generation of bathymetric technology for shallow water hydrography and benthic mapping. With EdgeTech's enhanced bathymetry capability and the latest lightweight packaging, the 6205 is designed to offer excellent resolution and precision measurement of the sea floor with co-registered, simultaneous dual-frequency side scan imagery. Multiple frequency options are available to address all coverage requirements from 0 to 200m of water depth. The 6205 is a combined bathymetry and dual-frequency SS system with no nadir gap.

McMillan Design, Inc.

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E: jmcmillan@seacatch.com
W: www.seacatch.com
CEO: John McMillan
No. of Employees: 2
Annual Sales: $500,000.00

The Company

McMillan Design, Inc. is a small, privately owned, multi-disciplinary design company located in Gig Harbor, Washington. It concentrates its current efforts in manufacturing, improving, and marketing the Sea Catch Toggle Release and other innovative related related products. The Sea Catch is now available in over 68 different models.

The Sea Catch Toggle Release hook, designed exclusively for safe release of lines or objects under load, and is designed to be the simplest and most innovative in-line, quick release hook design on the market. Since 1994, Sea Catches have gained praise from engineers and users in 14 major industries around the world.

The Tech

Using computer-generated parts precision-cut from aerospace-grade stainless steel plate, Sea Catch is a revolutionary, tough, mult-purpose quick release that combines unique features such as no springs, common shackle connection, multi-directional, low friction releasing and a hitch-pin safety lock. The key is the combination of a proven toggle linkage principle, low friction, computer-generated parts and a lot of thinking about its jobs.

Every day, all over the globe, engineers, technicians and crew members find themselves faced with the daunting and often unpredictable task of releasing a heavy object while under load. Releasing an object under load need not be a daunting task any longer.

Novacavi

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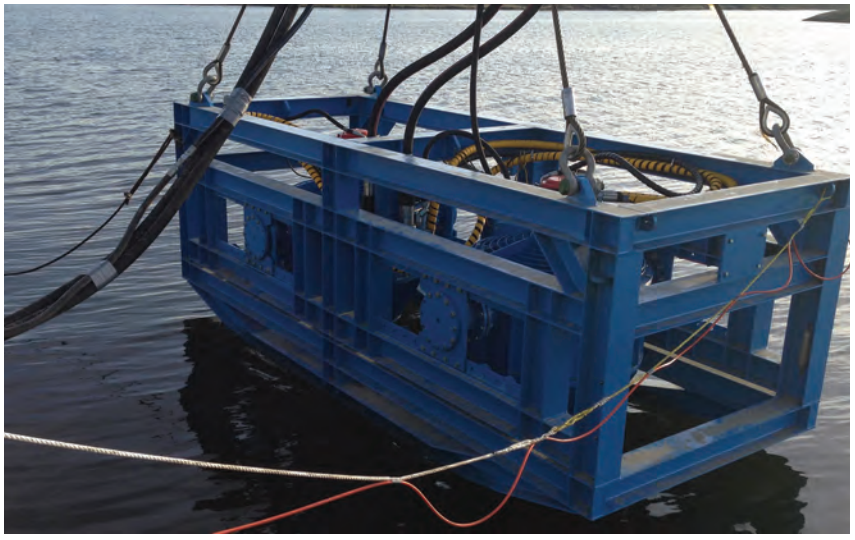
CEO/President: Ferruccio Ramploud
Engineering Director: Decio Gasparetto
Number Of Employees: 30

Established in 1975, Novacavi provides expertise in designing and manufacturing in-house unique cables. As a privately owned company with almost 40 years of experience in designing and manufacturing customized special cables that 15 years ago decided to focus also on underwater technologies, this year Novacavi has launched Aquancable, a wide range of specialist bespoke cables for maritime and underwater technologies. These include ROV cables, Fiber Optic hybrid cables, umbilicals, subsea armoured cables, subsea detection and instrumentation cables to be suitable in any harsh environment conditions while guaranteeing the requested performance. With Aquancable it broadened its portfolio with a patented product family that ensures performance for specialist situations to marine and underwater industry.

James Fisher Mass Flow Excavation

James Fisher and Sons formed a new venture with Aberdeen based company KDM Marine – James Fisher Mass Flow Excavation – to jointly offer its subsea excavation capability and resources to the offshore industry in a single entity. JFMFE combines the specialist subsea excavation, de-burial and trenching capabilities of both organizations and offers the extensive HydroDigger capability of James Fisher together with the highly innovative KDM Twin Prop system to the offshore oil, gas and marine renewable energy sectors worldwide.



Prometheus Inc.

21 Arnold Avenue, Newport, RI, USA 02840
T: +1 401 849 5389
E: jim@prometheus-us.com
http://www.prometheus-us.com
CEO/President: Jim Byrnes
Number Of Employees: 25

Prometheus Inc., incorporated in 1983, is a mathematics and engineering research firm that specializes in the application of high-level mathematics to modeling, simulation and signal processing. Its senior professional staff of 23 includes 15 PhD scientists (mathematics, engineering, physics). **Its goal: Provide mathematical solutions and real-time code to dramatically improve system performance at reduced costs.**

Prometheus has provided computationally efficient mathematical solutions for: remote material discrimination with radar and sonar; feature-based pattern recognition; real time broadband reverberation modeling; closely spaced object discrimination; waveform diversity, particularly for space-based radar; and the Advanced Acquisition Decision Aid to evaluate technology investments.

Supported by the U.S. Navy, Air Force and National Reconnaissance Office Prometheus developed algorithms leading to the automatic determination and discrimination, in intense clutter, of organic materials including foliage, people, chemicals and biologicals at various temperatures and moisture content, as well as man-made objects such as submarines and mines.

Its algorithms compute materials identification in real time from scattered measurements, have good noise rejection and are robust to clutter. Its success in providing the Fleet with information not available in today's operational sonar systems is exemplified by the FY12 award of a $3M Rapid Innovation Fund contract by the Navy. Its real-time object detection software provided a greater than 100-fold data reduction in the analysis of undersea video taken to locate and discriminate chemical munitions canisters in waters near Pearl Harbor.

Falmouth Scientific, Inc.

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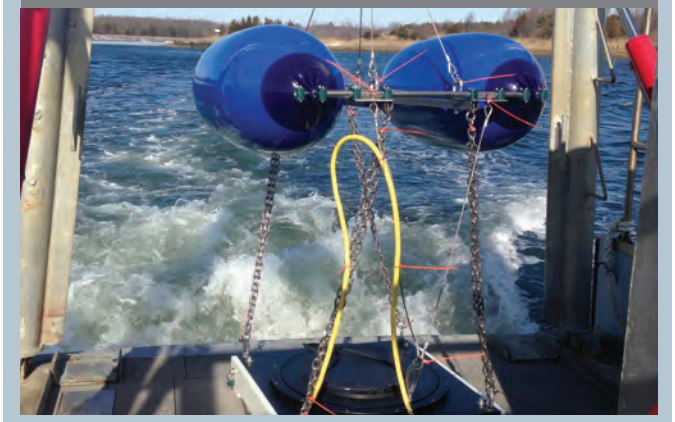
http://www.falmouth.com
CEO/President: John Baker
No. Of Employees: 17



The Company

FSI's experience includes the design, manufacture, and integration of stand-alone and turnkey systems to collect and relay oceanographic data in real time. Core competencies include system and design engineering; on-site volume production, rapid prototyping, encapsulation, and assembly; and electrical, acoustic and system testing. Its products and systems are used in environments ranging from estuarine to full ocean depths. Besides offering a suite of standard products the FSI team has engineered many custom solutions to meet specific and varied needs. Founded in 1989, FSI operates from a manufacturing facility located in the marine technology corridor on Cape Cod, MA.

The Tech

Sensors: The FSI PLUS Family of current, wave, and tide instruments are designed to enhance the ability to measure current speed and direction under difficult conditions, offering the ability to make accurate current measurements in very clear and/or very shallow water, as well as at the surface and sea-floor boundary areas. Data can be acquired in real-time or captured and logged in internal memory. FSI offers shallow (200m) and deep (7,000m) ACM-PLUS current meters as well as options to add an integrated CTD and one or two external sensors. FSI also offers the ACM-WAVE-PLUS which gives 3D currents and wave characteristics, and the WAVE-TIDE-PLUS which gives 1D wave and tide data.

Systems: The HMS-620 Bubble Gun low-frequency, ultra-portable seismic system is designed for small boat shallow water geophysical surveys. FSI also offers sidescan sonar systems, hull mount arrays, and other specialized transducer systems.

Bibby Offshore

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Scotland
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E: info@bibbyoffshore.com
W: www.bibbyoffshore.com
Chairman: Sir Michael Bibby
CEO: Howard Woodcock

Going back to 1807, Bibby Offshore has kept up its tradition of top-class ship ownership for more than two centuries. It has since expanded its services to the offshore oil and gas industries, starting in the 1980s. Sixth generation Sir Michael Bibby has been able to uphold the values that his ancestors created the company upon. Over the past 10 years, Bibby and its sister companies have skyrocketed in size, going from having just 10 employees, to having 1300 employees today.

Bibby Remote Intervention Limited (BRIL), a branch of Bibby Offshore, has added to its fleet by signing a charter for an IRM (Inspection Repair and Maintenance) light construction vessel and two ROVs.

These charter agreements have been reached in preparation for the construction of an MT6021 vessel. The vessel serves the purpose of providing IRM services, pipeline & structural inspection, and light construction support. The ROVs, SMD Quasar 150hp vehicles, will aid with survey, construction, and drill support operations in Bibby Offshore's newer markets, Southeast Asia and North America. Additionally, Bibbly Offshore has invested nearly $51.4 million in an effort to expand its fleet. This investment has gone towards such vehicles as the *EDT Jane*, an ROV support vessel.

Bibby Offshore has had booming success in its newly developed North American division, Bibby Subsea. Located in Houston, the branch has tripled since its inception. Market demand has been great, projected to grow 43% over the next five years.

ROMOR Ocean Solutions

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W: www.romoroceansolutions.com
CEO/President: Darrin Verge
No. of Employees: 6

ROMOR Ocean Solutions has created the source, supply and solutions to meet customers, oceanographic and geophysical application requirements. With 30 years of experience in the marine and ocean technology industry, ROMOR has become a leading provider of world renowned instrumentation in the oceanographic, defense and offshore oil & gas sectors. Working closely with industry, academia and governments, ROMOR has been able to source, supply and solve the customer's requirement to retrieve and collect data in the field. Whether it is providing instrumentation, support, or collaboration to its customers, ROMOR is focused on discovering and introducing new opportunities to the world. The ROMOR C-ROM (Compact Recoverable Ocean Mooring) is an oceanographic subsurface mooring solution that offers a reliable and compact design to mooring and recovering oceanographic instrumentation. The C-ROM consists of a subsurface flotation collar mounting assembly for instrumentation that provides approximately 80lbs positive buoyancy starting at depths of 750m, progressing to full ocean depth. The C-ROM floatation collar encloses a customer specified acoustic release assembly as well as the client specified instrument(s) that can be accommodated within the dimensions of the design. The arrangement is a two-piece flotation collar that fastens directly to a strong back assembly to which the acoustic release is attached. Each half of the collar is a polyethylene shell filled with a syntactic foam. As an option, the C-ROM Roto Drum can be included with the C-ROM to enable recovery of the mooring anchor once the mooring has been released and surfaced. Additional options, such as an acoustic modem for remote data collection, can also be included into this design.

Teledyne Marine

All the sonars you need, in one place

UTS Boston
October 7th – 9th

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RDSEA International, Inc.

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CEO/President: Rick Cole

RDSEA International, Inc., St Pete Beach, Florida, founded in 2002 by Rick Cole while a Research Associate at the University of South Florida's College of Marine Science, around the increased need for experience and expertise in "ocean technologies" in the blue-water and coastal regions of our oceans, bays and estuaries (fresh water not to be excluded). RDSEA's foundation began on federal, state and local oceanographic programs and observing systems focusing on "air-sea interaction" and "ocean circulation". Its experience spans over three decades of ocean measurements and technology evolution. Knowledge of our ocean environment is no longer limited to science and scientists. The growing list now consists of: coastline emergency management, U.S. Coast Guard search and rescue operations, the U.S. IOOS, public health, recreational and commercial fishing, diving, alternative energy solutions, the public's need and want to know more about what is taking place offshore of their beaches and, of more recent concerns, oil spill response management and mitigation. All now front and center for those of us that provide the technology, methodology and services of collecting critical data on observation platforms, systems and programs, especially in today's era of increased natural phenomenon such as hurricanes, earthquakes and tsunamis.

RDSEA measures large or small-scale-ocean atmosphere interactions, mixed layer dynamics and ocean circulation. With a variety of data loggers and transmitters to choose from within our quiver of components, based on project specifics, we can record internally and transmit externally environmental parameters directly to your facility server for further post processing. Ocean measurements have come a long way since first recording the basic physics of water column density and currents only. Technology has altered and advanced the manner in which we measure, record and transmit the above mentioned parameters. Eliminating "cables" and "moving parts" is a goal of many groups in today's era of offshore sampling, both top-side and subsurface.

Bluefin Robotics

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W: www.bluefinrobotics.com
President: David P. Kelly
No. of Employees: 200

The Case: This year, the US Navy used the Bluefin-21 for the search for missing Malaysia Airlines Flight 370 in a remote and very deep area of the Indian Ocean. The AUV was launched 25 times in order to collect over 850 sq. km of seafloor imagery. As a result, authorities successfully discounted the area as the final resting place of those on-board.

Company Profile:

Bluefin Robotics, a Battelle Company, develops, builds, and operates Autonomous Underwater Vehicles (AUVs), subsea batteries, and related technologies for defense, commercial, and scientific customers worldwide. It offers a full range of modular, free-flooded AUV platforms having designed in more than 50 different configurations. The Bluefin team brings a unique set of skills including hard-won expertise in the application of advanced materials, systems, and technologies to real-life operating conditions. It offers research and development capabilities, technology integration, full-scale manufacturing facilities, test and evaluation infrastructure, and customer support functions from training and marine operations to logistics and full life-cycle support. Headquartered in Quincy, Massachusetts, Bluefin's 55,000-sq. ft. facility houses three floors of engineering, manufacturing, marine operations, and corporate administrative functions. With ample space for equipment and direct ocean access, it is able to design, build and test our systems all in a single location allowing our team to work efficiently and effectively. No other provider has our depth and breadth of expertise and resources dedicated exclusively to AUV development and production. Bluefin Robotics spun-out from the Massachusetts Institute of Technology in 1997. In 2005, the company became a wholly-owned subsidiary of Battelle and in 2013 expanded its autonomous capability portfolio with the acquisition of SeeByte of Edinburgh.

Bluefin's product line includes the new modular Bluefin-9, the mid-size Bluefin-12, and the Bluefin-21 most recently used by the US Navy to search for missing Malaysia Airlines Flight 370 in the Indian Ocean. Bluefin AUVs can be equipped with a variety of state-of-the-art payloads, collision avoidance, pipeline tracking capabilities, and Witness, Bluefin's new communications and visualization add-on used for viewing imagery while underway. Bluefin subsea power's power portfolio includes the production of over 500 batteries for both AUV and non-AUV applications.

Noteworthy Defense Programs:

• SMCM UUV - Knifefish is a specialized Bluefin-21 for the mine countermeasures mission package for littoral combat ships

• Next generation counter measures - This expendable UUV is a small-diameter vehicle customized specifically for torpedo defense

• SHARK ASW System – SHARK AUV is a ground-breaking anti-submarine warfare concept for the DARPA/DASH Program, leveraging Bluefin's deep ocean technologies for persistent presence

• Proteus - this hybrid swimmer delivery/AUV platform introduces game-changing conops to subsea warfare

• HAUV-N - HAUV with a manipulator arm that serves as a mine identification and neutralization capability for use in explosive ordnance disposal.

David P. Kelly

Imagenex Technology Corp.

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CEO/President: Willy Wilhelmsen
No. of Employees: 25

The Company

Imagenex was founded in 1988 by pioneers in the development of high-resolution imaging and profiling sonar. Within two years, the company had produced its first sonar – an imaging head for the commercial underwater industry that was the unheard-of size of a coffee mug and rated for 300 m depth.

Company milestones include introducing the industry's first digital color imaging sonar that could be operated from a computer without a dedicated processor in 1995; introducing a side-scan sonar in 2000 with a revolutionary price/performance ratio; and developing a high quality, compact and cost-effective multibeam sonar with obstacle avoidance or profiling configurations and optional depth ratings to 6,000 m.

It is the company's development of the lightweight, cost-effective Delta T multibeam sonar that is successfully bringing the benefits of real-time, high-resolution, 3D visualization within reach of operators that previously had to use mechanical scanning single-beam devices.

The combination of reduced cost, high quality imaging and functionality of the Delta T and other Imagenex products has been increasing its popularity in the scientific market, and for commercial, recreational and search and rescue (SAR) applications around the globe.

The Tech

Imagenex has developed a reputation for products that break new ground for depth capability, size, cost, imaging quality and functionality. Innovation is both a goal and methodology for the company, which closely manages its product development, in order to control quality. As Imagenex continues to bring new products to market, it adds variations and improvements to existing equipment.

The DT100 Multibeam Echo Sounder reaches a new performance level in

INNOVASUB

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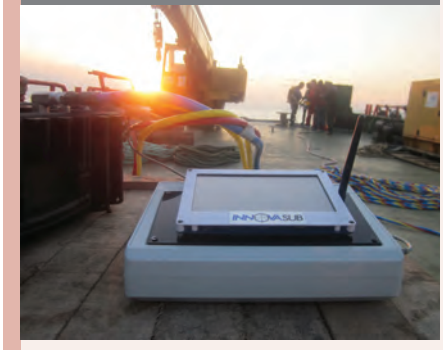

The INNOVASUB mission is to develop, trade and distribute innovative underwater technologies that can serve the needs of commercial, recreational and sportive divers and dive organizations. Apart from distributing worldwide trusted products of partner brands; it produces a variety of products from software to hardware in order to match, guide and contribute to the formation of the needs of today's divers. INNOVASUB awarded five R&D contracts by the government; one R&D contract by European Union EUREKA project, two CITEPH R&D project. The latest R&D project is sponsored by Technip and aims to use a Decompression Index to investigate the Saturation Diving Intervals.

The software engineering team in INNOVASUB produces a large variety of applications ranging from mobile solution to cloud applications. For instance, the real time decompression management software DepthMonitor is a product to be used with the INNOVASUB Divephone case rated to 500 ft.; The Frameanalyser software is a signal processing tool to detect post decompression bubbles from ultrasound recordings. The SSK (Supervisor SideKick) is a tool for diving supervisor to organize their dives and to maintain small and medium scale databases of equipment and divers. Its electronic hardware team has patents on converting the analog panels to digital and for monitoring breathing. Its electronic team can not only design but also manufacture small scale electronic prototypes in our antistatic Lab. The wholistic approach in design at INNOVASUB also incorporates Mechanical, Mechatronics Engineers that work with the company on part time or contract basis. The patented dive computer system of INNOVASUB in the market is running the Depth Monitor software that can be downloaded from App Store or from Google Play. The last patent pending device IWU, monitor the breathing pattern of the diver and provides alarms based on abnormal breathing patterns or respiratory arrest: IWU can also detect the regulator malfunction. The harness incorporated version of IWU (STP) detect, logs the position of the diver and in case of respiratory arrest provides emergency ascent together with the safe position of the body.

the new DT101 – a single instrument integrating the sonar, motion reference unit (MRU), and sound velocity sensor into one sleek and compact unit. The DT101 requires only one cable for operating all three sensors.

Gyro-stabilization of the Imagenex Model 881A-GS & 881L-GS make these high resolution sonars into systems capable of crystal clear visualization of the ocean environment from moving platforms, no longer compromised by the blurring effects of host vehicle rotation. An advanced, low drift gyro is integrated directly into the sonar head, so the sonar can now compensate for vehicle motion in real-time with unprecedented accuracy, stability, and robustness.

Rowe Technologies

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CEO/President: Marc Parent
Number of Employees: 16

The Case

Technology focused and customer centric, Rowe Technologies (RTI) designs and manufacturers innovative and robust ADCPs and DVLs used for measuring currents, directional waves and underwater navigation for shallow coastal environments to full ocean depth. RTI provides the industry's only dual frequency ADCP/DVL and highest resolution velocity measurements (0.01 cm/s) in the industry.

The Company

Rowe Technologies, Inc., founded by Dan and Steve Rowe in 2009, is a private company with its headquarters located in Poway, California (USA). It employs a staff that develop, manufacture, market and service leading edge, high quality, underwater sonar systems for use in oceanography, navigation, limnology, and hydrology applications worldwide. Its instruments are pulsed backscatter sonar systems or Acoustic Doppler Current Profilers (ADCPs) and Doppler Velocity Logs (DVLs) used to transmit and receive echoes from "targets" in the water column and along surface and bottom boundaries, to compute the following:

- Vehicle and water velocity from Doppler frequency shift
- Range to targets based on acoustic travel time
- Angle to targets based on beamforming and echo angle-of-arrival, and
- Bottom and water column acoustic image characteristics based on echo intensity and range.

The Tech

Rowe Technologies' (RTI) core team is centered on advanced electronic engineering and signal processing development as well as acoustic transducer design and development of traditional and multi-frequency piston products and planar arrays. Its core competencies are:

- Underwater Acoustics
- Acoustic Imaging
- Embedded Signal Processing
- Advanced Electronic Design
- Complex FPGA Design
- Transducer Development and Manufacturing
- Deep Ocean Design

Seafloor Systems Inc.

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W: www.seafloorsystems.com
CEO/President: John Tamplin
No. of Employees: 7

The Company

Seafloor Systems, Inc. was formed in Portland, OR, in 1999 by veteran naval hydrographer John Tamplin to provide hydrographic survey equipment and consulting to survey companies in the Pacific Northwest. Specializing in geophysical survey equipment, Seafloor has built up the largest multibeam echosounder rental pool in the U.S., providing full spectrum of equipment, software, personnel, training, and support. Combined, it has completed more than one million line-miles of multibeam survey.

The Tech

Seafloor Systems, Inc. provides turnkey multibeam systems for shallow to medium-water depths (1-3000m). In addition to sonars, it provides a range of ancillary sensors such as motion and attitude sensors, sound velocity profilers, and tide gauges. It has sensors from many manufacturers such as Applanix, Coda Octopus, Teledyne Marine, Trimble, Valeport, and Ohmex. It also offers a Reson

John Tamplin

8160 50-kHz multibeam echosounder, capable of mapping the seafloor down to 3,000 meters. For data acquisition and processing, it offers software systems from Triton Imaging, Hypack, Chesapeake Technology, and Caris. Its data processors can process data from multibeam echosounders, side scan sonars, magnetometers, and subbottom profilers acquired in most common formats such as XTF, Q-MIPS, .ALL, .HSX, SEG-Y and many more.

Kongsberg Maritime

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The Case: Kongsberg Maritime's sonar, multibeam echo sounders, cameras, positioning and underwater communication systems, and AUVs are used in survey and inspection operations worldwide. Working closely with customers to develop technology that pushes the limits in subsea applications, Kongsberg Maritime is also dedicated to developing innovative environmental monitoring solutions.

The Company

Company Mission: Maximizing performance by providing The Full Picture. Kongsberg Maritime is a global marine technology company providing innovative and reliable solutions for all marine industry sectors including merchant, offshore, subsea, naval and fisheries. A world leader in technology advances, Kongsberg Maritime delivers systems that cover all aspects of various maritime applications:

- ***Subsea survey and construction***
- ***Maritime security***
- ***Environmental monitoring***
- ***Scientific research***
- ***Dynamic positioning and navigation systems***
- ***Marine automation***
- ***Safety management***
- ***Cargo handling***
- ***Maritime simulation and training***
- ***Satellite positioning***

Integration of systems is a key driver to the success of Kongsberg Maritime. The company is dedicated to providing innovative and reliable solutions for all customers and stakeholders that ensure optimal operation at sea and onshore.

Market Segments

Key markets are countries with large offshore, shipyard and energy exploration & production industries. In exploration the company provides sophisticated underwater and positioning technology and systems for survey vessel operation. In field development, construction and offshore vessels are supported with innovative solutions for operation and specialist applications whilst in production our hardware and software enhances output and minimizes downtime. For maritime transport and offshore vessels, The Full Picture is supplied, including navigation, automation, training and safety systems.

The Tech

Kongsberg Maritime develops innovative products using the latest technology and techniques. It develops cutting-edge hydroacoustic survey systems including market leading multibeam and single beam echo sounders, and sonars, connected to positioning equipment, heading and motion sensing instruments, as well as sound velocity sensors and processing software.

Kongsberg Maritime is a leader in the field of underwater cameras and AUV development, counting several navies and the world's leading survey companies as customers of its Seaglider, REMUS, HUGIN and MUNIN AUVs. HUGIN has been a key technology development area since 1990 and is used for a variety of civilian and military applications.

Environmental monitoring solutions are a recent focus at Kongsberg Maritime, with a sophisticated new Integrated Environmental Monitoring System for Statoil, developed with IBM, DNV and other KONGSBERG Group stakeholders, in addition to a new Modular Subsea Monitoring Network.

Kongsberg Mesotech Ltd, the Canadian subsidiary of Kongsberg Maritime, is a leader in the underwater acoustic industry. With over 40 years of innovative sonar experience, the Company designs and manufactures acoustic instrumentation with superior image resolution. Mesotech supplies a worldwide customer base with sonar for search and recovery, marine engineering, security and surveillance, fisheries and scientific applications.

Kraken Sonar Systems Inc.

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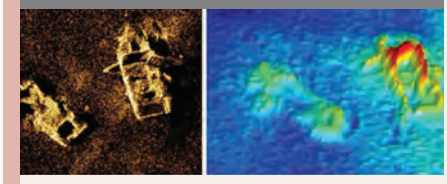
W: http://www.krakensonar.com
CEO/President: Karl Kenny
No. Of Employees: 9



Kraken is a marine technology company engaged in the design and development of high performance sonars and acoustic sensors for military and commercial applications.

It is leading developers of Synthetic Aperture Sonar (SAS), a sonar technology for ultra-high resolution seabed imaging. SAS uses sophisticated signal processing of successive acoustic pings to form an image with much higher resolution than conventional sonars.

SAS was initially developed for military applications such as naval mine detection and classification. As SAS technology becomes more affordable, it's expected to find wide use in civilian markets and become a valuable supplement to, or even a replacement for, conventional sonar technology. SAS is also emerging as an ideal sensor for unmanned underwater vehicle applications. By using vehicle motion to create a long synthetic array, image resolution can be increased by an order of magnitude or more compared to traditional side scan sonars. SAS technology is also well suited for interferometric processing, facilitating very high resolution imaging and 3D bathymetry imaging from the same sensor.

SAS, a fairly new technology, provides ultra-high image resolution combined with very efficient area coverage rates. Kraken has successfully developed AquaPix, an advanced, ultra-high resolution Interferometric Synthetic Aperture Sonar (InSAS) with 3D bathymetric capabilities. AquaPix is primarily designed for use on AUVs, ROTVs, ROVs and Tow Bodies and is capable of generating practical image resolutions of 3cm across swath widths of 600m. It can also produce bathymetric data with a resolution better than 25cm out to full range while delivering very high depth accuracy. In parallel with the hardware design, senior sonar scientists at Kraken have developed a complete software package for InSAS imaging called INSIGHT (INterferometric Sas ImagingGeoreferenced High-fidelity Toolbox).

Both AquaPix and INSIGHT were developed by Kraken's team of scientists and engineers over a record time span of less than 18 months. The first system was successfully integrated and deployed onboard DRDC's Arctic Explorer AUV in Halifax, Nova Scotia in August, 2012. All of the InSAS software processing was performed by Kraken's INSIGHT toolbox.

L-3 Communications Klein Associates, Inc.

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CEO/President: Frank Cobis
VP: Michael Mitchell
Engineering Director: Ronald Allen
No. of Employees: 50

L-3 Klein, a division of L-3 Marine & Power Systems is a leading sensor technology provider that designs and manufactures high-resolution sonar systems and radar-based security and surveillance systems.

L-3 Klein is a sensor technology provider that manufactures and designs high-resolution sonar systems, and radar-based security and surveillance systems. The Klein S5900 is a COTS multi-beam Side Scan Sonar with sensors and capabilities that are suited to mine-like object detection. The sonar provides high speed, high resolution imaging with 100% bottom coverage in detection and classification modes. The addition of Klein's gap filler sonar on the S5900 tow body, provides single pass coverage in the sonar nadir region, thus enabling very fast coverage rates that reduce survey times by 40% or more. The high background-to-shadow contrast ratio of the S5900 enhances bottom features and target definition while active motion compensation and advanced beam-forming technologies nullify blurring caused by tow body motion.

The Klein UUV-3500 product line leverages a powerful – wholly FPGA implemented – multi-channel processing engine. The UUV 3500 operates exclusively with L-3 Klein's proprietary wideband technology providing unmatched side scan range and resolution performance in a low power, compact and lightweight payload. The system electronics will easily integrate into all small Unmanned Underwater Vehicles (UUV) platforms currently on the market and is available in a water tight pressure case configuration. L-3 Klein's newly designed, ruggedized transducers can be molded to meet the vehicle's space and configuration requirements and are built to last and perform in the most demanding environmental conditions

L-3 Klein's Side Scan Sonar data acquisition and display software, SonarPro, is now available in Chinese as well as English and Japanese languages. Klein's SonarPro offers operator control, data acquisition, and display of both bathymetry and side scan data was developed for users by users of Klein side scan sonar and bathymetry products.

LinkQuest, Inc.

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CEO/President: Ning Xiao, Ph.D.

The Company

LinkQuest manufactures precision acoustic instruments for offshore oil exploration, construction, drilling, survey, environmental study and other oceanographic applications. The company's acoustic communication and positioning products are based on the innovative Broadband Acoustic Spread Spectrum (BASS) Technology and are widely used worldwide. LinkQuest's high speed underwater acoustic modems transport more than 95% of the world's acoustic communication data. These systems have set a series of technical performance records in field deployments all over the world. LinkQuest's line of TrackLink Acoustic Tracking Systems provide highly robust, accurate and cost-effective Ultra Short Baseline (USBL) solutions.The FlowQuest Acoustic Current Profilers, FlowScout Acoustic Flow Meters and NavQuest Doppler Velocity Logs (DVL) were designed to provide solutions for current profiling, wave measurement, flow measurement or precision underwater navigation applications. These products offer significantly longer range with high accuracy. LinkQuest also manufactures PinPoint LBL acoustic positioning systems and Precision Marine Geodetic Systems used for tsunami and earthquake monitoring and prediction.

Teledyne Marine Systems Group

TELEDYNE MARINE SYSTEMS Everywhereyoulook™

TELEDYNE BENTHOS Everywhereyoulook™

TELEDYNE GAVIA ehf. Everywhereyoulook™

TELEDYNE WEBB RESEARCH Everywhereyoulook™

Insights from Thomas W. Altshuler, Ph.D., VP and Group GM, Teledyne Marine Systems

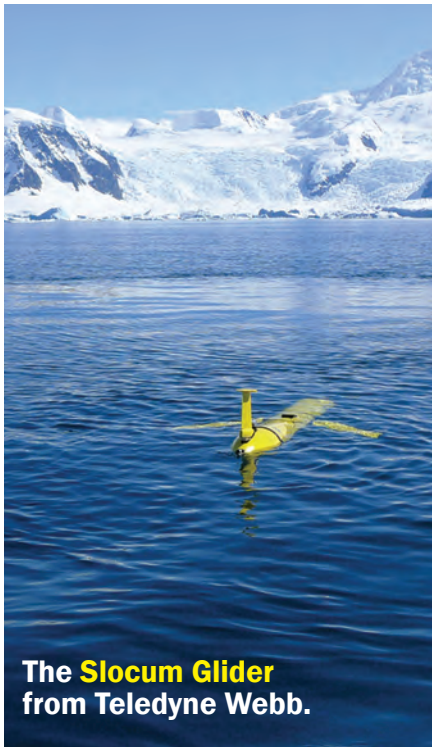
Please provide an overview of the companies in your group, citing examples of group collaboration.

The Teledyne Marine Systems Group consists of Teledyne Benthos, Teledyne Gavia, and Teledyne Webb Research. The group focuses on the development, production, and support of underwater vehicles and tow-bodies, acoustic communication and positioning, and sound sources and infrastructure to support subsea data collection.

The three companies that make up the Marine Systems Group work in concert to provide integrated systems. We work closely with our sister Teledyne Marine companies to make available to the market unique system solutions. Recent collaborations include the integration of both Teledyne RDI Acoustic Doppler Current Profilers (ADCPs) and Teledyne Benthos acoustic modems onto the Teledyne Webb Research Slocum Glider and the development and production of a deep-towed sonar platform that includes both Teledyne RESON multibeam echosounders and Teledyne RDI Doppler Velocity Logs (DVLs).

What is your group's most exciting technology advancement since MTR 100 2013?

Over the last year, the Teledyne Marine Systems Group has continued to invest heavily on new technology and product development. We have released the first member our newest generation of acoustic releases, the R12K, that provides enhanced information about release status and increases overall ease of use. We have developed our Slocum Oil & Gas Glider that has sensor suites available specifically targeting the needs of the Oil and Gas community. After successful field testing, we have introduced our deepest profiling float, the 6000 meter APEX Deep that is able to provide conductivity, temperature and depth data for more than 150 profiles at an average cost of about $500 per profile.



The Slocum Glider from Teledyne Webb.

What market trends are fueling your group?

Over the last 12 months, we have seen a continued acceleration of the uses of underwater gliders in defense, oceanographic, and the Oil & Gas markets. This growth is fueled by the continued improvements of the vehicles and the integration of new sensor technology. We have also seen a strong growth in the use of AUVs in the Oil & Gas survey market and a drive for deeper operations.

Teledyne Benthos

Located in North Falmouth, Massachusetts, Teledyne Benthos is an industry leader with a history of over 50 years of innovation in marine technology. Benthos designs and manufactures rugged, reliable oceanographic instrumentation and infrastructure for marine environments. Teledyne Benthos products include: acoustic releases, acoustic telemetry modems, positioning systems, hydrophones, remotely operated vehicles (ROVs), glass flotation spheres and instrument housings, and locating devices. These tools provide the building blocks of ocean observing systems for diverse users. Benthos technologies provide access to the deepest ocean depths.

www.benthos.com

Teledyne Webb Research

Joining Benthos in a dramatically expanded North Falmouth facility in later 2013, Teledyne Webb Research has been serving oceanographic research, commercial, and government customers for over 30 years. Webb Research designs and manufactures scientific instruments for oceanographic research and monitoring with a focus on extended observations over both time and space. Teledyne Webb Research specializes in three areas of ocean instrumentation: Neutrally buoyant, autonomous drifters and profilers, autonomous underwater gliding vehicles, and moored underwater sound sources. These systems are core to several major ocean monitoring programs including the international Argo array, the National Science Foundation Ocean Observatories Initiative and the US Navy Littoral Battlespace Sensing – Glider (LBS-G) program of record. A Webb Research slocum glider was the first unmanned vehicle to cross an ocean.

www.webbresearch.com

Teledyne Gavia

Located in Kopavogur, Iceland, Teledyne Gavia provides turnkey survey solutions to customers undertaking a variety of tasks for defense, commercial and scientific applications. The Gavia Autonomous Underwater Vehicle (AUV) can carry an array of sensors and custom payload modules that make it suited for any research, monitoring or surveillance task where autonomy, cost and ease of deployment matters. Its modular design allows for rapid sensor reconfiguration and battery replacement. While compact and "low logistics" the Gavia is also extremely capable, rated to 1000m and proven with a variety of sensor systems. As an Icelandic technology and compatible with sensors from other international sources the Gavia AUV is widely exportable and the chosen low logistics AUV of commercial survey firms.

www.teledynegavia.com

Subsea's hard problems demand

Soft Solutions

While it is the hardware that generally earns the headlines, working effectively, efficiently and safely in the subsea ocean environment increasingly is correlated directly to the performance of software systems. In this edition of the "MTR100," our editors present the case for six companies that are leading the way to gather, distribute and analyze information.

CARIS

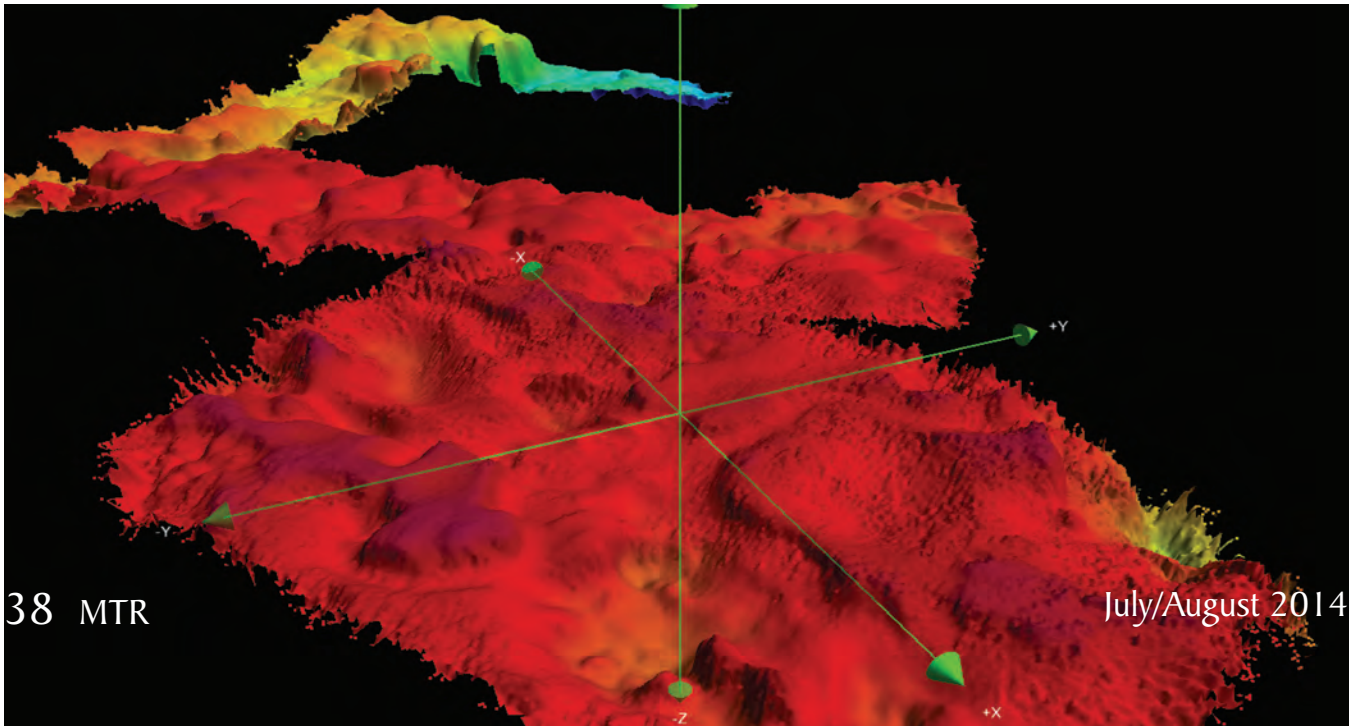
CARIS is a well known commodity in subsea circles, an international organization leading the development of marine GIS software. CARIS offers a complete Ping-to-Chart solution. CARIS products continue to adapt with the needs of its clients and the advancement of technology including support for Synthetic Aperture Sonar (SAS) data, as well as the exploration of Autonomous Underwater Vehicle (AUV) onboard data processing and near real-time product creation.

For more than 35 years, CARIS has been a leading developer of geospatial software designed to cater to the marine GIS community and is built on decades of hydrographic experience. The CARIS Ping-to-Chart solution is designed to deliver an integrated and seamless solution for the complete workflow of hydrographic information from processing the echo-sounder ping to the production and distribution of the chart. This integrated software solution provides our clients with resource optimization and a true operational advantage.

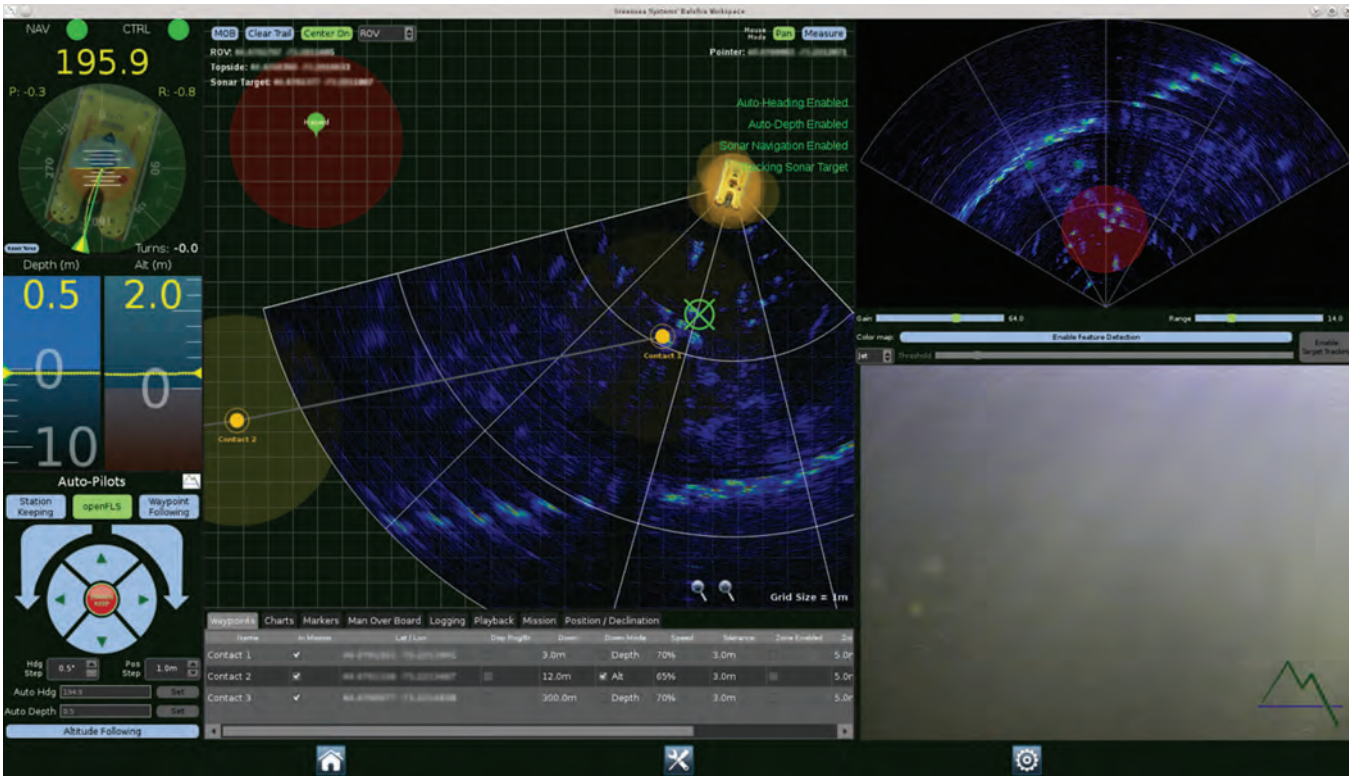
The CARIS Ping-to-Chart product line is designed to deliver an integrated software solution for the entire workflow of hydrographic information from processing the echo-sounder ping to the production and distribution of charts. CARIS software enables the processing and visualization of large bathymetric datasets, geospatial data management, spatial analysis, paper, ENC and military chart production, calculating maritime limits and boundaries based on United Nations guidelines, port and waterway engineering and Web mapping and discovery.

Through liaisons with the International Hydrographic Organization (IHO) CARIS has been involved in the development of industry data standards and has worked on various consulting and development projects. CARIS is a member of the Open Geospatial Consortium (OGC) and utilizes open standards for geographic data exchange and management including the ISO standards.

CARIS



Greensea Systems Inc.



Greensea Systems Inc.

Greensea Systems, Inc. develops software specializing in control and navigation systems for ROVs and AUVs derived from a common core architecture. Providing both commercial software products and custom software development, Greensea strives to deliver powerful operator workspaces and vehicle control software worldwide to the military, commercial and scientific offshore communities.

In short, Greensea develops software to make offshore operations more efficient, productive, and reliable. The automation, integrated workspace, and precision navigation capabilities provided by the openSEA technology and the commercial products Balefire and Endal, enable unprecedented efficiency and performance in ROVs while lowering the training required for consistent and reliable operations. Based on a fundamental commitment to robustness, reliability, and ease of use, Greensea has developed its technology by working offshore alongside ROV operators. Greensea's control systems and operator workspaces provide a cohesive operating environment with automated functions, station keeping, dynamic positioning, and sonar integration so that crews can work smarter and more efficiently. Common application areas of Greensea's technology include offshore oil and gas, exploration, science, and military activities including EOD, MCM, and UXO. Greensea's control, navigation, and operator workspace products for ROVs and AUVs easily support new builds, upgrades and retrofits to existing systems, and OEM product development.

Greensea provides commercial software products as well as bespoke software and integration packages.

• Commercial Products: Greensea offers a commercial ROV operator workspace, navigation, and control solution named Balefire and a commercial forward looking sonar integration package named Endal. In addition, Greensea provides standard product solutions for data logging, down hole control, sensor management, and software development tools.

• openSEA: The Open Software and Equipment Architecture (openSEA) is the foundation technology used in all of Greensea's products. The openSEA library and software suite provides robust capabilities for automation, communications, fault management, hardware interfaces, and more than 600 native device drivers for the underwater industry.

• Services: Greensea provides bespoke software development and integration based on our commercial products and core technologies.

Hypack

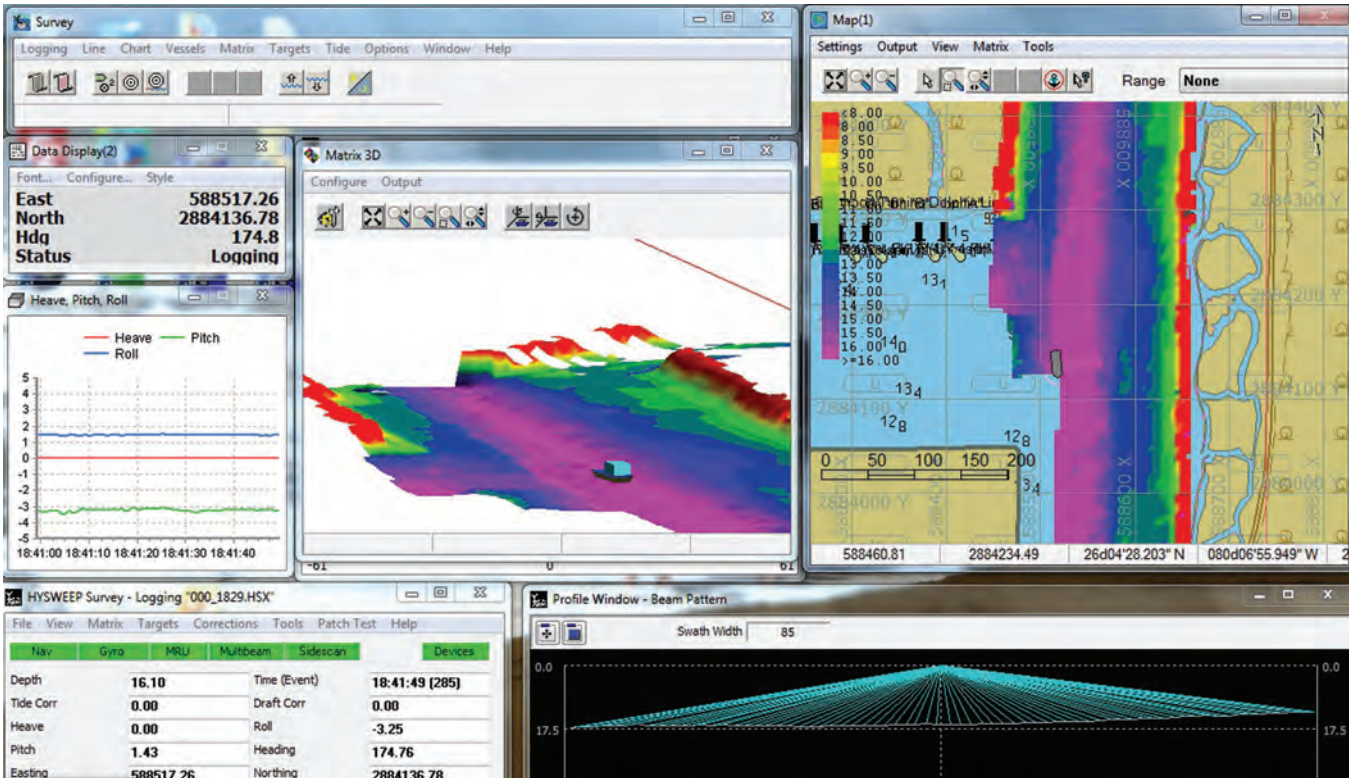
HYPACK reportedly was the first hydrographic surveying software in windows environment. It has become the standard package in the industry, and has all the tools needed to complete any job, with more than 8,000 users worldwide, and more than 25 years of experience.

HYPACK, Inc. developed a Windows based software for the Hydrographic and Dredging Industry. Founded in 1984, HYPACK, Inc.(formerly Coastal Oceanographics, Inc.) has evolved from a small hydrographic consultant to a successful provider of hydrographic and navigation software worldwide.

HYPACK provides the Surveyor with all the tools needed to design their survey, collect data, process it, reduce it, and generate final products. Whether the user is collecting hydrographic survey data or environmental data, or just positioning your vessel in an engineering project, HYPACK provides the tools needed to complete your job. With users spanning the range from small vessel with just a GPS and single beam echosounder to large survey ships with networked sensors and systems, HYPACK gives you the power needed to complete your task in a system your surveyors can master.

HYPACK, a hydrographic survey software with single beam, side scan, ADCP Mag, and subbottom support. HYPACK also has the CLOUD program that can be used for data review and final clean-up. There is also the TIN MODEL that creates stunning surface models, generates DXF contours and computes volume quantities with a variety of jobs. Large ship or small dinghy, HYPACK's survey program gets your survey job done right. HYSWEEP is our powerful module for multibeam and topographic laser calibration, data collection and 64 bit processing. With its Patch Test that allows you to determine the exact mounting angles for your single head and dual head system in hours. HYSWEEP's SURVEY provides you with coverage diagrams, relay time TPU displays, and QC tools needed to efficiently complete your multibeam survey. Lastly, HYSWEEP also has MBMAX, HYSWEEP and HYCUBE. DREDGEPACK is designed to show you how deep you are digging, how deep you need to be digging, and how deep you have already dug. Real time cross sectional profiles show you the 'As Dredged' and 'As Surveyed' surface displayed 'along track' or 'across track' for hopper dredges. For cutter suction dredges and excavators you can display a cross sectional profile along the arc of rotation. Included in DREDGEPACK is, Bucket patterns, Bucket reports, Dredge statistics, MTX Reporter, HYPLOT, CHANNEL DESIGN and ADVANCED, and CHANNEL DESIGN.

HYPACK

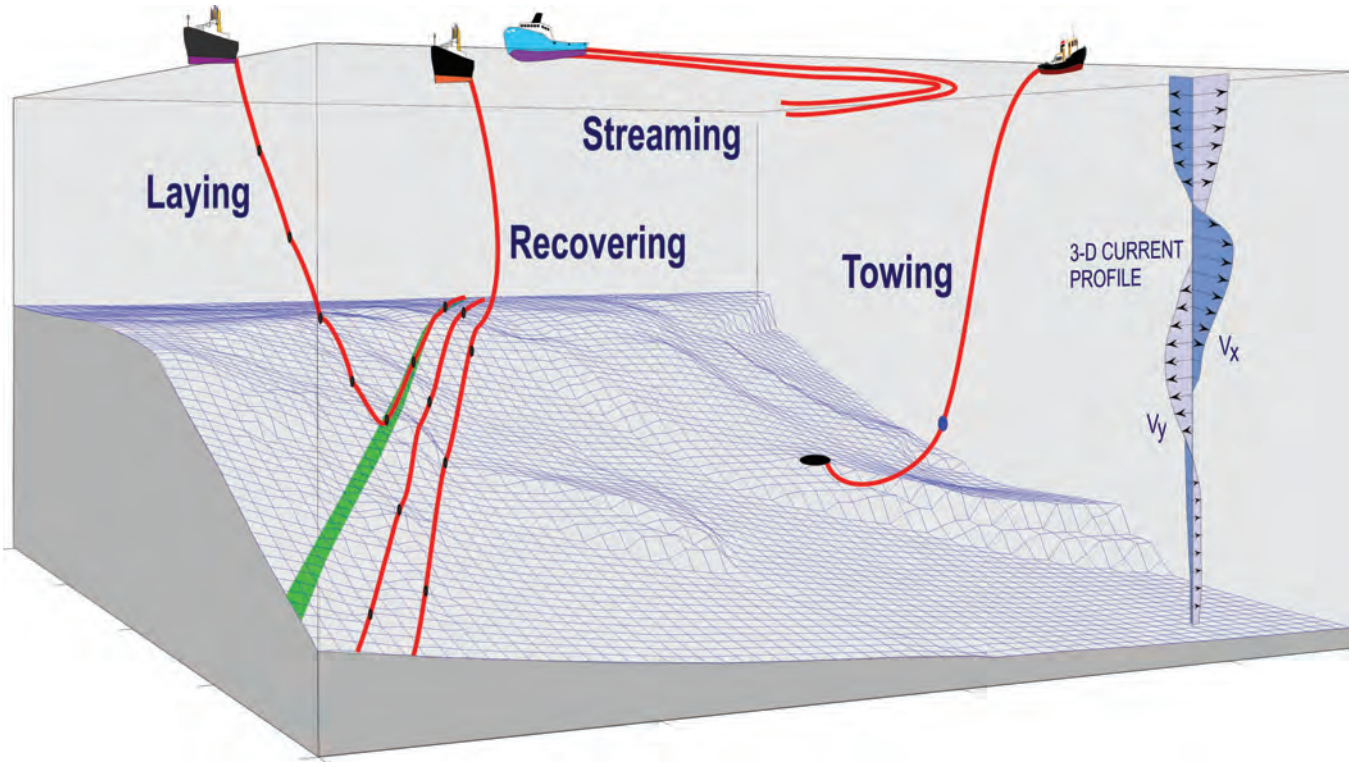


Makai Ocean Engineering

Makai reports it was the first company to implement software for subsea cable route engineering using a GIS based platform, as well as the first to develop a FEM based, real-time cable installation software to accurately monitor and control the placement and tension/slack of a cable on the seabed. This system is used by 80% of the world's Telecom cable installation fleet and has been used to successfully install over 400,000 km of cable.

Makai Ocean Engineering was founded in 1973 as a diversified ocean engineering company focused on providing design engineering and development services to a broad range of clientele both foreign and domestic. Practice areas include engineering for ocean based renewable energy (OTEC and SWAC), large underwater pipelines, software for planning, simulation, installation and recovery of submarine cables and arrays, and

Makai Ocean Engineering



software for visualizing scientific 4D/5D data. Makai Ocean Engineering takes pride in its extensive record of success in achieving innovative solutions to difficult problems for its partners and clients and continues to serve leading industrial and commercial firms as well as federal, state and local governments worldwide.

Makai products include:

- **Route and Installation Planning Software:** MakaiPlan is a software product which can be used to create submarine cable routes, define cables and in-line bodies, edit routes, define and adjust slack, instantly create an RPL and SLD, estimate costs. There are more than 300 licenses sold. MakaiPlan Pro is designed to allow the user to perform powerful and precise 3-D, dynamic simulations of a submarine cable installation. Entire lays can be simulated in advance 50 times faster than real-time and is used for training cable engineers, for pre-lay and post-lay analysis, and to create a detailed Ship Plan for installation.
- **Lay Software:** The heart of Makai's cable lay software is a powerful 3-D cable model that incorporates all significant factors influencing the position and control of the cable during installation: full 3-D modeling, complex cables and shapes that change with time, irregular bottom terrain and complete current profiles. Numerous cable types and cable bodies can be incorporated into a single cable lay or recovery. These programs are suitable for all ocean depths and cable laying speeds and have been fully validated over the last two decades.

Planet OS

Planet OS platform is designed to reduce the time related to decision-making involving sensor data by 80%, enabling to securely organize and distribute all data assets in one location — ingest and curate data flows, manage users and access control, inspect individual platforms and data streams.

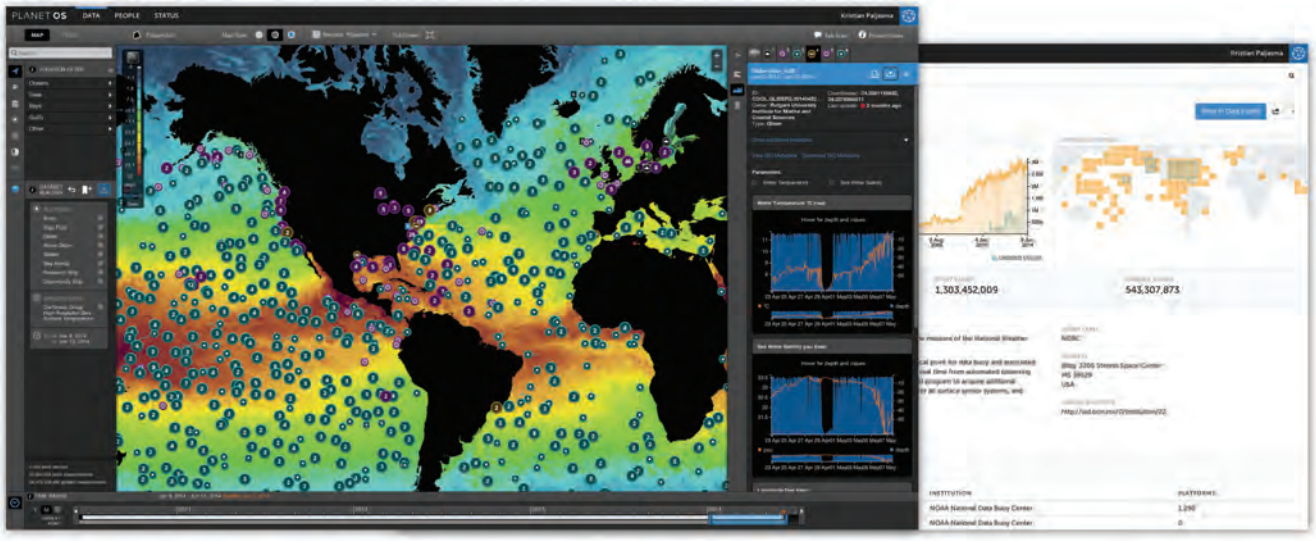
Founded by Estonian entrepreneurs in 2012 as Marinexplore, Planet OS Inc., is a Silicon Valley based big data company focused on providing the world's most powerful platform for analyzing vast data sets taken from millions of sensors around the planet. The Planet OS platform helps sensor-connected industries and governments to systematically analyze their sensor data using a single platform. Planet OS investors includes Intertrust Technologies, Philips and angel investors from the energy, automation, cloud software and resource management sectors. The company is headquartered in Sunnyvale, California, with offices in Los Angeles, Houston, and its biggest office in Tallinn, Estonia.

Planet OS is an analytical data platform between databases and applications, automating data transformation, accessibility and on-demand visualizations. The platform has a broad range of applications including real-time environmental monitoring of oil platform operations, data discovery and fusion for data centers, accessibility of disparate data sources through APIs, automated data transformation of disparate sources, data dissemination from unmanned vehicles to end-users and data visualization of entire datasets. The same technologies apply to a broad variety of industries from agriculture to urban planning as well as shipping and transportation.

Planet OS is designed for multi sensor and model data. It has integrated data management and fusion for satellites, remote sensors, in-situ devices, high frequency radars, geospatial systems and simulation models.

Spatio-temporal storage enables easy-to-access data from sensors and machines with spatial and temporal content. Extensible software components integrate diverse sensor and machine data in an index for fast querying and interaction.

Planet OS



Currently, the largest Planet OS deployment transforms and fuses data from over 42,000 individual data streams. The platform is continuously developed to achieve sub-second data stream refresh rates and enable high performance integrations with simulation models.

QPS

QPS has since 1986 been headquartered in The Netherlands, and is an independent software company, now with subsidiary offices in the U.S. Canada and UK. In 2011 QPS merged with IVS3D so uniting QPS QINSy with QPS Fledermaus. In 2012 QPS became a member of the SAAB (Sweden) group of companies (Security and Defence Solutions).

Quality Positioning Services (QPS) makes industry leading software for collection, post processing and visualization of maritime geomatic data. Its products QPS QINSy and QPS Fledermaus seamlessly partner ArcGIS for Maritime, to solve problems and gain efficiencies for maritime related survey business. Our product QPS Qastor is an Electronic Chart Software (ECS) that enables navigation, piloting and precise docking, as well as several other application such as Oil & Gas FPSO/SPM mooring, patrol vessel and tugboat operations. QPS QINSy is a software suite used for various types of maritime geomatic surveys, ranging from simple single beam surveys up to the very complex offshore construction works. Commercial, academic and government clients worldwide use QPS Fledermaus to interact in 4D with geographical datasets. This provides users with added value in data processing efficiency, quality control accuracy, data analysis completeness, and project integration, that promotes clear communication.

First introduced in 2000, Qastor has continued to be developed and enhanced, and now includes a wealth of options and benefits specifically the result of extensive use in canals, ports and riverways around the world. Using wired or wireless methods, Qastor interfaces to most devices outputting NMEA data strings, to AIS units, and to the QPS Qastor Connect Server which is supplying meteorological data, VTS targets and ENC updates to Qastor users.

Connect

These companies are strong providers of advanced software solutions to the subsea sector:

CARIS
115 Waggoners Lane, New Brunswick, Canada E3B 2L4
T: 506-458-8533
E: info@caris.com; W: www.caris.com/
CEO/President: Dr. Salem Masry
No. of Employees: 170

Greensea Systems, Inc.
10 East Main Street, Richmond, VT 05477
T: 802.434.6080
E: info@greenseainc.com ; W: www.greenseainc.com
CEO/President: Ben Kinnaman
GM: Barbara Herrington
No. Of Employees: 15

HYPACK, Inc.
56 Bradley Street, Middletown, CT 06457
T: 860-635-1500
E: Brittany@hypack.com; W: www.hypack.com
CEO/President: Pat Sanders
No. of Employees: 27

Makai Ocean Engineering, Inc.
41-305 Kalanianaole Hwy, Hawaii 96795
T: +1 808 259 8871
E: duke.hartman@makai.com; W: http://www.makai.com
CEO/President: Dr. Jose Andres
Engineering Director: Dale Jensen
No. of Employees: 30
Annual Sales: $9m

Planet OS Inc.
920 Stewart Dr., Sunnyvale, CA 94085
T: +1 650 391-4111
E: rainer@planetos.com; W: www.planetos.com
CEO/President: Rainer Sternfeld
No. of Employees: 12

QPS (Quality Positioning Services) bv
Huis ter Heideweg 16, Zeist, Utrecht,
The Netherlands 3705 LZ
T: +31306941200
E: sales@qps.nl; W: www.qps.nl
CEO/President: Tomas Hjelmberg
No. of Employees: 55

Getting Defensive

Defense Innovation Days – September 3-5, 2014 in Newport, RI – brings together industry, government and academia

Defense Innovation Days organized by the Southeastern New England Defense Industry Alliance (SENEDIA) promises to bring together an "A List" of speakers and attendees from industry, government and academia for a common mission: for an open discussion on current trends and to engage in discourse on the future of technology and the defense industry.

Scheduled for September 3-5 in Newport, RI, Defense Innovation Days promises not only a compelling conference and speaking line-up, but also a host of social events designed to provide all parties with a more informal venue to meet and connect on issues that are important to individuals, companies and the defense industry as a whole.

The organizers have lined-up plenary sessions on Innovation from the technology perspective, the war fighter perspective and the unmanned vehicle perspective. In addition, there will be several panels with the RI, MA and CT congressional delegations on the State of Foreign Affairs and the effect on the Defense Industry and Defense; "the View from the Hill."

SENEDIA

Defense Innovation Days

What:
Defense Innovation Days

When:
September 3-5, 2014

Info:
www.defenseinnovationdays.com

The event has attracted many top line organizations for participation, including the following six (6) companies that are featured in this year's "MTR100."

Boston Engineering

Boston Engineering delivers product design and engineering consulting solutions, and it strives to create breakthrough solutions by combining focused creativity, experienced insight, and a big-picture perspective. It manages the entire product development process — from idea to supply chain development, or it is adept to jumpstart a project in any product development phase.

Boston Engineering's Advanced Systems Group (ASG) develops game-changing robotics, unmanned systems, and special tactical equipment. Boston Engineering's defense and security technologies provide advanced capabilities to support U.S. defense and homeland security operations. Its robotics capabilities emphasize unmanned vehicle innovation — including unmanned ground vehicles (UGVs) and autonomous underwater vehicles (AUVs).

In addition to Small Business Innovation Research (SBIR) funding, Boston Engineering has been awarded contracts from agencies and organizations including the Department of Homeland Security Science and Technology Directorate (DHS S&T), the Office of Naval Research (ONR), the Naval Sea Systems Command (NAVSEA), the U.S. Army Research, Development and Engineering Command (RDECOM), the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC), the Defense Advanced Research Projects Agency (DARPA), and the United States Special Operations Command (SOCOM).

Traditional unmanned underwater vehicles (UUVs), AUVs, and other waterborne robots can be restricted by limited communications. To address these capability gaps, Boston Engineering is advancing biomimetic autonomous UUV capabilities to increase mobility in a system that employs payloads. Its UUV technology replicates the dynamics of biological fish to move rapidly, accurately and in challenging areas than other marine technology solutions. Funding is primarily from the ONR and the DHS S&T, and its UUV funding supports the advancement of two related products:

- **GhostSwimmer** is a stealthy biomimetic AUV used for various military missions including surveillance, mine countermeasures, port security and other defense and homeland security initiatives.
- **BIOSwimmer** is a biologically-inspired UUV with broad commercial and homeland security applications that include inspecting ships, securing ports, and conducting marine maintenance operations.

Globe Composite Solutions

Globe Composite Solutions is a composite designer and manufacturer in business since 1890, makers of non-metallic composite components for the nautical and aviation defense

industries. Globe Composite Solutions designs and manufactures advanced composite materials for components and applications used in the industrial, medical, material handling, and defense industries. It specializes in custom non-metallic composite components, cast and molded products, fabrication, prototype products, extrusions and roll coverings. Current defense customers and products include: The U.S. Navy, providing Gradual Transition Coatings (GTCs) and shielding for sonar arrays; Components for both the Virginia-class submarines and Ohio-class submarines; Northrop Grumman & Lockheed Martin.

Globe has the ability to evaluate, design and manufacture components for different levels of defense contracts. Recently it completed construction of a dedicated clean-room facility to perform high-level testing and production of high-tolerance, defense-related components.

Its defense applications include, but aren't limited to:

- Acoustic and/or Electromagnetic signature reduction materials
- High-strength, high-tolerance precision gaskets and seals
- Highly-engineered power transmission barriers, drive system accessories, & vibration dampeners
- Active acoustic monitoring components
- Air handling systems
- Hydrodynamic structures, surface control, & surface treatments

- Coatings
- Transducer Covers
- Degaussing equipment

Globe has also just been awarded a second U.S. patent for its High Gravity Composite (HGC) material, Brandonite, often used in radiation shielding for sonar and radar arrays on ships and submarines.

Mikel Inc.

MIKEL is a technology development and services company that provides innovative, cost-effective undersea solutions for the U.S. and foreign navies. MIKEL's products enable its customers, especially those in the Submarine Force, to solve their technology problems, and to better meet their business and mission requirements. MIKEL is committed to providing an environment that challenges its employees to use and advance their skills and knowledge to exceed customer expectations.

Started in 1999 by Brian Guimond and under the leadership of Kelly Mendell, MIKEL has grown yearly, employing a diverse and capable workforce of technicians, engineers, computer scientists, analysts and many support functions to its Navy customers. Expertise in undersea acoustic tracking and navigation, combat systems and performance assessment has enabled a thorough understanding of the technology gaps and the development and installation of their solutions. In each of these areas, the company strives to provide a complete solution – ranging from an understanding of the operational context of the problem, to development of algorithms that process data, to the delivery of software and hardware systems.

The Submerged Acoustic Navigation System (SANS), Advanced Contact Management System (ACMS), Active Intercept and Ranging System (AIRS) and Standardized Metrics for Assessment, Readiness and Training (SMART) are four recent technologies developed by MIKEL. SANS was developed to address the problem of accurate submerged platform positioning in the absence of GPS. AIRS was developed to address the problem of passive sonar target localization, in response to an SBIR award. ACMS was developed to address the problem of heavy operator workload during bearings-only sonar target tracking in response to an SBIR award. SMART addresses the quantification of performance.

SANS - positional accuracy of several meters in real-time in a local operating region. Currently, SANS is installed on U.S. submarines with APB-11 software support or higher.

AIRS - passively localizes a target in 3D emitting active acoustic energy via the use of spatially diverse sensors. The technology removes the necessity for collinearly placed hull sensors by actually exploiting their non-collinearity.

ACMS from Mikel Inc. reduces submarine operator involvement and manual data editing processes during passive sonar target tracking.


Carl Forsythe, Globe Composite Solutions


Kelly Mendell, Mikel Inc.


Joe Marino, Rite Solutions

ACMS - greatly reduces submarine operator involvement and manual data editing processes during passive sonar target tracking. ACMS offers a 4:1 reduction in operator workload and easily and succinctly supports multi-sensor data fusion.

SMART – performance assessment tool that provides objective real time and post event analysis capabilities. SMART allows for a standardized approach to operator, crew and system performance evaluation during shore based training and at sea exercises.

Purvis Systems

Purvis Systems has been providing services to the U.S. Navy and Public Safety customers for more than 40 years, and its

Connect

These companies are strong supporters of the defense industry in the New England region:

Boston Engineering Corporation
300 Bear Hill Road
Waltham, MA 02451
T: (781) 466.8010
E: info@boston-engineering.com
W: www.Boston-Engineering.com

Globe Composite Solutions
254 Beech St., Rockland, MA 02370
T: +1 978-855-0059
E: rlegault@globecomposite.com
W: www.globecomposite.com
CEO/President: Carl Forsythe
VP: Kevin Lynch
Engineering Director: Brian Evans
No. of Employees: 250

Mikel Inc.
275 Martine Street, Ste 205
Fall River, MA 02723-1500
T: (508)675-2681
W: www.mikelinc.com
President: Kelly Mendell

PURVIS Systems Incorporated
1272 West Main Road,
Middletown, RI 02842
T: 401-845-8409
E: dproffitt@purvis.com
W: www.purvis.com

Progeny Systems Corporation
HQ: 9500 Innovation Drive,
Manassas, VA 20110
Tel: (703) 368-6107
Email: businessopportunities@progeny.net
Website: www.progeny.net

Rite Solutions, Inc.
One Corporate Place, Middletown, RI 02842
T: (401) 847-3399 X 123
E: jmarino@rite-solutions.com
W: www.ritesolutions.com
CEO: Joe Marino
President: Dave Fabianski
No. of Employees: 125

Progeny Systems defense solutions

core capabilities embody its collective knowledge and technical capabilities. Capabilities include: Laboratory/Facility Design, Operations and Maintenance; Operational Capability Assessments; Test and Evaluation; Acquisition and Operational Logistics; Installation and Checkout; Mine Warfare; and Anti-Submarine Warfare. Its products include: Fire Department Management System; Automated Notification System; Fire Station Alerting and Communications System; Electronic EMS Reporting System; and Incident Management and Control Systems.

Progeny Systems

Established in 1995, Progeny Systems is a privately-held, high-tech corporation headquartered in Manassas, Va. Its mission is to improve warfighters' capability while reducing total ownership costs, and its products can be found throughout the naval fleet and commercial markets. Progeny maintains more than 14 offices nationwide that are located to serve its customers while providing a range of research, development and production capabilities. Its production facilities are ISO 9001 Certified and since 2006, our system and software engineering processes have been appraised at CMMI level III.

Progeny Systems offers a full array of computing expertise, laboratories, and engineering talent to support the design, development, testing and integration of leading-edge technology solutions. It has an outstanding portfolio of solutions for complex problems for the U.S. defense that include the toughest high-tech challenges. Its business solutions focus on:

Defense Systems and Integration; Aviation & Maritime Surveillance Systems; Tactical Combat Systems; Sonar Systems & Torpedoes; Advanced Information Systems and Security; Non-Tactical Enterprise Applications; Undersea & Surface Systems; Research and Technology Development; Biometrics & Image Processing; Acoustics & Acoustic Signal Processing; Undersea Systems, incl. Robotics & Control Systems; Precision Navigation & Timing (PNT); Full-Scale Manufacturing; Electronics Manufacturing; Metalwork Fabrication/Manufacturing; and Sensor/Transducer Manufacturing

Rite Solutions

Rite Solutions is recognized for its thought leadership on the subject of Innovation in over two dozen management books and magazine articles including Newsweek, the N.Y. Times, and an NBC Special on The Business of Innovation. Rite Solutions, a Service-Disabled Veteran-Owned Small Business with more than 125 engineers, scientists and software developers, brings more than 2500 combined years of experience in providing Systems, Software Engineering, and Information Technology services and products to DOD and commercial clients.

Rite Solutions has gained a niche as a premier provider of services and products to the U.S. Navy, particularly in the area of Undersea Warfare. We have also been successful in leveraging our core competencies into the commercial business spaces of Human Capital Management and Workforce Development as well as Healthcare Systems Support and Secure Information Dissemination. Its core competencies of systems engineering, software development, and information technology, aligned to four technical areas: Automated Decision Support Systems, High Availability Software Intensive Systems, Human Centered System designs, and Information Management System Environments.

Its Automated Decision Support Systems focus on command level decision making and emergency management and response systems, getting the right amount of the right information to the right decision-maker at the right time.

High Availability Software Intensive Systems focus on building high integrity systems that must never go down; have high transaction processing rates; and incorporate sophisticated information assurance capabilities. Human Centered System designs provide a comprehensive methodology for the incorporation of human-system integration considerations into the product gestation, development, and sustainment processes. It has applicability in virtually any application domain in both government and commercial product areas. Its Information Management System Environments incorporate state-of-the-art heterogeneous system networks, enterprise service buses, and simulation and visualization technologies. Our Rite-View data rendering and visualization product is a significant contributor to maximizing situation awareness and is readily adaptable to a broad spectrum of commercial and government products and applications.

The Norway Way

Norway has a long and rich seafaring history, and it also sits on one of the world's richest oil & gas resources in its sector of the North Sea. Earlier this year MTR contributor Eric Haun traversed the country in search of companies worthy inclusion in this year's MTR100. He found, and presents here, a dozen.

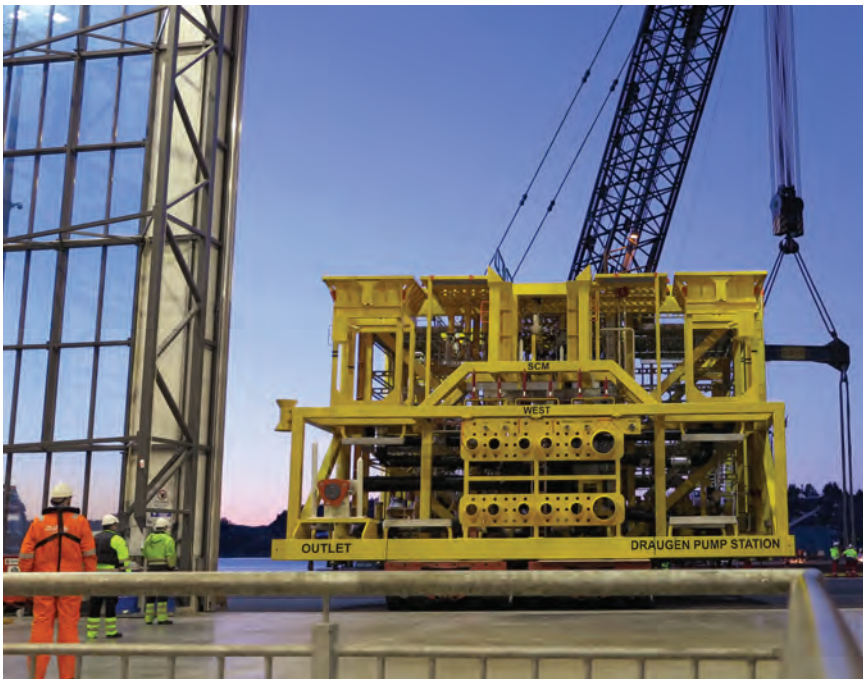
OneSubsea

Announced at the end of 2012 as a joint venture between subsea systems provider Cameron and oilfield services company Schlumberger (split 60/40, respectively), OneSubsea combines the expertise of two leading firms to deliver integrated solutions, products, systems and services for the subsea oil and gas market. As Cameron Chairman, President and CEO, Jack B. Moore explained, OneSubsea essentially provides a marriage of Schlumberger's oilfield services technology and Cameron's subsea equipment heritage. OneSubsea leverages Cameron's flow control expertise, process technologies and world-class manufacturing and aftermarket capabilities, along with Schlumberger's petro-technical leadership, reservoir and production technology and R&D capabilities, while also bringing into play its subsidiary, Framo Engineering, which provides subsea measurement, boosting and processing systems.

OneSubsea is currently operating in more than 20 countries through its six divisions: Integrated Solutions, Production Systems, Processing Systems, Control Systems, Swivel and Marine Systems and Subsea Services. The company offers a step change in reservoir recovery for the subsea oil and gas industry through integration and optimization of the entire production

While FMC Technologies U.S.-based, it is strong, long-term player in Norwegian subsea sector.

Image courtesy of FMC Technologies



(Photo courtesy of OneSubsea)

Draugen subsea multiphase booster pump system at OneSubsea's test facility at Horsoy, Norway.

system over the life of the field. Using its comprehensive total system approach – from the reservoir through the well, subsea production system, up to the surface – OneSubsea aims to optimize complete subsea production systems and ultimately improve production and recovery from offshore subsea developments. **The company claims its processing systems have increased production rates for operators by as much as 30-100%.**

FMC Technologies

U.S.-based FMC Technologies is one of the world's leading equipment and service providers for the global energy industry, operating from 30 production facilities in 17 countries to design, manufacture and service systems and technologically sophisticated systems and products such as subsea production and processing systems, surface wellhead systems, high pressure fluid control equipment and pumps, measurement solutions and marine loading systems. The company also specializes in subsea technologies that maximize recovery of hydrocarbons from challenging reservoirs.

In 2013, FMC recorded $7.1 billion in revenue, 66% of which came from its deepwater and subsea technologies segment (Subsea Systems, Multi Phase Meters and Schilling Robotics), 25% from surface technologies (Surface Wellhead, Fluid Control and Completion Services) and the remaining 9% from energy infrastructure (Measurement Solutions, Loading Systems, Material Handling Solutions, Separation Systems and Automation and Control).

FMC claimed 40% of the global subsea tree unit market share from 2009-2013, and the group presently has subsea processing projects in every major deepwater basin. The company attributes much of its growth to an increased global focus on deepwater operations. According to FMC, deepwater is the fastest growing source to meet incremental production demands, and large deepwater sources are increasingly discovered in multiple basins. This, along with technological advancements that improve exploration success and recovery rates, provides an opportunity for IOCs to employ differentiated technology.

Going forward, FMC looks to ex-

DOF Subsea Group

DOF Subsea is an international subsea operating company and leading provider of subsea services to the oil and gas industry in the North Atlantic, Gulf of Mexico, Brazil, Asia and West Africa. DOF's two core business segments are long-term charter agreements for the fleet and the execution of complex subsea operations to depths of 4,000 meters, using the group's owned and operated purpose-built vessels.

With a world class fleet of 25 offshore vessels, 59 Remotely Operated Vehicles (ROVs), including one AUV/IIV system and 10 diving spreads, the group combines expertise and technology to deliver integrated subsea solutions to the offshore oil and gas industry. DOF's fleet of 25 offshore vessels, built primarily by Vard, has an average age of seven to eight years and awaits seven newbuilds presently under construction in yards in Norway and Brazil.

DOF's multi-tool fleet enables the group to perform work for high-profile clients in marine operations; engineering, construction and mobilization; supply services; geotechnical and geophysical services; ROV operations; wellhead intervention; decommissioning; pipelay; pipeline survey and diver assisted intervention.

The Bergen-based DOF Subsea Group, recorded a turnover of NOK 6.579 billion in 2013, compared to 5.248 billion in 2012, attributing much of its growth to its subsea project business, which saw revenues rise 32%. DOF's EBITDA also saw an increase over the same period, rising roughly 9 percent to NOK 1.945 billion in 2013 compared to 1.788 billion in 2012. The group's backlog entering 2014 was NOK 34 billion.

DOF subsea workers stand on the deck facing the hull of a massive DOF Subsea offshore vessel.

(Photo courtesy of DOF Subsea)

pand its subsea solutions scope for its core products (trees, manifolds, control systems, template systems, flowline connection systems) as well as new products (subsea processing: separation, boosting and gas compression; well intervention services; and ROVs and ROV manipulator systems). As of March 2014, FMC identified potential for more than 300 major subsea production projects (valued at more than $150 million each) in the coming 15 months, including prospects for 48 trees for Nigeria, 38 for Norway and 20 for the Gulf of Mexico.

Bandak GroupAS

The Bandak Group – a complete multidiscipline project supplier to Subsea Production Systems (SPS) and Subsea Umbilicals, Risers and Flowlines (SURF) players – provides advanced mechanical products, services and solutions to world-leading companies within oil and gas, marine, defense and space industries. The group provides deliveries; engineering and project management, machining, welding, surface treatment, assembly, test, tubular services and documentation for some of the industry's top players, in Norway and globally, including key customers Statoil, FMC Technologies, GE Oil & Gas, Aker Solutions, Kongsberg, NationalOilwell Varco and Rolls-Royce.

Bandak supplies mechanical subsystems and parts that are fitted into subsea production systems or drilling systems (quick connectors, leveling jacks, HUBs, pig launchers, guide posts, connectors, etc.), also supplying capacity related to drilling systems and equipment. Typical products are drillpipe, casing, tubing and many types of related downhole products, including specialized services for OCTG. Bandak develops and manufactures tools for various mechanical offshore operations, both subsea and topside, utilizing its capabilities within engineering, manufacturing, assembly, testing and documentation. **With 10 locations in Norway and two in Malaysia, Bandak is a company on the rise, reporting 4x growth in the last three years and expanding its staff from 150 to 550 in the last four years.** Bandak has recently expanded in the APAC oil and gas industry with the acquisition of fabrication and engineering company

Bandak CEO Per Gunnar Borhaug

Statoil ASA

Founded in 1972 as the Norwegian State Oil Company, Statoil is an international energy company and true subsea pioneer with 40 years of experience in oil and gas production on the Norwegian continental shelf. The Norwegian government remains Statoil's largest shareholder with approximately 67% percent of the company's shares, while the rest is held in public stock.

With operations in 36 countries and more than 520 subsea wells globally, Statoil claims a position as the world's second largest subsea operator. **It is the largest operator on the Norwegian continental shelf, with 60% of the total production, and since 2010, Statoil's annual investments there have increased by 75%.**

As a technological forerunner, Statoil has traditionally achieved success by pushing the boundaries to what is possible under water, frequently going "longer, deeper and colder," but as the complexity of global subsea projects grows, so too does the bill for all involved in subsea projects.

Statoil is therefore targeting standardization in certain situations as a means to generate cost savings in even the most complex projects. Rather than spending costly engineering hours working toward the next grand, over-over-the-top subsea solution, industry leaders are striving for smart, simple answers to some of the sector's largest challenges. This means innovation comes in the form of quick and effective, yet less costly, solutions that do not sacrifice quality.

Statoil's Fast Track work process, for example, adds "simple, standard and cheaper" to "longer, deeper and colder," said Torger Rød, Statoil's SVP for Subsea, Pipelines and Cessation. The program essentially fuses tailored innovations with standardized solutions to develop and begin subsea production within a 30-month timeframe. Under this accelerated method, product specifications are simplified, existing designs are reused when possible and concepts are chosen from a preexisting catalog, eliminating the concept selection phase, Rød explained. With Fast Track, the company reports a 40% shorter execution time, a low breakeven level of $40/boe and average IRR (nom) greater than 25%. Statoil currently has six Fast Track projects in operation off Norway, with six more on the way.

Statoil is targeting standardization in certain situations as a means to generate cost savings in even the most complex projects.

(Photo: Øyvind Hagen – Statoil)

(Photo courtesy of CCB)

CCB is considered to be the Logistics hub for the North Sea's Tampen fields

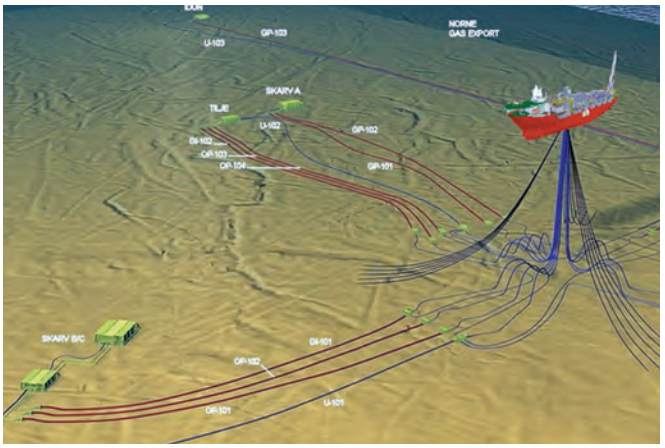
Multi Fibre Snd. Bhdin Malaysia in March 2014, and its acquisition of ITM in 2013 began its move into the maintenance and service market. Annual investment hovers between $6.5-8 million in recent years, with funding toward new machining centers and transition to new clad welding technology. Bandak primarily held by is Herkules Private Equity Fund III (90% share), while the remaining shares are owned by minority shareholders including management and other key employees.

CMR Instrumentation AS

CMR Instrumentation, an arm of Christian Michelsen Research AS, is a research and development center directed towards instrumentation research and development.

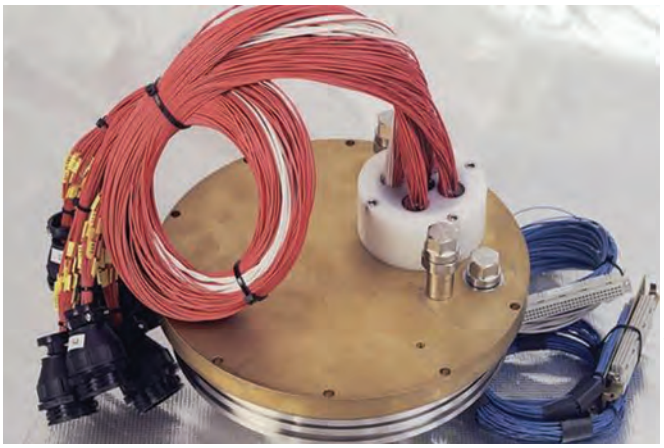
The firm covers measurement science, physics, modeling, software, sensor technologies, electronics and signal processing, among others. CMR typically works in collaboration with clients and partners to carry out projects from ideas and research to qualified industrial measurement solutions and products, and can deliver both turnkey solutions or be a sub-supplier to development projects. CMR also offers services within analysis of metering stations, including uncertainty analysis and dedicated measurement campaigns.

One of CMR's current initiatives aims to improve subsea operation and maintenance by bringing risk management into real time through Integrated Well and Subsea Instrumentation (IWSI). As improved sensors, tools and models are developed by the center, data relating to reservoir and production management, subsea control and safety systems, flow assurance management and integrity management will be used to provide real time performance and risk management, and then visualization and decision support. If workers can better gauge the conditions in which they operate, higher levels of efficiency and safety can be achieved, and thus costs are reduced and safety improved.



(Photo courtesy of Reinersten)

Reinersten's scope of work in the Skarv field off Norway.



(Photo courtesy of Benestad)

Signal penetrator from Benestad

Ingeniør Harald Benestad AS

Established in 1973, Benestad is a world leader in **glass/ceramics-to-metal sealing and thin film (PVD) technology.** The company provides sophisticated design and product solutions that are based on this technology, and then uses it as a technical advantage as glass/ceramics offer excellent corrosion and erosion properties, will not degrade over time or allow diffusion of liquids/gas, thus providing unmatched long-term stability. The company says highly specialized proprietary processes are at the heart of its products and production. Under major shareholder Aker Solutions, Benestad's market segments are split between oil and gas (85%) and the defense industry (15%). For the oil and gas market, the company produces customized penetrators (signal and power distribution systems), instrument sensors and subsea instrumentation. For subsea, this comes into play for controls, boosting and processing and power distribution, as well as down-hole ESP. In-house activities include research and development, product design and engineering, manufacturing of core technologies (both for glass-to-metal sealing and thin film deposition) and testing and qualification.

HTS maskinteknikk

Located in the heart of the Subsea Valley in Drammen, Norway, HTS maskinteknikk (HTSM) is a manufacturer and global supplier of mechanical precision components to the subsea, aerospace and defense industry. HTS, established in 1982, is an independent contractor specializing in critical machining and welding of advanced materials, and offers a range of professional production technology advisory services. The company prides itself on its capacity as a total-solution supplier with all disciplines available in-house at its workshop which contains a production area of more than 60,000 square feet, including departments for turning, milling, welding, inspection and inspection/calibration. HTSM effectively manages everything from small-scale prototype production to large-scale serial production, though its forte is in more complex components.

HTS maskinteknikk has delivered high precision mechanical components to the oil and gas industry for more than 20 years, with a specialty in the manufacturing of hydraulic couplers and subsea valve components. The group's subsea client portfolio includes market leading EPC contracts as well as specialized subsea installation and provision companies. Its largest customer is FMC, which it supplies to directly for sites throughout the world including South America and Brazil.

Roughly 79% of HTS' business in 2013 was for the subsea sector, and as such is the recipient of the majority of the group's current investments. HTSM has recently placed significant capital into its staff, state-of-the-art equipment and facility, greatly expanding upon its operational capacity.

Reinersten AS

Family-owned Reinersten delivers advanced offshore engineering, infrastructure and construction, as well as consulting engineering services. Reinersten is product independent and its clients are mainly oil and gas companies, in Norway and internationally, for which it builds modules and prefabrication units for topside-building projects as well as subsea structures and components. Reinersten's main market areas within subsea are field development, production systems, processing (subsea-factory), flow assurance, power supply and distribution, control systems and umbilicals, pipelines/flowlines, risers and structures/stations.

The company is regarded as a major supplier of maintenance services on Norwegian processing sites, Norwegian shelf and inland. Its department of Installation is in charge of realization of the project's installation phase on-site, and is responsible for HSE and quality control, completion, resources and subcontractors. Reinersten has also established long-term working agreements with the service trades suppliers within surface protection, isolation, scaffolding, rope access technique and pressure testing.

(Photo courtesy of DNV GL)

DNV GL's president and CEO, Henrik O. Madsen

(Image courtesy of Computas)

Computas' software framework for IO collaboration and decision support.

Coast Center Base

Coast Center Base (CCB) is a logistical hub and main base for supply activities to the petroleum fields in the Tampen area of the North Sea (Statfjord, Gullfaks, Veslefrikk, Troll, Huldra and Kvitebjørn), and has compiled considerable expertise as a service provider in technical maintenance and harbor operations since opening in 1973. CCB offers provision of services and supply to the petroleum activities offshore, the North Sea basin's largest subsea community with an offshore subsea test well reachable from quay, harbor terminal services for traditional line shipping and IRM maintenance services for rigs and vessels. The CCB base covers about seven hectares, has 1,000 meters of quays, some with water depths up to 50 meters and no weight limits, workshops, warehouses and office buildings.

Connect

Strong supporters of the subsea and offshoreO&G industry from and working in Norway.

(In the background: Installation of the Åsgard subsea factory with Saipem 7000. (Photo: Øyvind Hagen – Statoil)

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Phone: 47 35 57 33 47
Web: bandakgroup.com
Leadership: Per Gunnar Borhaug - CEO
Number of employees: 550

CMR Instrumentation AS
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Phone: 47 55 57 40 40
Web: cmr.no
Leadership: Sveinung Botnen - Technology Director
Number of employees: 160

Coast Center Base AS
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Phone: 47 56 32 30 00
Web: coastcenterbase.no
Leadership: Kurt R. Andreassen - Managing Director
Number of employees: 250+

Computas AS
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Phone: 47 67 83 10 00
Web: computas.com
Leadership: Trond Eilertsen - CEO
Number of employees: 280

DNV GL Group
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Phone: 47 67 57 99 00
Web: dnvgl.com
Leadership: Henrik O. Madsen - President and CEO
Number of Employees: 17,000

DOF Subsea Group
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Web: dof.no
Leadership: Mons S. Aasr - CEO
Number of employees: 1,667

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5875 N. Sam Houston Parkway W.,
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Email: corporate.info@fmcti.com
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Web: fmctechnologies.com
Leadership: John Gremp – Chairman, President and CEO
Number of Employees: 19,500

HTS maskinteknikk
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Web: htsm.no
Leadership: Nina C. Solberg - Managing Director
Number of employees: 110

Ingeniør Harald Benestad AS
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Web: benestad.com
Leadership: Geir Ove Karlsen - Managing Director
Number of employees: 50

OneSubsea
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Leadership: Scott Rowe - CEO
Number of employees: 6,000+

Reinersten AS
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Leadership: Torkild R. Reinertsen (chairman) and Erik R. Reinertsen CEO) - owners
Number of Employees: 2,700+

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Leadership: Helge Lund - CEO
Number of Employees: 23,000

DNV GL Group

DNV GL provides classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas and energy industries. An international giant with operations at 300 sites in more than 100 countries, DNV GL stands among the world's largest ship and offshore classification societies and is a leading technical advisor to the global oil and gas industry and expert for the energy value chain, including renewables and energy efficiency. DNV GL predicts it will generate annual revenue of approximately $3.4 billion.

Det Norske Veritas (DNV) began in 1864 as a small Norwegian classification society, and in the 150 years since, has grown into one of the world's largest enterprises of its kind with the formation of DNV GL. In September 2013, Norway's DNV and Germany's Germanischer Lloyd (GL) Noble Denton merged to create what is now the DNV GL Group. DNV Foundation holds 63.5 % of the group, while GL's owner Mayfair SE holds the remaining 36.5%, and together, DNV GL serves the maritime, oil and gas, energy and business assurance segments.

DNV GL is a leading technical advisor to the global oil and gas industry, providing consistent, integrated services within technical and marine assurance and advisory, risk management and offshore classification, to enable safe, reliable and enhanced performance in projects and operations.

Computas AS

Lysaker- based Computas, a 1985 spinoff from DNV Høvik, is a 100% employee-owned Norwegian IT consulting company that provides services and solutions for work processes, business systems and collaboration, with core competence in software development, architecture and integration, project management and consulting. With clients in both public and private sectors, the group serves a number of industries globally, one of them being offshore oil and gas. Computas claims its solutions currently have more than 25,000 users, including names such as Statoil, ConocPhillips, Technip, Eni, Aker Solutions and FMC Technologies.

As subsea activity on the Norwegian continental shelf and elsewhere reaches new depths, and the industry's players are forced to become more efficient with fewer resources, new challenges persistently arise. That's where Computas comes in to answer the call for efficient IT solutions. Computas operates with a great focus on innovation, research and development –its keywords being delivery fitness and added value. The company's work offshore can essentially be broken down into three main categories: (a) compliance, to ensure that operations are traceable and carried out according to agreed standards; (b) decisions and processes, to provide decision support plus task support for complex work processes; and (c) information, to capture and process massive amounts of data, the basis for decisions and value generation.

Teledyne Marine Sensors Group

TELEDYNE RD INSTRUMENTS Everywhereyoulook™

TELEDYNE CDL Everywhereyoulook™

TELEDYNE TSS Everywhereyoulook™

TELEDYNE GEOPHYSICAL INSTRUMENTS

William Kikendall, President of Marine Sensors and Systems Group

Which companies are included in your group? Site an example of your group collaboration.

The Sensors Group includes Teledyne Geophysical Instruments, Teledyne RD Instruments, Teledyne TSS and Teledyne CDL. Collectively this group designs, develops, manufactures and delivers a wide variety of sensor technologies that are utilized to measure phenomenon of interest or to facilitate accurate measurement of the phenomenon. Our current sensor suite directly measure acoustic energy, water velocity and direction, physical motion, pipe and cable location (through induced signals), water conductivity, temperature and depth (pressure). Teledyne's navigation and motion measurement instruments and systems facilitate delivering an instrumentation package to a location of interest on ROV's, AUV's, ASV's as well as manned systems and our motion reference units assure that the influence of heave, pitch and roll can be compensated for in high-accuracy, complex systems. Through our Sensors Group as well as our Systems Group we offer products that facilitate surface and subsurface systems operation. These devices include motion measurement, data loggers, data telemetry systems, etc. Teledyne CDL in particular offers a wide range of products and services for solving complex subsea system integration challenges. Our individual business units are continually identifying ways to bring more value to the market by collaborating across the groups. Perhaps the broadest example of this is the utilization of Doppler Velocity Logs (DVLs) in systems to enhance the navigation capability. This includes the use of RDI DVL's on Webb Gliders and Gavia AUV's as well as for integration into Inertial Navigation Systems produced by CDL and TSS.

TRDI ADC

Photo credit: Dr. Peter Gill

What is your group's most exciting technology advancement since MTR 100 2013.

With such a large and diverse group it is difficult to select only one

technology. If I focus on technology since MTR 2013, I would select the introduction of the TSS Saturn. The Saturn is a complete new family of advanced AHRS and INS (Inertial Navigation and Attitude and Heading Reference Systems) based on Fiber Optic Gyro (FOG) technology. This technology provides a core building block that will be the center of many products we introduce over the next several years.

What market trends are fueling your group?

Over the past year, our strongest growth market centered on undersea vehicles. This is the vehicles themselves as well as the equipment that they utilize. For the Sensors Group this is DVL's and Integrated Navigation Instruments such as the TOGS and TOGSNAV products. This includes core growth in terms of number of units as well as adding more capability to existing platforms.

Teledyne CDL Ltd

Teledyne CDL is a global engineering company that designs and manufactures a variety of sensors including gyrocompasses, attitude and heading reference systems, and inertial navigation systems. In particular, Teledyne CDL has pioneered the development of small form factor inertial measurement systems for use in subsea applications where space is at a premium, such as on-board remotely operated vehicles (ROVs). Teledyne CDL also offers advanced control and monitoring technologies for subsea infrastructure and engineering activities. Pioneers of the Tiny Optic Gyro System (TOGS), Teledyne CDL also provides products that satisfy the markets inertial positioning, sensor, telemetry and navigation requirements through their Fiber Optic Gyro (FOG), Ring Laser Gyro (RLG), Doppler Velocity Log (DVL), and Acoustic technologies.

Teledyne Geophysical Instruments

Teledyne Geophysical Instruments designs and manufactures sensors and sensor arrays for marine oil & gas exploration, high-resolution surveying of the ocean floor to facilitate pipe laying or structure placement, conducting and receiving acoustic surveillance data to identify marine targets, marine research for defense and homeland security. TGI is the largest independent supplier of towed geophysical arrays in the world, with facilities in the U.S. and U.K.

Teledyne RD Instruments

Teledyne RD Instruments, Inc., located in San Diego, CA, specializes in the design and manufacture of underwater acoustic Doppler products for a wide array of current profiling and precision navigation applications. Originally founded as RD Instruments, the company was formed in 1982 through the development of the industry's first Acoustic Doppler Current Profiler (ADCP), a revolutionary device capable of profiling currents at up to 128 individual points in the water column. In 2005, RD Instruments was purchased by Teledyne Technologies.

Teledyne TSS Ltd

Teledyne TSS conducts research, development, manufacturing and test in addition to comprehensive customer and product support from its HQ in Watford, Hertfordshire. The TSS product range includes:

- Motion sensors
- Underwater pipe and cable location equipment
- Navigation solutions for the commercial marine market.
- Saturn is the latest range of fiber optic gyrocompasses from TSS.

Teledyne CDL

Saturn is the latest range of fiber optic gyrocompasses from TSS. The range will include attitude and heading reference, inertial and full DVL aided systems.

Maritime Training & Competence Solutions

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E: enquiries@mtc.info
W: http://www.mtcs.info
MD: Richard Warburton
GM: Ian Durrell
Number of Employees: 12

The Case: MTCS is a fully accredited training and assessment centre for the Offshore industry. Its role is vital to the professional development of personnel involved in safety critical activities in the Offshore Sector. Its clients rely on MTCS to benchmark personnel competence against Industry Standards

The Company

MTCS is a fully accredited training and assessment centre for the oil and gas industry with offices in Singapore and the U.S. as well as the HQ in the U.K. We work with an international client base that consists of the world's leading subsea Engineering Contractors. Companies are now requested to demonstrate that they have a competent workforce to meet the rigorous challenges of the offshore oil and gas industry. In addition to competence management MTCS also offer a range of specialist training courses in ROV operations (Remotely Operated Vehicle). Courses are delivered across the globe, including on board vessels and installations if required. MTCS has recently launched an Virtual Learning Environment (MTCS Online).

The Tech

MTCS offers training in all aspects of subsea equipment, including: Electrical & Power Distribution; Control and Fiber optics; Hydraulic Systems; and Fault Finding Techniques. Course are suitable for all subsea equipment that relies on the above mentioned technologies.

A wide range of subsea equipment relies on High Voltage Electricity to operate. MTCS are world leaders in the delivery of this training for personnel who are required to isolate and make the equipment safe prior to maintenance

MTCS Online makes use of the latest VLE technology to deploy these courses to a remote environment such as vessels and rigs. MTCS Online also provides a robust assessment platform that assesses the knowledge and understanding of core subjects.

All our courses can be tailored to client equipment and procedures.

MMT

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CEO/President: Stefan Eliason
No. of Employees: 225

The Company

MMT has surveyed more than 50,000 sq. .km of seabead and more than 5000 km of pipelines.

Specializing in high-resolution marine surveys, MMT is one of the world's leading marine survey companies. It collects, processes and visualizes the conditions of the seabed and the assets on it. Continuously expanding and developing its core skills, it offers assured surveys in bathymetric, geophysical and geotechnical services, specializing in the oil & gas, hydrography and renewable energy & marine cable sectors.

The Tech

MMT manage all clients' projects with the latest state-of-the-art technology, which is handled and operated by its qualified personnel. ITs specialty is high resolution mapping. We have survey equipment from near shore to deep offshore and innovative techniques for UXO surveys, pipeline inspection and OOS surveys as well as hydrographic surveying. We have a dedicated GIS department. It claims to possess the only ROV capable of collecting high quality data at up to 5 knots.

Equipment resources include: ROVs, ROTVs and AUVs; ROV Excavation; Positioning and navigation ;Multibeam echo sounders; Side scan sonars; Sub-bottom profilers; Sound velocity probes; CP probes; Magnetometers; Gradiometer arrays; TVG; CPT, Vibrocoreres, grab samplers, boxcorers and gravity corers.

The Oceanscience Group

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W: www.oceanscience.com
CEO/President: Ron George
VP: Tricia Takacs
Engineering Director: Ashley Cantieny
No. of Employees: 35
Annual Sales: $7m

The Case: Oceanscience has been supplying deployment solutions to many of the major oceanographic and hydrographic operators around the world for 15 years.

The Company

Since 1998, Oceanscience has developed and manufactured oceanographic, hydrographic and hydrologic field equipment and instrumentation for corporations, major government agencies and institutions in more than 50 countries. One third of the staff are either ocean scientists or mechanical, robotics, or ocean engineers. Oceanscience focuses on building collaborative relationships with its customers, industry partners and representatives around the globe and placing an emphasis on customer satisfaction. Oceanscience manufactures a wide range of integrated systems for measuring and monitoring the world's waterways, from the deep ocean and coastal waters to rivers, lakes and ponds.

The Tech

• ***UnderwayCTD:*** Oceanscience underway profiling systems are the most compact and versatile options available to oceanographic researchers and hydrographic surveyors. The UnderwayCTD and UnderwaySV offer research quality conductivity, temperature, depth (CTD) or sound velocity (SV) profiles from 15m to 1000m depth, while underway at up to 20kts.

• ***Remotely-Operated Hydrographic Survey Boats:*** The Oceanscience Z-Boat offers a portable, fully integrated ready-to-use bathymetric survey solution for shallow water. There is no need to mobilize a manned boat for a difficult survey area; simply launch the remotely-operated Z-Boat and start surveying. Singlebeam echosounders or side scan sonars may be accommodated.

• ***Environmental Monitoring Deployment Systems:*** Seafloor and buoy-mounted platforms for acoustic Doppler current profilers lead the industry in longevity and ruggedness.

• ***River Discharge Boats for ADCP's:*** Oceanscience has shipped more than 4000 unmanned boats for a wide variety of fresh and saltwater applications. The Riverboat/ADCP system has significantly reduced discharge measurement time and labor all over the world.

Ulstein

Photo: Ulstein Group, Tonje Alvestad

Norway's Ulstein is the first name in design and construction for vessels serving the offshore industry. The Ulstein Verft subsea newbuild, Island Performer, was delivered to ship owner Island Offshore, yet another in a long line of flexible, state-of-the-art RLWI/IMR vessels from innovator and MTR100 company Ulstein Verft. "The vessel is customized to suit the scope of work in the FTO contract, in which RLWI (Riser-less Light Well Intervention) and IMR (Inspection/Maintenance/Repair) are the main tasks. She is able to perform operations at depths down to 3,000 m, and the contracted work start at year's end," said Håvard Ulstein, Managing Director, Island Offshore. "However, the very first assignment will be for the RogFast connection in Norway, in which the scope of work will be to investigate the sea bottom."

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

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

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

"Island Offshore has previous experience with this design," said Håvard Ulstein. "The two SX121 designed vessels already in our fleet have proved to be very successful to us. We are certain that the 'Island Performer' will achieve good results in complex deep water operations in the Gulf of Mexico."

FTO is a joint venture between FMC Technologies, Edison Chouest Offshore and Island Offshore.

CEO Gunvor Ulstein, Ulstein Group, said "The three contracting companies combined have extensive competence in the advanced subsea segment. Together, we have developed a solution which is particularly adapted to both RLWI and IMR work, and we strongly believe that the 'Island Performer' will prove her value in the years to come."

Wachs Subsea LLC

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http://www.wachssubsea.com
CEO/President: Nathan Drucker
Sales Manager: Keith Polifka
Number Of Employees: 140

The Case: Wachs Subsea CPT (Combination Prep Tool) represents the latest thinking in subsea pipeline repair and emergency preparedness systems. It's a single multifunctional machine that's innovative in its combination of proven technologies to perform five machining functions. Its compact size and light weight allow it to be air lifted within hours to any contamination site, and eliminates the need for a large surface support ship or heavy workclass ROV to deploy it.

The Company

Wachs Subsea is a manufacturer of diver and ROV operated machine tools used in maintenance, repair and decommissioning projects. Products including Diamond Wire Saws (DWS), Deepwater Diamond Wire Saws (DWDS), split frame rotating ring cutters and platforms, the Guillotine (Wachs) pipe saw, and the Trav-L-Cutter. Other products include subsea specific drills, offshore hydraulic power units, the EICC casing cutter, deck plate and rail mills, shipping baskets and more. Wachs Subsea is unit of ITW Oil & Gas, a division of ITW.

The Tech

Wachs Subsea CPT-3, or Combination Prep Tool Generation 3, is a hydraulically powered subsea machining system equipped with three modules that perform five functions: cutting, beveling, counter boring, weld seam removal and FBE (fusion bonded epoxy) removal.

It's part of a cut, lift, remove and replace system designed to machine subsea pipelines from 12 to 24 in. OD (DN300-600) at depths up to 3,000m (9843 sfw). Available soon is the CPT-4, utilizing the same technologies as the CPT- 3 but scaled up in size and capabilities to accommodate pipelines in the 26 to 44 in. OD (DN650-1050) range.

Xsens

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W: http://www.xsens.com
CEO/President: Casper Peeters
Number of Employees: 60

The Company

Xsens, acquired by Fairchild Semiconductor in 2014, is a supplier of 3D motion tracking technology and products. The company develops and supplies Inertial Measurement Units (IMUs) and Attitude and Heading Reference Systems (AHRSs) to a large customer base in the maritime industry. The products in various accuracy and integration levels finds its way into e.g. surveying applications, ROV/AUV control and navigation, ship state estimation and USBL systems. Xsens employs 30 highly-educated researchers and developers (50% PhD), with a total of 60+ employees. Xsens is participating in European research projects as well as carrying out independent research. The recent acquisition by Fairchild allows the Xsens-technology to be integrated in even smaller and more cost-effective sensor modules.

The Tech

Xsens' products portfolio consists of two separate product ranges, the MTi 10-series and MTi 100-series. The MTi 10-series is available as MTi-10 IMU, MTi-20 VRU and MTi-30 AHRS, featuring various integration levels. The IMU outputs sensors data (acceleration, rate of turn and magnetic field), the VRU outputs roll and pitch as well and the AHRS outputs stabilized yaw. The MTi 10-series is a cost-effective solution for stabilization applications. The high-performance MTi 100-series is an excellent alternative to higher grade (optical) IMUs. With an IMU, VRU, AHRS in the product range, the MTi 100-series can be interchanged with the MTi 10-series without any software or hardware modification. Next to the IMU, VRU and AHRS, there is an extra product in the MTi 100-series: the MTi-G-700 additionally outputs position and velocity information using a GPS receiver. GPS data is also used to improve the orientation output. The products of Xsens sample the inertial sensors at a rate of 10 kHz. This high sample rate and the carefully designed strap down integration (SDI) algorithm allow high accuracy motion tracking, even under vibration. Synchronization features include polling, SyncIn, SyncOut and clock synchronization. The high accuracy is independent from the output rate, a low output rate relieving the host CPU. Free-to-use source code and drivers are available for many platforms and programs.

Liquid Robotics Inc.

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CEO/President: Gary Gysin
No. of Employees: 115

The Company

Liquid Robotics instruments the ocean with fleets of networked, wave-powered ocean robots, solving critical problems for its defense, oil & gas, commercial, and science customers. Its Wave Gliders are seeking to transform ocean observation, making data collection and monitoring easier, safer, and more cost-effective. With headquarters in Sunnyvale, CA, and engineering & test facility in Kona, Hawaii, Liquid Robotics works with customers and partners around the globe to provide transformational, long duration ocean observation and monitoring.

In 2012, Liquid Robotics and Schlumberger created a join venture named Liquid Robotics Oil & Gas (LROG). Since this time, LROG has been providing oil & gas measurement services to the major oil companies using fleets of Wave Gliders.

The Tech

The key innovation of the Wave Glider is its ability to harvest energy from ocean waves to provide essentially limitless propulsion and ensuring persistent presence. It is the world's first wave powered ocean robot. No fuel required, no personnel needed, no maintenance, no emissions.

Because of this energy independence, Wave Gliders are able to persistently gather and communicate ocean data on a far broader scale and with greater timeliness than ever before possible. It is no longer necessary to expose people to the risks and hardships of deep ocean operation. From the arctic to the equator, Wave Gliders are expanding our ability to understand the world's oceans.

The Wave Glider is composed of two parts, the float (size of a surfboard), and a sub with wings. Connected by an umbilical tether, the float is on the surface of the ocean where conditions are the harshest with the sub below the surface protected from the surface conditions.

The separation between surface float and sub harvests wave energy and transforms it into forward thrust.

The Wave Glider is equipped with sophisticated computers for navigation and payload control, satellite communication systems, and state of the art ocean sensors to measure the environment around it. Highly customizable, it supports a growing array of sensors able to collect a wide variety of scientific and commercial data.

Polarcus

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CEO: Rolf Rønningen

The Company

Founded in 2008, Polarcus has the vision of delving into the depths of seismic activity while leaving the environment unharmed. The company has achieved this by employing tactics such as reduction, recycling, and emissions indexing. It has been able to maintain a fleet that is among the most advanced in the world in order to address current and future problems.

Polarcus carried out a propulsion and streamer upgrade on its Polarcus Naila, leading to less utilization and reduced revenue in the first quarter of 2014. Despite this, technical downtime and operational costs were both low, proving that the company has still provided high-quality services. CEO Rønningen remarked that the weak market from the end of last year has continued over, so it was in the company's best interests to spend this time upgrading the vessel to increase potential revenue in the future.

Sensor Technology Ltd.

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CEO/President: Niru Somayajula
Number of Employees: 55

Sensor Technology Ltd. was founded in 1983 near Toronto, Canada. The company began as a research-driven manufacturer of acoustic transducers, hydrophones and piezoelectric materials. It has conducted experiments on the space shuttle, the Mir space station, in both the Arctic and the Antarctic and in ocean depths exceeding 20,000 feet. Over its 30 years in business the company has shifted its focus to industrial applications.

Sensor Technology Ltd.'s history of R&D lends itself to the company's strong design capabilities. With in-house machining, assembly and testing facilities, Sensor Technology Ltd. is capable of taking customers through the entire design process from concept, to prototyping, to full-scale production.

The Tech

Sensor Technology Ltd. manufactures components for sonar arrays and other acoustic systems.

- Sensor Technology Ltd. manufactures a wide array of piezoelectric ceramic materials. The company produces hard and soft PZT (Navy Types I, II, III, V, VI), lead titanate, a series of lead metaniobate materials and the unique, ultra-hard PZT, BM200. In-house CNC machining capabilities allow it to produce a wide range of geometries, from small 0.070" (1.78mm) diameter tubes to plates almost 7" (177.8mm) long. Uncompromising quality controls ensure consistent piezoelectric ceramic performance, from shipment to shipment.
- Sensor Technology Ltd. uses its own piezoelectric ceramics to design and manufacture custom acoustic transducers and hydrophones. Volumes range from one-offs and prototypes to high volume production feeding thousands of pieces each week directly into customer production lines. Past projects include transducers with multiple transmit frequencies, vector hydrophones, high channel count arrays with side lobe suppression, towed array hydrophones for seismic applications and ruggedized units, capable of withstanding pressures exceeding 10,000 psi or temperatures up to 280° C.
- Sensor Technology Ltd. designs and manufactures preamps and transformers for piezoelectric acoustic transducers. These components provide the first layer of electronics, simplifying the process of integrating the sensors into sonar arrays and other acoustic systems.

OceanServer Technology, Inc.

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W: http://www.iver-auv.com/
CEO/President: Bob Anderson
Engineering Director: Jon Crowell
Number of Employees: 14

The Company

OceanServer Tecnology is the developer of the Iver family of modern, low-cost Autonomous Underwater Vehicles (AUVs). These robust, man-portable systems are ideal for survey, search and rescue, scientific and military applications in near-coastal water. The low, all-inclusive price (including mission planning and post mission analysis software) has enabled many organizations to add this technology into their equipment pool and survey methodology. OceanServer Technology, Inc. is a leading provider of man-portable Autonomous Underwater Vehicles (AUVs) with more than 200 AUVs deployed worldwide.

The Tech

The Iver AUV is designed to be an affordable, commercial vehicle used for general survey and sub-surface security work, and serves as a research platform for autonomy, behavioral and sensor development studies.

SBG Systems

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http://www.sbg-systems.com
CEO/President: Thibault Bonnevie
Number Of Employees: 25

The Case: Since 2007 SBG Systems delivers high performance and cost-effective MEMS-based Motion Reference Unit (MRU) and Inertial Navigation Systems (INS) to the Marine industry (40% of its turn over). Its products are mainly used in Offhore, Marine, and Underwater applications. In February 2014, SBG Systems released the Ekinox Subsea Series, a new product range of high accuracy inertial systems operational up to 6,000m.

The Company

SBG Systems is a supplier of MEMS-based inertial motion sensing solutions. The company provides a wide range of inertial systems from miniature to high accuracy. Combined with cutting-edge calibration techniques and advanced embedded algorithms, SBG Systems products are ideal solutions for Aerospace, Land, and especially Marine (surface and subsea) projects such as vessel motion monitoring, ROV & AUV control, Hydrography and Buoy positioning.

The Tech

SBG Systems designs, manufactures, and calibrates all its products. SBG Systems adds value to its inertial systems by designing specific data fusion algorithms and calibration techniques to enhance sensors' performance.

SBG Systems offers Motion Reference Units, Inertial Measurement Units and Inertial Navigation Systems.

The new Ekinox series provides 0.05° Attitude, 5 cm Heave on four monitoring points, and 2 cm position (GNSS enhanced). It accepts aiding data from DVL, Dual Antenna GPS, USBL, etc. With additional NMEA protocol and Ethernet communication, Ekinox is appears as a cost-effective alternative solution to FOG technology for Marine applications. With its subsea enclosure, the Ekinox Subsea Series, released in February 2014, is operationnal up to 6,000m.

OHMSETT

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CEO/President: Lori Medley
Number Of Employees: 17

The Case: The U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement (BSEE) manages the facility as part of its mandated requirements by the OPA 1990. Ohmsett is an integral part of the BSEE oil spill research program and directly supports the BSEE goal of ensuring the best and safest oil spill detection, containment and removal technologies are available to protect the U.S. coastal and oceanic environments.

Ohmsett's mission is to improve oil spill response through research and development, testing, training, and to provide performance testing of response equipment and marine renewable energy systems.

Located in Leonardo, NJ, Ohmsett provides independent and objective performance testing of full-scale oil spill response equipment and marine renewable energy systems (wave energy conversion devices). It is the largest outdoor saltwater wave/tow tank facility in North America and the only facility where full-scale oil spill response equipment testing, research, and training can be conducted in a marine environment with oil under controlled environmental conditions (waves and types of oil).

The Ohmsett facility consists of an above-ground concrete test tank measuring 667 feet long by 65 feet wide by 8 feet deep filled with 2.6 million gallons of crystal clear salt water, conference rooms, maintenance/machine shop, oil/water chemistry laboratory, and offices.

The U.S Department of Interior's Bureau of Safety and Environmental Enforcement (BSEE) operates Ohmsett as part of its mandated requirements to ensure that the best and safest technologies are used in offshore oil and gas operations. The facility is maintained by MAR, Incorporated through a contract with the Bureau of Safety and Environmental Enforcement (BSEE).

The Tech

Ohmsett represents an intermediate step between small scale bench testing and open water testing of equipment ensuring the best and safest oil spill detection, containment and removal technologies are available to protect the U.S. coastal and oceanic environments. Many of today's commercially available oil spill cleanup products and services have been tested here, as well as the collection of a considerable body of performance data and information on mechanical response equipment. This information is used by response planners in reviewing and approving facility response and contingency plans.

The facility has the capability to test and evaluate oil spill response technologies such as: mechanical oil recovery systems, chemical treating agents and dispersants (to include subsea dispersant effectiveness), oil in ice and cold weather climate, remote sensing and detection instruments, sorbent materials, temporary storage devices, viscous oil pumping units, and oil water separators.

In addition, Ohmsett provides a venue for first responders with the most realistic hands-on training available, enabling rapid and efficient response to an actual spill event.

The Ohmsett test tank is large enough to accommodate many alternative energy devices, in particular wave energy conversion mechanical devices, in a controlled environment at meso-scale. The advantage is that arduous scaling considerations are minimized, and validation testing is more realistic.

MacArtney Underwater Technology Group

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Group MD/CEO Niels Erik Hedeager,
Sales & Marketing Director: Marco MacArtney
Number of employees worldwide: 300 (approx.)

The Company

The MacArtney Group is a supplier of underwater technology specializing in design, manufacture, sales and service of a wide range of systems to offshore oil & gas operators, surveyors, the renewable energy sector, ocean science institutes and navies across the world. The company offers an extensive variety of advanced and reliable products and system solutions which are designed and tested to supply high quality, efficiency and dependable performance in challenging underwater environments. All MacArtney systems and components are backed by an international network of subsidiaries and representatives, providing local access to global support. MacArtney has been supplying products and engineering solutions for more than 35 years and is a privately owned corporation with group headquarters in Esbjerg on the west coast of Denmark. From its head office, it has been providing logistical, technical, financial and marketing support to all of the companies within the group since 1978.

The MacArtney Group supplies and services a wide range of integrated systems and products designed, developed and manufactured by MacArtney. It also represents manufacturers of underwater products. MacArtney supply includes underwater connector (SubConn, Opto-Link and MacAPI), cable and termination systems, advanced NEXUS fibre optic telemetry systems, electric COR-MAC and MERMAC winch, handling and LARS systems including active heave compensation (AHC) winches for ROVs. The MacArtney range of fast and precise remotely operated towed vehicles (ROTV) includes the MacArtney FOCUS-2, TRIAXUS and FLEXUS vehicles. Moreover, MacArtney supplies a versatile range of LUXUS underwater cameras, lights, media controllers and accessories. System design and integration by qualified, experienced engineers is an important part of the MacArtney portfolio. Combined with a wide range of products and systems, MacArtney can offer turnkey solutions designed specifically for requirements and installed ready for use wherever needed.

MacArtney has a network of testing facilities available at our workshops in Europe and in the US. Its in-house facilities include large full ocean depth, computer controlled pressure testing vessels, an 8x3x3m test tank and a cable tensioning rig. Some of its sites offer portable and mobile testing facilities, performing a range of tests on site.

All testing procedures are documented and it also works closely with external companies and institutes that specialise in such disciplines as hydrodynamics, corrosion and cable dynamics.

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Think Sensor Research Inc.

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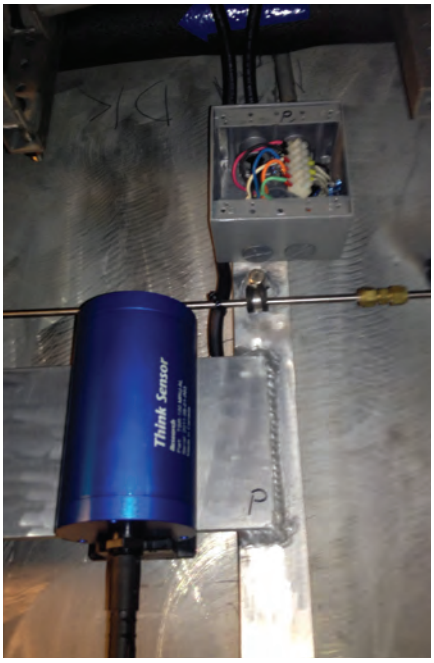
W: www.thinksensor.com
CEO/President: Pavel Haintz
Number of Employees: 5

The Profile

Think Sensor Research was founded in 2008 to revolutionize the way data is collected in the marine industry by providing state of the art sensor products and highly individualized assistance and on-going support. Its TSR-100 Motion Reference Unit is designed to accurately measure pitch, roll, heading and heave in surface and underwater applications under static and dynamic conditions. It is currently being used in applications ranging from underwater platform monitoring to small survey vessels to large supply vessels. The TSR-3000 3-D Sonar is a high performance modular sonar system that can be configured for our customers requirements. TSR-3000 can be used to collect simultaneous profile and image data. The TSR-3000 Sonar is designed for a wide range of applications from bathymetry to underwater structure inspection of bridges and dams.



The Tech

Think Sensor Research Inc. develops its own sensor fusion algorithms for its motion reference unit which can be customized for unique applications.

It also has extensive expertise in sonar system design from transducers to embedded electronics to sonar signal processing.

Its transducers for our sonar systems are custom designed and developed for optimal performance in combination with our own custom sonar electronics and sonar processing algorithms.

Sonardyne International Ltd.

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http://www.sonardyne.com
CEO/President: John Ramsden
Engineering Director: Simon Partridge
Number Of Employees: 310

content with remaining known as a world-class manufacturer of underwater acoustics, the last few years has seen UK-based Sonardyne International transform its business into a 300 people-strong organization able to offer inertial navigation, sonar imaging and wireless communication technologies all under one roof.

The Company

At Sonardyne, creating innovative, low risk solutions that solve clients' subsea challenges is the driving force behind this independent design and manufacturing company. Now in its 43rd year of business, Sonardyne has a portfolio of acoustic and non-acoustic technologies ranging from autonomous monitoring subsea sensors to high resolution imaging sonars for AUVs.

A vertically integrated company with in-house research, design, manufacturing, testing, marketing, distribution and support, Sonardyne is geared to quickly respond to its clients' needs. In 2014, Sonardyne opened the doors of its new multi-million dollar UK manufacturing facility, home to its expanded Production, Engineering, Testing, Quality and Repair departments. With these significantly increased manufacturing capabilities, Sonardyne has invested to ensure it has the best infrastructure to supports its clients and future growth.

The Tech

Sonardyne's technology portfolio covers four categories:

- **Acoustic positioning** – Sonardyne's 6G USBL, LBL and LUSBL systems are operational in every deepwater development, helping navigate subsea vehicles, install subsea structures and position surface vessels. 6G systems use ultra-wide bandwidth acoustic signals to achieve exceptional subsea navigation, communications and positioning performance. In 2014, its capabilities were recognized with a prestigious international award for technological innovation.
- **Inertial Navigation** – This offers contrasting and complementary characteristics to acoustic and satellite positioning. The seamless integration of these produces a single solution offering a continuous position output with no drift. Sonardyne INS systems tailored for DP reference and subsea vehicle positioning deliver greater overall precision and accuracy than acoustics, GPS/GNSS or inertial alone.
- **Wireless Communications** – Sonardyne is renowned for reliable through-water acoustic and high speed optical communications. With this, users can harvest data from seafloor sensor nodes using unmanned surface vehicles, reducing the cost and risk associated with deploying conventional ships.
- **Sonar Imaging** – Sonardyne sonar imaging expertise protects vulnerable waterside facilities and vessels from the threat of attack, enables AUVs such as the Bluefin-12 to gather pixel-perfect seabed images, monitors a billion cubic feet of water for oil leaks and navigates hazards for vessels.

SL Hydrospheric

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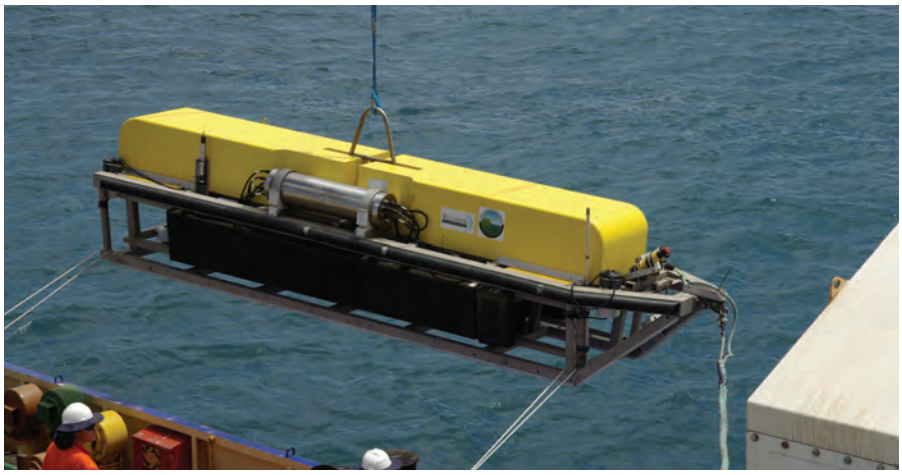
CEO/President: Jay Larsen
Vice President: Kevin Beck



SL Hydrospheric, LLC is made up of eight members, all hailing from the deep ocean search and survey industry. In 2009 it formed the company to combine its deep tow sonar expertise with the newly available ProSAS suite by Applied Signal Technologies (now Raytheon). The result is the SLH PS-60 vehicle, capable of 6000 meter depth and a two km swath at 10 cm resolution. It has performed sonar searches and surveys in the U.S., Canada, Australia and Nigeria.

The technological thrust of SL Hydrospheric is in the design of Synthetic Aperture Sonar (SAS) enhanced vehicles and their application in the search and survey industry. Its first vehicle is the SLH PS-60, onto which is incorporated Raytheon 60 kHz ProSAS components. SL Hydrospheric engineers and technicians designed, built and operate the vehicle and associated power and telemetry systems. With an emphasis on long range sonar performance, the power systems were designed to be ultra-quiet, electrically. In the future SL Hydrospheric looks forward to owning and operating AUV based systems as well, to cover the full range of SAS application.

Valeport Ltd.

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E: kedwards@valeport.co.uk
http://www.valeport.co.uk
CEO/President: Matt Quartley
# of Employees: 76

The Case: Valeport designs and manufactures all its products at it facilities based in the UK. With its own specialist R&D department and dedicated service facility, Valeport offers total product control from design and manufacture to calibration and servicing.

The Profile

Established in 1969, Valeport designs and manufactures instrumentation for the oceanographic, hydrometric and hydrographic markets, with a worldwide customer base that includes the environmental, military, oil & gas, renewable, construction, dredging and civil engineering sectors. It has a philosophy of retaining all aspects of the development and manufacturing processes in-house. Its riverside premises in the picturesque town of Totnes in the southwest of the UK houses all facilities for designing, CNC machining, environmental testing, assembly, calibration and servicing of all its instruments.

In 2011, it recognized that a combination of this philosophy and its consistent growth meant that it was outgrowing its premises on the bank of the River Dart in Totnes, so it embarked upon the most significant step so far in Valeport's history. In September 2013, the Reade Building was completed; situated next door to its existing site, the 16,000 sq. ft., 3.5 story building more than doubles Valeport's workspace, and houses our entire production facility with a fully equipped CNC machine shop, state-of-the-art-calibration laboratory, and two floors of ESD protected assembly workshop.

The Tech

Manufactured products include: Current meters for both inshore and offshore applications; Tide gauges for shore based and seabed deployments; Radar Level Sensors; CTD & Multi-parameter CTD; Sound Velocity Sensors and Profilers; Altimeters; Echo Sounders and Depth sensors; Wave Recorders; and Fluorometers.

Black Rock Tidal Power – a SCHOTTEL subsidiary

The Company

The Canadian SCHOTTEL subsidiary Black Rock Tidal Power Inc. (BRTP) has recently won a demonstration berth in the Bay of Fundy, known for its high tidal range. BRTP will install SCHOTTEL tidal generators (STG) on a Triton platform developed by Tidal Stream Ltd. in which SCHOTTEL holds shares. The device will be readily installed in spring 2016 with initially 16 STG turbines (1.1 MW capacity), stepping up to the full capacity of 2.5 MW using 36 STG turbines in early 2017. The generated electricity will be fed into the North American power supply system, amortizing the costs of the installation.

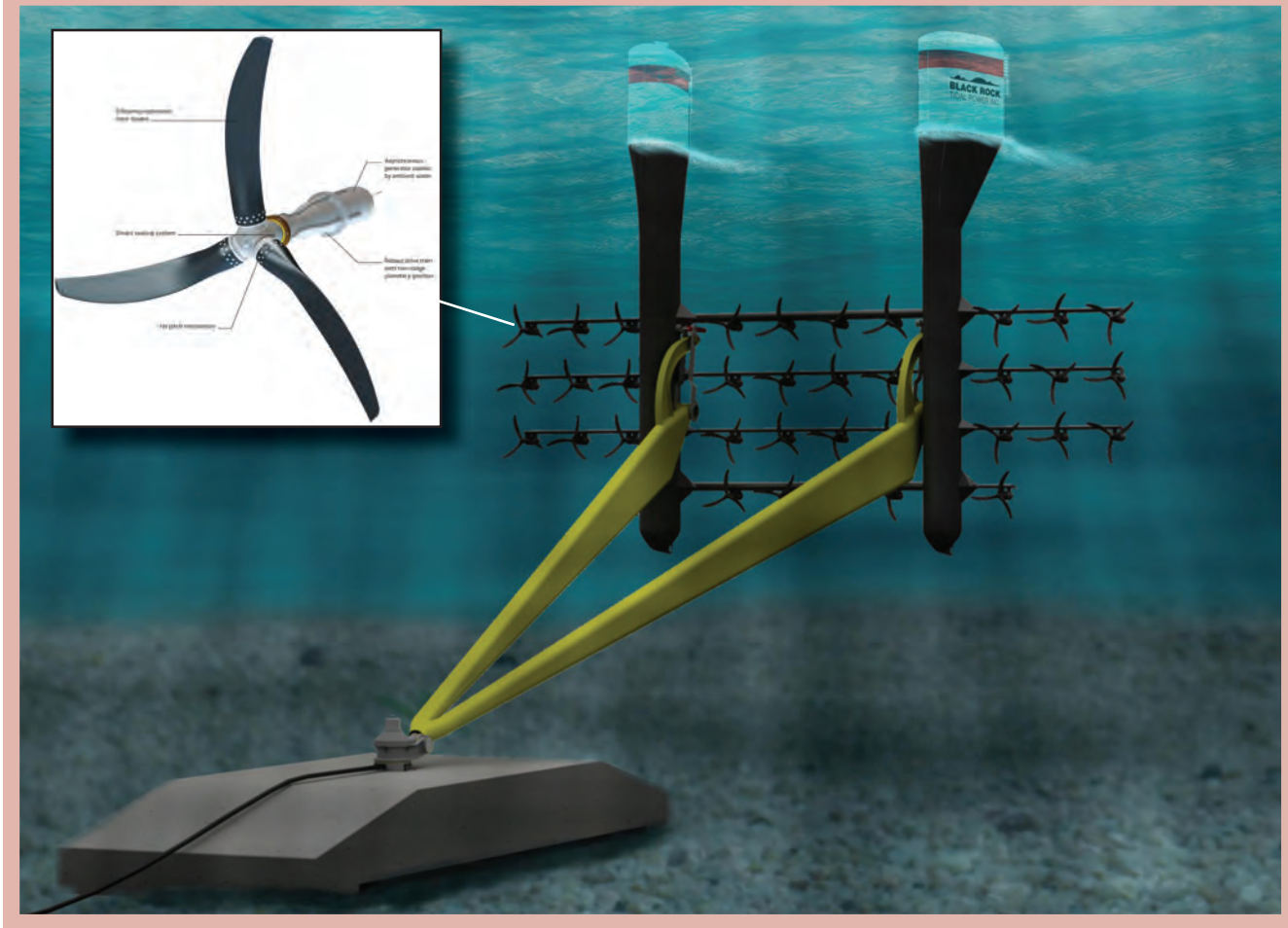
Already in early summer 2014 another test platform with SCHOTTEL STG turbines will be installed off the Isle of Wight. The platform is designed by the British company SME (Sustainable Marine Energy). Further operational experience will be gathered in 2014 and 2015 through test installations in Northern Ireland and Atlantic Canada.

"Our tidal turbines are very flexible components. This is obvious from the variety of projects operating with the turbines, and the trust of our clients and supporters, including the private sector as well as public authorities," explains Niels Lange from SCHOTTEL. "Hydrokinetic energy will play an important role in the future energy mix. With our turbines we offer cost-effective harvesting!"

The Tech

The STG is a light-weight, yet robust tidal generator, based on the fact that reducing turbine size leads to a better ratio of power and material use. High overall power can be reached with a higher number of turbines. Depending on the current velocity, one STG produces between 54 and 70 kW rated, grid-ready electric power based on rotor diameters between five and three meters. Each of the turbines is connected to a frequency converter feeding into a common DC bus installed on the tidal platform. Thanks to the modular approach, STG can be implemented in rivers, sea straits and tidal races offshore in jetty, floating or submerged platforms in varying quantities.

BRTP combines a Triton platform with the small and robust SCHOTTEL STG turbines (inset) for energy harvesting in the Bay of Fundy.



Saab Seaeye Ltd

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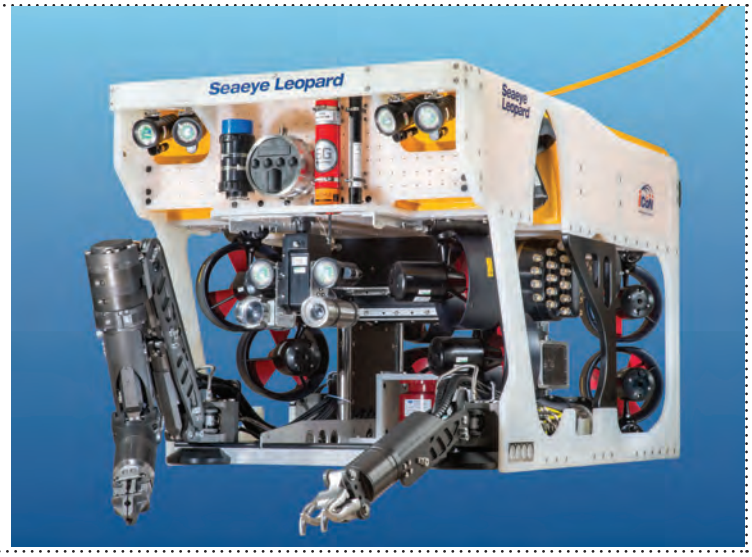
Managing Director: Jon Robertson
Turnover: $70m



The Company

Saab Seaeye manufactures electric ROVs, a line-up that includes Saab's range of tethered and hybrid underwater vehicle systems for both the defense and commercial markets. Accredited by DNV to ISO 9001 and ISO 18001, Saab Seaeye is a leading supplier of electric ROVs to the oil and gas industry, and a major ROV resource for renewable energy, defense forces, marine science and hydro-engineering.

Saab Seaeye has facilities in both the UK and Sweden and employs more than 230 people. It has a turnover of around $70 million and recently doubled the size of its manufacturing and engineering operations in the UK. Exports stand at over 80% of sales with the company represented and supported in 25 countries around the world, and it has an office in Houston, TX.

Founded in 1986, Seaeye has pioneered many innovations in the ROV industry including: Brushless DC thrusters; Polypropylene chassis; Carbon fiber pressure vessels; Distributed intelligence control system; Fault-tolerant systems with self-diagnostics; and High frequency power distribution.

More than 750 ROV systems have been sold, fitted with a range of standard and custom designed tooling and sensors that includes cameras, manipulators, survey sensors, cutters, tracking systems, sonars, torque tools and water jetting tools. The company also designs and manufactures a range of ROV handling devices including Tether Management Systems.

In-house deep rated pressure test facilities are installed at the company's Fareham factory along with a test tank for final vehicle Factory Acceptance Testing together with product development testing. The company also has access to a local indoor test facility and another substantial indoor test tank is located in Sweden. For major trials Saab uses its harbor and workshops on the shore of the 1900 sq. km Lake Vättern.

The Tech

Technologically, the Saab Seaeye range comes in various sizes, power and tasking options that extend from compact inspection ROVs to work ROVs and AUV/ROV hybrids. Recently introduced is the Seaeye Technology Toolbox concept that creates a common architecture resulting in the lowest number of parts at the least possible cost for the highest possible performance and quality. Commonalty of software and hardware across all vehicles offers customers simpler repair and maintenance, easier upgrades, quicker delivery, more assured quality and a lower real through life cost. It also results in simplified and common training for operators in using and maintaining the systems.

The Seaeye Technology Toolbox is important in the development of breakthrough concepts like the Intelligent Control System, iCON, - a vital innovation that makes every device within an underwater vehicle aware of its own status, predicts failure and takes action as necessary to keep the vehicle working.

iCON also lets engineers reach across the world into the heart of a vehicle through an internet gateway that gives them ready access to diagnostics, software upgrades and system inventory.

The Commercial Range includes:

- **Falcon** – Portable ROV for easy deployment. Distributed control system. Five thrusters. Rated 300 and 1000m.
- **Tiger** - Industry standard observation ROV. Five thrusters. Rated 1000m.
- **Lynx** - Larger than the Tiger with additional outlets for survey sensors. Six thrusters. Rated 1500m.
- **Cougar XT** - Powerful observation and light work ROV. Six thrusters. Rated 2000m.
- **Cougar XT Compact** – Low profile version for strong currents. Six thrusters. Rated 300m.
- **Cougar XTi** – iCONcontrol system. Six thrusters. Rated 3000m.
- **Panther XT** – Light Work and Survey ROV. Six thrusters. Rated 1500m.
- **Panther XT Plus** – Powerful fast swimming version. Ten thrusters. Rated 1000m
- **Leopard** – Compact, powerful, work ROV. iCONTM control system. Eleven thrusters. Rated 3000m plus.
- **Jaguar** - Largest work ROV. iCONTM control system. Eight thrusters. Rated 3000m with 6000m option.
- **Sabertooth** – Autonomous, hovering, long range AUV/ROV hybrid for inspection and light work tasks.

Shark Marine Technologies

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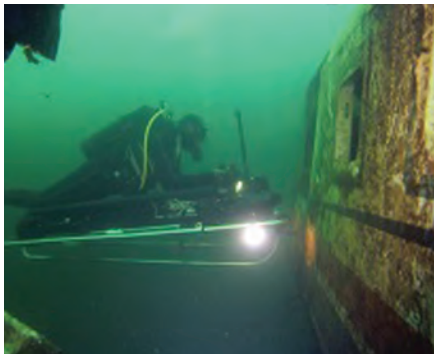
CEO/President: Jim Garrington
Vice President: Wendy Garrington
Marketing Director: Michael Aitken
Sales Manager: Jim Honey
General Manager: Scott Charles
No. Of Employees: 20

Celebrating 30 years in the business, Shark Marine Technologies Inc. began in the garage of president Jim Garrington. Today it's well known in the business for its underwater technologies which have expanded from camera systems, to ROV's, to diver held sonar and navigation systems and now its diver delivery system that can operate completely autonomously.

Shark Marine today has a broad offering that includes the following: Diver Held Sonar Imaging and Navigation Systems; Diver Propulsion Systems; Video Systems; Remote Operated Vehicles; Survey Equipment; Tether Management Systems On-site Operational Support Consultation; Custom Design and Manufacture; and Training. It is with great pride that Shark Marine serves an ever growing customer base including commercial diving, scientific research, survey firms, film companies, search and recovery organizations, educational institutions, natural resources industries, and some of the most elite military forces in the world.



The Tech

Shark Marine Technologies Inc. head office and production plant is located in St. Catharines, Ontario Canada, about 15 minutes west of Niagara Falls. Shark Marine Technologies Inc. (Canada) and Shark Marine Technologies Corp. (USA) together, are a family owned small business, currently employing 20 people. The employees consist of machinists, electrical engineers, software engineers, electronic technicians, administrative and assembly personnel.

Its facilities include a machine shop where its design, prototyping and development is done.

Its primary facility Unit 4 at 23 Nihan drive is 6500 sq. ft. and houses administration, machine and electronics departments. Its second facility, Unit 1 is 3200 square feet and serves as a warehouse and training center.

SeeByte

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Sales Manager: Ioseba Tena
Engineering Director: Dr. Scott Reed
No. Of Employees: 50

The Company

SeeByte provides clients in the Military and Oil and Gas sectors with the most advanced software to enhance the capabilities of their underwater sensors, vehicles and systems. The company has offices in Edinburgh, UK and San Diego, U.S. SeeByte has achieved a position of leadership in the development of smart software for remote or unmanned assets in both the military and energy sectors, and provides products and services to major government and commercial clients around the world. Its customers include BP, Chevron, BAE Systems, Subsea 7, SMD, the U.S. Navy, the Royal Netherlands Navy, VideoRay and BlueView. SeeByte is a Bluefin Robotics Company.

The Tech

SeeTrack Military is a technology used by Explosive Ordnance Disposal (EOD) and Clearance Divers around the world, to achieve success in managing their off-board assets during dangerous and demanding missions. This unique system for rapid on-site analysis and fusion of sensor data has been used within numerous military & security exercises, surveys and operations.

SeeTrack CoPilot is the world's most advanced, easy-to-use, plug-and play software that makes piloting any ROV a much simpler task. Through a straightforward and intuitive point and click interface, SeeTrack CoPilot has led the way in the offshore oil and gas industry. SeeTrack CoPilot permits pilot controlled auto-transit and stop-and-hover, while providing automated sonar tracking and movement relative to a target. By offering the largest available set of flight modes, SeeTrack CoPilot delivers the benefits of Dynamic Positioning in environments and scenarios not achievable using any other software product.

Texas A&M University at Galveston

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CEO/President: RADM Robert Smith III
Vice President: Dr. Patrick Louchouarn
Marketing Director: Bob Wright
No. Of Employees: 306

The Case: Texas A&M University at Galveston's mission is to inspire and train tomorrow's engineers, researchers, navigators, scientists and business leaders to unlock the vast secrets of the earth's underwater frontier.

Profile

Texas A&M University at Galveston is a special-purpose institution with a student population of more than 2,200 students concentrating on instruction in marine and maritime studies in science, engineering and business and for research and public service related to the general field of marine resources. The university offers ten undergraduate ocean-oriented degrees, three master's degrees and one doctoral degree. The university is home to the Texas Maritime Academy. The academy prepares cadets for officer training for the U.S. Navy as well as professional desk and engineering licensing for the U.S. Merchant Marine. The university's training ship General Rudder takes cadets on summer training cruises to ports around the Gulf of Mexico and Caribbean. The university is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools and by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The Tech

Texas A&M Galveston's Gold LEED certified Ocean and Coastal Studies Building has 17 marine science centers and research laboratories and contains more than 17 different centers and laboratories on campus including the Wetlands Center, Seafood Safety Lab, Sea Life Center Research Lab, Center for Texas Beaches and Shores and the Laboratory for Oceanographic Environmental Research. Campus waterfront operations include a fleet of floating classrooms and laboratories with immediate access to the ocean and Galveston Bay.

Southwest Electronic Energy

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http://www.swe.com
CEO/President: Len Beckenstein
Engineering Director: David White
No. Of Employees: 85

The Case: Southwest Electronic Energy is celebrating 50 years of providing innovative custom energy management solutions, particularly lithium and lithium-ion battery technology for oil and gas and subsea applications. SWE is at the forefront of providing advanced technology battery solutions, helping make offshore oil and gas more accessible and affordable.

The Company

Today, SWE serves more than 300 customers, many of which have been with SWE through much of the company's 50 years of innovation in energy management solutions. Located in the greater Houston metropolitan area, SWE's battery solutions serve a broad industrial customer base operating in diverse fields, including oilfield services, seismic, pipeline inspection, medical, military, remote monitoring and process control, marine, solar renewable energy, telecommunications and homeland security. SWE's core competency drives its business philosophy: to design and build custom advanced battery solutions with higher quality and faster turnarounds supported by top level service and support.

The Tech

SWE tackled the challenges of how to provide advanced battery management in pressure-tolerant tested subsea battery solutions. The result of SWE's extensive research and testing is a way to safely provide higher and longer lasting power than the old technology of sealed lead acid (SLA) batteries. SWE pioneered, researched and developed SWE SeaSafe, a battery solution that delivers breakthrough safety, reliability and configure-to-order flexibility. SeaSafe smart battery solutions are poised to change the game in subsea applications, enabling electric powered monitoring, sensing, propulsion and feedback control, for more efficient, precise, and reliable operations. SeaSafe is available in smart modules that are easy-to-use battery building blocks for customers to integrate in their own enclosures.

SWE has introduced other subsea ready battery components: SeaSafe pressure equalization case, SeaSafe Observer software, and optional SeaSafe Parallel Integrator Isolators. SWE's patented Battery Management System (BMS) highlight SWE's Lithium-Ion battery products. The BMS has the brainpower to assure safe operation, protect the module's cells from damage, allow reliable distributed battery system architecture, and prolong battery life.

To meet its subsea vehicle pressure tolerant battery needs, Woods Hole Oceanographic Institute provided requirements' guidance and feedback on the SeaSafe modules.

Royal Dutch Shell

Courtesy of its investment in the world's first Floating liquid natural gas (FLNG) facility, a structure which is longer than four football fields, as heavy as 6 Nimitz-class aircraft carriers and almost as tall as the Taipei 101 skyscraper, costing an estimated $11 to $13 billion and essentially turning the maritime and energy world's upside down, Royal Dutch Shell PLC earns a much deserved spot on the MTR100.

As Shell moves the LNG processing out to sea, it incorporates more than its fair share of subsea technologies.

FLNG Prelude will measure at 488 x 74 m, and it will clock in at 600,000 tonnes when fully ballasted. The FLNG facility, which is under construction at the Samsung Heavy Industries shipyard in South Korea, will be the largest object ever floated on the ocean. Designed to last 50 years, withstand level 5 cyclone winds and liquefy gas to minus 162 degrees Celsius, it is scheduled to go into service in 2017, spending the next 25 years tapping the Prelude and Concerto gas fields in the Caswell sub-basin of the northern Browse Basin, about 200 km off the coast of Broome, Western Australia. Once in place, it is expected to produce 3.6 MMt/a of LNG, 0.4 MMt/a of LPG and 1.3 MMt/a of gas condensate annually, enough gas to fuel Hong Kong for a year.

Some observers scoff at the idea of using a hugely expensive facility to extract gas from small fields. But one of the beauties of FLNG facilities is that they are mobile and can flit from gas field to gas field, servicing one or many wells at the same time, while pipelines to onshore processing plants are essential tied to one field. Once its targeted field is sucked dry – the expensive pipeline has no further use. The plant can still receive LNG for processing, of course, but at that point it's coming in on tankers from various distances and the facility will have to be able to accommodate those ships and the necessary offloading process.

Knowing where the gas is, and getting to it, however, are two different things. There are many so called "stranded" deep water gas reserves that have been considered either too small in terms of likely productivity or too far out, to tap into in an economical manner. Factors such as geographical proximity, slowing oil production rates, technological advancement, abundant supply and unprecedented demand growth in Asia point towards a locus of FLNG development in Australian waters, according to Murray Dormer, an analyst with Douglas-Westwood. Douglas-Westwood expects the market for construction of FLNG vessels to increase from $3.7B in the period 2007-2013 to $64.4B over 2014-2020, according to its report, "*World FLNG Forecast.*"

As its name implies, the Prelude won't be alone for long. Nor will it remain the world's largest floating offshore facility. There are at least three other similar projects following in its wake. One of these, from Exxon, and others in the planning stages at Shell, will pump up the size equation even more.

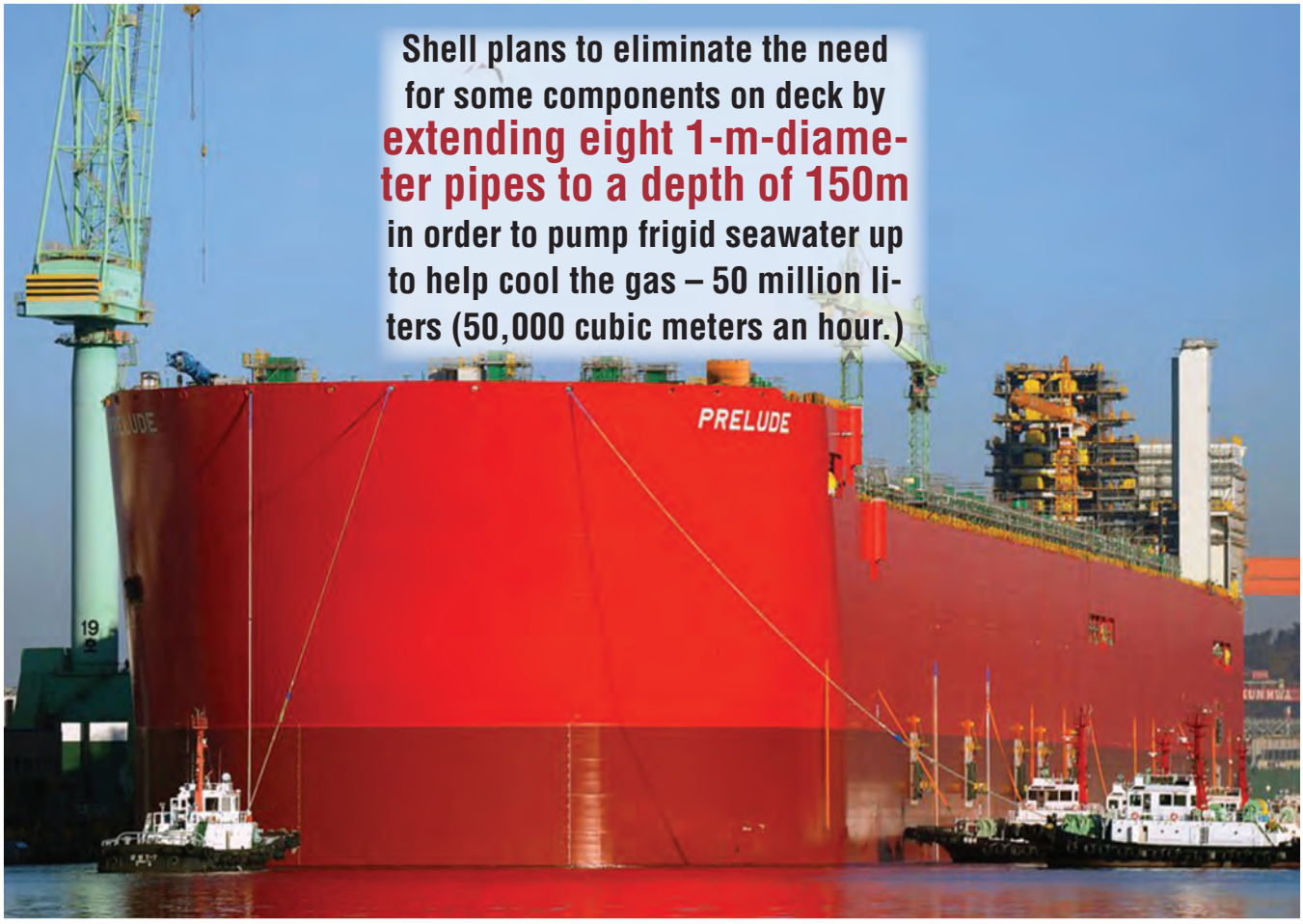
Competitors include:

- Exxon in partnership with BHP Billiton is looking to install what would be the world's largest FLNG - a 495 meters (1,624 feet) long facility - in its Scarborough gas field off the Australian coast. Design specs call for it to produce an estimated 6 million to 7 million mt/year of LNG from five trains, and to hold 10 storage tanks with a capacity of 380,000 cubic meters.
- Malaysia's PETRONAS plans to launch an FLNG plant in 2015, and has already announced plans for a second FLNG plant. It's PFLNG 1 is expected to be the first such facility in operation, beating Prelude by two years. It will be 365 meters long, about 60 meters wide, weigh approximately 125,000t when fully loaded and is expected to produce 1.5 million tonnes of LNG per year.
- GDF Suez of France and Santos, which are looking to put an FLNG plant in the the Bonaparte project off northern Australia.

Before Shell can hope to reap FLNG's many anticipated advantages, it must first surmount some very big challenges, not the least of which is force-fitting an entire LNG processing plant onto what some have likened as a "barge" in the middle of the ocean.

Shell had to find a way to adapt its shore-based technology for a much smaller, floating platform. This was solved in part by stacking components on deck vertically to save space.

The Prelude plant will include 7 wells, four flow lines approximately 4 km in length, umbilicals and flexible risers as well as the FLNG facility. The management of subsea wells and manifolds is carried out via the umbilicals, which are connected to a control rom



Shell plans to eliminate the need for some components on deck by extending eight 1-m-diameter pipes to a depth of 150m in order to pump frigid seawater up to help cool the gas – 50 million liters (50,000 cubic meters an hour.)

A related solution kills two birds with one stone. Shell plans to eliminate the need for some components on deck by extending eight 1-meter-diameter pipes to a depth of 150 meters, in order to pump frigid seawater up to help cool the gas – 50 million liters (50,000 cubic meters an hour.)

Among other challenges, there's the fact that Prelude will be sitting out in the middle of nowhere in cyclone alley central. Shell has no intentions of untethering the facility every time a bad wind blows and towing it to shore. Instead, a number of factors are supposed to ensure that Prelude sits tight in savage seas. First there is its sheer size and weight. But more important, Gilmour claims Prelude's mooring system can stay on station even in the face of a category 5 hurricane.

Four groups of mooring lines will be attached to the world's largest (93 meters) mooring turret on one end, anchoring the facility, via connections to suction pile anchors, to the ocean floor on the other. The swiveling turret turns slowly with the wind, reducing the impact of water and weather conditions. The links in the record-setting mooring chains are said to be large enough to stand inside of .

Meanwhile, the offloading of LNG onto an LNG carrier required the design of a special loading arm system with swivel joints and quick connect/disconnect flanges, capable of offloading both LNG and LPG.

How It Works

The Prelude plant will include 7 wells, four flow lines approximately 4 km in length, umbilicals and flexible risers, as well as the FLNG facility. The management of subsea wells and manifolds is carried out via the umbilicals, which are connected to a control rom. The plant itself is comprised of liquefaction units, production storage (with capacity of 436,000 cubic meters of LNG, plus LPG condensate) and loading facilities, utility systems, control room, maintenance facilities and accommodation. It will sit on top of the gas field where a series of wells will feed gas and condensate from the reservoirs via four flexible risers into the facility that will draw gas up into the turret for processing.

Next, the LNG has to be separated from a mix that included condensate, LPG, water and CO2. After which the LNG will be liquefied, using Shell's Dual Mixed Refrigerant (DMR) process, which uses steam-driven refrigerant compressors and ultra-cold seawater to chill the gas to –162°C, shrinking the volume by 600 times. Stored in tanks in the hull with an overall capacity of over 430 million liters (114 million US gal), it will be transferred by special loading cryogenic arms to tankers moored next to the facility.

SeaView Systems Inc.

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CEO/President: Matthew Cook
Vice President: Geoffrey Cook
Engineering Director: Edward Celkis
Number Of Employees: 7

SeaView Systems, Inc. was founded on experience in maritime electronics and Remotely Operated Vehicles. Since beginning operations in 2003, it has built an extensive portfolio of more than 60 projects working in nine countries catering to various industries. SeaView operates what it builds.

Its underwater surveys have included the use of Inertial Navigation Systems (INS) for geo-referencing and 3D sonar modeling. SeaView's in-house developed custom devices include fiber multiplexers; a modular smart hydraulic control stack; dimmable networked LED lamps; HD cameras and other electronic, electro-mechanical devices and software.

SeaView System's engineering capabilities include expertise in electronic, software and mechanical design. Incorporated into these capabilities are electro/mechanical assembly and integration, machining and fabrication. In addition to leading edge services, it also manufactures underwater technology products.

SEA CON

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The Case: Our 46 year journey has taken yet another significantly positive turn; not only has SEACON (europe) Ltd. been awarded the Queen's Award for Enterprise in International trade, but the SEA CON Group has been acquired by TE Connectivity (TE); joining their world-class portfolio which includes Rochester Wire & Cable, DEUTSCH connectors as well as TE's other connectivity products.

The Company

The SEA CON Group has always prided itself on being customer centric from the seeds of the business to the current day. Seeking new innovations to match the needs of the markets it services has been at the forefront of the mission. The vision is simply to offer customers leading underwater connection system solutions across every major industry, application and region. SEA CON continues to support and develop its use of fiber optics in the oil and gas industry as well as other technologies and it continues to expand the application of its entire range in renewable energy, defense and other vital global areas.

The Tech

For many years SEA CON has adapted existing products to meet the changing needs of the market.

Its MSS (Metal Shell Series) has offered high contact density and a variety of power and signal configurations to meet customers underwater power and data requirements. Adapted from this series, its API (American Petroleum Institute) connector range complies with API specifications 16D (Control Systems for Drilling Well

Control Equipment and Control Systems for Diverter Equipment) and 17E (Specification for Subsea Umbilicals).

As each year passes, the needs of the clients increase. In recent years it hase seen a significant demand for connectors that can operate in even harsher, and in many cases, hazardous environments.

Many of these applications also require the facility for quick, but safe disconnect of connectors. SEA CON's solution to this need is the development of its latest range of robust Exd connectors due to be released soon.

The EX-MATE is based around SEA CON (europe)'s existing and successful SEA-MATE connector range and can be wet-mated in depths of up to 50m in addition to its suitability for use in explosive environments. This new series will be available in four shell sizes (G, K, L, M) with between 2 & 37 contact configurations, however, like the SEA-MATE range, this series has interchangeable inserts so can be adapted to a number of pin configurations.

In addition, the EX-MATE incorporates an Atex approved glanding system for the cable which is encapsulated within the over mold, making it suitable for a number of applications including topside FPSO, drilling vessels or other potentially explosive environments. This series has undergone testing at an independent testing house and has achieved Atex certification to II 2G Ex d IIB T6 amb -40°C to +55°C.

In addition to its new product developments, SEA CON also continues to expand its facilities. A prime example of this is the opening of a Encapsulating & Molding shop in the West Houston area to better serve the expanding market and develop even better levels of support to the Gulf Coast region as well as internationally.

Also, three of SEA CON's manufacturing facilities; SEA CON in El Cajon, CA, the Advanced Products division in Bellville, TX and SEACON (europe) in the UK have all recently expanded their manufacturing facilities and equipment to support SEA CON's continued growth.

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Marketing Director: Chris Gibson
Engineering Director: Marcus Kolb
No. Of Employees: 45

VideoRay

The Case: A leader in MicroROV technology, VideoRay says it is the world's largest volume producer of ROVs. The VideoRay Pro 4, its most recent model, features capabilities in current handling and thrust-to-vehicle weight ratio and remains the standard for accessory manufacturers and underwater technology partners.

The Company

VideoRay is a leader in observation class Remotely Operated Vehicles (ROVs) and says it is the largest volume producer of ROVs in the world. With more than 2,500 units delivered to a wide range of organizations for a wide range of missions, hundreds of VideoRays work every day throughout the world underwater keeping us free from terrorism, finding and retrieving objects, inspecting infrastructure both inland and offshore, and keeping divers safe from hazardous conditions.

Since the first systems were delivered, users have tried VideoRays in increasingly challenging situations and environments. Today, VideoRays can be found on every continent, and owners in a growing number of industries have learned to trust them for a variety of underwater inspection, location, and recovery applications where reliability is a necessity.

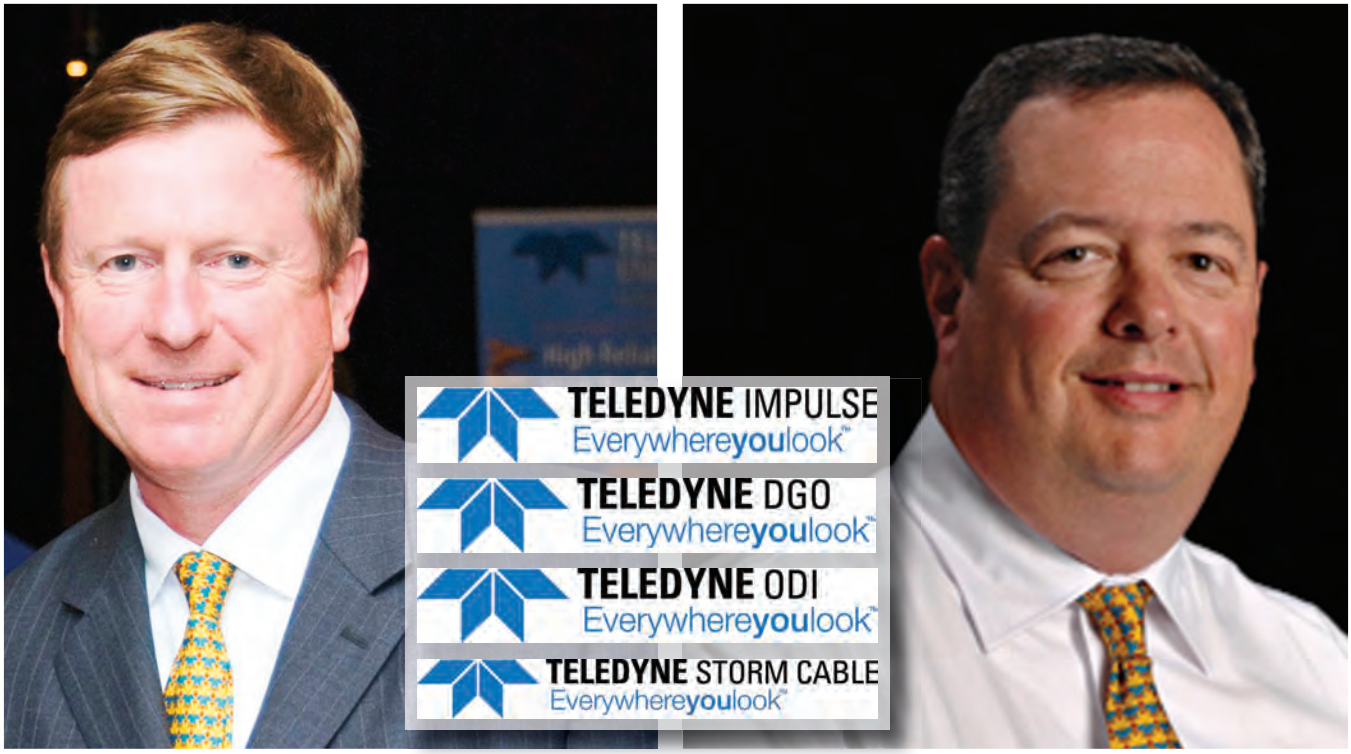
VideoRay prides itself on providing highly portable, rugged and reliable ROVs capable of accomplishing assigned tasks in a wide variety of operating conditions and mission objectives. Its systems are designed for professionals demanding easy to use, portable, versatile, and cost effective technology that can make them successful.

Scott Bentley

The Tech

The VideoRay Pro 4 incorporates the latest in small ROV design and technology. Completely computer driven by a software platform called VideoRay Cockpit, the Pro 4's technology and internal features position it at the head of the class. The Pro 4's size, powerful thrusters, and minimal mass allow it to conduct multiple missions. Its compact size, comparatively low weight and ultra-low power requirements allow remote deployment unlike any other ROV system available – even by one person from a small inflatable boat. Equipment set-up takes only minutes, but missions can last as long as the operator is willing. The VideoRay Pro 4 has the best flexibility in its class and allows the customer to select accessories that work best for each specific operation. With the Pro 4 hardware in position, operators can easily incorporate a variety of tools, software, and sensors developed specifically around the size and capability of the Pro 4. Available accessories can add vehicle autonomous control, a manipulator arm, sonar, and positioning systems. Following VideoRay's ideals of making its ROV systems and accessories "plug and play," capabilities can be added or removed with either a simple software update or a quick hardware add-on in the field.

Teledyne Marine Interconnect Solutions



Mike Read, President of Teledyne Oil & Gas

Earl Childress, SVP, Business Development, Marketing and Strategy

Describe the companies in your group, citing examples of your group collaboration.

Teledyne Oil & Gas consists of Cormon, DGO, Impulse, PDM, ODI, Storm Cable and VariSystems. This synergistic collection of product lines formed from Teledyne companies with 13 locations around the globe. They work in symphony to provide a broad range of power and data transmission interconnect solution options from terrestrial and topside applications to littoral and deep ocean environments. Applications include demanding explosion proof systems, dry-mate submersible instrument and vehicle harnesses, high differential pressure penetrations, and connections to wet-mate electrical and hybrid jumpers for high reliability long performance life in deep ocean.

In a single ocean observatory distributed sensor network, the Teledyne Oil & Gas organization via the Teledyne Marine Interconnect Solutions (TMIS) vertical market provides the backbone for power and communications transmission enabling interconnect from the shore station all the way through to the most remote deployed sensors in the system. This begins with shore station equipment networking cable and molded harness assemblies, moving to the cable termination assemblies at the backbone to power node junction. The TMIS kit in the CTA moves the raw power and optical through the power and optical conditioning equipment with high reliability subsea wet-mate power connectors and wet-mate optical connectors and provides the transmission capability at the output into the network. The wet-mate hybrid connections on the back end of the CTF provide the sole path of power and communications out to the secondary nodes or SIIMs (Science Instrumentation Interface Modules) allowing for long distance data transmission to a network of modularly expandable sensors deployed in wide area networks on the ocean floor in deep water. These science instruments are powered through dry-mate submersible to wet-mate Ethernet transmission jumpers that allow for the wet configuration that enables high bandwidth data transfer and unlimited reconfiguration, upgrades, and modular expansion. One hundred percent of the world's modern ocean observing systems are using Teledyne Marine Interconnect Solutions technology. The reliability is driven by the partnership between Teledyne Scientific Corporation (formerly Rockwell Scientific Materials Laboratory) and the Teledyne Oil & Gas Technology Development Center to meld science and engineering practice. Together they design and verify long performance life reliability through a structured program of qualification of materials systems, component designs and systems exposed to combined stress

analysis in simulated ocean conditions to provide accelerated aging life performance metrics. All are tested to failure to create a true understanding of the mechanisms, time and conditions to create robust solutions for high reliability survival in harsh environments. In addition, the harsh operating environment of the deck systems and the ROV deployment vehicles and systems themselves require high reliability interconnect harnesses to power and transmit data to and from the many instruments in the deployment operations.

What is your group's most exciting technology advancement since MTR 100 2013?

The size, breadth and depth of the world's oil & gas production fields, along with the need for more advanced communication from the expanding network of health management sensors, has driven an investment in new product development at Teledyne Oil & Gas. Our solutions focus on complex challenges for subsea power and data transmission to meet new requirements for enhanced oil recovery and subsea processing capabilities. The ocean science community directly benefits from the technology outputs funded by the major oil & gas operators. The most exciting recent examples of this new technology include the development of "Active Flying Leads" which describes an expanding family of ruggedized wet and dry-mate jumper assemblies that can expand the length of sensor deployments beyond the ranges available just a few short years ago. This is achieved through the use of a qualified set of subsea repeater systems and miniature subsea media converters combined with application specific cabling for high integrity data transmission across very long distances. E2FL (Extended Ethernet Flying Leads) surpass the length of deployment distances for reliable Ethernet transmission from the 70 meters available just years ago to a full 100 meter lengths using special Ethernet cables. Up to 300 meters is accomplished by using recently qualified repeater systems and to a distance of up to 10 kilometers using recently subsea qualified miniature E/O media converters in symphony with electrical Ethernet connectors and hybrid cable systems. CAB Bus transmission systems are available in similar configurations designed to follow the qualification path and utilizing component housing developed for the Ethernet systems. These advances enable ocean bottom instruments to be deployed at great distances from the SIIMs and nodes to allow scientists to observe organisms in an environment free of the distractions of manmade structures, a reality that has frustrated scientists for many years in this market.

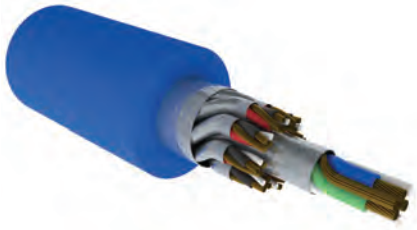
What market trends are fueling your group?

Our primary market, oil and gas production and exploration is driving trends for higher subsea power and more advanced levels of data transmission due to emerging legislation requiring higher yields for production from existing fields in order to earn new leases. These conditions introduce challenges that until recently were determined as too expensive to feasibly tackle. Increased production yields requires a greater understanding of the evolving conditions of the reservoirs, which in turn demands greater and more capable sensors, such as dense networks fixed seismic life of field networks, requiring more transmission bandwidth. Additional challenges for maintaining and increasing pressure in the well reservoirs, is driving the need for high power subsea motors and pumps to re-pressurize the wells to increase production flow. These systems require high power wet-mate connectivity for long life reconfiguration and high pressure differential / high temperature differential penetrations in order to make meeting these new requirements possible.

Teledyne Impulse Wet Mate Group

Teledyne has grown tremendously in recent years via acquisition, a strategy we have covered in our pages previously. What are the advantages? What are the challenges?

The benefit provided through the Teledyne Marine Interconnect Systems and Teledyne Oil and Gas is the synergy delivered through a cohesive group of aligned product lines that provides a powerful level of reliability and security of supply to our customer community. The ability to construct a contract with a single PO, with a single set of terms and a single warranty across a mix of what was once seven companies requiring separate contracts and contract management is a powerful differentiator for our customer base. Simply having a total interconnect harness consisting of components from a single organization is a concept unheard of just five years ago. It lowers operational risk and reduces instances associated with assigning warranty that have until now been a nuisance and a normal fact of life. The immediate access to broad levels of expertise in technology available through the expansive network of Teledyne companies in and beyond the market place is very powerful in identifying and generating engineered solutions to complex challenges for our customer base. The challenges are manifested in maintaining the lines and aisles of communication between Teledyne consolidated business units and the teams that are calling on the same customer base offering various and differing parts of an overall solution. At Teledyne, we are investing in awareness training and networking among the teams to understand how to recognize applications where our sister organizations have technology and skill sets that are a match to our customers challenges. We grow better in this area each and every day through combined exhibits at conferences, cooperation with presentations at sales and technology training events and through friendly camaraderie.



Teledyne DGO

DGO incorporates the unmatched reliability of glass to-metal seals into electrical and optical penetrators and interconnect solutions for harsh environments. In the over 1 million solutions delivered since 1962, these seals have never failed to maintain pressure integrity. Combining this capability with strong design, material and process controls, DGO delivers interconnect, penetrator and high pressure/high temperature feedthrough solutions with the greatest level of long-term reliability for high pressure and/or high temperature applications.

Teledyne Impulse

Impulse designs and manufactures highly reliable electrical and optical interconnection systems for a broad range of harsh environment applications. Impulse's proven dry mate, splash mate, wet mate, and custom interconnect solutions are complemented by unsurpassed customer satisfaction, quality assurance and rapid response. Impulse provides engineering, flexible manufacturing process and dedicated customer support. Impulse-PDM in Alton specializes in complex molding technology in polyurethane and polyethylene for cable assemblies, complex sealing mold designs and molded bend restrictors.

Teledyne ODI

ODI is a leader in subsea power and broadband data transmission interconnect systems. ODI's wet mate connectors include signal and high-power electrical, fiber optic and hybrid electro-optical products. All are based on patented oil-filled, pressure-balanced technology. Companion dry mate submersible connectors complement these wet mate lines. These rugged components can be used at any ocean depth and in the harshest environments.

Teledyne Storm Cable

Storm Cable delivers engineered application specific multi-core cable and complex over-molded interconnect assemblies/harnesses requiring rugged performance in harsh environments.

UTEC Survey Inc.

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CEO/President: Martin O'Carroll
No. of Employees: 360
Annual Sales: $84.4m in 2013

The Case: Since the company was founded in 2006, UTEC has achieved remarkable growth and success making it worthy of inclusion. UTEC continues to flourish in key locations around the world and revenues are on track to hit $100+ million this year.

The Company

UTEC provides a wide range of survey services including offshore positioning and construction support, metocean, geophysical and AUV surveys, geotechnical sampling and consulting services to the oil, gas and energy industries. With a focus on people, performance, excellence and ethics, the company also offers dimensional control surveys, laser scanning, 3D modeling and the iSite™ asset management software. UTEC has offices located around the world including Australia, Brazil, Canada, Indonesia, Italy, Singapore, United Arab Emirates, United Kingdom and United States.

The Tech

UTEC has a global reputation for supplying technology in a streamlined, cost-effective and time efficient way with safety always at the top of the agenda. The extensive suit of products and services includes geoROV a compact, powerful geotechnical CPT system which is conveyed to a seabed test site by ROV. It gathers geotechnical test data and soil samples for advanced pipeline stability design and trenching engineering. geoROV is based around a versatile and robust thruster drive system and can be deployed quickly and easily. The company currently offers 6 units - 3 in the UK, 2 servicing the Americas from Houston and 1 servicing South East Asia from Singapore. iSite is a customized web based portal which provides a customer viewing experience that can be utilized by clients without expensive software and highly training operators. Based on 3D point cloud data which captures top side and subsea assets, iSite enables clients to view geospatial data combined with high resolution photography which allows the client organization to view projects/assets remotely. In addition, UTEC recently advanced its service offering by doubling its AUV fleet in response to increasing demand for its highly regarded services. The company now operates a fleet of 4 identically equipped 1000m rated AUV systems offering fleet enhanced subsea positioning, robust operational performance, low logistics designed for dual mode operations utilizing client's vessels of opportunity.

Martin O'Carroll

Unique Maritime Group

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CEO/President: Harry Gandhi
General Manager: Ian Huggins
Engineering Director: Eric Jaeger
Number Of Employees: 500

The Case: Unique Maritime offers world-class, complete solutions in Marine, Diving, Survey, NDT and Inspection and Oil & Gas. The international presence of the Group combined with its global expertise gives UMG an edge

Founded in 1993, Unique Maritime Group is one of the world's leading integrated turnkey subsea and offshore solutions provider. Through its expanding network of companies, UMG is a specialist in the provision of services, and the sale and rental of equipment for the marine, diving, hydrographic, oceanographic, Oil & Gas, Inspection and NDT market sectors.

The group has an established manufacturing capability for the delivery of customized engineering projects worldwide. Through a process of both organic growth and the targeted acquisition of companies, the group has continued to expand its services, capabilities and geographical infrastructure to better support customer requirements, regardless of their location.

Headquartered in the Hamriyah Free Zone of the United Arab Emirates over an area of 14,630 sq. m., UMG has built up a reputation for quality, innovation, service and speed of response in its nearly two decades of existence. The Group's operations are spread across seven global regions in the Middle East, USA, UK, South Africa, India, Nigeria and Singapore, all well positioned to manage all project requirements and a fast growing international customer base, and employs over 500 people worldwide.

Turner Designs

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Vice President: Pam Mayerfeld
Sales Manager: Tom Brumett
Number Of Employees: 25

The Case: Turner Designs recently introduced several products addressing what it perceived as gaps in offerings available to the marine community – ICAM, an in situ absorption instrument requiring little or no correction for scattering; C-sense, a low cost, lightweight, low power pCO2 sensor; and Ballast-Check, a field-ready, handheld instrument for ballast water compliance monitoring.

The Company

Turner Designs provides innovative optical-based solutions for environmental research and monitoring, water quality analysis, and pollution control analysis. Having a unique focus on fluorescence instrumentation for over 41 years and customers throughout the world, Turner Designs is the leader in filter fluorometer design, manufacture and support. Turner Designs is known for providing rugged, reliable, stable instruments. It offers submersible, field, handheld, laboratory and online optical instrumentation varying in functionality, size, and price to fit any type of user need. It holds several patents for product innovations.

The Tech

Moving beyond fluorescence to provide researchers with additional measurements for better characterization of aquatic habitats, Turner Designs is expanding its repertoire of optical instruments with several recent product introductions. It introduced ICAM, an in situ absorption tool which requires little or no correction for scattering and C-sense, a small, low power in situ pCO2 sensor. In addition, it developed Ballast-Check, a handheld active fluorometer ideal for ballast water compliance monitoring.

It continues to provide numerous standard fluorescence configurations: in vivo and extracted chlorophyll; blue-green algal pigments such as phycocyanin and phycoerythrin; active fluorescence for determining yield; dissolved organic matter (algal as well as terrestrial); ammonium; optical brighteners and tryptophan for wastewater monitoring; dye tracers; crude and refined oils as well as infrared wavelengths used to detect turbidity. Custom optical configurations are also available. Package configurations include submersible, handheld, field, laboratory, online, and ready for integration into vehicles.

Submersible to depths of 6000 meters, instruments can be configured for depth profiling, long-term monitoring and horizontal mapping with GPS-integration. Data acquisition is available both real-time and via datalogging. Solid secondary standards enabling quick instrument verification and calibration checks are known to hold their value over several years of usage.

Tritech International Limited

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Established in 1991, Tritech International Limited [Tritech] began with the aim of producing an innovative range of subsea products for the offshore oil & gas industry, military and other worldwide subsea markets. As specialists in the production of high performance acoustic sensors, sonars, video cameras and mechanical tooling equipment we serve professional underwater markets, including; defense, energy, engineering, survey and underwater vehicles.

In recent years, new markets have emerged from within these professional underwater markets, within the energy industry; decommissioning, debris clearance, hydro-electric and renewables and in within the defense industry; law enforcement and Search and Rescue (SAR). Operations in these working environments usually result in low-visibility and in very shallow or very deep water. From our imaging ranges (mechanical and multibeam) to our bathymetric sensors, to hydraul=ic and mechanical equipment, Tritech are able to support these developing industries. Today, Tritech, now a Moog Inc. company, remains a respected industry leader in the provision of sensors and tools for ROV/ AUV markets, a reputation achieved from over 21 years of delivering expertise through key industry-standard products such as the Super SeaKing mechanically scanning sonar and now the renowned Gemini suite of imaging and now profiling sonars.

The Tech

Obstacle Avoidance & Target Recognition Sonar: Tritech's SeaKing sonar is the sonar of choice for many of the world's ROV fleets. For fast, reliable and complete operational flexibility, all products in the SeaKing family can be run simultaneously on a single ArcNet communications link, using the same processor and display.

The SeaKing Range

Real-Time Multibeam Imaging Sonar – Gemini

Gemini's real-time imaging eliminates the restrictions in low-visibility conditions.

Eliminate restrictions in low-visibility conditions with a real-time imaging capability

- Ultra-fast update rate (10-30 kHz)
- Up to 120m operating range
- Available as in a narrow vertical beam option (Gemini NBI)
- 120° (130° NBI) field of view

High-Resolution Profiling Sonars – Mechanical and Multibeam

Subsea profiling for sectional and positional profiling.

- Dual-frequency mechanical profiler or single frequency multibeam profiler
- Hard booth protection for profiler transducer
- Simultaneous use with other SeaKing sensors

The High-Speed Upgrade – Gemini 620pd

Gemini 620pd is depth rated to 4000m and designed to be run in a dual head configuration as a high-speed replacement for the SeaKing DFP, or in a single head configuration for bathymetry surveys.

- 130° swath
- 4000m Titanium housing

Hydroid

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Part of Kongsberg Maritime's AUV Group, Hydroid is a trusted manufacturer of advanced Autonomous Underwater Vehicles (AUVs). REMUS AUVs provide innovative and reliable full-picture systems for the marine research, defense, hydrographic and commercial offshore/energy markets. REMUS vehicles are advanced, diversified and field-proven; combat-proven in continuous operation with the U.S. Navy.

The Company

Historically, the sheer magnitude of the ocean has made comprehensive exploration unfeasible. Hydroid is changing that with its full-picture REMUS AUVs. These unmanned underwater robots offer a flexible alternative to surface vessels. They can glide along the surface, dive to deep depths, explore shallow waters or hover in hazardous areas where navigation is difficult. Hydroid AUVs have reduced the high costs of ocean exploration and sampling while increasing the availability, quality and quantity of scientific marine data. Using Hydroid AUVs for undersea mine reconnaissance has helped save lives by eliminating human divers from mine fields, and the customizable robots have helped solve plane and ship disaster mysteries. Hydroid AUVs also provide scientists data on pressing global issues including climate change, the world's declining fish population and environmental disasters. As leader of the team that originally developed the REMUS AUV at Woods Hole Oceanographic Institution (WHOI), Hydroid founder Christopher von Alt's knowledge of the intricate technology has been integral to the products' development and widespread adoption. After years of fabricating and developing the REMUS vehicle at WHOI, in 2001 von Alt co-founded Hydroid, creating an independent company to commercially manufacture, support and further develop the REMUS systems. In 2008 Hydroid was acquired by the Norwegian technology conglomerate Kongsberg Gruppen. Now, a subsidiary of Kongsberg Maritime, Hydroid is recognized as a leader in the maritime industry.

The Tech

The REMUS AUV is the culmination of 16 years of leading-edge R&D and boasts a proven track record for highly reliable and consistent field operations. REMUS AUVs are offered in three vehicle classes: The man-portable REMUS 100 (depth rated to 100m); the highly versatile, modular REMUS 600 (depth rated to 600m or 1500m); and the REMUS 6000 (depth rated to 6000M), a deep-water workhorse. All REMUS AUVs are built on a common technology base incorporating the intuitive vehicle interface program (VIP); this keeps vehicle maintenance, mission planning, checkout, data analysis and cross-vehicle training seamless across the model line. The vehicles differ by size, endurance and payload sensor configurations. The vehicles can be equipped with many different instruments, depending on the model and the intended use. This includes advanced GPS-aided inertial navigation; Doppler velocity log; acoustic fish trackers; varying sensors; nitrate and nutrient analyzers; conductivity and temperature monitors; radiometers; side scan sonar; bathymetry; bottom-mapping, echo sounder, forward-looking sonar; video camera module; turbidity sensors; and electronic still camera with strobe and magnetometers.

Photo: Hydroid

REMUS 6000

All vehicles incorporate embedded software. Hydroid's R&D efforts have focused on enabling AUVs to operate multiple payload sensors simultaneously, enabling the real advantage AUVs offer over traditional survey methods.

Testing Capabilities: The new facility will feature a testing tank and pressurized water chamber. The tanks are used for ballasting vehicles and ensuring that the systems are ready for at-sea testing. Hydroid also utilizes two boats for testing. The larger boat is equipped with a launch system.

Forum Energy Technologies, Inc.

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CEO & Chairman of the Board: C. Christopher Gaut

Forum Energy Technologies (FET) is a leading global manufacturer of mission critical, complex, stocked and custom oilfield products and related after-market technical services, for use onshore and offshore. Forum has been a strong corporate consolidator in the subsea space, and its subsea product suite includes ROVs, launch and recovery systems, tethering systems, simulation software, data acquisition software and geosciences product management. Forum's ROV vehicle brands include two of the most well known names in the industry - Perry and Sub-Atlantic. It's complete list of subsea technology brands includes: Dynacon; Forum Subsea Rentals; GEMS; Moffat Engineering; Perry; Seafloor Geoservices; Specialist ROV; Sub-Atlantic; Syntech Technology, Inc.; Tooling & Robotics; UKPS Offshore; VMAX Technologies; Visual Soft

Forum Energy Technologies, Inc. recently announced that it received an order from Marine Platforms Limited (MPL) to supply four work-class remotely operated vehicle (ROV) systems each complete with a Dynacon Launch and Recovery Systems (LARS). The order includes three Perry heavy work class XLX Evo 200HP ROVs, the latest generation of the Perry XLX series. Two of the systems will be mobilized aboard MPL's new "African Inspiration" multi-purpose service vessel for service offshore West Africa and the other two will be added to their global fleet.

Perry XLX ROV

Fischer Connectors

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The Company

Fischer Connectors is a leader in push-pull connectors and cable assembly solutions. Logistics and on time deliveries are vital to the success of projects, and to that end Fischer Connectors has put lean manufacturing and efficient processes in place to help fulfill this demand. Fischer Connectors' primary design and manufacturing facilities are located in Saint-Prex, Switzerland, with subsidiaries and distributors located worldwide.

The Tech

A new trend in connectors for marine technology applications is the use of fiber optic connectors. As increased bandwidth, more data and better quality audio/video is demanded, the use of fiber optics in these applications has grown rapidly.

When looking to invest in fiber optics it is necessary to understand the role that cleaning plays in the application at hand, and learn the best methods of cleaning their particular connector especially when fiber optics will be mated/unmated in rugged conditions.

It is this usually lengthy and detailed cleaning process that may contribute to slower-than-expected fiber optic growth in rugged field conditions. However, attention paid to new connector design will reduce the time required and difficulty in cleaning. With a rugged, sealed connector, field cleaning is simplified by rinsing with any clean, available water source, and drying the ferrules with clean canned air. This approach only applies to connectors sealed to IP67/68 standards where water intrusion is eliminated. The water wash can be done in the field to remove dirt around the outside and inside of connectors without fear of introducing additional contaminants.

Digital Edge Subsea

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Director: John Benson
Engineering director: Mike Cameron
No. of employees: 5
Annual sales: 1.7m

The Case

Just four years old, the company has recorded growth that has doubled year on year and it now has more than 220 systems offshore, being used by ROV and diving companies.

Digital Edge Subsea was founded in July 2009 and started trading in early 2010. The company is based in Ulverston, UK. It has designed its EdgeDVR Inspection system to be used by personnel of all abilities. Its strong inspection ROV and technical background has allowed it to deliver a product that is bespoke to client needs. Digital Edge supplies both standard definition(SD), high definition(HD), multi channel recording systems, and alll systems are modular and can be upgraded as required. The EdgeDVR range are remotely accessible via the internet, which allows instant access to the system for its engineers to provide tech support and training.

The Tech

The EdgeDVR Inspection system is housed in a 19-in. rack mounted unit. The system is PC based, running the windows 7 operating system. The demand for HD recording is growing, with more ROV manufacturers providing HD capability, so Digital Edge have developed 3 models of HD DVR.

Silicon Sensing Systems Ltd.

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The Case With a heritage dating back 100 years and experience of supplying >20 million devices, Silicon Sensing Systems is a leading company in the development and manufacture of MEMS gyroscopes, accelerometers and inertial systems. Its high performance products, CRS09, CRS39 and CRH01 (performance less than 0.3°/hr) provide cost effective alternatives to FOG-based products.

Silicon Sensing Systems Ltd. is one half of a joint venture based in Plymouth, UK in the southwest of England. It is a gyroscope and inertial systems engineering development company.

Jointly owned by UTC Aerospace Systems, who are based on the same site in Plymouth, and Sumitomo Precision Products, the company was formed in 1999. The two companies each bring an equal strength to the joint venture. UTC Aerospace can trace its heritage in gyroscopes and inertial sensors back to the Sperry Gyroscope Company which was founded in 1913, giving this half of the venture a great depth of expertise in the field of complex inertial systems and their deployment in real-world applications. Sumitomo Precision Products, based in Amagasaki, Japan, bring a unique expertise in the field of silicon MEMS fabrication.

After 14 years of successful partnership, Silicon Sensing Systems has become a highly respected supplier of reliable, quality products to a worldwide market for a variety of commercial applications. The company is seeing a rise in the interest of the high performance products with many customers looking for a more cost effective solution to FOG-based systems.

The Tech

Silicon Sensing has 100 years of experience in design, intellectual Property and innovation expertise of the design and development of inertial system as well as being developers and manufacturers of deep reactive-ion etchers essential for MEMS production.

Our two facilities in Plymouth, UK and Amagasaki, Japan have the full range of manufacturing and test equipment to allow all of our work to be done in-house.

Both sites are fully qualified to ISO 9001 and ISO14001.

ASV

Autonomous Surface Vehicles (ASV)
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Engineeering Director: Richard Daltry
Number of Employees: 40

C-Enduro

The Case In just four years ASV has established itself as a leading supplier of unmanned marine systems, pushing the boundaries of autonomous technology. With a team of 40 people, ASV have designed and built more than 50 Unmanned Surface Vehicles (USVs) which operate globally in the commercial and military sectors.

The Profile

Committed to building advanced, innovative unmanned marine systems, ASV has a team of naval architects, mechanical, software and electronics engineers who specialize in the design and development of Unmanned Surface Vehicles and sophisticated control systems. Products include marine target drones, mine countermeasure vehicles, long endurance survey catamarans, oil field services vehicles and station keeping buoys.

In 2014, ASV designed and built C-Enduro: a Long Endurance Marine Unmanned Surface Vehicle under a UK government funded Small Business Research Initiative (SBRI). The world's first unmanned oil and gas workboat was also designed and built at the Portchester facility as well as 12 marine target drones.

In 2014 ASV expanded its business into the U.S. with the creation of ASV LLC operating out of Houston, TX and Alexandria, VA.

Plans are already in place to expand the company's UK site; ASV are due to relocate to a 24,000 sq. ft. facility in Portchester in summer 2014.

The Tech

In early 2014, ASV commissioned the long endurance USV, C-Enduro. The concept centers on a three-pillar energy solution enabling the vehicle to be deployed at sea for up to 90 days. The three elements comprise solar panels, wind turbine and a lightweight diesel generator, together providing 100W of continuous payload power. This environmentally friendly power structure creates a sustainable source of data collection over extended periods of time. C-Worker has been developed by ASV specifically as an unmanned oil and gas work boat. The first of its kind, the 6m vehicle is designed to conduct subsea positioning, surveying and environmental monitoring without the need of a ship on station or seabed anchoring.

ASV is continuing to develop the mine countermeasures (MCM) vehicle, Halcyon, which was designed and built for Thales. The vehicle was specifically developed for mine hunting, sweeping and disposal. In addition, the company maintains a well-established portfolio of marine target drones in 3m, 6m, 9m and 13m.

Dan Hook

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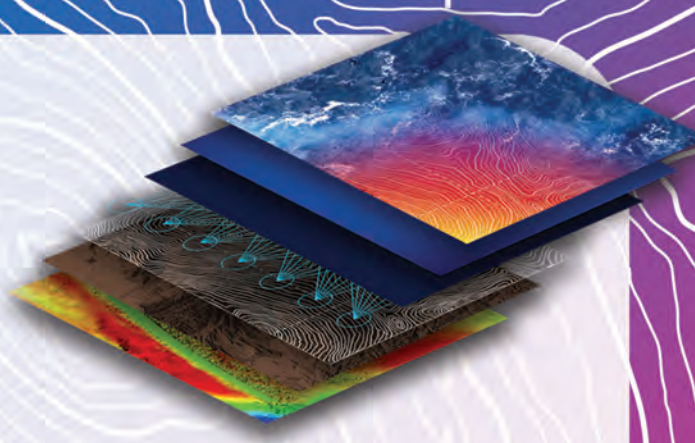

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- bit error rate: better than 10^{-10}

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