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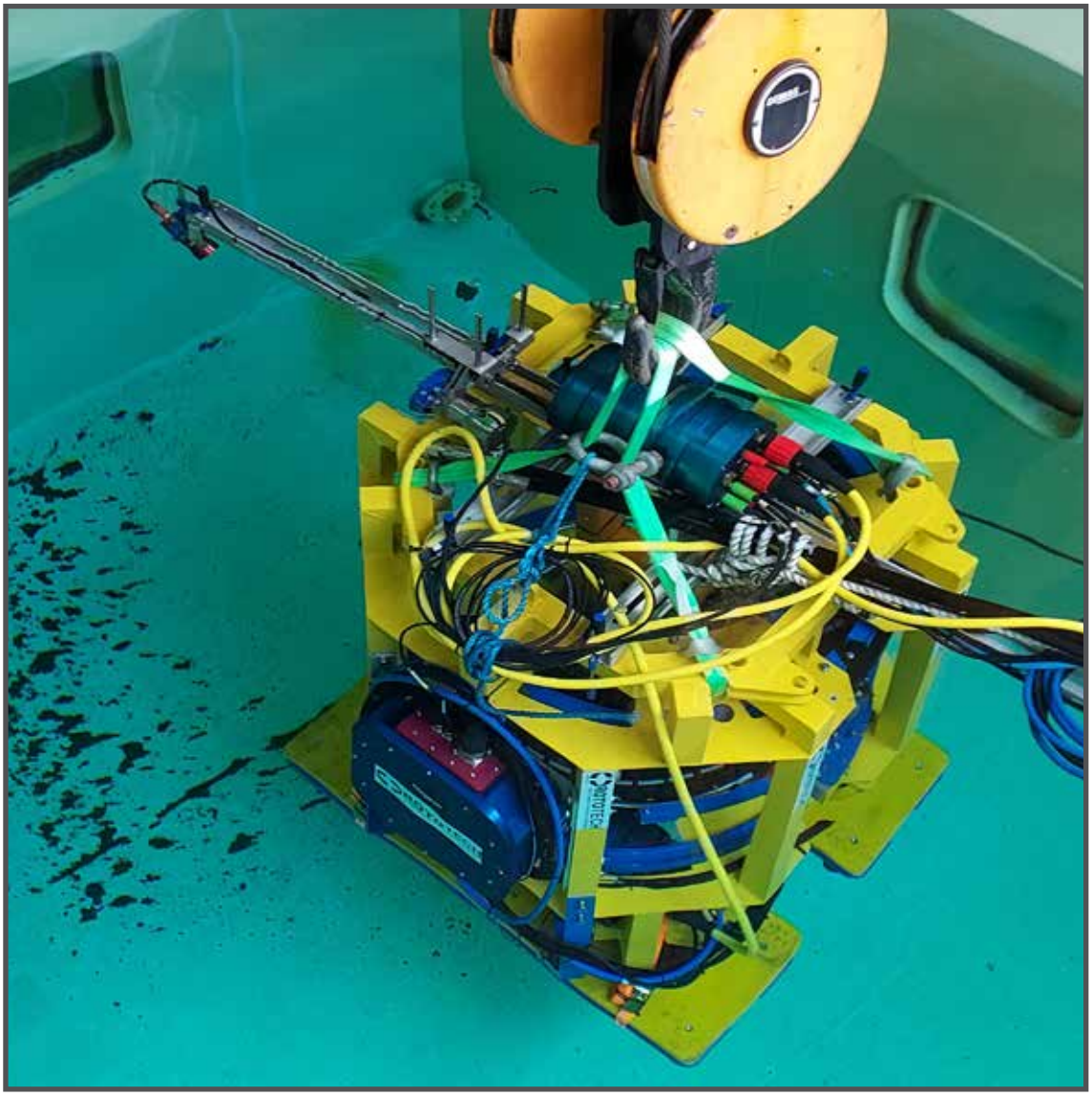
UNDERWATER TECHNOLOGY

ISSUE 4 2021



RISERS
DREDGERS

SUT
Society for Underwater Technology

SOCIETY FOR UNDERWATER TECHNOLOGY

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Vol 15 No 4

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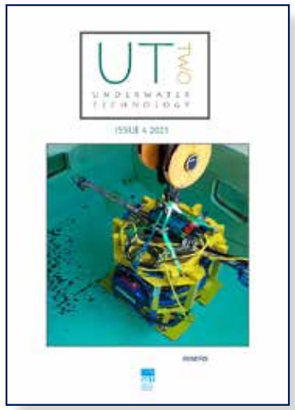


RotoTech's Riser inspection and repair tool

BUZZARD PHASE II INSTALLATION

Subsea 7 has successfully installed a 5km pipeline bundle for the CNOOC International Buzzard Phase II (BPII) project.

Subsea 7 was awarded the contract in 2018 for the project management, engineering, procurement, construction and installation of the bundle, along with associated well and platform tie-ins.
Bundle technology is an ideal fit for this project. It provides all subsea production, water injection and gas lift flowlines, as well as control functions and end manifolds in a single integrated system, which is fully fabricated and tested onshore.

The BPII bundle system also incorporates a large drill centre manifold (36m long and 300t), allowing for up to 12 wells to be tied-in.8

Buzzard Phase II bundle

HOD B PLATFORM INSTALLED

The Fixed facilities alliance, between Aker BP, Aker Solutions and ABB, has delivered yet another platform on time, with a high level of quality and with no harm to people or the environment. The topside was installed just one year and two months after the first steel cut.

The 2000t topsides were placed on the jacket on the Hod field in the southern part of the North Sea on Sunday.

Hod B sailed from Verdal on 4 August. 50 apprentices at Aker Solutions have completed large parts of their apprenticeships on the Hod B project at the yard in Verdal.

The first steel for Hod B was cut in Aker Solutions' yard in Verdal, just hours after the Norwegian Parliament adopted temporary changes in the petroleum tax in June of last year.

The first normally unmanned platform delivered by the fixed platform alliance was Valhall Flank West. Hod B is a copy.

Hod B will be remotely operated from Valhall, and the field will have extremely low CO2 emissions thanks to power from shore. Aker BP and partner Pandion expects Hod to produce 40 million barrels of oil equivalent.

Several subsea campaigns will be conducted in the Hod project leading up to production start in 2022, such as installation and connection of the gas lift pipelines, production flowlines and umbilicals.

Modification work is under way at the Valhall field centre, and the Maersk Invincible drilling rig will be arriving this autumn to drill production wells.

LONGEST E.T.H. SUBSEA PIPE

Neptune Energy has installed and tested the world's longest trace-heated subsea production pipeline at its Fenja field in the Norwegian Sea. The 37km electrically trace-heated (ETH) pipe-in-pipe solution will transport oil from the field to the Njord A platform, operated by Equinor.

The ETH pipeline was developed and qualified through a collaborative approach with TechnipFMC. Due to the high wax content of the Fenja oil, the contents of the pipeline must be warmed to a temperature above 28°C before starting the flow after a scheduled shut down or interruption.

The offshore installation was carried out across two subsea campaigns in 2020 and 2021 by TechnipFMC's vessel, approximately 120km north of Kristiansund, Norway, at a water depth of about 320m.

JANSZ-IO COMPRESSION POWER

Jansz-Io Compression (J-IC) project

ABB has won an order worth approximately $120 million to supply the overall electrical power system (EPS) for the multi-billion-dollar Jansz-Io Compression (J-IC) project. The order, comprises contracts with Chevron Australia and with Aker Solutions.

The Jansz-Io is located around 200km offshore the north-western coast of Australia, at water depths of approximately 1400m. The field is a part of the Chevron-operated Gorgon natural gas project.

The J-IC project, which moves gas from the deep seas to shore, marks only the third time that world-leading subsea compression technology is being deployed globally and the first time outside of Norway where ABB is also responsible for providing the EPS.

The project will involve the construction and installation of a 27000t (topside and hull) normally unattended floating Field Control Station (FCS), approximately 6500t of subsea compression infrastructure and a 135km submarine power cable linked to Barrow Island.

ABB will provide the majority of the electrical equipment, both topside and subsea, for J-IC. The project will combine two core ABB technologies - power from shore and Variable Speed Drive (VSD) long step-out subsea power- for the first time.

The electrical system will be able to transmit 100 megavolt-amps over a distance of approximately 140km.

The subsea compression system is expected to be in operation in 2025.

SEA-KIT CERTIFICATE

The first ever Unmanned Marine Systems (UMS) certificate has been awarded to SEA-KIT International by Lloyd's Register, representing an important milestone for the maritime industry.

SEA-KIT has worked closely with Lloyd's Register since early 2020 in a concerted effort to achieve the highest standards for the Unmanned Surface Vessel (USV) sector, culminating with their latest 12m X-class USV.

SEA-KIT has identified numerous applications for its USV technology in other marine sectors and recently ran a series of live capability demonstrations for maritime defence and security stakeholders from its base in Tollesbury, Essex.

Sea-Kit

BALTIC EAGLE INSTALLATION

Van Oord has signed a contract with the Spanish energy company Iberdrola for the Baltic Eagle offshore wind farm. Van Oord will transport and install the foundations and ensure the supply, transport and installation of inter-array cables.

Van Oord plans to deploy its 8000t heavy-lift installation vessel *Svanen* to install the 50 foundations. So far, the *Svanen* has installed more than 700 foundations throughout Europe and the vast majority of monopiles in the Baltic Sea, including those for Baltic 2, Arkona and Kriegers Flak.

Wreck Hunting

Proton 5

Magnetometers are 'must have' equipment for the serious deep-sea researcher. Magnetometers detect variations in the Earth's magnetic field caused by iron or other magnetized material such as brick or rock.

The main feature that distinguishes this from the benefits of a side scan sonar is that a magnetometer can detect objects buried under the ground while sonar only portrays what is on the surface. JW Fishers' Proton 5 magnetometer is used across the globe to locate sunken wrecks, aircraft, vehicles, and other critical objects.

A small dive club, "The Wreckless Divers," currently use JW Fishers' Proton 5 magnetometer for their most important searches. The group consists of technical divers operating at depths of around 120m.

Some dive on rebreathers while others rely on open circuit scuba. The team is based in Cape Town, South Africa.

According to one of the founders, Bruce Henderson,"There is an enormous number of shipwrecks off our coast dating from the 1700's through the early 1900's and even more recent wrecks.

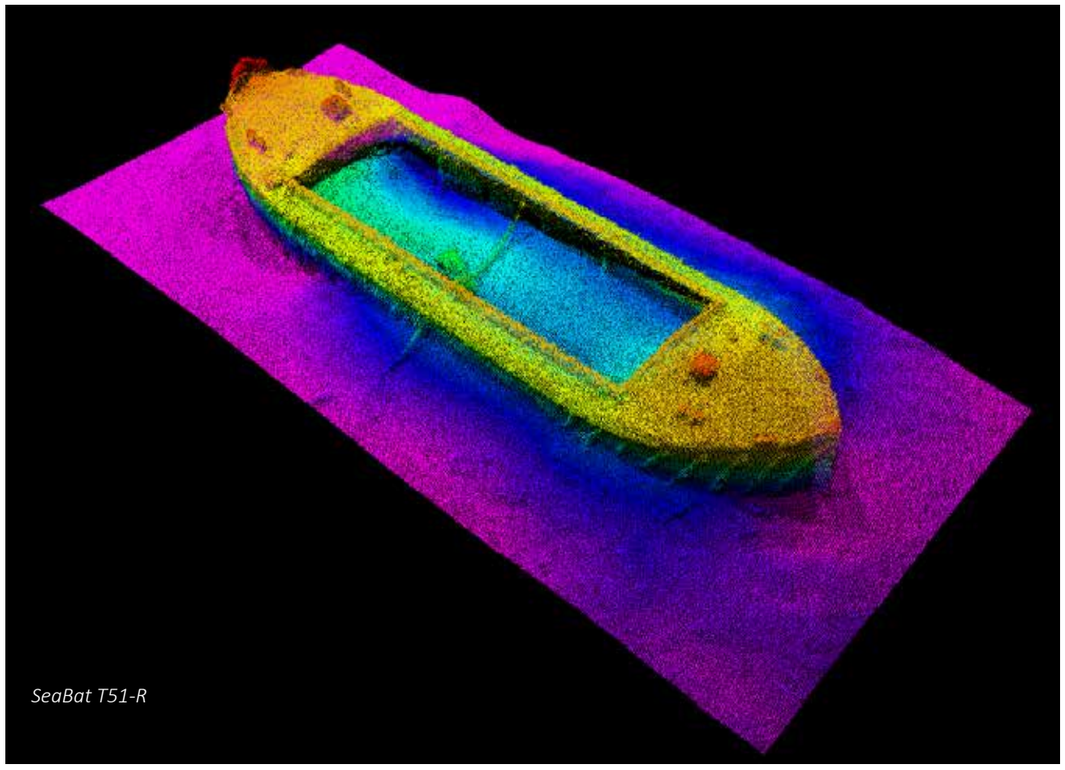
We are very keen to find the more interesting of these wrecks and dive on them to confirm the identify, location and condition. In particular, a German 'merchant raider' called "The Wolf" laid mines off Cape Town during World War I and sank at least 4 major merchant vessels. None of these wrecks have been located.

We have begun a methodical search for these wrecks. To date we have found an old fishing trawler and a whole bunch of magnetic rocky outcrops. But it's been fun and we will persevere until we find the wrecks that we are after.

MULTIBEAM PUSHES BOUNDARIES

Detailed knowledge of the shape of the seafloor is crucial to humankind. Bathymetry data is critical for safety of navigation, environmental considerations, charting, and many other applications.

Teledyne Marine has developed a revolutionary multibeam echosounder which offers outstanding performance, mapping in greater details than ever seen before. The unrivalled true 800 kHz technology offers high-frequency resolution without compromising swath coverage, giving up to 150 degrees full swath width allowing for superior efficiency and short survey turn-around time.



SeaBat T51-R

The new SeaBat T51-R from Teledyne Marine pushes the boundaries of what is technically possible. It is the latest addition to our class-leading portfolio of marine survey solutions.

Built on the renowned SeaBat T-series technology crafted from decades of sonar experience, the SeaBat T51-R helps you drive efficiency onboard with fast throughput of exceptionally clean data and precise imagery.

SIMULATION

Software and control company Greensea Systems has launched EOD Workspace Simulator. Created in partnership with GRi Simulations, the new simulator, incorporates a physics engine based on actual subsea vehicle models which provides the realism needed to prepare operators, technicians, and other subject matter experts to be successful in critical real-world subsea environments when using EOD Workspace in the field. Operators get to practice in a low stress classroom environment, ensuring that these skills are solidified.

CSEM

Controlled source electromagnetic (EM) surveys have established themselves as a useful tool to complement seismic surveys in the drive to reveal the presence of commercial hydrocarbon reserves.

Recently, Canadian company Ocean Floor Geophysics has entered into the market by making a deal Norwegian company PGS, acquiring exclusive rights to their unique towed streamer CSEM technology.

“The idea of applying CSEM methods to hydrocarbon exploration was developed over twenty years ago,” said Matthew Kowalczyk of Oean Floor Geophysics."

When it started, however, the method was probably over- hyped as a panacea that would solve all exploration problems. This led to disappointment in the market, and some companies still will not use the technology because it failed to live up to its original promise , There are, however, still many users, who exploit the capability of the CSEM method to de-risk or high grade seismically identified prospects. “

Seismic systems essentially work by directing an acoustic source into the ground, and then measuring the returns.

Electromagnetic systems work on a similar principle: Electromagnetic energy is transmitted through the ground to an array of receivers, which measure the electric and/or magnetic field. By studying the recorded signals, the resistivity of the sub-surface can be determined.

This technique exploits the property of hydrocarbons as electric insulators. Hydrocarbon-filled reservoirs are normally more resistive than the surrounding water-filled sediment.

This contrast in resistivity can be detected using electromagnetic methods. The reason that the technique is useful is that resistivity measurements are complementary to other geophysical attributes, allowing sub-surface properties to be determined with greater certainty that when only a single data type is considered.

There are different ways that CSEM is deployed. The two most common in the marine environment are nodal surveys and the towed streamer approach.

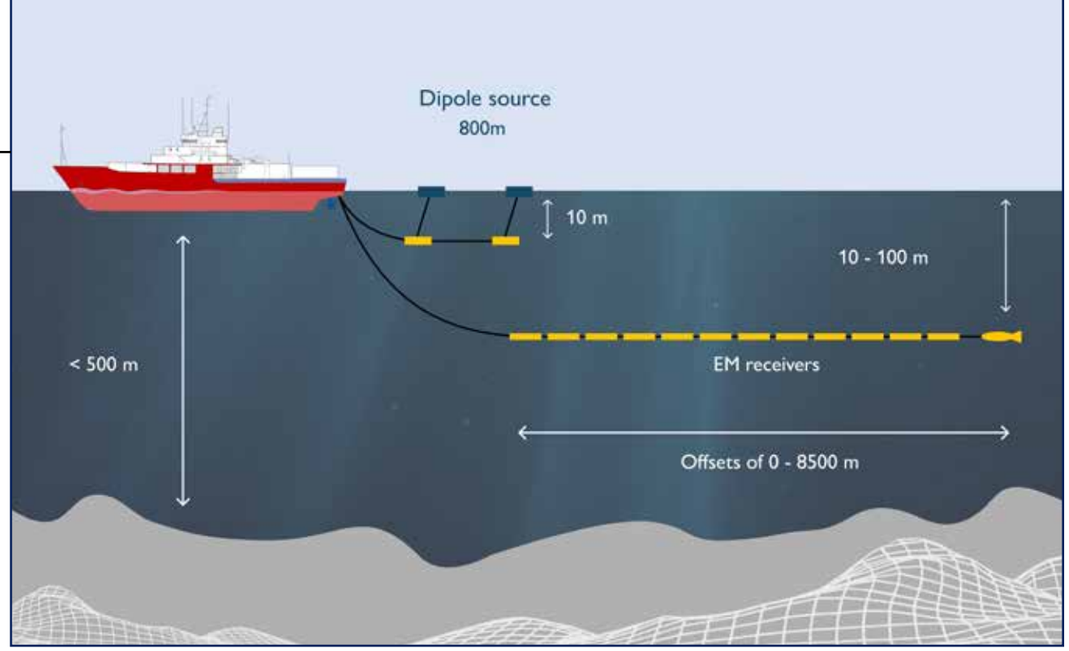
Nodal CSEM

In a nodal CSEM survey, receivers are pre-laid on the seabed and a dipole transmitter is towed over them.

The receivers measure up to three components of the electric and magnetic field at the seafloor, and are sensitive enough to measure field strengths that vary greatly in magnitude, from naturally occurring, magnetotelluric signals (EM signals generated in the Earth’s atmosphere and ionosphere) to the signals that are transmitted by the dipole source as part of the survey. For large surveys, these receivers have to remain autonomously operational for several weeks.

The EM source is an electric dipole towed close to the seabed, made up of two electrodes supported on a neutrally buoyant streamer, towed behind a deep-tow vehicle. The EM signal is formed by switching the polarity of a high current signal passed between the electrodes using a GPS synchronised time reference.

The frequency and source-receiver geometry is custom-designed based on the target geology. In order to reach deep targets, the EM source has to be particularly powerful, typically with a peak output current of 1.25kA, although source currents up to 7kA have been used.



Towed streamer array

It is necessary to know the exact position of both the towed source and the receivers. This is accomplished using standard ultra-short baseline acoustic navigation systems.

Towed streamer CSEM

The second approach to CSEM uses a towed dipole source and an array of electric field receivers, which are both towed at relatively shallow depth behind a survey vessel. This is similar to a standard 2D seismic acquisition approach. In the system that OFG have acquired from PGS, the streamer is 8.5km long, with electric dipole receivers along its length.

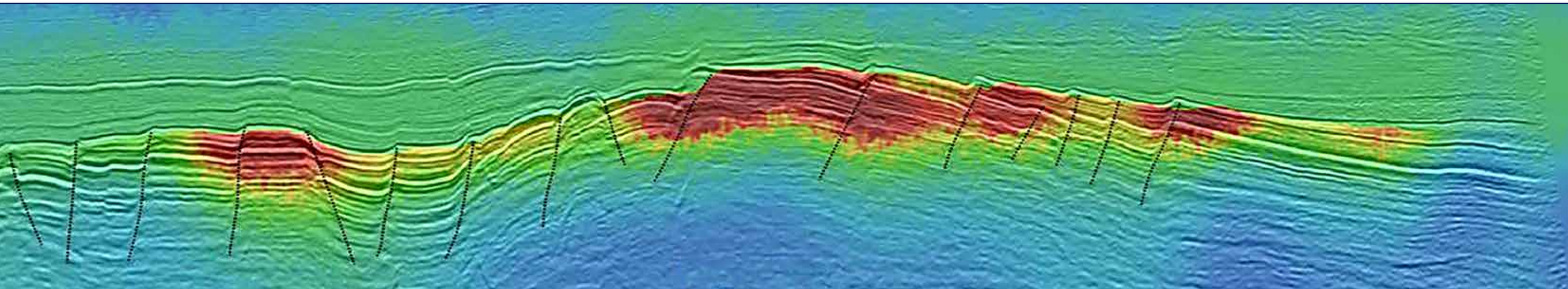
The towed streamer CSEM approach is considerably more efficient than the nodal CSEM system: more data can be acquired within a fixed budget. The towed streamer CSEM system can also be deployed in tandem with a 2D seismic survey, allowing efficient collection of multiphysics data.

Since both source and receivers are towed at relatively shallow depths, however, the system is limited to water depths of about 400-500m or shallower. In deeper water the source is simply too far from the seafloor for a good signal to be achieved. In this setting, a hybrid deployment of nodal and towed streamer CSEM may be advantageous.

A further approach is deep water is to use a deep towed source, behind which are towed an array of 3-component electric field receivers, typically up to about 1km long. This approach has been used successfully by OFG for applications such as mapping and quantifying gas hydrate deposits in Japan.

“CSEM is a very powerful tool when combined with other geophysical methods,” said Kowalczyk. “Using multiphysics analysis approaches to combine CSEM and seismic data allows a robust interpretation of sub-surface properties.

"This is particularly important in settings where the interpretation of one data type in isolation is ambiguous, for example when determining whether the hydrocarbon saturation in a prospect is commercial or not, a problem that is notoriously hard to resolve using seismic alone."



COMPANY NEWS

Canada-based marine technology company **Kraken Robotics** has completed the acquisition of 3D acoustic imaging specialist PanGeo Subsea. The acquisition was finalised on terms previously disclosed in the definitive agreement signed in July,

Subsea 7 has entered into an agreement to acquire a majority interest in the equity of Nautilus Floating Solutions, a developer of technology for the floating wind market based in Bilbao, Spain.

Nautilus has developed a promising concept for a floating wind foundation based on a semi-submersible steel structure that supports a centrally-placed wind turbine.

iXblue has formed a strategic partnership with Rear Admiral (RDML) Timothy Gallaudet through his marine technology consulting agency, Ocean STL Consulting.

With this partnership, iXblue and RDML Tim Gallaudet will be advancing iXblue's growing market presence in the U.S. in the fields of maritime autonomy, navigation and positioning for both defence and the private sectors.

Ocean Infinity, the marine robotics company, has acquired marine geotechnics experts, Geowynd.

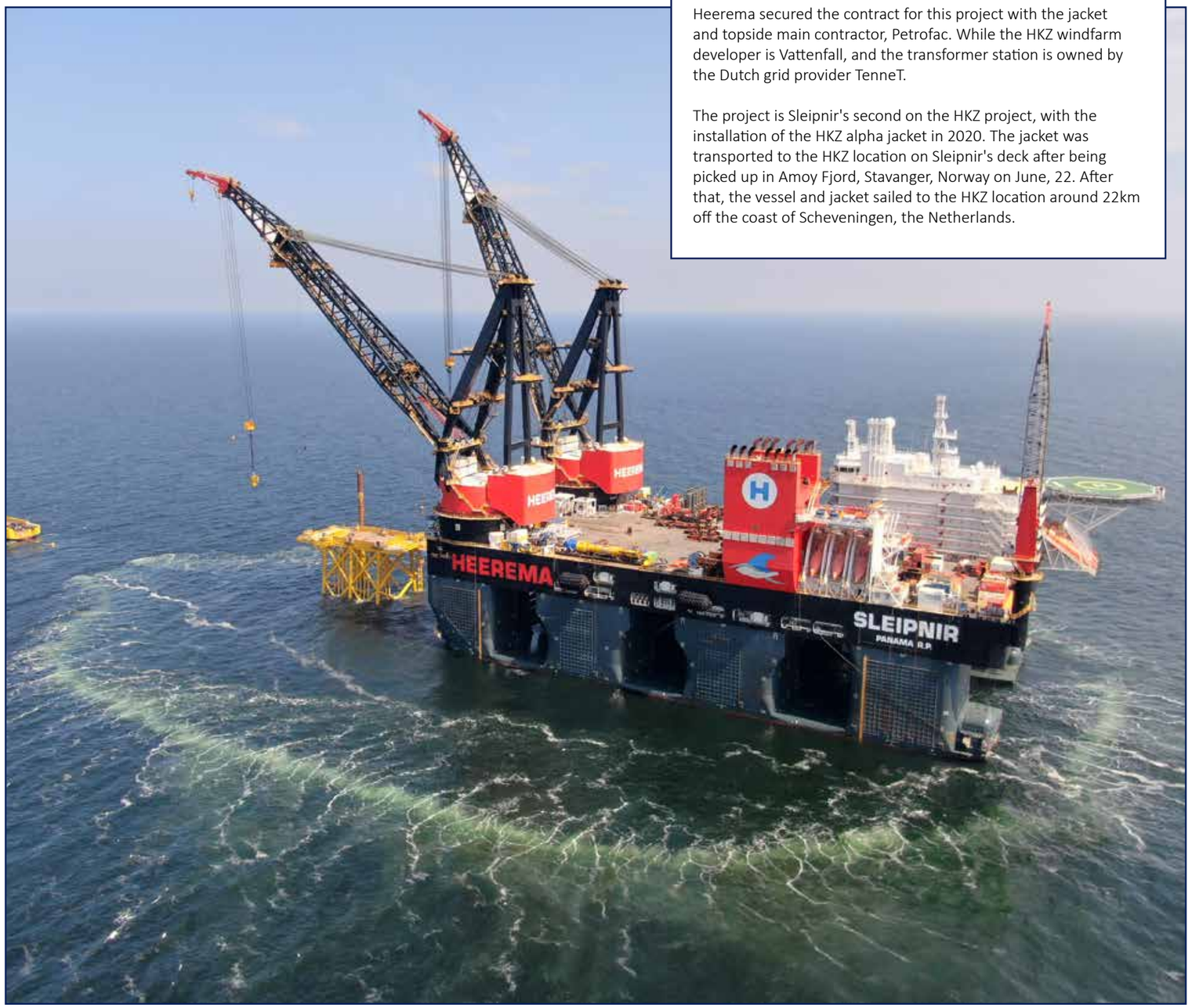
Based in the UK, Geowynd's provides geotechnical engineers consultancy services for offshore renewable energy projects.

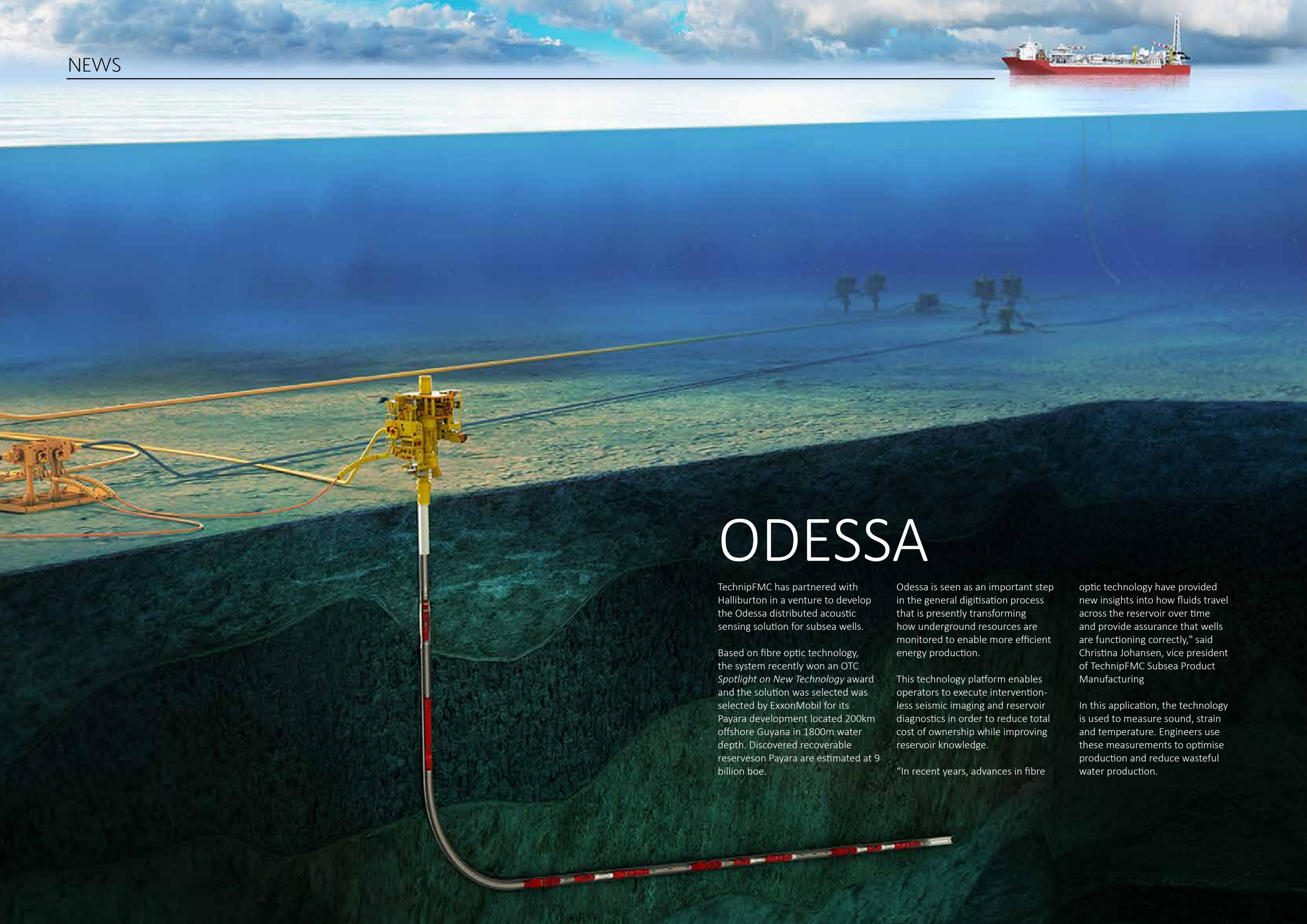
HKZ INSTALLATION

Heerema's SSCV Sleipnir has successfully transported and installed the six-legged, 2,852t, and 50m-long jacket for the Hollandse Kust (zuid) (HKZ) offshore transformer platform.

Heerema secured the contract for this project with the jacket and topside main contractor, Petrofac. While the HKZ windfarm developer is Vattenfall, and the transformer station is owned by the Dutch grid provider TenneT.

The project is Sleipnir's second on the HKZ project, with the installation of the HKZ alpha jacket in 2020. The jacket was transported to the HKZ location on Sleipnir's deck after being picked up in Amoy Fjord, Stavanger, Norway on June, 22. After that, the vessel and jacket sailed to the HKZ location around 22km off the coast of Scheveningen, the Netherlands.





ODESSA

TechnipFMC has partnered with Halliburton in a venture to develop the Odessa distributed acoustic sensing solution for subsea wells.

Based on fibre optic technology, the system recently won an OTC *Spotlight on New Technology* award and the solution was selected was selected by ExxonMobil for its Payara development located 200km offshore Guyana in 1800m water depth. Discovered recoverable reserveson Payara are estimated at 9 billion boe.

Odessa is seen as an important step in the general digitisation process that is presently transforming how underground resources are monitored to enable more efficient energy production.

This technology platform enables operators to execute intervention-less seismic imaging and reservoir diagnostics in order to reduce total cost of ownership while improving reservoir knowledge.

“In recent years, advances in fibre optic technology have provided new insights into how fluids travel across the reservoir over time and provide assurance that wells are functioning correctly," said Christina Johansen, vice president of TechnipFMC Subsea Product Manufacturing

In this application, the technology is used to measure sound, strain and temperature. Engineers use these measurements to optimise production and reduce wasteful water production.

AQUACULTURE MONITORING

Ocean Scientific International has released its new Aquaculture Monitoring Buoy. The development of this new buoy has been driven by a significant increase in Seaweed Farming globally, and offers a range of benefits specific to this market to improve asset management at a local level.

The unique buoy offers a full suite of standard metocean (meteorological, waves & currents) and water quality parameters with the added bonus of a Pan Tilt Zoom (PTZ) camera.

The unique PTZ camera is individually addressed, enabling operators to remotely view moorings and site detail in high definition with up to 40x zoom. This unique system helps farm operators to better manage the mooring system through the growing season.

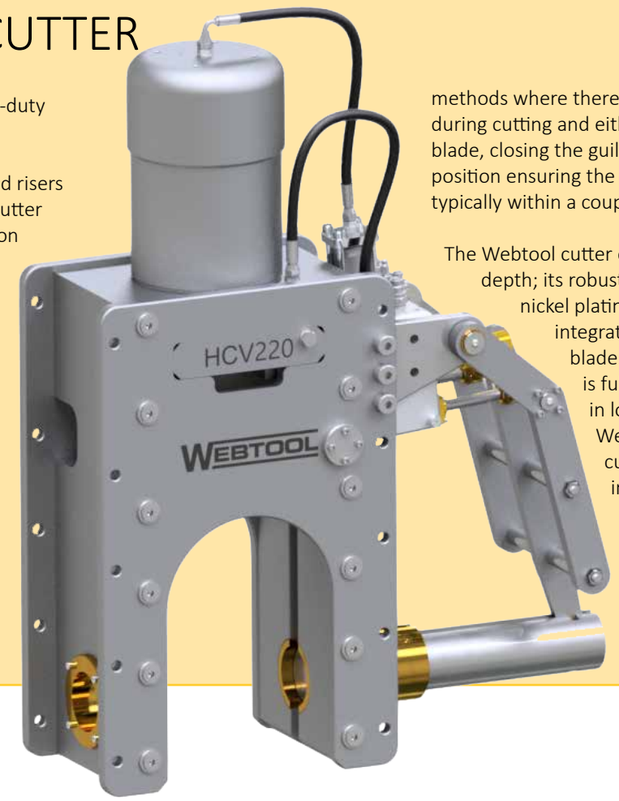
HEAVY-DUTY CUTTER

Webtool has released a new heavy-duty cutter, the HCV220.

Designed to cut cable, umbilical and risers in severe working conditions, the cutter can be deployed subsea mounted on an ROV, and as a deck-mounted cutter for planned production cutting.

Designed to cut through the toughest armoured cables in seconds, it comprises a jaw containing a blade and anvil powered by an inbuilt pressure intensifier.

Once the cable or umbilical is positioned in the jaw and the anvil closed, the guillotine blade is activated. Unlike other cutting methods where there is a risk of the item flexing during cutting and either trapping or snapping the blade, closing the guillotine's anvil locks the cable in position ensuring the cut is completed successfully, typically within a couple of minutes.



The Webtool cutter can be used at any water depth; its robust steel design with electroless nickel plating is resistant to corrosion. An integrated interlock ensures that the blade cannot activate until the anvil is fully deployed, making it safe in low visibility environments. Weighing 320kg in the air, the cutter uses 210 bar maximum input pressure.

The HCV220 is suitable for both offshore and subsea deployment as part of cable lay operations.

DRT

Deep Reach Technology. (DRT), an engineering company that develops novel solutions for complex offshore challenges in renewable energy and marine energy minerals production, has signed a memorandum of understanding (MOU) with Trendsetter Vulcan Offshore (TVO) to collaborate on developing innovative support structures for large offshore wind turbines.

As one component of the MOU, DRT and TVO will work together on one of the 15 projects to receive grants from the National Offshore Wind Research and Development Consortium (NOWRDC), an entity established with funding from US Department of Energy to support innovation in offshore wind solutions, US-based supply chain development, electrical systems innovation, and solutions for impacts on wildlife and radar.

With the grant pending, DRT and TVO are laying plans to investigate how novel offshore oil and gas platforms can be adapted to be used for large wind turbines.

The initiative outlined by DRT will focus on developing designs for very large fixed-bottom and floating offshore wind turbines that can be built economically to expedite offshore wind energy development.

"This MOU is a major step forward in the work DRT is doing in the renewables sector to develop technologies that enable affordable energy," says DRT Co-founder and Chairman Dr. John Halkyard

SAILDRONE SAILS TO HONOLULU

The uncrewed, autonomous, Saildrone Surveyor has arrived in Hawaii after a groundbreaking maiden voyage from San Francisco to Honolulu.

While ocean crossings are nothing new for Saildrone's autonomous surface vehicles, the Saildrone Surveyor is a new, much larger class of vehicle optimized for deep-ocean mapping. During the 28-day voyage, the Saildrone Surveyor sailed 2,250 nautical miles and mapped 6,400 square nautical miles of seafloor.

Using renewable wind and solar energy for its primary power source, the Saildrone Surveyor is the only vehicle in the world capable of long-endurance, uncrewed ocean mapping operations. The valuable data it collects will help address issues impacting our world including climate change, offshore renewable energy, natural resource management, and maritime safety.

Measuring 72 feet long (22 m) and weighing 14 tons, the Saildrone Surveyor carries a sophisticated array of acoustic instruments, normally carried by large, manned survey ships.

The Surveyor's sensors interrogate the water column looking at underwater ecosystems and map the seafloor in high resolution to a depth of 23,000 feet (7,000 m).

Multibeam data from the Saildrone Surveyor has been calibrated and assessed by an external team from the University of New Hampshire (UNH), which normally calibrates large government survey vessels.

With this successful proof of concept voyage, Saildrone, Inc. of California, will now build a fleet of Surveyors to be manufactured at US shipyards. Saildrone intends to map the entire earth's oceans in the next 10 years.

Saildrone Surveyor in the surf

Saildrone Surveyor passing under the Golden Gate Bridge

Oak poles

WATER QUALITY MONITORING

A project to monitor water quality during the renovation of the old Hamburg warehouse resting on aged oak poles, has been managed by MacArtney Germany.

Built between 1885 and 1927, the Speicherstadt, the world's largest complex of warehouses and UNESCO World Heritage Site, rests on thousands of oak poles that have deteriorated over time due to a slow advancing bacterial decomposition as well as indentation of the fleet bed as a result of an expanded tide difference.

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Renovation work is necessary to prevent the poles from sinking towards the fleets, including bed reconstruction arrangements raising the fleet bed by 0.5 to 1.5m and supply of bearing sand. Furthermore, the bed is stabilised with cement.

As part of the renovation, an accompanying water quality monitoring has been undertaken, especially controlling and remedying any impacts on the water quality caused by the cement placement.
For this purpose, nine EXO1 Multiparameter Sondes from US manufacturer YSI have been placed in different locations close to the ground on the existing fleet poles.

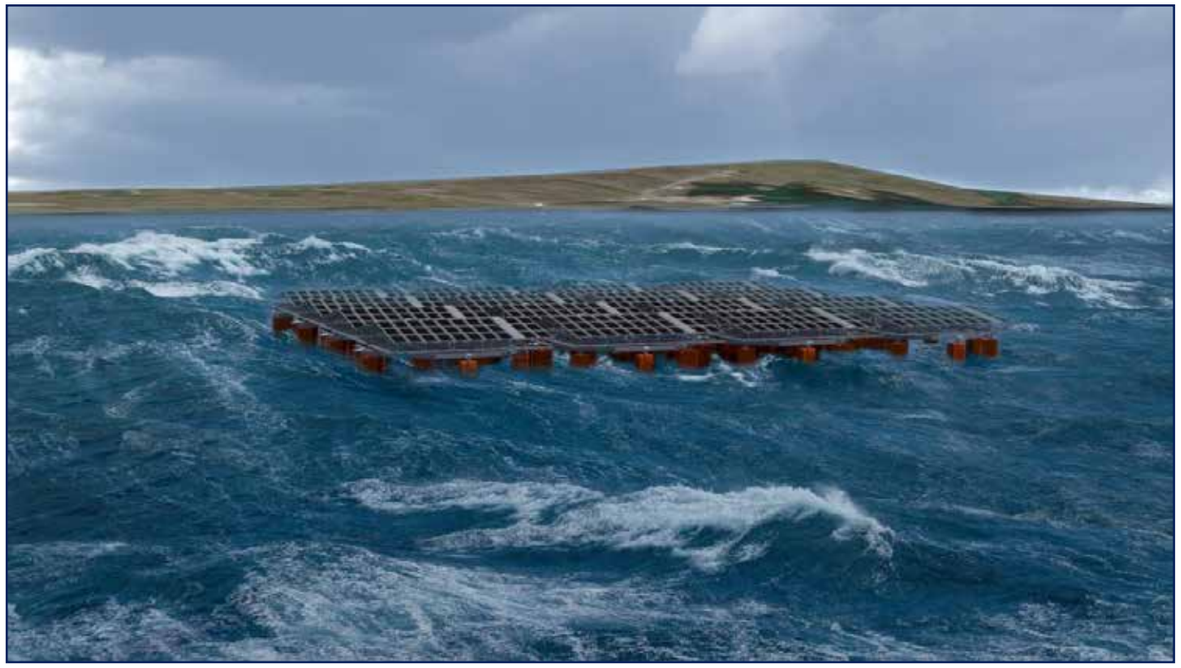
The EXO 1 Sonde measures temperature, conductivity, pH value, dissolved oxygen content and turbidity every 5 minutes over several days and time sequences. The sondes feature internal data storage and power supply for autonomous operating.

MacArtney Germany was commissioned to take on the supply of the multiparameter sondes, including a measurement and service concept for the project and all planning plus execution of the water quality measuring.

This involved regular calibration and maintenance of the sondes in the in-house workshop, data provision and installation and de-installation of the sondes on-site.

Speicherstadt

FLOATING SOLAR



Equinor is to explore the opportunities within offshore solar power. Together with Moss Maritime the company wants to start testing off the island of Frøya.

The plan is to build a floating pilot plant off Frøya near Trondheim in the late summer of 2021. It is set to become the world's first pilot plant for floating solar power in rough waters.

The municipality of Frøya has been positive to and is involved in the planning of the pilot plant. Equinor has filed an application with the Norwegian Water Resources and Energy Directorate. Planned to measure 80 m x 80 m, the plant will tower less than 10m over the sea surface. According to plans the pilot will be tested for minimum one year. The project is a collaboration between Equinor and the technology company Moss Maritime.

The purpose of the pilot plant is not primarily to see how much energy it can produce, but how the weather conditions affect the plant. The Norwegian coast and continental shelf are world-class when it comes to oil, gas and wind, but when it comes to sun, other regions offer better conditions. As a test area, Frøya is still very suitable.

This is the third research project that Equinor is involved in. Equinor is already involved in a project off Sri Lanka. Here a concept in calm waters is being tested to decide how to produce as much energy as possible.

In addition, Equinor is involved in a project in the Netherlands. Here three different floating solar power concepts are being tested on a lake. This provides important knowledge about the resilience and predictability of production under rougher conditions than in other current production sites for floating solar power.

Equinor has not made any decision on the production of power from floating photovoltaic panels, besides the research projects.

COMPACT 6,000M SONAR

Impact Subsea has announced the launch of the world's most compact 6000m / 19 685ft depth rated imaging sonar.

The new addition to the ISS360 range of sonars provides a full 360deg field of vision, 80m range capability and high resolution imagery using powerful CHIRP based signalling. Heading and Attitude readings can also be provided by the sonar.

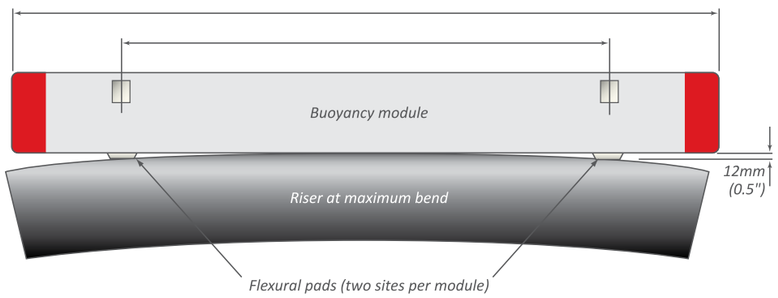
Developed to meet the demands of deep rated Autonomous Underwater and Remotely Operated Vehicles for commercial and scientific applications. At just 72mm / 2.83 inches long and weighing 0.37kg / 0.81lbs the deep rated ISS360 Imaging sonar is understood to be the most compact available today.

The ISS360 makes use of an inductive coupling between the electronics and scanning transducer which ensures there are no slip rings to wear and require periodic replacement. Housed in Titanium, it ensures many years of operation without the long term corrosion issues associated with anodised aluminium or alternative housing materials.

The world's most compact 6000m Imaging Sonar

ULTRADEEP-WATER DRILLING RISER

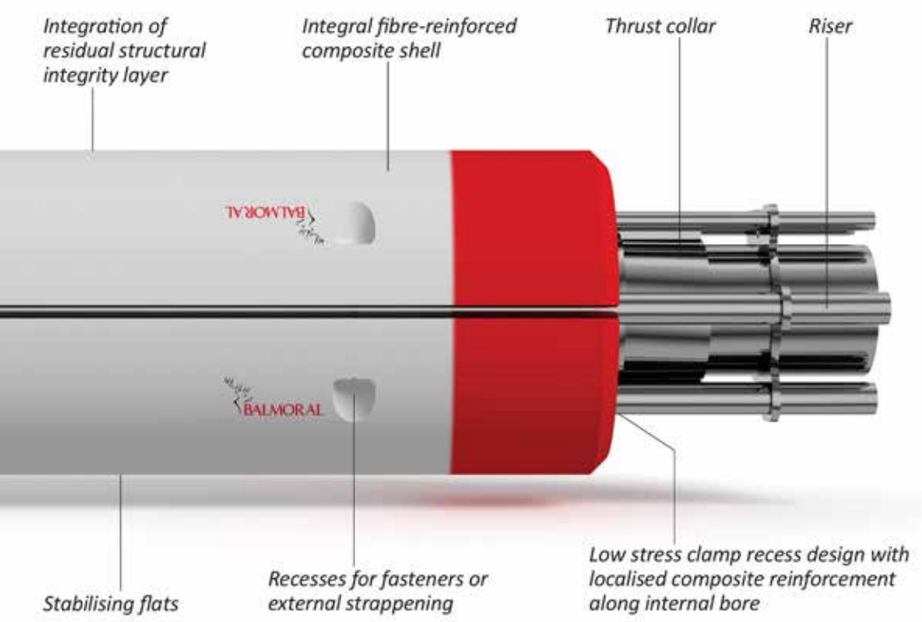
The drilling market has been depressed over recent years but there are signs that the deeper water segment may be slowly picking up. A vital component of the deep water drilling system is the riser that extends from the BOP on the seabed up to the rig. It is used as a wellstream conduit while supporting choke, kill and auxiliary lines.



Rigid buoyancy attached to a riser string

Drilling risers typically consist of around 90-100ft normally steel joints connected together. In shallow waters, these are hung from the rig but as the water depth increases, it is necessary to incorporate buoyancy to reduce the submerged weight of the riser joints. This helps to minimise top tension and prevent stress in the riser. It also serves to reduce loadings during deployment and retrieval of the blow-out preventer (BOP) stack.

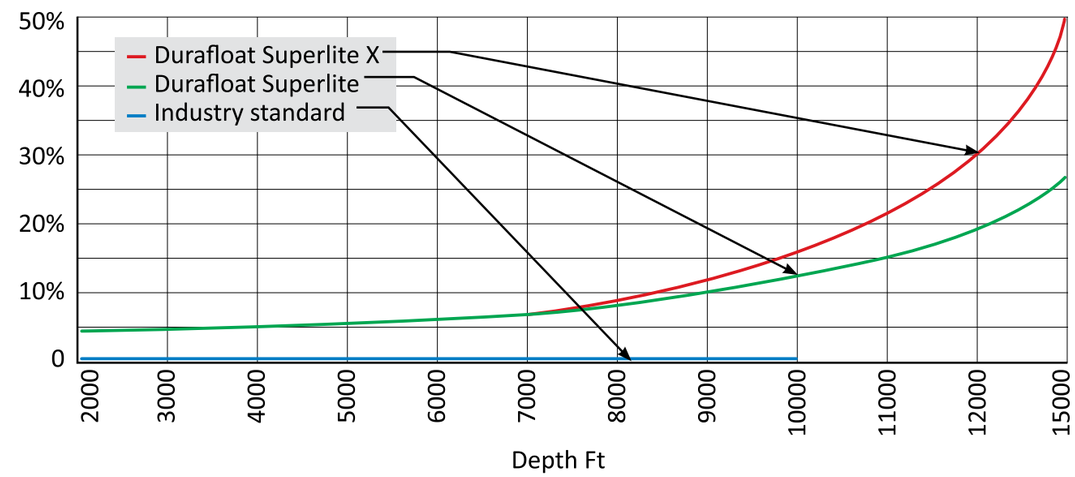
Buoyancy systems on the riser



Balmoral manufactures a range of drilling riser buoyancy modules. They are fitted around the steel riser, with moulded apertures used to accommodate auxiliary lines and riser clamps.

The vertical lift from the syntactic modules is transferred into the riser by a thrust collar located below the upper coupling. A matching collar is normally installed at the lower end of the assembly to facilitate the transfer of the module weight during handling.
Balmoral normally manufactures modules to be used in water depths to 12 000ft but as these depths increase to around 15 000ft, the buoyancy demands increase and a requirement for greater integrity and higher performance is required to counter the extreme conditions to which the riser can be subject.

"A 10 000ft riser moves and bends in the sea current a lot more that anyone might realise," said Engineering and Projects Director, Fraser Milne, "and it is sometimes challenging to attach the rigid buoyancy to these flexible steel lines.



Uplift provided by DuraFloat Superlite and Superlite-X compared to industry standard systems

"The most common way to attach the buoyancy is by strapping with stainless steel axis bars as well as stud bolt attachments between module and riser. In some cases, the design might benefit from locating the bolts in reinforced pockets or stainless steel U-bolts with Kevlar strapping.

"Depending on riser geometry, these options can be located within the pitch circle diameter (PCD) of the auxiliary lines. This reduces the transverse bending moment on the buoyancy module."

Flexural pads are built into Balmoral buoyancy modules at strategic locations to ensure that excessive bending loads are not transferred from the riser to the module when lifted in the horizontal plane

As the syntactic foam forms the outer skin, it is not only subject to the movement and stresses but represents the first line of protection from impact and constant handling.
This prompted Balmoral to develop its DuraFloat high performance ultra-safe riser buoyancy system.

Durafloat modules benefit from an integral composite epoxy skin that delivers a robust impact resistant performance.

The team also created a specialised riser buoyancy series, DuraFloat RIS, comprising a high impact protective skin and residual integrity system to minimise the risk of cracking and fracture.

In order to face the unique challenges of working depths of 12000ft, Balmoral recognised that further performance improvements were required and has engineered a lighter syntactic material for use at operational extremes to 15000ft.

The increase in mechanical performance required to operate at these depths cannot be accompanied by a reduction in available buoyancy, and the engineers at Balmoral experimented with reducing foam density alongside improving mechanical performance.

The result of the R&D programme is DuraFloat Superlite and DuraFloat Superlite-X. These feature an extreme impact resistant shell with anti-fracture reinforcement.

The design gives it enhanced flexure resistance while the shell gives it an improved stacking and storage capability

RISER MONITORING

IRM Company RotoTech has entered into a collaboration with Resimac to apply a tubular coating facility into its multipurpose pile riser/tubular cleaning and inspection tool.

“Our inspection system is very efficient with no vessel required for the installation, reducing costs and carbon footprint,” said RotoTech Managing Director, Simon Hartog.

“The new venture, however, gives repair and maintenance capabilities. In the Middle East and Asia alone, many platforms are now 30 years old and risers, conductors and caissons need urgent repair and preservation, so the market is very large.”

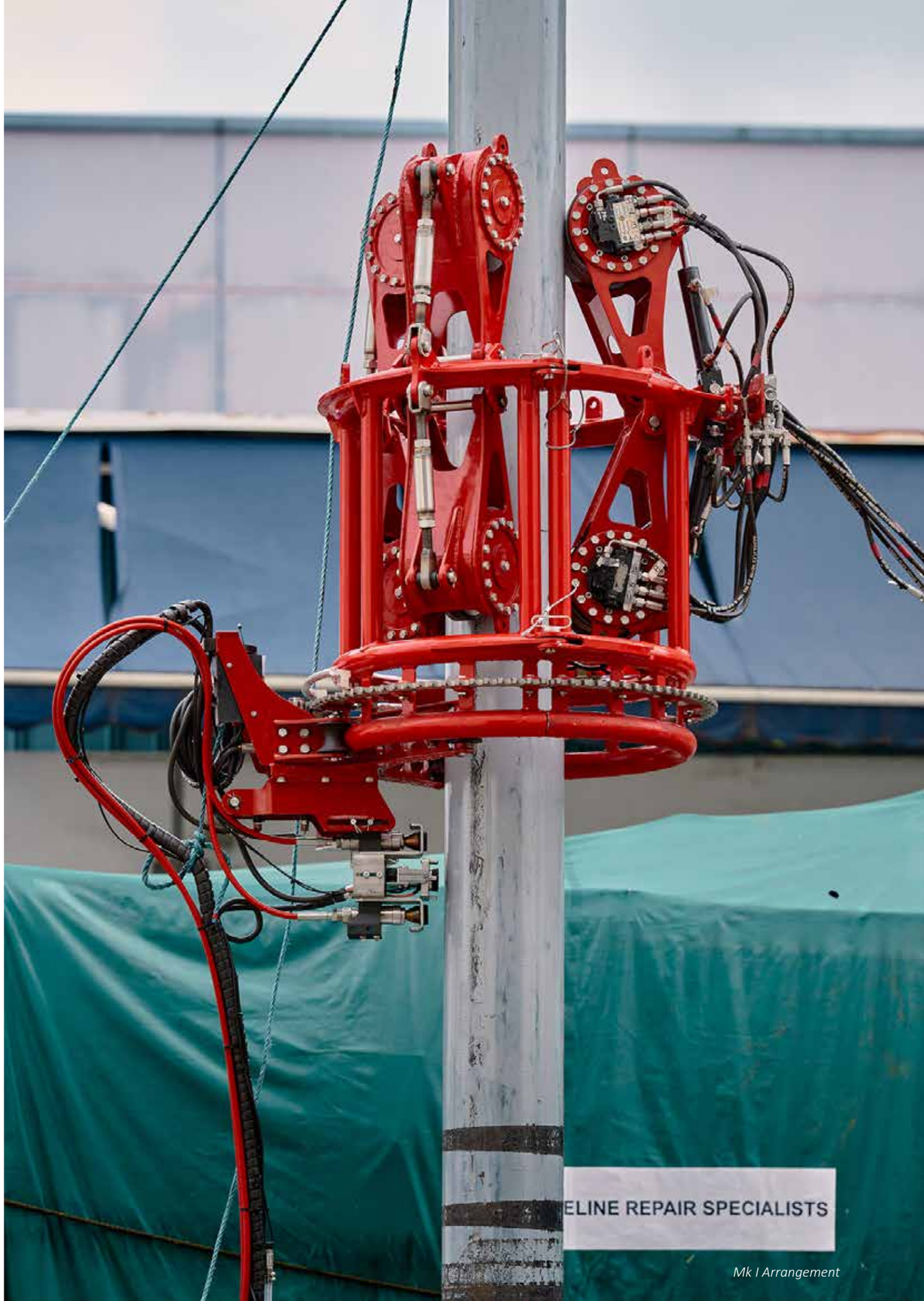
One of the most vital components of an offshore production system, is the conductor or riser that brings the wellstream into the topsides. Passing through the splash zone, these tubes may be subjected to high energy forces which impose stresses on the metal while the presence of seawater and oxygen provides a highly corrosive element. This means that in order to ensure integrity, the lines must be inspected regularly.

One way to inspect such lines is to run intelligent sensors housed in an instrumented pig, inside the pipe. The pig, however, passes very quickly which limits its sensitivity.

A preferred alternative may be to run a sensor mounted on some sort of tractor system, up and down the outside of the tubular. These devices are equally useful for scanning the tubulars that make up the jacket legs themselves.
The historical problem with this, however, is that in order to resist external dynamic waveforces, the risers are often physically secured to the jacket by some sort of hang-off.

Similarly, the jacket itself has nodes and bracings as part of its design. When a crawler passing along the outside of pipes reaches such an abutment or blockage, the crawler has to stop. It was for this reason that

Cygnus UT gauge



Mk I Arrangement

RotoTech expanded its Roto Climber capabilities.

The company has designed two models – the Mk 1 and the Mk 2 which are chosen depending on levels of intervention. Two sizes allow it to be used on tubular diameters 8in-22in and again, between 22-36in. The Mk1 is the budget model – lightweight and relatively inexpensive. Self-sufficient, it can be launched, operated and recovered with a small crew size.

It can carry out close visual inspection using a pair of Subsea Tech's high resolution colour (700TVL) UVAS100RL 1080P HD video cameras. With a depth rating of 100m and a 0.01 lux, (night mode) sensitivity, the ultra-compact high resolution colour camera can work off battery power or mains power.

To increase its capability, the camera can be removed from the body and subsequently deployed from a telescopic pole from the surface, with a diver (wrist or hat mounted) or from any fixed or moving support. It is supported by integrated variable density LED lighting (500 lumens) system.
The image produced from the cameras, is output from a waterproof console which has a 12in LCD screen and a digital recorder/reader (SD card) in a Pelicase IP65 housing weighing only 11.5 kg.

The console and the camera are connected through an umbilical for power supply and video signal. Audio communication, text edition and depth meter functions are available on demand.

Mk II Clamp bypass sequence

"As part of the inspection process, an important requirement may be to clean the target," said Hartog. "The Mk 1 tool is, therefore, equipped with a pair of Stoneage Barracuda (BC-H9-C) nozzles that deliver seawater up to a pressure of 3000 Bar with a flow of up to 28 lit/min. Both parameters are adjustable.

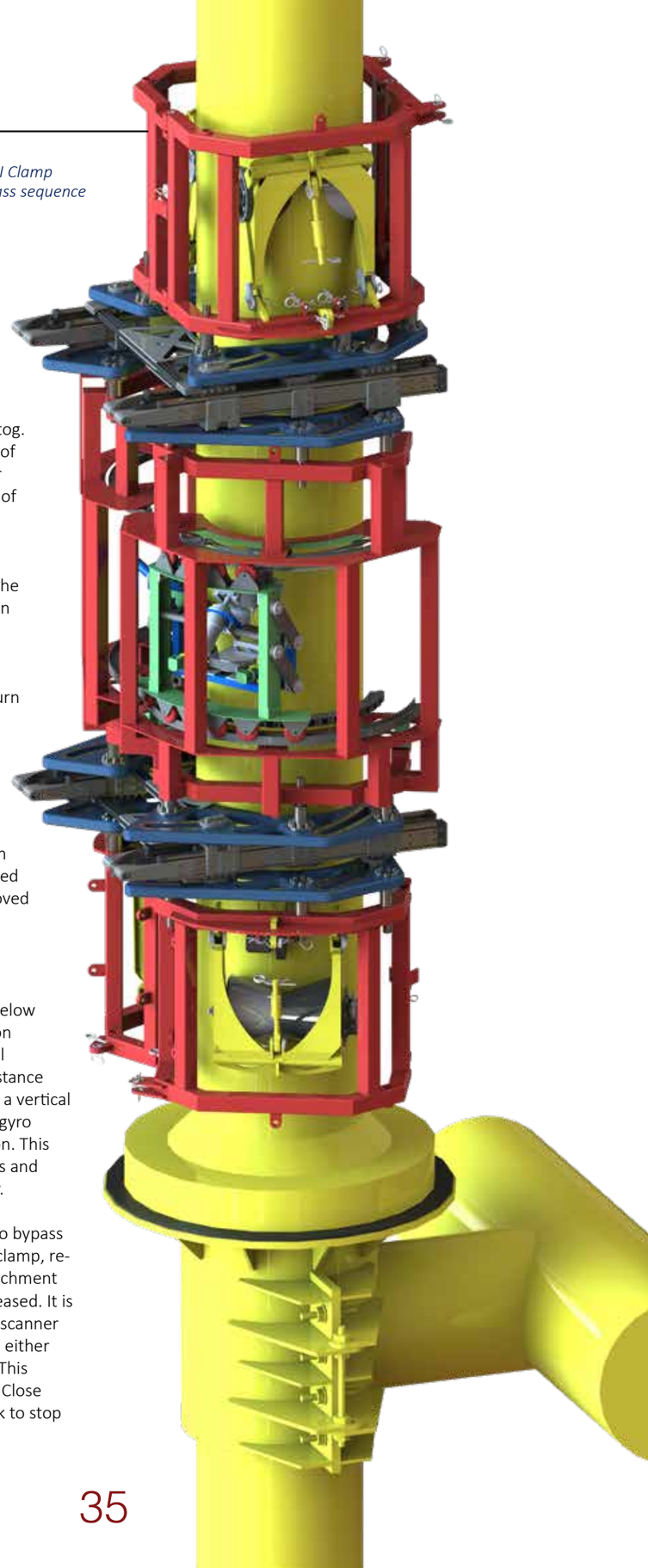
The Mk1 also carries a Cygnus ROV mountable 2K ultrasonic gauge. It can measure the thickness of the metal wall through coatings of up to 20mm or 0.8in thickness and works on both corroded and coated structures.

These measurements are checked using three return echoes to give repeatable and reliable results. There is also an eco strength indicator to aid measurement. The actual ultrasonic gauge itself is depth rated to 2000m.

For subsequent, more in-depth investigation, RotoTech offers a larger Mark II version in which an increasing number of work packages can be installed into a much larger discrete sensor body. This is moved by a separate traction unit. There are two types – a smaller climber that works on 8-22in diameter tubulars, and a larger model for 22-36in.

"The sensor module can be mounted above and below the hydraulic tractor unit depending on what action is required to be performed," said Hartog. "Control equipment within the body allow it to measure distance moved by the carriage, both from starting point in a vertical direction, and also in a horizontal direction with a gyro being used to determine a North/South Orientation. This enables the unit to exactly replicate its movements and return to a defect location with very little difficulty.

"An important feature of the system is the ability to bypass a clamp by releasing one part, moving it over the clamp, re-engaging it and then using that to provide the attachment to the pipe when the first part is subsequently released. It is even possible to check the clamp and bolts as the scanner passes over it. The work packages can be attached either above, or below, or both, to the Traction Module. This means that it would be possible to clean, perform Close Visual Inspection, make an NDT survey, drill a crack to stop



A Mk II Arrangement

it propagating and then recoat the surface all in one operation."

The Mk II Incorporates multiple cameras and the Cygnus UT system of the Mk 1 but includes other work packages. One such is the Olympus FOCUS PX Phased Array system for corrosion mapping as well as crack detection. The FOCUS PX instrument together with the HydroFORM scanner enable corrosion mapping to be performed up to 64 times faster than conventional methods. The results can be observed remotely in several different ways depending on available internet offshore and bandwidth. It is possible to upload data to a cloud for real time or later analysis onshore as raw data.

Amongst the other packages RotoTech have developed is a novel drilling device with the aim of accurately placing a hole in the path of a crack to stop it propagating. Elsewhere, a cutting module that can cut shapes into a pipe. It is the latest work with Resimac, however, that gives the Mark II a novel repair facility.

"If no significant structural damage is found and the customer would just like to have a very tough anti-corrosion coating replaced, the system can apply a paint-on coating from say 6m below the high tide level to the bottom of the spider deck," said Hartog. "This coating has a 10 year life span and it is tolerant of less than perfect surfaces."

Boasting a high build capacity, the

Olympus Focus PX Phased Array testing, showing the HydroForm Buggy, which is mounted inside the Mk II Cleaning /CVI/ PAUT Module."

Resimac 305 InterFlex is a flexible high build solvent-free abrasion resistant epoxy coating specifically designed for the external coating of pipework, bearing piles, oil rig conductor pipes and risers, and steel structures in sea water environments. The surface to be coated must be free of any marine life such as algae or barnacles, and any degraded coating or surface corrosion must be cleaned from the surface.

This could require the surface be hydro-blasted at a minimum pressure of 3000psi to ensure the majority of contaminants will be cleaned from the surface. This spray can be applied in a moving habitat from say up to 10 meters below seawater level up through the splash zone to just below the level of the spider deck.

If wall loss is found and structural integrity restoration is needed, however, then a composite wrapping system with a wrap that can be applied and cured underwater may be a favoured solution. Rototech and Resimac are developing such a system which involves the use of a unique underwater curing resin composition pre-applied onto high tensile strength woven tape which when applied under tension consolidates into a high strength homogeneous repair. This can be applied robotically and without habitat.

"The only other robotic system in the world so far is the Kongsberg Ferrotech solution which costs millions of dollars and can only wrap pipelines in a dry environment," concluded Hartog.

AI and Robotics Ventures Company Limited (ARV) has officially partnered with RotoTech Private Company Limited to introduce and further develop the 'Roto Climber' technology. ARV is a subsidiary of PTT Exploration and Production (PTTEP),

Movement sequence bypassing attachment

ELASTOMERIC CENTRALISERS

Aberdeen-based Mako Offshore has recently completed the installation of their Dorsal centralisers on multiple 46in conductors in the North Sea.

Conductors are multi-string conduits allowing fluid or gas to travel to/from the well and provide an essential structural component of fixed installations.

At the horizontal elevations of the jacket, guides are used to maintain the position of the conductor in the x-y directions. The main operational purpose of the guide is to manage the fatigue life of the conductor as it is exposed to cyclical loading due to current and wave action upon it.

The conductor fatigue life can further be enhanced by centralising it within the guide – reducing the wave imparted bending moment and the impact loading caused by the tubular clashing with the guide.

This can be challenging over the long term. Poor fitting (or non-existent) centralisers leads to excess lateral movement and reduced fatigue life.

Reducing the lateral movement of the conductor using steel centralisers is at best a temporary solution. Failure leads to vibration migration to the structure, damage to the conductor, damage to the guide, weld failure on stub guide, bolts loosening on retrofit guides, fretting, fatigue and localised external corrosion.

In recent years, elastomers have emerged as a considerably better option for centralisation applications. They provide resistance to the lateral motion of the conductor whilst still offering compliance thus reducing shock loading, fatigue and vibration issues.

These types of solutions are becoming the benchmark for new designs and are already retrofitted on older jackets. A well designed, appropriately specified elastomeric solution will typically last for the life of the platform.

Dorsal, the elastomeric centraliser system

Mako Offshore uses an elastomeric centraliser system called Dorsal. The company says that unlike other elastomeric solutions available, the chemistry of their polyurethane means that key properties can be controlled to provide a more tailored product based on the client's requirements: It can be installed using two methods.

When installing within the splash zone or dry environment, the material is cold cast on site. The Dorsal material is poured into Mako's in house designed project specific moulds between the conductor and guide bucket. The mould creates a liquid tight seal against the conductor and guide, preventing any escape of the casting fluid. What happens then is a multistage casting process to create the Dorsal centraliser *in situ*.

Subsea applications are tackled utilising a different method as polyurethane reacts with water.

There are systems which utilise bags however there is potential to burst that bag and lead to a spill to sea. Instead Mako have opted for a precast method and remove the casting process to their onshore base. The centraliser is made in multiple sections to aid the offshore installation and trials are performed to simulate the job prior to mobilisation.

WATER INJECTION DREDGING

DREDGING

Van Oord recently launched two new hybrid water injection vessels – the *Maas* and *Mersey*. Both vessels are equipped with a novel hybrid energy management system allowing the vessels can store energy in batteries from residual heat that is normally lost. This energy is subsequently used for various purposes including propulsion. .

Water injection dredging is an efficient and environmentally friendly way of maintaining the depth of navigation channels, ports, marinas and rivers. It is a niche tool but has been used for over 30 years.

Many conventional dredging systems work by extracting sediment into a vessel, sailing it to a remote location and then ejecting the material offsite. Water injection vessels,however, use a different methodology.

The dredging technique is based on moving a horizontal jet bar over the surface of the sea bed. Onboard pumps force large volumes of water at low pressure through a series of nozzles located on the jet bar.

This water jet is directed downwards onto the basin floor, effectively lowering the density of the local area until it fluidises the sediment.

The mass flow, sometimes assisted by the gradient of the slope or river currents, sweeps this fluidised material horizontally across the bed into areas of higher-energy environments where it is mixed with other naturally occurring sediment particles.

“The specific characteristics of water injection make this technique highly suitable for a variety of projects," said a spokesperson, " such as maintenance dredging of navigation channels ports and marinas. It is particularly useful for dredging in areas with limited access."

WID has a number of advantages.

Apart from eliminating the need for mechanical excavation and transportation of dredged material, the vessels can be smaller in size. They are more manoeuvrable and faster to mobilise. They also have considerably lower CO2 footprint of cubic metre of dredged material. In this case, the two vessels have Diesel-electric engines will further reduce CO2 emissions

They latest technological developments have been applied to both vessels, such as active heave compensation and dynamic positioning, which means that the dredging can be pre-programmed to a great extent and performed more efficiently.

At the same time they can dredge up to 24m water depth and are certified as unrestricted seagoing vessels.

CFE DREDGER

SEAJET Systems (SJS) has signed a manufacturi ng partnership with Soil Machine Dynamics (SMD) to build a Controlled Flowed Excavation (CFE) tool. This is useful for the burial or de-burial of seabed structures.

The tool is normally deployed by over the side of a vessel and positioned at a specific height over the seabed, typically around 2m. Powerful rotors create a column of water which can be varied in volume and pressure depending on the seabed condition.

Upon contact with the seabed, this water begins to excavate the sands and even clays. By use of a multi-beam sonar being able to image in real time, it is possible to steer the excavator while removing spoil to a precise depth.

The technique provides two advantages. At no time is the tool in physical contact with the seabed and in particular, subsea assets. This means that is suitable for work near subsea architecture. The other is that there is no need to dispose of spoil. It is normally possible to deploy these systems from small vessels which improve the economics of the project.

These are devices are normally provided as part of a turnkey service is which a subcontractor will not only provide the equipment but also operate it.

In many cases , the ability to provide this service is valuable to the client. The subcontractor knows how best to use the tool, understands its limits and can maximise its efficiency. This, however, comes with a commensurate cost and the client might already have its own in-house expertise.

This prompted a new company, Sea Jet Systems the ability to own and operate CFE technology.

The company has signed a manufacturing partnership with Soil Machine Dynamics (SMD), the world's largest independent designer and manufacturer of specialist subsea intervention equipment.

The partnership will see SMD exclusively build, test and commission what they claim is the most advanced fleet of CFE equipment available in the market by introducing advanced hydrodynamic properties suitable for a wide range of applications and variable seabed conditions.

SJS also offers a tailored aftermarket support package to inspire client confidence to own, operate and maintain their own CFE equipment.

I AM SPARTACUS

DEME has taken delivery of its giant new cutter suction dredger 'Spartacus' from Dutch shipyard Royal IHC. 'Spartacus' is the world's largest and most powerful self-propelled cutter suction dredger and the first able to run on liquefied natural gas (LNG).

With a total installed power of 44,180 kW, its production rates and ability to cut hard soil are unmatched in the industry. The four main engines can run on Low Sulphur Heavy Fuel Oil or Marine Diesel Oil, as well as LNG, and the two auxiliary engines have dual-fuel technology. The CSD also has a waste heat recovery system that converts heat from the exhaust gases into electrical energy.

The heavy cutter ladder, able to be controlled and operated from the bridge by a single person, can operate up to a dredging depth of 45 m.

'Spartacus' will set sail for its first assignment in Abu Qir, Egypt, which is the largest dredging and land reclamation project in DEME's history. This vast greenfield project includes the reclamation of 1000 hectares of new land, the deepening of the port's approach channel to 23m and the dredging of a turning basin to 22m.

DEME expects to dredge an enormous volume of more than 150 million m3 during the course of the project.


LIEBHERR
SPARTACUS

FALCON FOR FRENCH DAM AND BRIDGE INSPECTION

French dams and bridges inspection specialist, IDCBTP, has chosen a Saab Seaeye Falcon for detailed infrastructure examination.

“We chose the Saab Seaeye Falcon because it's a reliable system that’s simple to use and to upgrade,” says Clément Chaudouet of IDCBTP.

“It's also a stable system, which is very important to us as we need perfect control of the ROV during a dam inspection.”

He adds that Saab Seaeye’s position as leader in the world of underwater robotics was important in their decision to choose the Falcon- and that the company “has a great support team.”

For a clear and accurate analysis of the condition of the structures, IDCBTP’s Falcon is fitted with a range of systems including lasers, multibeam sonar, profiler sonar and navigation and positioning systems.

Precision data collected in this way can identify repairs needed, help maintenance planning and spot trends in structure condition.

Wet test of the Subsea Pumping Technology unit at an ROV test tank at Oceaneering's Morgan City, Louisiana, facility in 2020

SUBSEA PUMPING TECHNOLOGY

Wet test of the Subsea Pumping Technology unit at an ROV test tank at Oceaneering's Morgan City, Louisiana, facility in 2020

Back in 2019, Oceaneering won a Spotlight on New Technology Award for its novel Subsea Pumping Technology (SPT) designs. Since then, the company has built hardware around this concept and in 2020, started long term underwater system qualification testing in concert with a major operator.

Chemical injection is an important component of many field production strategies to ensure operational integrity management and flow assurance. Adding methanol, MEG and other paraffin/wax inhibitors are needed to improve well functionality and production performance.

For subsea tiebacks, the inhibitor chemicals are typically stored in tanks on the host platform and delivered to the subsea site through long umbilicals.

Applications that require high dosing of chemicals consequently necessitate locating large storage tanks on a platform that is often short of space. Such constrictions often mean that personnel are often in close contact with pressure-containing equipment.

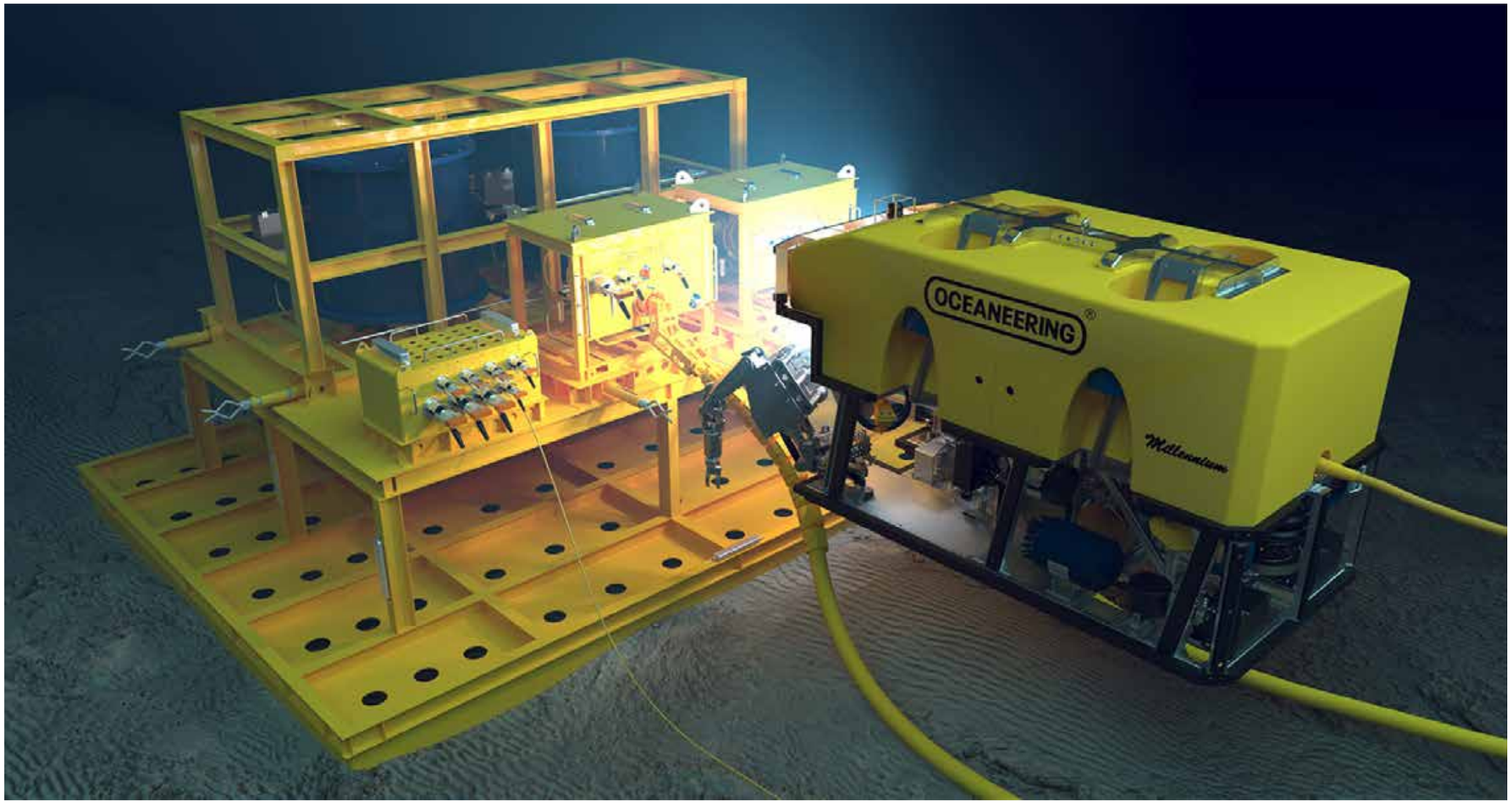
As the tieback distance grows, the cost of the umbilical increases accordingly. Oceaneering, themselves a global manufacturer of umbilicals, openly recognises that this has a significant impact on field economics.

Because of the materials and complexity, these umbilicals are expensive to manufacture and can have long lead-times of anything between 14 and 18 months. Up to now, there have been few alternatives.

“SPT essentially removes the reliance on such complex umbilicals, thus allowing operators to engage in longer tiebacks with much reduced capital expenditures,” said Michael Hearn, Sales and Business Development Manager with Oceaneering’s Energy Products group.

The SPT system that Oceaneering has engineered is based on relocating the pump from the remote platform to the local seabed site. The chemical injection fluid is stored in a tank farm also located subsea. At a stroke, this reduces or eliminates their topside footprint.

This means that the long complex umbilicals are no longer necessary as the wells can be fed by much shorter local lines.



Subsea Pumping Technology unit with an Oceaneering ROV subsea.

"There still needs to be umbilicals from the host platform, however, but these lines can be much smaller as they are not required to transport volumes of fluid," said Jake Schrager, Lead Engineer for SPT. "All the umbilical really needs is to carry power and control communications from the host. They can be less complex. As one of the major cost items, this immediately reduces both Capex and lead times.

"Calculating project economics is difficult because it always takes into account a large number of variables, but the sweet spot for using this subsea pumping technology is around 25 km. As the tieback distances increase, subsea pumping becomes more economic," said Hearn.

The layout scenario envisages one or more pump/storage units feeding into a single termination unit. This in turn is connected to the production facilities.

“The key to designing a universal system compatible with the maximum number of field scenarios is that is that it has to be configurable and scalable,” said Schrager. “We have designed three different types of pump modules which we can use depending on the application. Each serves a different purpose.”

The three pumps are Axial Piston, Triplex Plunger, and Diaphragm Pump. There is a pump for each application the client may need, ranging from 0-50 GPM (189 LPM) at a design pressure up to 15,000 psi.

The Axial pump plays the middle between the low dosage Diaphragm and the high-volume output of the Triplex and can deliver between the .2-8 GPM, said Schrager.

Each pump is equipped with onboard monitoring control systems that can supply instantaneous feedback to the topsides control station. This provides the operator with instant information on flow rates, ground fault monitoring etc to continually show the system status.

Each pump is equipped with a controls bottle for sending inputs and outputs back and forth from subsea to topside to control ethe pumps onboard the module. The controls bottle uses Rockwell plc architecture, which can be configured to work with any industry specifications, said Schrager. Communications for the SPT system can be done via fibre from the communications and power umbilical. Local sources can be done by Ethernet. Additionally, the controls system can be MODBUS configurable.

Fluid Storage Module
The fluid storage module is based on a steel drum enclosing a 1,000-gallon (3,785 L) bladder although this single unit can be scaled up or down depending on the operator's requirements.

The outer steel enclosure affords protection while the secondary containment system ensures that there is no leakage of chemicals into the ocean.

Level indicators ensure that the tank contains the correct amount of fluid. These levels of chemical are closely monitored such that if the pressure decreases or the rate falls unexpectedly, an alarm is flagged.

When depleted, the fluid storage tanks can be re-filled from the surface using a subsea hose connected to a diverless interface.

Alternatively, it may be cost-effective to simply replace the entire module from the surface. Once the tank is empty, the unit it is retrieved using a crane with a replacement sent down and latch on to the base, again diverlessly.

Subsea Pumping Technology unit mobilized for a system wet test at Oceaneering's Morgan City, Louisiana, facility in 2020

"While a single tank contains 1,000 gallons, we have designed a typical module as a two-tank unit able to provide 2,000 gallons," said Hearn. "Furthermore, for larger demand, it would be simple to manifold a number of two-tank storage units to provide 8,000 or 10,000 gallons."

"The technology has been seven years in making," said Schrager. "Throughout the development and testing phases, one of the technical challenges around the fluid storage tank has been operating it in a high-pressure environment. We had to develop a robust testing programme to ensure that the bladder was capable of a wide range of applications.

"In the testing programme, we have especially concentrated on ensuring its integrity. Part of the reliability testing has included filling the bladder up and then emptying it," said Schrager.

"We carried out 47 fill-empty cycles to test the integrity but in real-life operational conditions, we would certainly start to think about replacing the module well before this point."

The wet test also validated the interfaces between the pump modules and the fluid storage modules. The valves had to prove they can terminate the flow and restart the system as commanded from the topside master control system.

The final design can withstand a broad range of chemicals up to a depth of 10,000 ft. It will not collapse but self-compensates for the pressure differentials at extreme levels.

"We see the system being suitable for intervention in both Brownfield and Greenfield applications. It can be used to meet a short-term need by providing a temporary solution to enable production during long term infrastructure development," said Hearn.

Alternatively, it can be used to supplement existing services when previous architecture did not fully consider the demands.

"The design is entirely congruous with the general move toward unmanned or subsea factories that many companies are proposing," Hearn said. It is compatible with all-electric technologies currently being implemented."

At present, the testing phase is at an advanced stage of completion and has achieved a technology readiness level of five to the system and six for the fluid storage modules.

Oceaneering plan to go into phase two level testing to optimise and enhance reliability.

TIDAL TURBINE TESTING

In 2019, the HarshLab facility became the site for the Next Evolution in Materials and Models for Ocean Energy (NEMMO). This project saw the installation of a set of gel/ fibreglass tidal turbine blade panels for testing.

The samples, taken from the current Magallanes' turbine blade, were be submerged for six months to determine the level of biofouling on the surface. These results will then be used as a reference for the development of new blade materials and coatings.

The creation of novel coatings and materials is a core part of the NEMMO project.

After extensive modelling and testing, the team will define the optimal material composition, textures and surfaces to reduce wear on the blade. The wider objective is to lower maintenance costs and increase the yield of tidal turbines, and to improve the cost-effectiveness of tidal energy overall. Check out the short video of the panels being installed at HarshLab's floating offshore laboratory.

The NEMMO project will boost the competitiveness of tidal energy by optimising tidal turbine blade design and performance. The project aims to create a larger, lighter and more durable composite blade for floating tidal turbines, enabling devices to reach capacities of over 2 MW.

The project's work on blade materials comes under Work Package 3: Nano-reinforced composites, antifouling coatings and antifouling biomimetic surfaces.

NEMMO project has received funding from the European Union's Horizon 2020 research and Innovation programme.

VIDEO Turbine blade testing under the NEMMO project

STORM EPSILON.

Three years after HarshLab was installed, in September 2018, a webcam installed by CoreMarine. This , provided vivid testimony of the effects of Storm Epsilon.

During each winter, the floating lab had to withstand extreme weather conditions, with eight-metre waves and winds of up to 20kts.

In Storm Epsilon, both the mooring lines and the infrastructure itself stood up well to the storm, and all tests in progress were able to proceed as planned.

The HarshLab is an advanced floating platform-laboratory developed for the evaluation of materials and components against corrosion, ageing and fouling in immersion, splash and atmospheric zones.

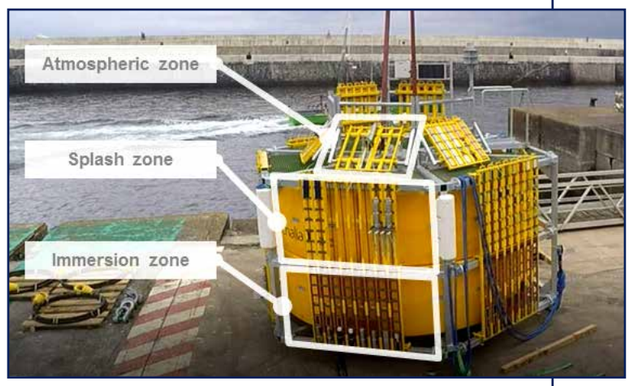
After three full winters withstanding the heaviest swells that swept the Bay of Biscay, Tecnalia, the group that manages the facility, as decided to upgrade current version of HarshLab.

HarshLab is moored in the Biscay Marine Energy Platform (BiMEP), an experimental sea zone with a total surface area of 5.3 sq km, situated in the Gulf of Biscay, 1,6 nautical miles in front of the village of Armintza (Bizkaia, Spain).

The new version of the HarshLab is being developed with unique infrastructure will enhance its potential to offer novel solutions to research projects related to offshore industries.

HARSHLAB 1

Within the last 3 years, more than 20 companies have already tested more than 500 samples and obtained valuable information about their behaviour in real offshore conditions. Anticorrosion, antifouling and antiaging solutions have been intensively tested in HarshLab through both private and public funded projects.



HarshLab

FRIDAY PHOTOS

Photos posted every friday on UT2Subsea's Linked-In profile

Ekofisk Jack-up

I posted some of the Ekofisk jackup some time ago but recently found this better picture showing 2/4-C

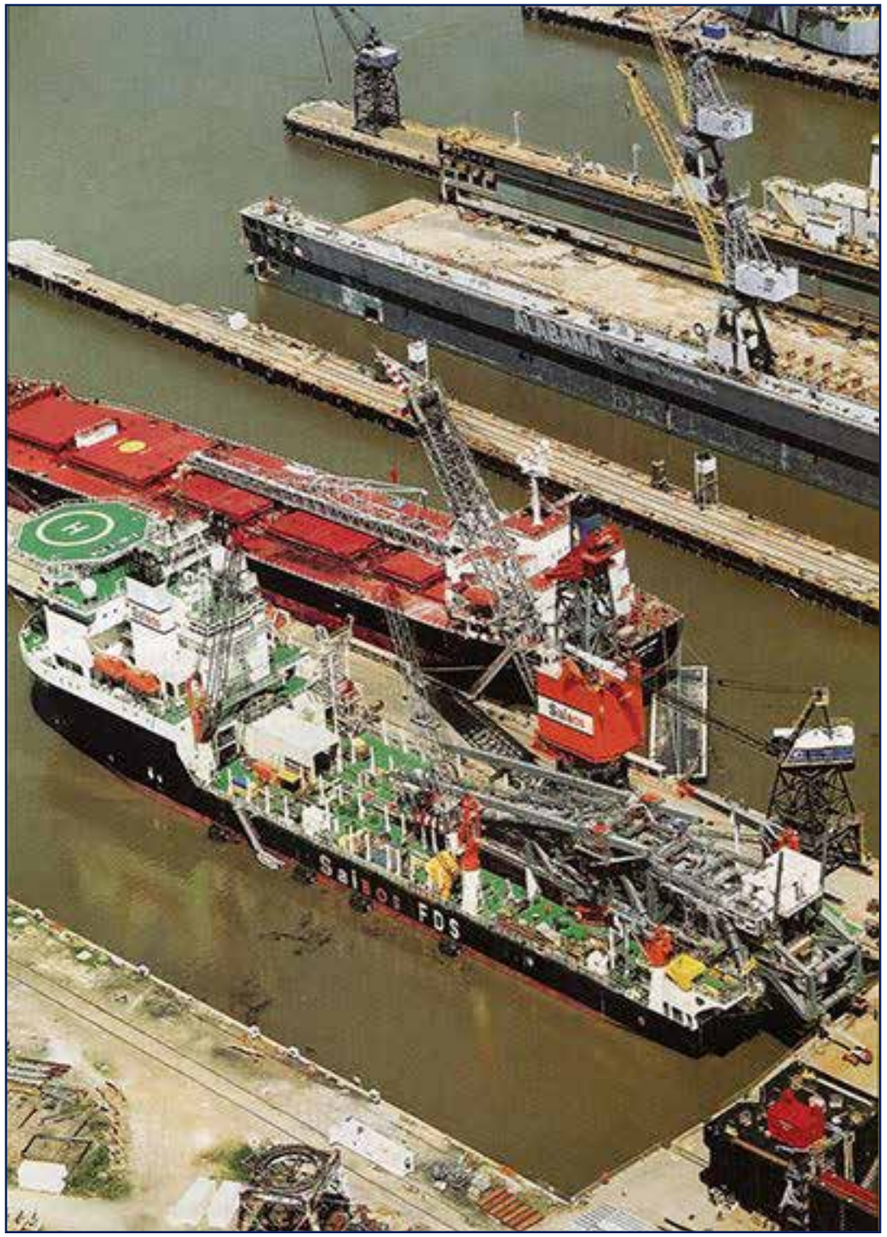
ITM Challenger 1987

This was the world's largest ship-shaped crane.
Well designed witha 4-tank heel and roll suppression systems, the operator of the Challenger came into question when ITM went into receivership. The 4000t jib was installed at NESL's Middlesbrough yard.

SAIBOS FSDS 2001

The field development ship sailed to the Atlantic Shipyard at Mobile, Alabama for the installation of a J-lay tower. It went from then to work on Canyon Express for TotalFinaElf.

The stern mounted tower from AmClyde permits 22in pipe (18 in diameter plus insulation) in water depth sup to 2500m



SE Forties

Most of the equipment is working and ready for load out/offshore hook-up

Frigg TCP2

The Treatment and compression platform. It was built by Norwegian Contractors and the Aker group.

It performed the same treatment process as TCP1 but it housed an additional large compression facility that came into operation in 1981. TCP2 also accommodated the gas treatment on NE Fridge and Odin.

Mr Mac 1985

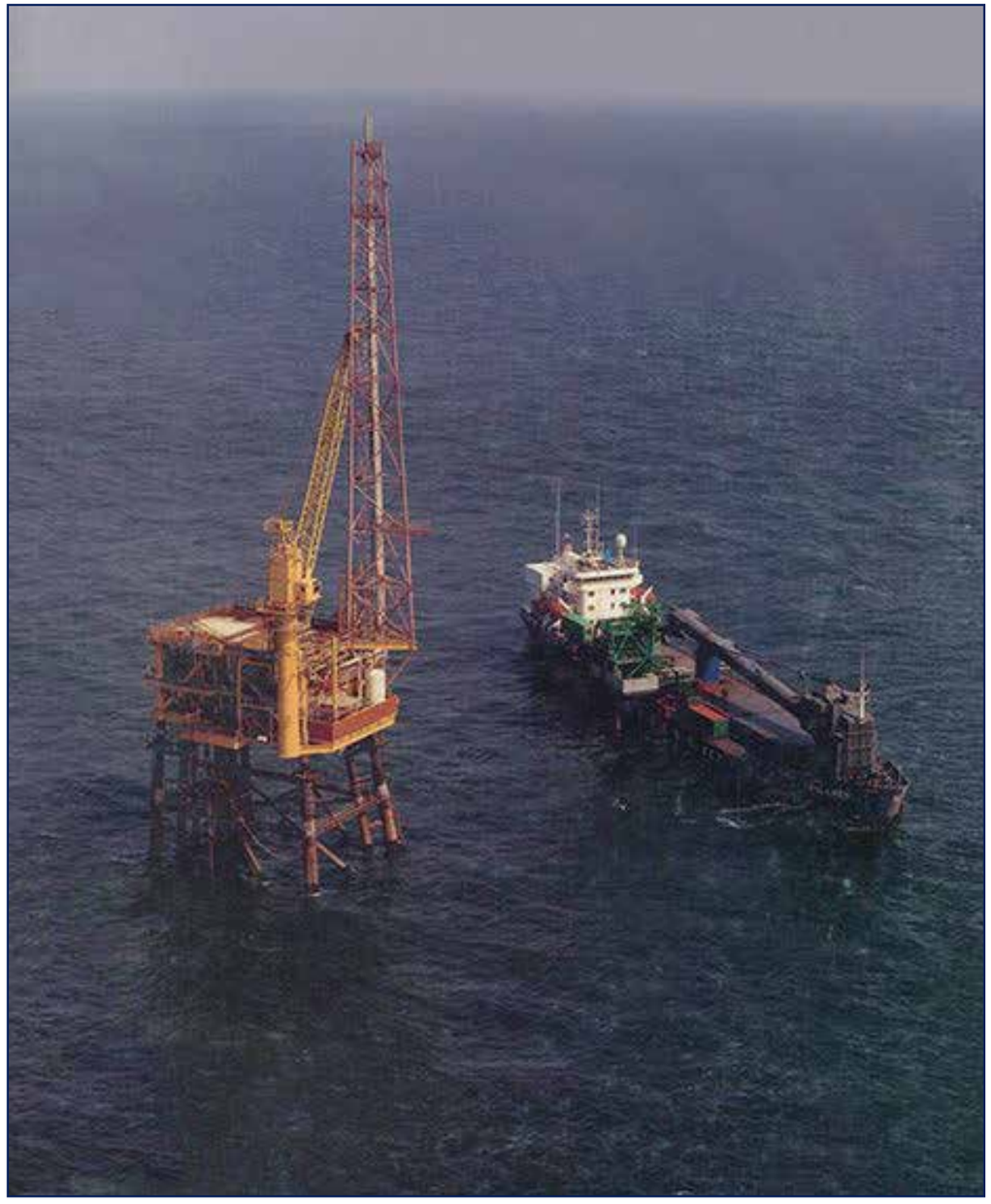
Leg sections of the Transworld Gorilla class jack up Mr Mac being assembled at UIE. This was hailed as Clydebank's largest project since the QE2.
The jack up was designed for drilling in 328ft North Sea waters with 100kt winds and 80ft waves.

Neptune 1996

Oryx's Neptune spar was the worlds first to serve as a production platform. The 11,000t Huss is about to be raised to the vertical. The topsides was later lifted by the DB50.

Arco Thames 1986

I was writing a feature on general dredging in the next issue of UT2, when I saw in the files, this old image of the scour protection being installed for the flow line, pipelines and crossovers. It was carried out by ACZ Marine Contractors' vessels Trollnes, Frans and Rocky Giant.

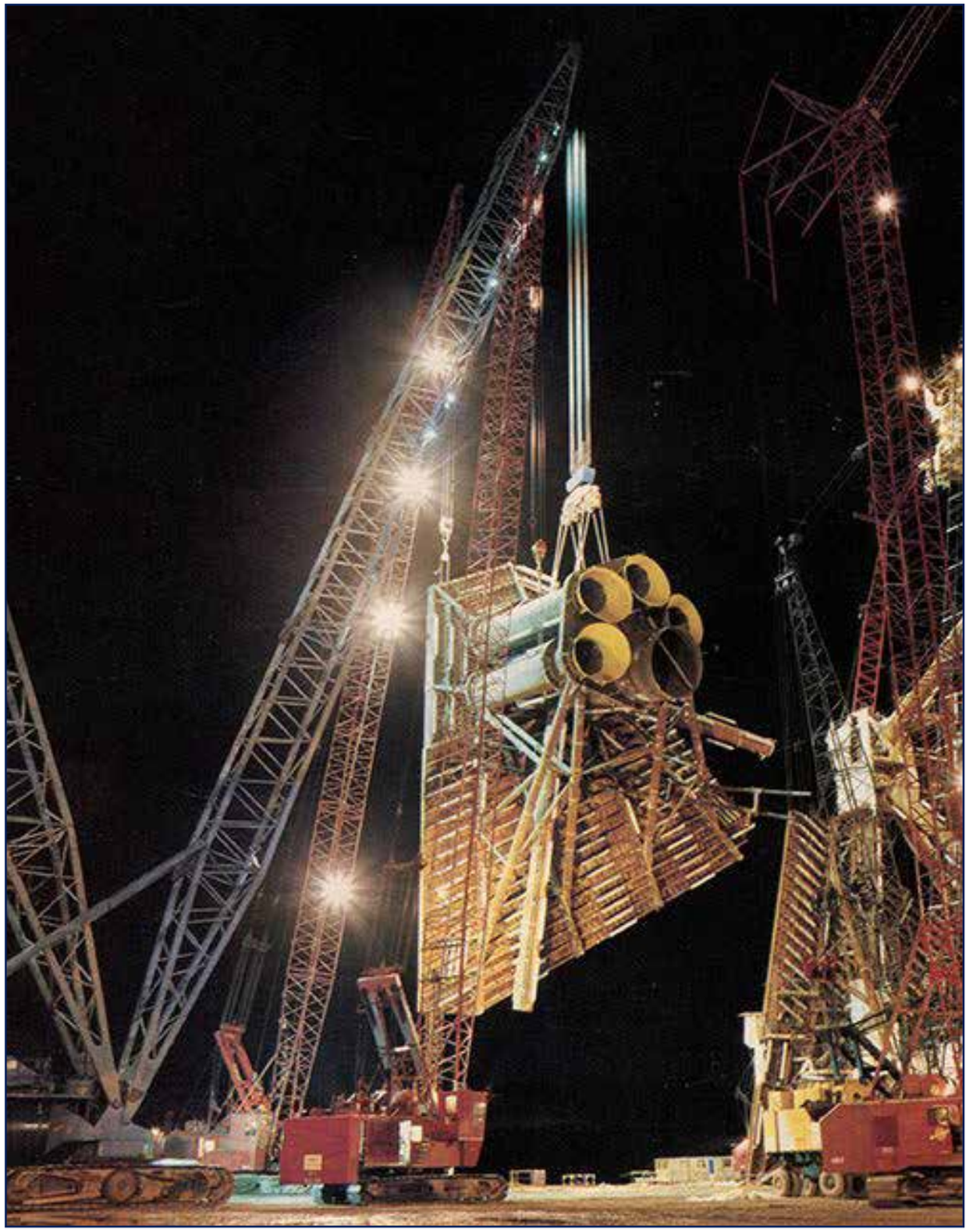


TLWP 1989

The mooring tensions are being pulled into Conoco's Jolliet TLWP.At the time, Jolliet was the worlds deepest production platform in 536m of water.

Alba 1993

Pile guides on the Alba jacket at Highlands Fabricators.



V-fields 1987

A jack up being towed to drill on Conoco's V-fields.

Despite the development being slightly set back by the demise of Howard Doris and installation damage to an accommodation jacket, the Southern gas basin was particularly busy for Conoco. BP's Cleeton and Ravenspurn, and Phillips Audrey platform were under construction along with announcement of new platforms for Amoco's Leman and Inde

HOOVER DIANA

The upgraded S7000 carrying out installation work. Was this really 20 years ago?

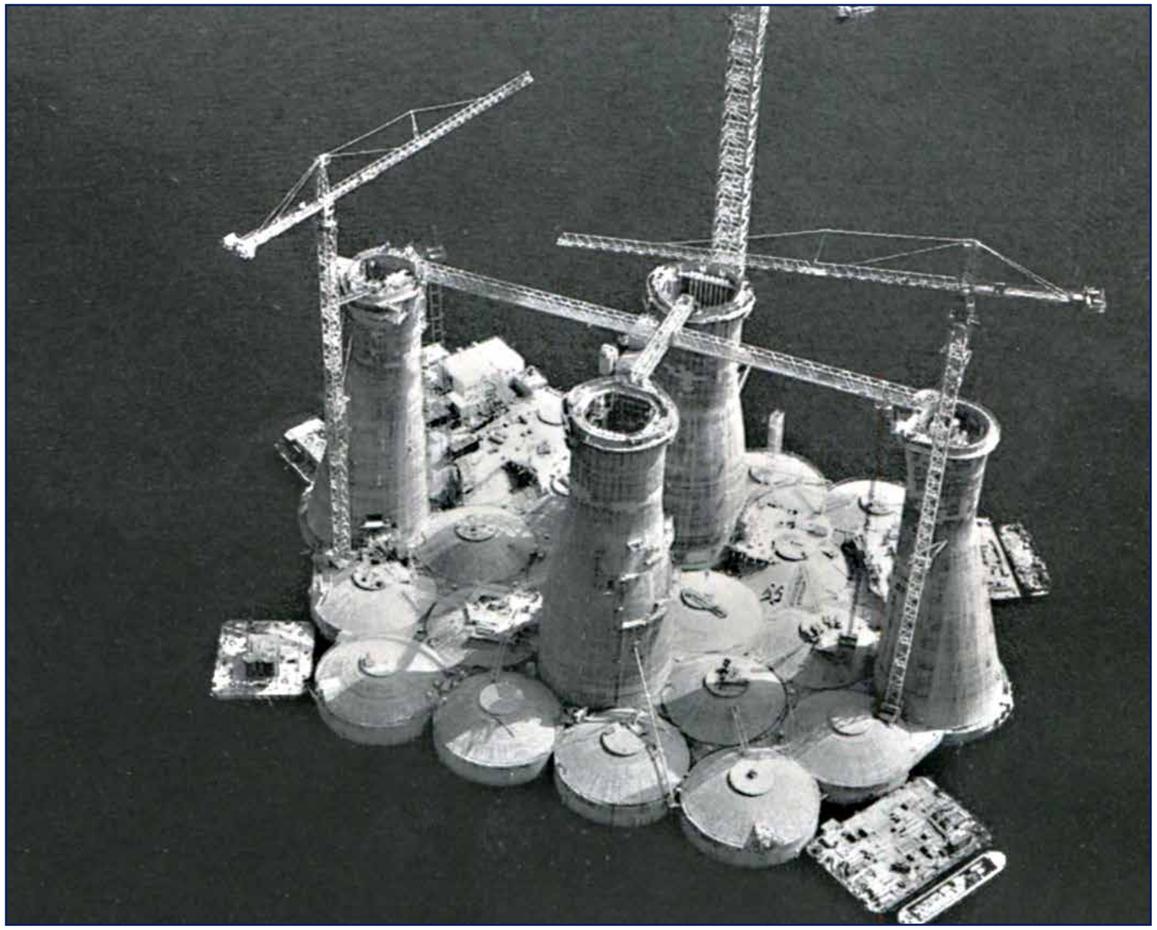
In 2000, the vessel upgraded its DPIII system and installed the world's largest J-Lay tower allowing it to install 4-32in pipe in 3000m of water.

A year later on Hoover Diana, it installed 12 suction piles as well as topsides and modules totalling 18 000t and laid flowlines and catenary risers.

SLEIPNER

Friday Photos Sleipner 1991
A virtually complete GBS prior to ballasting tests. Four towers rising above the base caisson. It contained 220 000t of structural concrete.
I was visiting this a week before the photo was taken.

What happened next?



https://www-users.cse.umn.edu/~arnold/disasters/sleipner.html

PENROD 72

Preparing for work on the pioneering Green Canyon 29 development. The floater had seen service on the Bonito field in Brazil. The Placid design was based on the worlds deepest commercial subsea production system. The flow line pull in system was built for the Shell UMC.

Santa Fe 135

Sunbathing in Cromarty Firth, 1986. It was built in 1983 in the Daewoo shipyard, South Korea. Better known as the GSF135. Surely disappeared long ago.

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