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MCDERMOTT FILES FOR BANKRUPTCY

McDermott will file for chapter 11 after having reached an agreement with more than two-thirds of its creditors in a restructuring programme to eliminate more than $4.6 billion in debt.

The restructuring will include selling Lummus Technology to a joint partnership of private-equity firms Chatterjee Group and Rhône Group for $2.73 billion.

The company said it would have the option to retain or buy a 10% equity ownership interest in the joint partnership.

COLLABORATIONS

Mammoet has acquired heavy lifting and transport specialists Ale. Both companies are active in the petrochemical industry, renewable energy, power generation, civil construction and the offshore industry.

Impact Subsea has signed a distribution agreement with China-based Deep TIDE Technology, a company focused on the provision of cutting-edge technology to the marine scientific research and engineering sectors.

NOAA’s Office of Ocean Exploration and Research and Ocean Infinity have announced a new agreement to develop deep-water autonomous technologies that can gather ultra-high-resolution ocean information.

The four-year Cooperative Research and Development Agreement (CRADA) will also focus on advancing telepresence or the transmission of ocean video and information in real-time to public and academic audiences as well as new data collection and processing methods to increase the value and relevance of deep-ocean data.

CORAL SUL

Eni has launched the Coral Sul Floating Liquefied Natural Gas (FLNG) treatment and liquefaction facility’s hull. The FLNG is part of the Coral South project that will put in production 450 billion m³ of gas of the Coral reservoir offshore Mozambique.

The project exceeds 60% completion and is in line with production start-up by 2022.

Coral South is Mozambique’s first LNG project. The hull is 432m long, 66m wide and weighs approximately 140,000t. Its eight-storey accommodation module, which will house up to 350 people, is also ready to be lifted and integrated with the hull system.

Fabrication activities are also well underway for the 12 gas treatment and LNG modules, with all main equipment ready for integration.

With a gas liquefaction capacity of 3.4 million tons per year (MTPA), the Coral Sul FLNG will be the first FLNG ever deployed in deep waters, at water depth of approximately 2000m, and the first purpose-build FLNG in Africa.

TATA PIPE

Tata Steel has secured three separate contracts with TechnipFMC for work in the UK North Sea, further building on the relationship between the two companies.

The scope of work includes the provision of High Frequency Induction (HFI) line pipe for carrier application and for both spool and pipe-in-pipe systems. The HFI line pipe will be manufactured in Tata Steel’s Hartlepool 20in pipe mill, and will be installed by TechnipFMC.

The three different projects span from the Northern North Sea to the Central North Sea. Two of the three will see Tata Steel provide more than 16km of 10in carrier pipes, with three layer polypropylene coating for anti-corrosion and mechanical protection, including weld on pads to allow fitting of sacrificial bracelet anodes.

The third project requires several kilometres of 14in carrier pipes and 10in spool pipes.

CAISTER

Last September, Chrysaor completed the acquisition of ConocoPhillips’ UK oil and gas business. The company is currently making progress through a ten-year decommissioning project covering these facilities.

This project began with well plugging and abandonment activities in 2014.

The latest part of this project is the submission of a plan for the decommissioning of the Caister CM platform.

This has a combined topsides and jacket weight of 2559t, standing in 41m of water. Caister CM is tied back to the Murdoch Complex via a 16in gas line and a 3.5in MeOH line to the Murdoch MD platform, 11 km to the north west.

In addition to the platform, the project will include a subsea structure (template/two riser sections and eight platform wells.

SUBSEA WATCHER

Those of us that used to enjoy reading Steve Sesamow deliberate on events in Subsea Engineering News, can now read his informative and entertaining blog.

You can follow him on Twitter, Linkedin or Instagram, or see the latest issue on www.kelttd.co.uk

Other decommissioning programmes will include the Caister CM pipelines the Boulton (BM) Boulton (HM), Kelvin, Munro, Katy, Watt, Murhood, Hawkley and McKaalm installations and associated pipelines (all to be submitted for approval in 2020).

The Murhood MA, MC and MD Complex installations and associated pipelines will also be submitted this year.
BP has announced early production from the Alligin field in the west of Shetland region.

Alligin forms part of the Greater Schiehallion Area and has been developed as a two-well subsea tieback into the existing Schiehallion and Loyal subsea infrastructure and the Glen Lyon floating, production, storage, offload (FPSO) vessel.

It is a 20 million barrels of oil equivalent field, which was originally forecast to produce 12,000 barrels gross of oil equivalent a day at peak.

The project’s performance has been better than expected, however, reaching 15,000 barrels gross of oil equivalent a day at peak since start-up in late December.

The development has included new subsea infrastructure, consisting of gas lift and water injection pipeline systems, and a new controls umbilical.

Alligin is part of BP’s advantaged oil strategy, a development with a shorter project cycle time with oil that is economic to produce and low risk to bring to market. Subsea tiebacks like this complement our major start-ups and help underpin our growing portfolio west of Shetland.

The Quad 204 project – a redevelopment of the Schiehallion and Loyal fields west of Shetland – delivered first oil in May 2017. The project included the construction and installation of the Glen Lyon floating, production, storage and offloading (FPSO) vessel, a major upgrade and replacement of subsea facilities and an extensive drilling programme.

Seagull, another subsea tieback, will be developed through BP’s ETAP (Eastern Trough Area Project) hub in the central North Sea and is expected to initially produce around 50,000 barrels of oil equivalent per day. First oil from the project is expected in 2021.

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The Echoscope® is the world’s only sonar capable of producing 4D volumetric images. These images represent a true volume of spatial data collected and processed at the same instant. Coda Octopus’ phenomenal leap from 4D to 5D and 6D capability sees a seismic shift to each ping generated, now returning over 1.6 million data values instead of the previous 16,384. Our new 5D and 6D sonars allow customers to do multiple things with these sequential 4D volumetric images including full-time series data with the parallel processing of each ping. Alongside this new technology comes the ability to capture raw data and perform post acquisition beamforming of data.

**5D** Images are 4D images represented with multiple slices of depth data; similar to a medical CT Scan. The 5D images contain more depth information, greater image density and image clarity of each target and sequential 5D images over time show higher resolution moving targets.

**6D** New EchoscopePipe (Parallel Intelligent Processing Engine) allows multiple parallel 5D images to be generated with different imaging and sonar parameters. This allows different processing to be performed on the RAW sonar data in parallel and extract more specific results without compromise.

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Coda Octopus Launches First Echoscope® 5D & 6D Sonar
Ocean Infinity has announced the launch of the marine technology and data company, Armada.

The pioneering AUV operator had previously built its operation on controlling multiple AUVs from a single mother vessel to survey the ocean seabed. The new company will broadly seek to emulate this by controlling multiple autonomous surface vehicles from a single location. The company will use up to fifteen bespoke-designed unmanned surface vessels to perform a multiplicity of offshore data acquisition and intervention operations. These robot ships will be capable of remotely deploying a wide range of the latest sensors as well as AUVs and ROVs for visual and acoustic data acquisition.

Armada’s fleet requires neither people on board nor a host vessel nearby. Instead they will be controlled and operated by experienced mariners via satellite communications from state of the art onshore facilities in both Austin (Texas) and Southampton (England).

With zero people required at sea Armada operations are set to be the safest the industry has seen. The fleet approach produces up to 90% less CO2 than other conventional survey vessels, also making it the most environmentally sustainable company in the industry. Armada’s fleet is currently under construction and is expected to be deployable by the end of 2020.
SONARDYNE ACQUIRES UNDERWATER IMAGING AND INSPECTION SPECIALIST 2G ROBOTICS

Marine technology provider Sonardyne International has acquired underwater imaging and inspection specialist 2G Robotics.

2G Robotics will join the Sonardyne group of companies, while remaining an independent business and brand, continuing to serve its customer base in unmanned and autonomous underwater vehicles (AUVs) and remotely operated vehicles (ROVs). 2G Robotics’ founder Jason Gillham will continue to lead the company as Chief Executive Officer.

The acquisition of 2G Robotics is the latest step in Sonardyne’s long-term growth strategy and follows the acquisition of Danish survey software company EIVA last year.

John Ramsden, Sonardyne’s managing director, says, “2G Robotics has a dedicated research team and well-developed product and service lines, with scope for growth. As an independent company, their offering is complementary to the growing range of products and services our wider group of companies provides to the marine sector.”

Jason Gillham adds, “Sonardyne is a great fit for us, with their existing global reach. We look forward to growing with their support and working with our new partners.”

2G Robotics is based in Ontario, Canada. The company was founded in 2007, and will continue to operate from its current location.

The terms of the acquisition, which was for the business and assets of 2G Robotics Inc., were not disclosed.
Production has started from the Liza Destiny floating production, storage and offloading (FPSO) vessel moored in the Stabroek Block, 190km offshore Guyana, ahead of schedule and less than five years after the first discovery of hydrocarbons. The first phase is expected to reach full capacity of 120,000 b/d in coming months, and the first cargo is set to be sold imminently.

The Liza Phase 1 development features the Liza Destiny being fed from four subsea drill centres supporting 17 wells.

A second FPSO, the Liza Unity, with a capacity to produce up to 220,000 barrels of oil per day, is under construction to support the Liza Phase 2 development. The Liza Unity design is based on SBM Offshore’s Fast4Ward programme, featuring a multi-purpose hull combined with several standardised topsides modules.

The FPSO also has an associated gas treatment capacity of 400 million ft³/day and water injection capacity of 250,000 b/d. It will be spread moored in water depth of about 1600m and will be able to store around 2 million barrels of crude oil.
Aker BP will proceed with Phase 2 of the Ærfugl project in the Norwegian Sea, three years ahead of the original plan. The Ærfugl field, which produces via Skarv FPSO, has a break-even price of around US$15 per barrel.

The goal is to start production from the first Phase 2 well as early as in first half of this year, which means that production start-up for phase 2 will come before the start-up of Ærfugl phase 1.

The subsea project will be in two phases, both tied into the existing Skarv FPSO. Phase 1, which will develop the southern part of the Ærfugl field, consists of three new wells while Phase 2 consists of an additional three wells in the northern part of the field. The original plan for start-up of Phase 2 was 2023, due to capacity restrictions for processing gas on the Skarv FPSO.

The Ærfugl reservoir is mainly a gas reservoir that extends over 60 km and is 2-3 km wide. The project holds a total of around 300 million barrels of oil equivalent. Total investment costs for the Ærfugl project are around NOK 8 billion.

The operator awarded Aker Solutions the contract to deliver the Ærfugl subsea production system. This will include wellheads, vertical subsea trees, satellite structures, control systems, a tie-in module and about 30km of umbilicals.
Aker BP and Pandion Energy has announced first oil was from Valhall Flank West in the North Sea.

Valhall Flank West is a wellhead platform that will normally be unmanned. It receives power from shore via the Valhall field centre.

The platform has been delivered with the world’s first electric lifeboat monitored from the Valhall field centre. Both the crane and seawater pump are electric and receive power from the field centre. All of this contributes to reduce maintenance.

Alliances have contributed to the project in addition to the wellhead platform alliance. These are Subsea alliance between Aker BP, Subsea 7 and Aker Solutions, the Modification alliance between Aker BP and Aker Solutions and the Alliance for jack-up rigs between Aker BP, Maersk Drilling and Halliburton.
Equinor has awarded Aker Solutions a front-end engineering and design contract (FEED) for topside modifications to accommodate power from shore at the Troll B and C platforms.

Using electrical power from shore will require large and complex modification work at the Troll B and C platforms.

“The main driver in the electrification project is to reduce CO2 and NOx emissions from the Troll B and Troll C platforms by using electrical power from Kollsnes and replacing the existing gas turbine driven electricity generators and gas compressors with electrical equipment,” says Geir Tungesvik, senior vice president for project development in Equinor.

“The selected concept for the electrification is full electrification of Troll C and partial electrification of Troll B with a possibility to fully electrify Troll B later,” says Tungesvik.

The CO2 reductions is expected to be 450 000 t/year after the project is completed.

The electrical system and power cable from shore will be designed to accommodate full electrification for Troll B and Troll C.

The Troll partners together with Aker Solutions will use the next year to plan the work in detail to ensure it can be executed safely without harm to personnel, environment or installations.

Troll A was the first platform on the Norwegian continental shelf to utilize power from shore, already from initial startup back in 1996.
Jeff Desjardins writes:

Policy Scenarios

The IEA bases its projections based on two policy scenarios:

1) The Stated Policies Scenario

This scenario is intended to reflect the impact of existing public policy frameworks, including announced policy intentions.

2) The Sustainable Development Scenario

This scenario outlines a major transformation of the global energy system, aligned with achieving the energy-related components of the United Nations’ Sustainable Development Goals (SDGs), such as reducing carbon emissions. Neither scenario is technically a forecast; the IEA sees both scenarios as being possible.

However, this data can still provide a useful starting point for decision makers and investors looking to read the tea leaves. Will countries stick to their current plans, or will those plans be scrapped in the name of bolder, sustainable initiatives?

Scenario 1: Stated Policies

In the Stated Policies Scenario, oil will be the largest energy source in 2040, making up about 28% of the global energy mix — and natural gas will be right behind it, for 25% of supply. Coal consumption, which is decreasing in Western markets, will stay consistent with 2018 levels thanks to growing demand in Asia.

Scenario 2: Sustainable Development

The IEA’s Sustainable Development scenario is very different from the status quo, as shown here:

The contrast between the energy needed in the Stated Policies (STEPS) and Sustainable Development (SDS) projections is stark, going from a 2,500 Mtoe increase to a 800 Mtoe decrease in total consumption, driven by residential and transportation sectors.

Under this scenario, renewable energy use for electricity consumption (incl. hydro) would need to increase by 8,000 TWh more, with ultimately more than half of it in Asia.

Under this transformational and ambitious scenario, fossil fuel use would plummet. Coal consumption would drop by roughly 60%, oil consumption by 30%, and the role of natural gas in the energy mix would remain stagnant.

Two Scenarios, One Path

Both scenarios are a possibility, but in reality we will likely find ourselves somewhere in between the two extremes.

This makes these two baselines a helpful place to start for both investors and decision makers. Depending on how you think governments, corporations, and organizations will act, you can then adjust the projections accordingly.
Kongsberg Maritime AS has signed an agreement to sell its underwater technology company Hydroid for USD 350 million to Huntington Ingalls Industries (HII), the largest supplier of vessels to the US Navy.

The agreement provides that, as of closing, the parties will enter into a strategic alliance agreement concerning underwater technology and maritime solutions.

Kongsberg Maritime acquired Hydroid for USD 80 million in 2007 and is now selling this US subsidiary for USD 350 million on a debt-free and cash-free basis and as adjusted off an agreed upon working capital.

"Kongsberg Maritime has driven technology development and created considerable value during the 12 years it has owned Hydroid, and we are capitalizing on this now. We are proud to have positioned Hydroid as a leading supplier of small and medium-sized autonomous underwater vessels in the market.

We now look forward to work together with HII on new, maritime solutions and, at the same time, strengthening our world-leading underwater environment in Horten," says Geir Håøy, President and CEO of the KONGSBERG Group.

"Kongsberg Maritime will continue to aggressively develop technologies including that related to our underwater expertise. We are the global leader in civilian-sector maritime technology, while HII is the world’s largest supplier of navy vessels. This alliance will allow a wider range of our maritime solutions for both naval and civilian usage in the United States and the rest of the world," says Egil Haugsdal, President of Kongsberg Maritime.
The Echoscope was the world’s first sonar system that allowed moving objects in the water column to be viewed in real time, making it the first truly four-dimensional sonar. The Echoscope’s video quality imaging has continued to lead the field for over two decades.

Coda Octopus are now achieving another world first—a 4D system to market the world’s first 5D and 6D Sonars.

The original Echoscope system, first released in 2000, revolutionised sonar by simultaneously beamforming a grid of over 16,000 beams, allowing a full depth image to be generated in under 1/10th of a second.

This rapid processing allowed the system to deliver the Echoscope’s trademark real-time output, generating video quality views of moving objects in the water column.

The ability to present these maps in real time means that the existing Echoscope is already a 4D system. However, it is this fourth dimension that continues to differentiate the Echoscope from its competitors.

Coda Octopus have continued to push the technological boundaries, and are releasing a series of new 5D and 6D sonars that are set to dramatically extend the capability of the Echoscope.

The biggest initial advantage is that the system generates much fuller, and more detailed images when the points are rendered in, as the beamformer can potentially see around smaller objects in the near-field.

The system also returns multiple range points for beams striking flat surfaces at high incidence angles, meaning that the seafloor is much better resolved in the far field of the volume image.

The state-of-the-art processor has also allowed the sensitivity of the beamformer to be increased, as its floating-point operation allows for a much greater dynamic range in the data.

This is a significant advantage in many acoustically challenging applications and environments. The combination of having multiple range points on each beam and the increase in sensitivity means that the far field can be much more clearly and densely resolved in the output images.

The major increase in the quality and volume of data generated by the 5D system means that new types of data processing are possible, and new useful information can be extracted. The challenge with large datasets, however, is that they can be slow and cumbersome to analyse. To combat this Coda Octopus have developed PIPE: the Parallel Information Processing Engine. This tool adopts novel parallel processing methods to perform multiple, simultaneous analyses of the large 5D dataset, delivering a range of useful outputs in real time. This ability to produce multiple, concurrent 5D datasets takes the new system to its sixth data dimension (6D).

The development of PIPE is not just restricted to the data processing side of the system, with hardware updates also being implemented to maximise the functionality of this new tool.

Different 5D data outputs might require different signals to be transmitted from the sonar, or might need different signal amplification and filtering operations to be applied. For example, one task might need high-resolution and a narrow field of view, while another could require a low-frequency, long range signal with a wide field of view.

PIPE allows these different 5D datasets to be processed concurrently by switching between many different sets of sonar operating parameters, with this switching occurring from ping to ping at 20Hz. It is possible, for example, to generate four completely different 5D sonar images separated by less than 0.05 sec, with the composite, 6D image being fully updated 5 times per second.

To understand the full potential of this new technology, consider a pipe inspection operation being conducted with an ROV. The ROV pilot requires a longer range, forward looking view to allow both navigation and obstacle avoidance.

There could then be an engineer inspecting the condition of the pipe itself, who requires a high resolution, downward looking image to be able to detect damage or corrosion on the pipe.

The 6D PIPE system is capable of generating both these images simultaneously in real time, meaning that the engineers are able to make instant decisions, such as whether to slow down to inspect a particular section of pipe in more detail.

Since the raw data from the survey is also being stored, it is possible to go back through the data in post-processing and apply different image processing methods to highlight different information.

While this does not provide quite the same flexibility as the real-time 6D processing, since the transmit and receive parameters are fixed—there is still significant value in having access to the measured raw data rather than a processed image that has already removed a large proportion of the original information.

In the case study presented above, all the different presentations of the data were being viewed by human analysts, but this doesn’t have to be the case: the new 5D/6D sonar data makes the latest generation Echoscope very well suited to deployment on a fully autonomous vehicle.

As an example, the system could be operated to simultaneously provide a far-field obstacle avoidance view, and a high-resolution seabed view for detailed autonomous navigation. The raw data could then be stored for subsequent human post-processing and analysis once the AUV is returned to the surface.

The Echoscope 5D/6D system is the sonar for the information age. It uses the very latest hardware and software to open up a range of new possibilities for visualising and analysing the underwater environment.

The 5D/6D system is also ideally placed to satisfy the future needs of the growing fleet of autonomous vessels in the world’s oceans, lakes and rivers. It therefore looks likely that the new generation of Coda Octopus 5D/6D Echoscopes will continue to lead the field, as their 4D predecessors have done before them.

5D & 6D SONAR

By Dr. Angus McFadzean Dr. Charlie Pearson

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The convoluted pathway of oil and gas, from subsea wellhead through to market, invariably involves its passage through a network of subsea pipes of varying sizes and dimensions.

While all lines strongly adhere to stringent design guidelines and are engineered not to leak, they may become subject to external conditions that could put the pipe under unforeseen stress.

This might, for example, include unplanned deburial, unconstrained thermal expansion or being subject to a catastrophic event such as a dropped object rupturing the pipe or a trawlboard snagging a subsea structure. Seabed instability may result in the pipe being unsupported, bent and put under fatigue, possibly leading to critical fracture or buckling.

As production techniques have become more efficient, existing subsea infrastructure has been asked to work beyond its original design life. Ageing equipment means more areas of potential leakage.

Statistics show that critical components such as connectors, flanges, seals and welds on valves and small-bore wellhead and template piping, are all common sources of leaks. Gradual leaks may also occur through microcracks caused by corrosion and wall thinning. These are far more difficult to recognise but can potentially represent a significant longer-term problem and demand enhanced inspection programmes.

Any early warning of small leaks can allow operators to take remedial actions, potentially saving money and reputation.

Monitoring is particularly important as the industry looks to work in new unexplored frontiers and depths, in a market increasingly sensitive to environmental issues and intolerant of introducing polluting materials into the marine environment.

Most subsea equipment such as valve manifolds, control modules and blow out preventers are actuated using hydraulic fluid delivered in tubes. Because of tightening legislation, these hydraulic fluids are now often water-based and more environmentally friendly, however, leakage within the system can result in falling internal circuit pressures, causing the equipment to shut down by failing safe. Once shut down, the system may be difficult to re-energise.

To detect leaks, the subsea industry has developed a wide range of complementary subsea detection systems. One such is by monitoring the parameters of the internal product.

INTERNAL DETECTION
Internal leak detection systems are based on installing sensors inside the pipe, particularly at interface locations. These look for changes in temperature, pressure, flow rate, density and sonic velocity etc. This information is then fed into the development’s supervisory control and data acquisition (SCADA) computers that form part of the field management system.

Unfortunately, during normal pipeline operations, variations in pressure and other key parameters occur every time the line is started, production moves into different flow regimes, part of the system is shut-in or even if a valve
Oil Release after Jumper Failure

Back in 2017, a fractured subsea wellhead jumper connecting the Mississippi Canyon 209 wellhead with a subsea manifold, released around 16000bbl of oil into the Gulf of Mexico. The Bureau of Safety and Environmental Enforcement (BSEE) recently published recommendations for improving subsea leak prevention and detection.

LLOG Exploration had previously shut-in the line to its Delta House semisubmersible in preparation for evacuation ahead of Hurricane Nate. When the personnel returned and operations began to ramp up, flowline pressure measurements indicated integrity issues. Subsequent ROV inspection confirmed that a jumper was found to be cracked at the base below the multiphase flow meter.

During this ROV inspection, it appeared that the pipeline end termination (PLET) connected to the wellhead, very close to the fracture, had moved from its installed position. This was possibly caused by thermal walking in the pipeline (where hot oil flowing from the reservoir heats the pipe’s metal which in turn expands). Any expansion could have imparted a force on PLET which would, in turn, exert excess stress on the well jumper.

The piping section was constructed of API 5L Grade X65 steel. Visual observations revealed evidence of corrosion on the inside surface of the piping. The pipe was later found to suffer a wall thickness loss of nearly 50% relative to what would be nominal thickness of the steel.

The fracture area had the highest thickness loss. Analysis concluded that carbonic acid corrosion was the primary mechanism responsible for the metal thickness loss. In the findings, the BSEE panel made a number of recommendations.

**Flowline construction**

The findings suggested the operator
- Evaluate designs of applicable components for their tolerance under increased loads due to thermal expansion or other movement.
- Evaluate the use and placement of sleepers or other components that mitigate the buckling of pipelines.
- Evaluate the construction of flowline components to ensure that materials have adequate corrosion mitigation properties.
- Evaluate the use of different surveying methods such as Light Detection and Ranging (LIDAR) to confirm that pipeline systems remain within their design tolerances throughout their service life.

Leak detection:
- Consider revisions to API RP 17V that include a section on subsea leak detection best practices.
- Consider improving subsea leak detection methods by employing conditional rate of change, mass in mass out, or other advanced monitoring technologies. These technologies should alarm, and where possible, initiate executive actions.
- Control room operators should receive training that increases the awareness of the possibility of flowline integrity loss to a higher consideration when undergoing startup operations.
- Due to its complex nature, pressure trend analysis for leak detection training should be evaluated and where possible, enhanced.

Neidermeyer Subsea Field Overview (LLOG)

Crack downstream of MPPM flange Image BSEE

Pitting on the inside of the jumper Image: BSEE
LEAK DETECTION

Is closed. This has prompted a number of procedures to be adopted for improved detection.

Mass balance (MB), for example, looks for pressure drop between two or more sensors within a system. This is difficult in a complex process that includes variable quantities of gas and liquid, temperature changes within various parts of the system and natural pressure drops within the pipework. The number and accuracy of the sensors available also affect the output.

Other measures include pressure/flow monitoring, pressure balance (PB), acoustic pressure wave analysis, real-time transient monitoring (RTTM), extended RTTM, bubble emission and pressure safety low (PSL) switches. In pipe-in-pipe arrangements, annulus monitoring is also used.

The general term for analysing the flow throughput and volume (or absence) by measurement is ‘computational pipeline monitoring’. These internal analytics are accurate enough to detect large leaks (greater than 1% of nominal flow rate) and can respond within 30secs, however, they are less sensitive to smaller leaks. These could take nearer 2hrs to detect.

EXTERNAL DETECTION

Leak monitoring, especially attempting to pick up smaller leaks, can be improved by employing external leak detection systems. These are based on a range of technologies and operating principles, each with their own advantages and disadvantages.

As there is no single perfect solution, facility operators may benefit from combining a number of complementary sensing methods together for optimum coverage.

With equipment such as subsea trees, manifolds, subsea control modules, hydraulic systems and multiphase pumps statistically ranking high as the areas most likely location for leakage, it is common to permanently install detection systems nearby. These devices are designed to measure at a specific location over a long duration and are termed ‘Point Systems’.

Oil (from an accidental leak or natural seep) may break surface many miles from the original release point, due largely to a combination of water depth and local currents. Gas outflows at the seafloor may also never surface in the vicinity because the bubbles may be absorbed into the seawater as they rise. It is, therefore, not only necessary to detect presence of hydrocarbons, but also find specifically from where they emanate.

This invites the use of more mobile detection systems such as ROVs, AUVs, towed systems, arrays suspended from support vessels on a winch or handheld equipment carried by a diver. The use of these portable systems significantly increase their geographic range of operation.

There are a number of tools available for external leak detection.

OPTICAL

The most immediate indication of leakage may be simple visual signs such as the presence of bubbles, water clouding or oil appearing at the surface.

Satellite-based infrared cameras or radar can detect the presence of oil slicks on water. A good way to monitor specifically from where the leak is happening, however, is to employ fixed or mobile underwater video.

Optical cameras require a clear line of sight and are, therefore, particularly sensitive to turbidity from water movement stirring up silt.

Depending on their application, underwater video cameras are useful at around 1m but this can be extended to nearer 5m with the addition of powerful light sources. Images also benefit from contrast in colour or luminance between the leak and the background.

CAPACITANCE

Since the first capacitance-based hydrocarbon detection systems began to appear in 1995, this has become a mature proven technology. The concept is based on a pair of concentric, insulated capacitor plates.

Seawater has a characteristic dielectric constant. When hydrocarbons come into contact between the plates instead of the clean seawater, the sensor recognises this change as a capacitance measurement.

In order to work effectively, the sensor must come into full contact with the leaking oil and this will only happen if currents passing over the subsea structure, do not divert the flow away. One successful way to prevent this, is to locate a hydrocarbon collector over the monitored structure such as the roof of a Christmas tree or the production manifold. Because hydrocarbons are lighter than seawater, they will float upwards and be contained in the collector trap.

As the leaking media builds up, it may eventually cover the sensor which immediately sends an alarm to the operator via the Subsea Control Module. The capacitance sensor has proved to be unaffected by long term hydrocarbon exposure to seawater.

One company to have advanced this technology is Benestad, which has patented its own capacitive sensor design featuring glass/ceramic-to-metal sealing technology. This provides a hermetically sealed sensor probe using inorganic materials only.

The cross-bound molecular structure of the glass prevents diffusion of water or gas into the sensor probe and provides high-long-term stability with no re-calibration required for the lifetime of the instrument. The sensors can be used at water depths up to 4000m.

Benestad has installed over 400 units on subsea X-mas trees.

METHANE SNIFFER

It is difficult to detect methane underwater. One such way, however, is by a methane sniffer which warns of the presence of gaseous hydrocarbons ahead of the more obvious physical clues such as the presence of bubbles.

This sniffer consists of a custom-made thin film membrane through which dissolved methane molecules can diffuse into a sensor chamber. The hydrocarbon desorbs together with water vapour, from the water and into the chamber, leaving the liquid water outside. Behind the membrane is a 5mm thick sinter-metal plate with pores between 0.5µm – 25µm. The sinter-metal supports the membrane against the high pressure in deep water.

Because of the micro-pores, the hydrocarbon molecules can penetrate the sinter-metal plate and react with the oxygen on the surface of the tin-oxide layer (surface temperature nearly 380 °C). This reaction releases free electrons in the layer and the conductivity increases in proportion with the hydrocarbon concentration. With a constant current passing...
LEAK DETECTION

through the layer the conductivity is converted to a voltage signal.

Sniffers can detect very small concentrations of dissolved gas in water; its sensitivity is dependent on the distance to the leak and the drift of the leaking medium. One such device is the Sniffit, developed by Neptune Oceanographics and distributed through Seatronics. This was developed specifically to allow, real-time in situ detection and has been successful in Hydrocarbon surveys to depths of over 3000m world-wide.

The sensor can be used as a quick pass for general ‘look see’ surveys or used in detail mode to detect the exact location of a subsurface leak. The Sniffit is easily mounted on a ROV, AUV, towed vehicle, manned submarine, or can be dived held.

**ACOUSTICS**

Acoustic leak detection (ALD) is based on highly sensitive sonar technology. There are two different types – passive systems that listen for external sounds, and active systems that emit a pulse and listen for the echo.

**PASSIVE**

Fluids leaking under pressure may emit high frequency noises at 30Hz – 120Hz. Provided the acoustic pressure waves propagating through the water are strong enough, ultrasound at frequencies can be picked up by hydrophones.

This means that the technique may not be suitable to detect small leaks per se, although detection can be improved by directional hydrophones if these small leaks are 3bar or above. The sound may also be potentially masked by background noise such as that made from the thrusters or manipulators of ROVs working in the area (although these sounds can be blocked out by a high-pass filter). By mounting the sensor at the front of the ROV facing forward, mechanical noise is less due to the sensor’s directionality.

Passive acoustics are very suitable for use as a point sensor: The higher number of sensors, the greater the spatial coverage while by measuring the precise time that the sound arrives at each sensor, it also may be possible to triangulate its origin.

**ACTIVE**

Active systems emit their own sound pulse. As this propagates through the water, it may collide with a bubble of gas or oil droplet, causing the sound to be reflected back. As such, the technique may potentially give a large coverage area while being largely unaffected by turbidity.

This technology may also be unaffected by the chemistry of the leaking medium as long as there is an acoustic impedance contrast compared with water. Oil droplets give a strong backscatter while gas has very high acoustic impedance.

As the gas bubble size changes with water depth, detection performance can be variable, but systems can be generally accurate enough to detect gas leaks of 1bbl/d at a range of 500m and oil live leaks of 10b/d at the same range.

When sonar systems are installed on vehicles, they can be used for wide area leak detection, such as over large reservoirs or along pipeline corridors. One such application was recently carried out using Sonardyne’s Solstice Multi-Array Sonar (MAS). This covers a 200 m wide swath with 0.15° along-track resolution, using just 18W. This low power consumption, wide swath and high data quality makes it suitable for use on low power, long-endurance Autonomous Underwater Vehicles (AUV), where Area Coverage Rate (ACR) and low false detection rates are key.

Solstice uses a back-projection beamforming technique to focus at every single pixel in the image, as well as using knowledge of platform motion and real-time array calibration to produce undistorted geo-stabilised imagery. Such high fidelity data enables the use of carefully designed and tested onboard Computer Aided Detection and Classification (CAD/CAC) and Automatic Target Recognition.

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**SENTRY**

Sonardyne has developed the Sentry IMS (Integrity Monitoring Sonar) point system, capable of monitoring more than one billion cubic feet of seawater, with 360° of coverage. A dual-phase oil leak of 0.1 b/d would detectable at ranges in excess of 500m.

Sentry works by sending a short-duration, high-bandwidth ultrasonic pulse into the water and listening for echoes. Internal software is capable of discriminating between hydrocarbon leaks and targets such as underwater vehicles.

When such a leak is detected, data regarding the leak characteristics and position are shown on a display and can also be exported to other monitoring or control systems via an Ethernet link.

Sentry does not need to be within visual range as would be the case for video inspection using an ROV. It can detect low differential pressure leaks that are silent and which can’t be picked up with passive hydrophones. The sonar has a user-configurable detection radius of up to 1500m (5000ft).

Recently, a major US oil company deployed Sentry onto the seafloor in more than 2000m (6500ft) water depths under a six-month trial to demonstrate its ability to provide real-time subsea asset monitoring. The Sentry sonar head was mounted on a seafloor lander and as part of the trial a simulated, an oil plume in the water was detected within seconds of the simulated leak occurring.

Sentry’s capability covers 100 barrels/day mono-phase oil leaks at distances of up to 740m (2427ft). For mono-phase gas leaks, the system is capable of detecting down to just 1 b/d at 500m (1640 ft) or 100 b/d at 1000m (3280 ft).

A recent battery-powered unit was deployed by major international and independent operators in the US Gulf of Mexico and offshore Papua New Guinea. It has also been used in the UK to detect carbon dioxide leaks from the seafloor as part of an offshore carbon capture and storage (CCS) demonstration project. Uniquely, its Titanium housing and ROV-deployable design also makes Sentry useful for deepwater asset integrity monitoring.

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**TEMPERATURE**

When hot oil escapes into the surrounding seawater, it may locally raise the temperature. Escaping gas, however, causes a cooling due to the Joule Thomson effect.

These can be detected by fast high-precision thermistors. Neptune Oceanographics has developed a differential temperature technique that can detect very small changes in water depths or salinities.

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**BIOLOGICAL**

By measuring their response to ambient pollution, it is possible to use biological organisms as point sensors. The blue mussel, for example, siphons 60 litres/day of water, but the valves (shells) have been shown to close up in varying degrees when exposed to harmful polyaromatic substances. It is also possible to detect changes in the heart rhythm.

One leak detection guide, therefore, involves placing a number of blue mussels on a tray and connecting them with sensors. This tray is then lowered into the water column. Shell movement is registered by electronic monitoring.

Different biological species may be required for different water depths or salinities.

There are two basic parts to this sensor: the biological component and the transducer that converts any physical movement into an electrical signal.

Researchers at Mississippi State University have been looking into using Exoelectrogenic bacteria based that survive on organic matter. These are placed on one anode looking into using Exoelectrogenic bacteria based that generate high voltage spikes. It potentially allows the detection of very small leaks at an early stage.

When organic compounds pass between, the biosensor cell will transfer of electrons, creating a voltage across a cell.

When hot oil escapes into the surrounding seawater, it may locally raise the temperature. Escaping gas, however, causes a cooling due to the Joule Thomson effect.

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**A blue mussel**

**The Sentry**
LEAK DETECTION

(ATR) algorithms to provide high probability of positive detections with low false detection rates.

For leak detection, the ATR algorithms ‘score’ detections for regions of interest and then save small ‘snippets’ of the sonar image data. When the AUV surfaces, these are then sent to shore, via satellite, along with navigation data and any chemical and physical sensor information gathered, depending on the AUV’s payload.

Onshore, an operator can then request the highest scoring images of the leaks, allowing a high confidence of the detection of a leak whilst the survey progresses.

When other sensors are fitted to an AUV, such as physical and chemical instruments, they can also be processed in real-time, along with the Solstice and navigation data, to cross-reference and validate any detected anomalies.

Solstice’s sonar arrays come in a 682mm-long, 95mm deep, 760g (2.11 kg in air) package. The small, lightweight form factor and low power usage means they can both support long endurance AUV operations as well as quick mobilisation onboard smaller man-portable AUVs, such as the Bluefin 9.

Solstice has been used on a number of projects to detect natural methane seeps using patented on-board algorithms. In a methane seep detection project, Solstice was tasked with detecting naturally occurring seeps from the ocean floor offshore California.

In data collected from a Solstice mounted on a Bluefin-AUV, the shadows caused by the active methane plumes and the nearby pipelines are visible. Some of the seeps can also be seen to be emanating from pockmarks.

Solstice has also been used to detect CO2 leaks and simulated oil leaks, using environmentally friendly detection analogues. A test target emitting 15 litres a minute was placed on the seafloor for a trial project in the North Sea. METAS METAS has developed a Wide Area Active Monitoring (WAAM) acoustic monitoring system. It is designed for subsea installation, detecting even small amounts of oil and gas in ranges up to 1000m.

METAS has also developed the Near Area Active Leakage (NAAL) System is used to monitor know areas of leakage in high resolution. The system uses multiple acoustic transducers to accurately measure the leakage rate, frequency and distribution for any change which could indicate an increasing risk of loss of containment.

NEPTUNE OCEANOGRAPHICS

Small leaks generate sounds at frequencies well above the audible range and requiring sophisticated sensors and software to reliably determine the difference between leak generated and ambient ‘noise’. One issue with this method is the sounds caused by the attendant (ROV) and other vessels in the vicinity can mask the sound.
The Neptune Oceanographics acoustic leak detection sensor incorporates a directional hydrophone with a high-pass filter that significantly reduces the effects of non leak generated sounds. The sensors have been tuned to respond in the range of frequencies known to be emitted by pressure leaks through small apertures.

FIBRE OPTIC
Subsea sensors typically require a power source and method of communicating the data back to a control centre, typically hard wire or acoustically.

This is not a problem when monitoring a local subsea installation as it may be possible to tap into the local control facilities, but it can become an issue when monitoring a long pipeline. This prompted the development of a distributed system based on a fibre optic line strapped to the pipe or riser.

Instead of discrete sensors positioned at pre-determined points and connected in some way, this employs the fibre itself to make continuous real-time measurements without any transducers along the optical path. The sensing element is the same fibre type used for communication to the subsea control module (SCM) allowing sensing and communication to be bundled and deployed as one cable.

OPTICAL FIBRE
Optical fibre is made of pure glass (silica) as thin as human hair. It consists of two concentric glass cylinders – the inner core and the outer cladding.

The cladding is made from glass with a lower refractive index to maintain guidance of light within the core. Both parts are encapsulated by a single or multiple layers of coatings for protection and easiness of handling. The typical diameter of an optical fibre is 125 microns that increases to 250 microns if including the thickness of standard acrylate coating.

There are two main types of optical fibres according to communication application standards. These are the singlemode, intended for long haul communications, and multimode for short haul communications. Multimode fibres have a larger core (45 to 50 microns) than singlemode fibres (8-10 microns), allowing more light modes to propagate and greater tolerance to connector alignment, with a disadvantage of higher loss per km.

Multimode fibres are normally usually used for temperature sensing, whilst singlemode fibres are mostly used for distributed acoustic and strain sensing. Fibre optic cables contain many fibres, which can be either a single type or a combination of both single-mode and multimode.

The system works by an interrogator unit sending series of pulses into the fibre, effectively making measurements at all points along the line. When the line picks up a disturbance such as acoustic signals from leaking gas or liquids, temperature rise, or an increase in strain, this changes the signal. This is reflected to the interrogator as backscatter.

This signature of the produced signal can be compared with a data library or model to identify the likely cause of the disturbance, possibly as the sound generated by leaking hydrocarbon (distributed acoustic sensing DAS), or alternatively recording a rise in temperature (distributed temperature sensing DTS). The position of a disturbance is determined by optical time-domain reflectometry (OTDR).

By measuring the time that the time-synchronised pulse is sent out and modified signal is returned, the difference can be accurately converted into the physical distance with good spatial and temporal resolution.

A benefit with fibre optic methods is that there are no blind spots, no power or electronics is required along the length of the cable and it is immune to electrical interference.

One company involved in fibre optic sensing is Silixa, which manufactures an Intelligent Distributed Acoustic Sensor (iDAS). This reproduces the sound faithfully in phase, frequency and amplitude.

This capability is critical for the advanced processing techniques used in many of the applications and is not common many DAS systems on the market currently, these may not offer the linearity, amplitude stability or phase accuracy required in advanced processing.

“A key differentiating feature of Silixa’s iDAS is the ability to perform measurements equally well on both single mode fibre and multi-mode fibre, even over very long distances. This allows Silixa to retro-fit an iDAS to an existing multimode fibre installation, or to utilise DTS multimode cables to perform the full scope of IDAS services,” said Garth Naldrett, Chief Product Officer at Silixa.
LEAK DETECTION

CHEMICAL

One of the most successful methods of finding a subsea oil leak detection is to look for fluorescence. This is a phenomenon in which a material absorbs light at one wavelength and emits it at a longer wavelength.

Crude oil contains Polyaromatic Hydrocarbons (PAHs) which causes them to fluoresce naturally. Alkanes also fluoresce but do so at a lower wavelength outside the visible light spectrum, making them less valuable as indicators of leaked oil. Gasses do not fluoresce at all.

Shining a ‘black light’ (unfiltered ultraviolet light) through the water excites these fluorescent compound molecules to a higher energy level absorbing light between 300nm to 400nm. Once the source is removed, the compounds return to the ground state, giving off light in the visible part of the spectrum at around 450 to 650nm range.

Teledyne Bowtech, for example has developed a Black LED Light for general oil leak detection. With an 85 deg wide angle beam, it has a thermal cut out to protect it from extended accidental operation in air and is fitted with a solid state UV array, with a wavelength of 365nm.

The largest UV detection system is to look for fluorescence. This is a phenomenon in which a material absorbs light at one wavelength and emits it at a longer wavelength.

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Nevertheless, it is a good indication of leakage. To achieve better results, it is possible to use ‘tuned’ tracer dyes such as Roemex RX-9022, Rhodamine, Castrol SFP dye, Schlumberger B275, Champion Fluorodye etc. Fluorescein was once common but it is being slowly phased out as it does not comply with legislation for marine discharge.

Fluorometers tuned to these tracer dyes are capable of measuring concentration levels, allowing the operator to ‘home in’ on the leak source. In some applications, dyes at very low concentrations in the ppm or ppt range can be detected, some, that they are barely visible to the underwater camera.

Teledyne Bowtech has developed the Pioneer-LD, an integrated solution for hydrocarbon leaks. It consists of 6 high-intensity green LEDs for excitation of fluorescent tracer dyes and a highly sensitive, high resolution monochrome camera fitted with a filter to enable detection of the fluorescing dye. The miniature, high specification 1/5in sensor provides 720 TVL, high resolution and excellent low light level sensitivity. The camera is enclosed within a Grade 5 Titanium housing, rated to 4000m operating depth. The camera is fitted with a fixed focus wide angle lens, giving a 57deg diagonal angle of view in water, through a sapphire window which is extremely scratch resistant and 99.8% optically pure. The camera features built-in reverse polarity protection.

OceanTools has developed high intensity Dyelighter lights that emit light at a specific wavelength to cause maximum molecular agitation of a dye. This allows the fluorescing dye to be detected its Dye Detection Cameras. Its DyeTection systems is similar in principle is similar but the Dye Detection system uses very advanced photo-multipiers that can detect incredibly small amounts of dye – down to single digit parts per billion.

These are perhaps 50X as sensitive as the human eye.

While longer-distance systems can work at ranges of around 10–20m, the sensor has to be placed nearer the leak plume for smaller leaks. To maximise the effectiveness, some systems are based on not one but two beams. One is used as a ‘wide angle’ beam to ensure as much of an area or plume is examined to provide wide spacial coverage. A second, more sensitive and accurate narrower beam can be used to pinpoint the source of the leak.

The company will conduct a staged closure of the operation during the first half of this year.
Damen has developed a new concept vessel—the Offshore Support Vessel (OSV) 9020, designed to perform a variety of offshore tasks both at surface level and subsea. It can be fitted with a moonpool-deployed saturation dive system to allow diving operations at offshore crane, a stern A-frame and an offshore access system. The vessel can also act as a submarine rescue vessel.

To ensure suitability for this scope of work, the available vessel accommodation, manoeuvring systems and dive support systems are crucial features.

The OSV 9020 provides living space for up to 120 persons on board.

The vessel is primarily designed to operate on DP. The profile ensures low wind catch. The four identical azimuthing thrusters are arranged symmetrically: two on the stern and two on the bow. This ensures maximum station-keeping performance while avoiding high noise levels in the accommodation.
A maritime innovation project looking to install the world’s first ammonia-powered fuel cell on a vessel has been awarded €10m funding from the European Union.

The ShipFC project is being run by a consortium of 14 European companies and institutions, co-ordinated by the Norwegian cluster organisation NCE Maritime CleanTech.

The project will see an offshore vessel, Viking Energy, which is owned and operated by Eidesvik and on contract to Equinor, have a large 2MW ammonia fuel cell retrofitted, allowing it to sail solely on the clean fuel for up to 3000 hrs annually. As such the project will demonstrate that long-range zero-emission voyages with high power on larger ships is possible.

The goal is also to ensure that a large fuel cell can deliver total electric power to shipboards systems safely and effectively. This is the first time an ammonia-powered fuel-cell will be installed on a vessel.

A significant part of the project will be the scale up of a 100-kilowatt fuel cell to 2 megawatts. The fuel cell is tested on land in a parallel project and development and construction will be undertaken by Prototech. Testing will be executed at the Sustainable Energy Norwegian Catapult Centre. The ship-side ammonia system will be supplied by Wärtsilä.

Viking Energy was the first LNG powered ocean-going vessel in 2003, and Eidesvik and Wärtsilä also collaborated on the 2009-built Viking Lady, another LNG fuelled vessel that was seen as a milestone in the transition of shipping with its installation of fuel cells and marine batteries.

The ammonia fuel cell system will be installed in Viking Energy in late 2023.
CCC Underwater Engineering is preparing to resume the second phase of a 2000km pipeline survey in the Arabian Gulf, totalling 316 pipelines.

They are inspecting the final 102 pipelines using their Saab Seaeye Leopard underwater robot, which CCC says is the best vehicle for the task.

Their objective is to achieve the most precise repeatable survey data possible, to a baseline accuracy below 0.5m.

This kind of accuracy, whilst working in extremely shallow water along different sized pipelines for extended periods, requires a large array of high definition filming and sensing equipment.

Abu Dhabi-based CCC Manager, Tavis Letherby, says that position repeatability accuracy is essential to secure a solid baseline for future surveys.

The necessary array aboard the Leopard includes three HD cameras with movie quality 1080i interlacing, two Kongsberg M3 profiling sonars, Sonardyne Mini-Ranger and SPRINT Nav 500 Hybrid INS, Valeport bathy suite including altimeter, Valeport mini sound velocity profiler, MCI’s photorealistic cloud system, laser line generator, CP and UT probes.

“For accurate data acquisition,” says Tavis Letherby, “only a Leopard has the manoeuvrability, control and payload to stay steady and on course without problems in shallow water when faced with strong cross currents and wave motion—sometimes working in less than six metres of depth.”

He points to the vehicle’s specification of 11 thrusters, 500kgf of forward thrust, 200kg payload and ICQ intelligent control architecture, as making it suitable for very shallow water working whilst fully loaded with equipment.

When long excursions are necessary the operating vessel must stay around 70 metres clear of platforms for safety reasons. On those occasions the Leopard needs to navigate for up to 100 metres to fulfil the pipeline inspection, which is a particular challenge in shallow water.

For Tavis Letherby the Leopard has advanced underwater robotics further into the digital world and offers operators a work vehicle costing half that of an equivalent hydraulic system.
Seatools has secured a contract from an undisclosed EPC player for the design and delivery of a piling template hydraulic and instrumentation system. The system will be used for pile installation during the construction of an offshore wind farm in Taiwan. Pile installation will take place in the second quarter of 2020. During this phase, the pre-piling template will accurately position and guide the pin piles. Meanwhile, the integrated instrumentation package including a wide range of survey equipment to monitor every step of the installation process will substantially draw on recently completed piling equipment projects, which have demonstrated excellent reliability and availability. Under extreme shock loads the packages contributed to uninterrupted offshore piling operations.

The cutting operation uses a hardened steel cutting blade, energised with 400t of force. The equipment has significantly improved general and operator safety due to its configuration and remote operation being a safe distance away from any cutting activity.

FarSounder has expanded their IP portfolio with the issuance of their 5th US Patent, number 20150369908. The company is the manufacturer of innovative forward-looking sonar systems. This invention is related to integrating acoustic data from their sonar system with other down-looking sonar and side-scanning sonar. This allows vessel operators to have an expansive display in the boat providing them with valuable information in a variety of directions. Having this information can increase the reliability when navigating and at the same time, obtaining a clear understanding of the seafloor beneath the vessel.

“The engineering team at FarSounder sees forward-looking sonar as a critical component in a diverse navigation sensor suite,” says Matthew Zimmerman, EVP of Engineering at FarSounder and one of the inventors. “By adopting a holistic point of view when looking at shipboard navigation, it is clear that information unique to forward looking sonar can improve the overall user experience. This new patent covers many new approaches of fusing this unique input with other, traditional sensors.”
FOR many years, the offshore service sector has been actively looking for ways to drive down costs. One key target has been deepwater operations involving underwater vehicles.

The cost of surface support vessels represents an uncomfortably high proportion of any ROV operation, and companies reasoned that a good way of reducing this expenditure would be to remove the vessel entirely. In practical terms, this would mean physically relocating the vehicle onto the seabed and providing basic fundamental support such as vehicle piloting and securing a suitable power supply, from elsewhere.

It is only in the last few years, however, that post-downturn confidence has grown enough for companies such as Equinor to make the large financial commitments necessary to bring the seabed-resident vehicle concept into reality. It has challenged ROV manufacturers to develop the necessary technologies and in-house processes necessary to accomplish this operational independence and backed this up with formal contracts.

“Oceaneering had already begun its own journey down this path by developing on remote piloting systems. Seabed-based operations, however, would require a radically new reappraisal.

“The first step in providing a seabed resident solution, was to determine exactly what the market demanded,” said Arve Iversen ROV Operations Manager, Special Projects. “We recognised two main applications.

“The first was for the use of a vehicle to carry out operations on a project-by-project basis, typically inspection and intervention tasks. It would reside subsea for relatively short durations of typically 1-8 weeks.

“The other application was very different and looked at the need to carry out considerably longer term infield monitoring and inspection duties in which a facility would be resident subsea for nearer six months at a time.

“It has challenged ROV manufacturers to develop the necessary technologies and in-house processes necessary to accomplish this operational independence and backed this up with formal contracts.

“The principal requirement for any subsea-resident system is very high reliability. Statistically, this favours an electric ROV,” said Iversen. “We already have our flagship eNovus.
The ROV entering the garage
electric ROV on the market. This was the base vehicle for the shorter-duration resident package known as the Liberty E-ROV system. In parallel, we built an entirely new vehicle called Freedom for longer term inspection operations."

Equinor awarded Oceaneering a three-year contract with two one-year options to develop, build and operate the E-ROV system for use in their inspection, maintenance, and repair (IMR) operations.

Turning the eNexus base model vehicle into a comprehensive seabed resident, however, involved solving two principal technological conundrums.

To achieve full independence required the vehicle to have its own independent, self-contained power source. The second issue was that any shore-based control station must be able to communicate with the seabed.

SEABED OPERATIONS

"Over the years, we have accumulated decades of practical experience housing ROVs on a seabed-based enclosure by virtue of using a simple garage with a tether management system," said Iversen.

"We looked at a number of alternative concepts for getting a power supply to it. In recent years, a number of floating power systems have appeared on the market, some able to harvest power through harnessing wind and waves.

"Others were a simple floating battery, itself remotely driven to the site. One advantage was that the cable running down to the seabed to provide power could double as a two-way communications conduit to a surface antenna.

"We eventually decided that while this arrangement might indeed be very appealing for long-term residency, the work involved in mooring a power

busy for operations lasting just a few weeks was impractical.

"We also considered incorporating fuel cells within the garage or on skid nearby, but again, we reasoned that while these may be suitable for longer term installations, they would potentially provide us with too much power for our requirements while greatly increasing costs. We decided that a battery would provide the correct amount of power."

These batteries, however, do not need to be incorporated into the ROV body itself as they increase its weight and decrease its manoeuvrability. They could be better housed in the garage and the power supplied to the vehicle by tether.

In the garage design, therefore six battery pods lie on either side. These 12 cylinders contain a total of 50,000 individual Lithium ion battery cells providing a combined 500 kWh of power. The power is intelligently distributed through a control system housed next to one of the cylinder arrays.

"We have kept an eye on battery technology. Companies have developed new chemistries, but the market has been largely driven by the automotive and computer industry, and the development has probably not gone as fast as a lot of people have envisaged.

"The direction of battery development seems to favour devices needing to be recharged very quickly and feature very high amp levels. While quick recharging is useful, it is not that important to us. We are far more driven by safety and reliability, and managing our existing power budget more efficiently."

"While the batteries give us a limited power budget, we can move our neutrally buoyant vehicle very economically using electric thrusters."

An advantage of a workclass ROV, however, is that it can also carry out intervention tasks. Activating the hydraulic motors for using the manipulators or the higher power demands required for lifting operations, will mean that levels can be more quickly depleted.

"This means that we will have to move away from the base case and supplement the existing power by adding more batteries onto the garage, where there is ample space, lower a simple battery pack to the seabed on demand and connect this to the garage, or send a conductor down from the surface to plug into a port on the side of the garage and recharge the seabed unit.

"We believe, however, that the battery system we have installed in the garage should be good for the majority of operations."

CONTROL

The project envisaged the ROV package being controlled from a remote location.

Oceaneering’s plans for developing a remote piloting system actually date back to the early 2000s, but it is only recently, that advances in 4G communication systems have made this a viable, cheaper, faster, more stable and practicable step in the journey remote connectivity.

"When we developed this, there was no similar system available and we didn’t have any historical experience so the design is fairly bold," said Iversen.

Housed in the rear of the garage is a constant tension winch connected to a pencil-shaped flotation device. On deck, this sits horizontally in a hinged funnel housing.

As the garage enters the water, this hinged funnel swings up into the vertical, releasing the float. As the garage is further lowered, the winch pays out, always allowing the top of the float to stay above the surface, always under tension. The float contains the antenna.

"We have an iridium system that can connect to a satellite," said Iversen.

"This can send and receive commands anywhere in the world, but does not contain the bandwidth for sending video. Instead, it is more common to use the 4G LTE broadband that is available in many platform locations, such as the North Sea and Gulf of Mexico. It generally has a range of 25 km from after which we start getting a reduced bandwidth."

"Once the garage lands on the seabed, the ROV can fly out," said Iversen. "We have used it on Statfjord, Troll, Johan Sverdrup, and other fields in 2019. It has a 1000 m umbilical, which essentially allows us to land one side of the giant Condeep platforms and fly round to the other side.

"From June 2019 to present, we had 19 deployments and the experience has been as good as we anticipated. At the start, it took us over four hours to get the garage onto the seabed but we can now do it in less than two.

"The surface sea state can often restrict ROV deployment, but we have experience in installing this in a 3.5 m significant wave height.

"We also see the powered garage becoming a useful tool in its own right. It could be used as a subsea base for other applications, such as a sensor or equipment that needs communication and power. It can even be used as a temporary or permanent docking station for Freedom," said Iversen.

The communications float remaining on the surface as the ROV is lowered.
eLARS

MacArtney is planning to launch an all-electric, cost-efficient, launch and recovery system (LARS) for the ocean space market. This is a response to the demand for eco-friendly business strategies and product development.

The eLARS can be delivered as a complete system or as a stand-alone A-frame and will support a wide range of inspection/observation class, and work class ROVs. The eLARS is centred around a fully scalable platform that can be tailored to any customer specification.

The eLARS eco-friendly features include zero pressurised oil over water, significantly reducing the risk of harmful oil spillages and improved power efficiency that is considerably higher than that of traditional hydraulic systems. It requires less vessel power and improves overall energy efficiency, enabling vessels with smaller generator sets to operate the system. Going electric also increases usable deck space in the absence of the traditional HPU (Hydraulic Power Unit).

Following market trends, a zero-energy eLARS is available for delivery, equipped with an energy harvest and battery system, significantly reducing the need for external power during operation and in some cases eliminating it entirely.

The new eLARS provides an intelligent and highly versatile control system. A range of real-time condition metrics displays vital information that empowers the operator to make operational and maintenance decisions in the moment.

The high degree of built-in redundancy and the Emergency Recovery Mode provide a new-to-the-industry level of confidence even in extreme operational conditions. Full automation capability is also considerably easier with a control system design equipped for semi and fully automated operational sequences.

Additionally, the control system can be upgraded to virtually any new function, offering versatility and longevity.

N-SEA-BODAC JV INVESTMENT

Formed in 2016, the joint venture (JV) has demonstrated year-on-year commercial growth. In that time, it has built a formidable track record in UXO survey, identification and disposal, complemented by three years of SHEQ incident-free operations.

BODAC CEO, Jeroen de Ouden commented: “Following three years of successful joint operations, the time is now right for N-Sea and Den Ouden Group’s BODAC to take our JV to the next level. Significant investment in the development of our market-leading UXO solutions and tooling, together with the creation of a distinct brand identity, demonstrates our intention to become the leading authority in UXO risk mitigation.”

N-Sea CEO, Arno van Poppel added: “Clients increasingly demand UXO risk mitigation to be delivered in the shortest time frame, against the lowest possible costs. This requires deep UXO expertise, local content and knowledge, innovative solutions, assets and operational excellence. The investment in our JV ensures that we are fully equipped to fully market requirements.”

The JV will continue to service the European UXO market, with four bases across the UK, Germany and The Netherlands. The JV team, with a core of strong market and solution experts, will benefit from the continuous support of both Ni-Sea and BODAC, including specialists from within each company.
This year marks 5 years since Jack Fisher passed away and the company has been recounting what has happened since then and what is planned for the near future.

"In 2016, all video and light systems were upgraded with LED lighting, replacing old filament bulbs," said Chief Operating Officer Brian Smith Fisher. "These LEDs have brightened up the video-product line and is much more efficient for operators.

"The ROV systems now boast 4400 lumens of light and the video systems all offer 3000 lumen lighting.

"In 2017, the SAR-1 underwater metal detector was introduced, which has been an incredible addition to the JW Fishers portfolio. The SAR-1 underwater metal detector showcases the same underlying technology of the award-winning Pulse 8X, but with a different housing, an easy to operate control system, "snareless" technology, a bright red LED readout, and a powerful vibration feature.

"The combination of these features offers the ideal equipment to excel in zero visibility environments when the mission is no-fail and safety is paramount.

"2018 brought the updated Proton 5 to the market. The next generation of the widely popular Proton 4 magnetometer received a massive upgrade to an all-digital system. The most popular feature is the auto tuning capability, which allows the operator to tune geographic frequencies digitally rather than opening up the equipment to manually change the settings.

"Other new features are a 6in LCD display built into the control box, a towfish able to separate into two pieces, a Pelican carry case, and easy to use software.

So what will 2020 bring?

"It will be a big year for JW Fishers with all of our video systems now coming standard with 1920x1080 [1080p] Full HD picture," said Fisher. "The TOV-2 HD Towed Video System, the DV-2 HD Dropped Video System, the DHC-2 HD Diver Held Camera System, and the MLC-2 HD Mini Camera System will come standard with the new camera.

"These systems also come with LED lighting (3000 lumens), Kevlar reinforced cable, and a rugged commercial design. The HD picture quality will set the new standard for all JWV underwater video systems.

Not only have all video systems been upgraded, but the VRM-2 Video Recording Monitor has also been redesigned for HD capability. The control panel of the VRM-2 HD contains switches and controls to operate both the camera and lights.

The built-in DVR recorder is operated via a waterproof, touch keypad. A GPS is now included with the system and will transfer coordinates onto the screen and recorded video. Time and date stamps are also recorded and text overlay is possible with the addition of an included waterproof USB keyboard. Finally, a microphone allows the topside viewer to record vocal notes while video is being recorded on an included 32GB SD card.

HD video is not the only thing that JW Fishers has been working diligently on; in the Spring, we will introduce our new 450/900 kHz CHIRP Side Sonar system! We are in final testing phase and expect orders to start shipping mid-Q1 of 2020.

FISHERS PLANS FOR 2020
In a first for the offshore wind sector, a vessel remotely controlled from shore took to the sea off Suffolk over the weekend to undertake survey work for Greater Gabbard Offshore Wind Farm, a joint venture between SSE Renewables and innogy.

The XO-450 Unmanned Surface Vessel (USV), owned and operated by XOCEAN, carried out seabed surveys on seven of the turbines at the 140-turbine wind farm, located 23km off the UK coast.

The unmanned vessel is around the size of an average car (4.5m) and half its weight (750kg), and can be monitored and controlled 24/7 via a satellite connection by a team at an on-shore control centre.

Throughout the survey, the data collected was monitored from shore in real-time by experts located in the UK, to validate data collection before the vessel departed the work locations.

This demonstrates the flexible and collaborative nature of this new technology, enabling industry experts to have direct access to real time data, from any location. XOCEAN’s USVs offer significant benefits including safety with operators remaining onshore, efficiency with 24/7 operations and environmental with ultra-low emissions which together leads to significant economic savings.
A2KUI

Later this year, the newly-designed A2KUI will commence sea trials. A contraction of the official name Autosub 2K Under Ice, this is the new autonomous underwater vehicle (AUV) that will spearhead the National Oceanography Centre’s research in the polar regions. It will essentially replace the Autosub 3, first built in 2006 and retired 5 years ago.

In its time, the Autosub recorded a number of important projects including a pioneering 34.5hr mission in which 110km of the 183km was spent under ice exploring the Pine Island Glacier (PIG), as well as looking at ice-shelf basal morphology and plotting Antarctic Krill. It had one of the first upward-looking multibeam.

The new 5.5m long, 0.9m diameter A2KUI will be able to carry out work that the Autosub 3 was not designed for, such as getting closer to the ice and further into the zone where the melted sea ice mixes with the salt water. It should be able to get physically nearer the ice and further into the zone where the melted sea ice mixes with the salt water.

"The front of the vehicle, contains the obstacle avoidance system, Conductivity Temperature Depth (CTD), upward and downward pointing multi beam, a small gyro and cameras. The rear includes the ADCP/Doppler velocity log up and the ADCP/Doppler velocity log down, as well as an Edgetech 2205 sidescan with sub bottom profiler, primary gyrocompass and spare pressure sensor. At both ends, there is considerable spare connectivity for additional instruments.

"If, for example, the front half of the vehicle is damaged and the obstacle avoidance were to stop working, the vehicle would stop doing near-ice operations and fall back on using the upwards and downwards facing ADCP's to prevent crashing into the ice or seabed.

"We did consider buying a commercial AUV, but concluded these were often specifically designed for specific applications such as pipe tracking or large area surveys and are not suited to the multibele configurable application we require. It is not easy to retrofit the types of new innovative sensors the scientists require of us, especially in AUVs where ballasting, trim and available space are major considerations.

Working under ice, a fundamental part of the ethos is high reliability and the ability to retrieve the vehicle in the event of an accident. The design we have adopted focuses on hardware redundancy.

"The key to the design is that the payload is split into front and rear areas" said Matt Kingsland, "each containing complementary tools such that in the event of damage to one part of the AUV some of the readings may be derived from redundant equipment and sensors in the other. Even if the front payload tube and half the power tube failed, the A2KUI could still return to station.

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"If there was damage to the rear, however and the ADCPs were to stop working, the forward-facing obstacle avoidance system has a wide enough range that it can see the ice above and the seabed below to prevent collisions.

Similarly if the primary navigation, which is positioned in the back of the submarine, were to be affected there is both a depth sensor in the CTD and a spare gyro in the front that can be used for navigation.

For the propulsion, it would be possible to lose one of the dual thrusters along with an actuator and it would still return due to the control algorithms and the cross-form actuator arrangement. The AUV has a cruise speed of 1.2-1.4m/s with a navigation accuracy of 0.01% or less than 0.1m per kilometre.

Power technology is another area that has changed radically in the past decade. In order to achieve a 40km range, the original Autosub 3 was powered by 5000 non-rechargeable alkaline D-Cells. The power system on the AUV, however, is based on using a new NOC designed pressure tolerant rechargeable lithium iron battery.

Each battery unit has a 4 x 1.25KW hr sub modules, giving a total of 5 kW hrs per battery with a maximum 30A discharge. The entire AUV has 12 such batteries giving a total output of "38KW hrs at 0°". The batteries only weigh 8kg each in water and can be located in one area or be distributed more around the vehicle.

AUV. One common way is for the AUV nose to be jettisoned and capturing the cord between the nose and the rest of the AUV with some sort of hook mechanism," said Kingsland.

"There are many ways of retrieving an AUV. One common way is for the AUV nose to be jettisoned and capturing the cord between the nose and the rest of the AUV with some sort of hook mechanism," said Kingsland.

"This is connected to a winch, allowing the AUV to be pulled up a ramp.

"Although this recovery system makes for a lighter submarine structure allowing for greater payload capacity it is not an ideal recovery system in high sea states. This is because mating a solid submarine and solid recovery ramp both going in two different directions due to wave action is tricky. Instead, the NDC-developed a system in which the AUV is attached to a pair of lifting points and the AUV recovered away from the ship, by a custom crane.

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Following in water trials winter 2020, the sensor commissioning and deepwater trials will follow in Spring/Summer 2021 with Under Ice trials later that year.
AUTOSUB2000 UNDER ICE
5.5m Length | 90cm Diameter | 2200kg | 2000m Depth Rated | 1.2m/s Cruise Speed

Front & Rear Antennas
Iridium Communications
WiFi + GPS

Rechargeable Batteries
55kWh at 0°C Maximum ~80hrs
300km Science Range +100km Contingency

Obstacle Avoidance System
N orb it FLS

Acoustic Remote Control & Tracking
Sonardyne Avtrak

Science Data Pods
2 x 5TB

Up Facing ADCP
150kHz - 800 kHz

Up Multibeam Sonar
N orb it WBMS

Dual Redundant Propulsion
Dual Thrusters
4 x independent cross form actuators

Precision Navigation & ADCP
Sonardyne Sprint Nav | 700 - 600 kHz
Survey Drift | <0.01% = <0.1m per 1km

Sub Bottom Profiler
Edgetech 2 - 6 kHz

Dual Frequency SSS Edgetech
410 kHz : 250 m swath | 0.2 m
120 kHz : 800 m swath | 1.0 m

Down Multibeam Sonar
N orb it WBMS

Pumped Dual CTD
EH, DO, Turbidity ... + others
Seabird 9+

Homing System
>75km 1kHz

Emergency Stand-alone Beacons
1 x Acoustic Beacon | 2 x Iridium Emergency
3 x Light Flashers | 1 x AIS

2 x Science Payload Tubes - Core Per Tube
12v, 24V, 48V - 600W per channel (1.5kW max) | 1 x Front Seat E3950 | 1 x GPS, WiFi, Iridium | 2 x 12port 1Gb Ethernet Switches | Ethernet, RS232 & RS485 Comm Ports | Optional Atomic Clock, Redundant IMU, Backseat Computer

noc.ac.uk
AUTOMATED SAMPLE TAKING

The hybrid ROV Nereid Under Ice (NUI) has taken the first known automated sample performed by a robotic arm in the ocean. A project undertaken by an international team of researchers exploring the chemical-laden environment of Kolumbo volcano, an active submarine volcano off Greece’s Santorini island.

To do this, NUI was equipped with Artificial Intelligence (AI)-based automated planning software—including a planner named ‘Spock’—that enabled the ROV to decide which sites to visit in the volcano and take samples autonomously. The NUI hybrid ROV was built by Woods Hole Oceanographic Institution (WHOI) in 2014 to carry out deepwater oceanography. While most ROVs are designed to move a few hundred feet laterally, the NUI is designed to travel laterally up to 40km (25 miles) while still receiving control signals and transmitting data.

The NUI ROV incorporates its own battery and controls to ocean robots will allow them to explore without human intervention.

Issuing a issued a command to the autonomous manipulator resulted in a slurp-sample hose attached to the robotic arm extending down to the precise sample location and sucking up the dirt.

This level of automation will be important for NASA as they look toward developing technologies to explore oceans beyond our solar system without the assistance of a pilot,” he said. “Moving forward, the work will include training ocean robots to see like ROV pilots using ‘gaze tracking’ technology, and building a robust human-language interface so scientists can talk directly to robots without a pilot go-between.

“We can eventually see having a network of cognitive ocean robots where there’s a shared intelligence spanning an entire fleet, with each vehicle working cooperatively like bees in a hive,” Camilli said. “It will go well beyond losing the joystick.”

BASED AT THE UNIVERSITY

Bar gave us a bird’s eye view of the site in Felling in the North East, where paint is produced and where their state of the art global R&D facility is located after a recent £12.6 million investment. It has dedicated test labs, for cyclic and non-cyclic testing, temperatures up to 350 deg C, pressures up to 300 bar and a cryogenic lab for LNG applications. The International paint brand is split into three divisions Marine, Protective and Yacht with a comparison described as “a protective coating looks good 5 meters away and a yacht coating looks good 30 cm away.” Protection coatings, Bas’ specialism, are used in various industries from upstream and downstream Oil and Gas applications, nuclear and coal power plants and high volume infrastructure. Two local projects are the Sage and Millennium bridge on the Newcastle/Gateshead quayside.

Bas explained the “McDonald’s model”, whereby paint purchased in one part of the world should be the same specification and quality as that purchased in another location. This is particularly important for projects where parts are made in different locations and need to come together to perform. An Australian project was used as an example where sections were manufactured and coated in Russia, China, Thailand and Singapore and then transported to Australia to be installed and function in the same environment.

Bas explained the importance of understanding the lifecycle of the asset because “coatings do not have a brain?” Bas explained the manufacture of FPSOs, FLNGs and feed platforms, historically fabricated in Singapore and Korea are moving to China for production. Therefore, the environment where the coating is applied and cured has a different temperature and humidity. The transport method and conditions to the end location is important, if it is on the back of a ship, corrosion from saltwater will need to be considered. The end location, where the asset will spend most of its life is important such as strong UV resistance in Australia or whether cathodic protection will be used, the temperature and harsh environments etc. The application and use of coatings also need to be registered in the parts of the world they will be used.

The challenges of developing coatings were discussed, typically customers are looking for performance to last >25 years to be economically viable. Inspection of assets is expensive due to inaccessibility and therefore a low inspection rate is specified. Remedial repair is very expensive so confidence in the coating’s performance is paramount. The industry is moving to deeper waters so there are new challenges that come with this. Along with contradictions in the specifications such as protection during thermal loading but requiring flexibility from the coating during transportation and as lightweight as possible to keep the total asset weight down. In conjunction with cost reduction in all areas which are squeezing the coatings budget.

The use of differing coating techniques for a single application was explained using the example of an offshore wind turbine.

UNDERWATER VEHICLES

North of England evening meeting:

HIGH PERFORMANCE COATINGS FOR CORROSION PROTECTION IN SUBSEA UNDERWATER AND OFFSHORE ENVIRONMENTS

Wednesday 29th January 2020

By Elizabeth Waterman, PDL Solutions Ltd

The first evening meeting of 2020 gave the North of England SUT branch an insight into marine coatings. Bas Hesselink who is Segment Manager for Oil & Gas and PFP at AkzoNobel started with an overview of the company. AkzoNobel is a global paint and coatings company which includes the International brand, along with household names such as Dulux.

Bas gave us a bird’s eye view of the site in Felling in the North East, where paint is produced and where their state of the art global R&D facility is located after a recent £12.6 million investment. It has dedicated test labs, for cyclic and non-cyclic testing, temperatures up to 350 deg C, pressures up to 300 bar and a cryogenic lab for LNG applications.

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Workshop:
Key Elements of Subsea Tiebacks

Register for the pre-conference workshop "Key Elements of Subsea Tiebacks" covering subsea developments, control systems, subsea completions, manifolds and tie-in systems, flowline tie-ins, offshore flowlines and pipelines, and subsea production control umbilicals.

About the presenters:

Don Schlister
Treasurer & Training Committee Chairman, SUT-US

Christopher Curran
Senior Consultant, CJD Enterprises

Chuck Horn
Senior Advisor, NanoRidge Materials, Inc.

Karl Schnakenburg
Global Engineering Advisor

William Taggart
Senior Engineering Advisor

This event is sponsored by:

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Organizing Committee:
Subsea Engineering and Operations (SEO)

Proceeds generated from SUT-US events help support our learning programs.

Are you attending the 20th Annual Subsea Tieback Forum & Exhibition in San Antonio, Texas?

Tuesday February 18, 2020, 8:00am-3:30pm
Henry B. Gonzalez Convention Center
900 E Market St
San Antonio, Texas 78205

Course Cost: $600
The Phoenix Has Risen

By Allan Devlin, MIEAust CPEng, NER, APEC Engineer, IntPE(Aus), Phoenix Committee Chair (2017-2019)

Phoenix was a Special Interest Group (SIG) of the SUT Perth, formed in September 2016 as a collective of subsea underwater professionals; each possessing extensive subsea experience in engineering, science or academia.

The group provided a focal point where members applied their experience, knowledge, skills, leadership and wisdom to current and future subsea challenges.

Strategy Sessions were held early in 2018, to engage with Phoenix Members and understand their motivations to be involved in Phoenix and what they wished to achieve. This allowed the Phoenix SIG to provide more focus for our efforts by determining our Objectives (What) and Goals (How) for 2018 and beyond. This process was completed again in 2019, to refresh the Objectives and Goals and ensure team alignment on our collective efforts. Thanks to Rodney Silverstein, Phoenix Under-Secretary, for your support including providing the meeting rooms at FLUX for Phoenix meetings in the early years.

One of Phoenix’s Objectives was to provide support for under-employed, unemployed and recently retired members of the underwater community.

As a Goal supporting this Objective, led by Phoenix Vice-Chair Peter Clarke, Phoenix partnered with recruiters (e.g., Spencer Ogden, Inverse Energy) at monthly meetings to share recruiting/job search best practices and advice, including engaging with recruiters, resumes, digital branding and networking. This was very successful in supporting Phoenix members as most returned to full-time work. A special thank-you to Katie Rowe, Specialist Recruiter at Spencer Ogden, for her partnership and support including making the boardroom at Spencer Ogden available for Phoenix meetings.

As another Goal, Phoenix Member Abdul Mueed gave a well received presentation on “Stored Electrical Power and Potential to Change Subsea System Power Distribution” at the April 2018 SUT Evening Technical Meeting: Researching into the Subsea Future.

Phoenix Member Dr. Paul Choate gave a presentation “Status and Opportunities for Space in WA” at the July 2018 Phoenix meeting. This was timely given the formation of the new Australian Space Agency as of 1 July 2018, and relevant given the SUT Perth Branch strategy of Diversification. Discussion topics included diversification of subsea engineering skills and technology transfer to and from the subsea industry.

Phoenix Chair Allan Devlin was invited to attend the WA DEFENCE REVIEW Strategy, Defence & Industry Dialogue in September 2018, co-hosted by The City of Perth and chaired by Professor Stephen Smith, Former Australian Foreign Affairs and Defence Minister. Attendees included representatives of the Royal Australian Army, Royal Australian Air Force, Royal Australian Navy, Regional Development Australia, Commonwealth, State and Local Governments along with Australian Industry and trade organisations. Opportunities for technical collaboration between the Defence and Resources Sectors were identified and discussed.

Allan Devlin Chaired the June 2019 Evening Technical Meeting.
Future of Subsea Autonomy, including presentations from the Royal Australian Navy and Marine Advanced Robotics, which further supported the SUT Perth Branch strategy of Diversification.

Phoenix Member Tim Hart assisted with registrations at the door and the microphones for Questions & Answers following presentations.

As a second Objective, Phoenix has helped Members to identify opportunities. For example, Phoenix partnered with the Subsea Energy Australia (SEA) Subsea Innovation Cluster (SICA) and National Energy Resources Australia (NERA) to identify collaboration opportunities for Phoenix Members.

Phoenix had strong attendance at SUT ETMs, Casual Catch-ups at the Cheeky Sparrow, Phoenix BBQs and after meeting drinks, and SEA SICA events, to enable the third Objective of providing networking and communications opportunities to keep Phoenix Members engaged in the underwater community.

For example, Phoenix held its one year anniversary BBQ in December 2017 at the Scented Gardens on the South Perth Foreshore. This event was well organised by Phoenix Secretary Carl Cledin. A great time was had by all, enjoying BBQ food and conversations as the sun set over the Swan River with a view of the Perth CBD.

By the middle of 2019, the Subsea Industry in Perth was well into recovering from the downturn. The Phoenix SIG had served its purpose in keeping Phoenix Members engaged and involved in the underwater community through SUT, with most Phoenix Members having returned to full-time work. The Phoenix Had Risen!

To allow for more efficient allocation of resources, the SUT Committee agreed to suspended the Phoenix SIG by keeping the Constitution in place but leaving the committee positions vacant. Should there be a demand for Phoenix in the future then the committee could be re-formed at that time.

The new former Phoenix Chair was elected to the SUT Committee for 2020 to help with re-allocating Phoenix resources to SUT Sub-Committees (e.g. Engagement, Courses, Mentoring Programme, National Engineering Register and Industry Diversification).

The Phoenix Goal of Transition To Retirement (TTR) was moved to the Engagement Sub-Committee to ensure continuity, as a key demographic of recently retired and transition to retirement Professionals that can continue to contribute to the SUT.

Thank you also to the rest of the SUT Committee and Branch Manager Jennifer Maninin for your amazing support and encouragement. We had some good times together over the years, and Phoenix Members will now transition into new ways of being involved with the SUT.

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June 2019 Evening Technical Meeting - The Future of Subsea Autonomy
Originally called Zeevang GT 1500, it is being used here to lay 40in Europipe. A look on the internet says that it is still working in the far east under the name of Alpha DMB 88. As it was built in 1971, that makes it 49 years old which doesn’t sound right.
BP’s Miller was one of the last ‘large’ platforms to be installed in the North Sea with a topside of 29,000t. The project managed to survive the oil price collapse of 1986 and underwent a major design reappraisal partway through the project, influenced by new safety thinking following Piper Alpha.

Humphreys and Glasgow (Later, Kvaerner H&G) carried out the detailed design and procurement while John Brown/Brown and Root Vickers carried out the detailed design and procurement of the jacket and template.

The £43million jacket weighed 18,000t and was built by Highlands Fabricators. The topsides fabrication was spread across Press offshore, Redpath Offshore, HiFab and SLP.

Dean Richardson
HVAC Engineer and Managing Director at RVHM
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Ferlin Quantrill
Business Development Manager at East Coast College
The accommodation module was being built by SLP Lowestoft when I was there in 1991.

Amanda McKay
CQP FCQI MBA TD Quality Director Balfour Beatty Major Projects
And those are my blue trailers underneath.

RONNIE LAMBERT
Catering and Facility Manager at Aramark
And that’s the galley landing area. Spend many a time looking over that side.

John Middlemist
Head of Core Banking PMO at Nordea
Thanks for sharing - another big jacket built by HiFab (after I’d left) Did HiFab also build the integrated deck for Miller? Anyone got photos of that during construction?

Simon James MSc
Chief Information Officer at the UK Oil and Gas Authority at Oil and Gas Authority HiFab did module M7 - the cellar deck. Ken MacDonald was the BP site manager. M5 and M6 at Redpath (plus flare), M3, M4 at Press Offshore M1 at Lowestoft I think SLP.

I was based at Redpath Offshore on the project. Happy days.

Redpath Offshore - another great yard I

Leslie A. U & A Compliance Manager at Balfour Beatty VINCI
One of the last construction projects I worked on at HiFab.

Derek Mc Gillivray
Welding Instructor at Tullos Training Ltd
You have almost encapsulated the demise of the skilled Trademen’s rates for offshore work.

Press. SLP you missed Wood Group. HiFab & the skill shortages of the time also contributed on a Massive Scale. The 6 week wonders who were Qualified internally & when struggling assisted & taught by Qualified 4 year time served tradesmen. We were actually teaching the Turkey how to change the outcome of Xmas.

When things went quiet in the jacket yards these guys went Offshore. No disrespect to any of them. We all have families to feed.

I particularly remember Piper Alpha. The foreman with SLP, Frank, was on less wages than wagleys welders. Kudos to him he set up a training / testing facility in, Cumbernauld.

Andrew Mccaig
Blast/spayer at Global Energy Group 2012-2017 Blast/spayer Bi-Fab 2017-2018
A wee blast from the past.

James Findlay
Rigging & Lifting Engineer / Onshore LOLER Focal Point at Wood
I was on the Skandi Neptune decommissioning the jacket in 2018.

TOM LAW
ComDec Marine Consultants
Worked on the Millar in 1996/7 during the massive AGI project and spent 43 days offshore (off for 2 days in the middle) in total during which time we modified over 220 leaking Oliver DBB valves due to a design fault.

I also involved Thames Valley Police to track a critical piece of mechanical kit necessary for start up which went astray en route.

OM’s like Gordon Millar, Jim Barr and Bill Johnston with Bill Clelland and John Harris in the operations team. A happy ship indeed.

Craig Codling
REP HV/Lead Petrochad/Mangara A Glencore Company
Never stop trying to make a difference. 1990 my god the Tyne fabrication yards were busy then, at the time hard days, now looking back good memories!!!

Les Mcmenzie
Offshore Piping & Construction Supervisor
Yeah, Press Offshore

Captain Michael Elson
Captain at BP Maritime Services
I recall joining a tanker at Wallsend dry dock in 1993 Craig
We are old Joanne, but with age comes experience and this industry is far from over and unfortunately the youth still need proper guidance and coaching from us oldies.

Maintenance & Reliability Supervisor/ Superintendent/Specialist/ if only someone would realise this is still the case

Gareth Smith (Tech IOSH) *Sr. LOLER AP / (TA) *Crane supervisor /Auto-Cad & RAMS Specialist **DBS Checked Supervisor at Lifting Logistics UK Ltd

Worked on the construction of the Miller yards.

RONNIE LAMBERT Catering and Facility Manager at Aramark Spent 17 years on there 2000 until August 2017 when I flew out on the last trip and walked off Miller, onto Sapem 7000. Good times.

Michael Poelz Software Developer / Helicopter Pilot But where did the chickens go

Gareth Smith (Tech IOSH) *Sr. LOLER AP / (TA) *Crane supervisor /Auto-Cad & RAMS Specialist **DBS Checked Director at Lifting Logistics UK Ltd

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Andy Edwards Open to New Opportunities I was on the Hook-Up, August ‘91 thru to October ‘92 (or thereabouts), Great Job, Great Team.

Glyn Rudhall Drilling Supervisor at BP Andy, small world! I was on the hook up too, were you on the Britt or the regalia

Martín Haynes General Manager (Technical) at Serikandi Oilfield Services Sdn. Bhd I was too Andy then we met in Sakhalin

Bill Dimmick Onshore Construction Manager at Independent Oil and Gas Remember first steel being laid at Haskin Yard in 89 ? After our HSB DPR & DFR topsides we’re loaded out. A lifetime ago indeed, think it’s time to give it all up

Mike Hill Instrument Assessor at PETROTEXNO Remember the Black pig - the Safe Britannia, 4 man rooms with the occasional hot bedding. Oh the good old days

Steve Davison Commissioning Manager great memories Mike

Anthony Davies Technical Consultant (ad-hoc) at OCCMS Ltd Yes, me too. Hook-up by AOC International as it was then, commissioned using a BP Integrated Management Team. Crew peaked at around 1200 if I remember correctly

Greg Smart - Burgess Toolpusher offshore at Ensign Worked on that at SLP before the offshore days

David Lemon Cementing Operator at Schlumberger We were part of the abandonment

Robert Bruce Crane Operator I was on the Drilling rig that drilled the holes Santa Fe rig 140

Glyn Rudhall Drilling Supervisor at BP I think the SF135 pre drilled the template 1988 to 1991

Eddie Walsh Scaffolding Supervisor at Wescott industrial and renewables Done the decom . Good job . Found out how dodgy siapem are though . www

Alex Buchanan Lifting operations technical coordinator for AB rigging consultants Ltd at Worley

Got to agree Scottie, great hook up squad

Jim Toye Maintenance Team Leader I worked right next door to the Brae Alpha 1993 - 1996

Craig Codling REP/ HV Lead Petrochad(Mangara) A Glencore Company. Never stop trying to make a difference. East Brem JH

Like I said Tyne yards were busy then. However when I went to HH Ulsan South Korea in 2013. I found out about yards been busy. However now that is going same direction as Tyne and other U.K. yards

John Rae Materials and Logistics Worked on that project as a steward on the safe caledonia busy times and the quickest hook up ever

Dave Colbron Field Engineer /IM Testing I was part of the decommissioning team on board the Millar; some good times on there especially the running around on a birthday. Funniest story was the pigeon with the vantage card

Gareth Smith (Tech IOSH) *Sr. LOLER AP / (TA) *Crane supervisor /Auto-Cad & RAMS Specialist **DBS Checked Director at Lifting Logistics UK Ltd HSB another from the past lol Morecambe bay

David Robertson Crane Operator /HLO at Eni/Meath Spent some 7 years on there until 2013 as Crane Op/!Great place too work and some of the best people I had the privilege to work alongside

Derek Bell Systemisation/Completions Engineer at Tengizchevroil LLP My first job in the yard

Jonathan Davey Well Services Specialist at Saudi Aramco

Good old SLP

Paul Woodhouse Offshore Construction Supervisor at Repsol 4d My first job offshore on the hook up great squad of guys

Andrew McAllister Instrument pipelifter at Balfour Beatty plc Missed the hook up I was blacked with AOC at the time but I worked on it hi fab

John Kennedy Upstream Operations Professional One of the last? Mariner A is 38kT topides … and you get a room to yourself

Miller being built at SLP
Unocal wanted to develop a promising step-out well from its Helder A platform. The problem was that the oil price had collapsed and the economics weren’t favourable anyway.
Ruling out a conventional jacket, Unocal decided to go with a low-cost tripod design, one of the first in the North Sea - Heerema’s TTP.

Standing in only 27m of water, it supported an unmanned 2-slot wellhead minimal processing facility. This was crane-lifted into position by the Hermod.
In the early days of the North Sea, submersibles competed with divers for survey and inspection work. One such was Vickers Oceanics’ Pisces 3. There was a lot of work. At the time, John Westwood of Vickers, said that ‘around 2400km of pipe will be laid in the UK sector alone before 1980.’

Bell diving was carried out at 200-250m. Submersibles had the advantage of being able to work at depth. Pisces 5 worked at 1500m during the Atlantic burial of the Canat 2 submarine cable.

Douglas Scott
Retired ROV and Tooling Engineer - Submersible Projects

It was actually carrying out pilot training and testing a torpedo deburial tool - great fun! Great people - great times - and loved every minute of my time with this great company.

Peter Upshall: It does indeed peter - but we had fun and at that stage had never even heard of a risk assessment - take care.

Steve Oliver
Subsea Client Rep / OCM Diving ROV GWO

Worked with PIII when it was on hire for the RN torpedo recovery 7511. 12 inch air drop weapon and Tiger fish recovery 24 inch. They lost 3 in 6 in the early days experimental, could not jump a diver to 600ft off Kyle of Lochalsh, who remembers the Refreshments bar on the train station, easy money if only the crack was good.

Ray Shields
Ambulance Care Assistant at Scottish Ambulance Service

The bar was called the Refresh. I still have a reel to reel video recorder with manned submersible recoveries sitting up the loft!

John Striton
Rov Senior Tech at Oceaneering

Worked on Pisces at Vickers Leith, also on L Boat Submersibles plus Perry Submersibles later on in Leith was a great job.

Doug Huntington
Business Development Engineer

I was extremely fortunate to work with Vickers Oceanics in the early 70s and remember Roger well. A great man and friend.

Robert Keith
Caregiver and Student of Aikido at Steady As She Goes

Transitioned into ROVs in ’78 with Ocean Systems and had the great pleasure and luck to work with 2 former Pisces operators, “Father John” O’Donnell, and “Dr” Al King. Some of us were divers, but they were ‘submariners’.

Douglas Scott
Retired ROV and Tooling Engineer - Submersible Projects

This week one of the two survivors of the Pisces 3 incident in the early 1970s passed away - this was his and Roger Mallisons boat and this picture was taken well after P3 was recovered and re-fitted - RIP ROGER CHAPMAN.

Rod Munroe
Electrical and Electronic Engineer

Where men weren’t boys. Cracking photograph.

Glenn Haskell
CSFSM Available

We didn’t wear them back then as a retired IW and Safety/Training for almost 13 years, I can argue/debate wearing vs not wearing a harness in some circumstances.

Status is reachable.

Hielke van Oostrum
Passionate about bridging the technology-solutions-people gap!

Richard Brown
Let’s dig up some NeSA CSD photo material :)

Neal Adamson
Sales Manager - World Leaders in Hydrographic and Oceanographic Instrumentation

A bit before my time but what a great shot!
Since publishing a picture of the Pisces III, Jim English kindly contributed a number of images.
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MIR-2
The MIRS sub with a small ROV on the bow
MIR-2
The MIRS sub with a small ROV on the bow
The Blue Whale was one of the largest floating cranes in the world, once an iron ore carrier. It was converted at the Boele shipyard in the Netherlands. A pair of side tanks were installed to increase stability. It also incorporated a 2000t crane and pipelaying equipment for 1.4m diameter pipe. Its first job was for Brent followed by the installation of modules in Piper for Occidental.
BLUE WHALE

Pieter J Graaf
O&G Offshore Installation & Construction manager, Technical authority, Functional Lead, Consultant, Auditor, Coach
The Blue Whale... laterTolteca... was owned by Netherlands Offshore Company. I spend lots of time on this vessel as field engineer... north sea, new zealand, mexico. It was almost my second home at the time

Vergne Caldwell
ROV Technical Manager at Beacon Offshore Ltd.
I worked on the Blue Whale in New Zealand on the Maui A Platform

Thor Sterker
Co-Owner at Platform Brokers v.o.f.
Good initiative.... I have fond memories to Capt. Zeger Giesler who thought me the old way of finding ones position at sea using the sextant and "seven star" method of calculating Latitude & Longitude

Rod Munroe
--Electrical and Electronic Engineer I bet you the grub was good.

J.C. Dejean Offshore Construction Manager at Telford
Spent a few years on her myself

Pieter C Holtes
Rig Move Master at Aramco Services Company
Tolteca "CMM" well remember with "blister tanks" on the side.

Teremoana O'Carroll
Senior Mechanical Technician. Offshore Pipelay
My father worked on the blue whale in Taranaki New Zealand in the 70's wow!

Emilio Romero
Director of Operations
Believe it or not that ship is still working at the Gulf of Mexico nowadays

EIDER 1989

James McAuley
Director at JWM Construction Ltd
Was on the hook up of Eider... and Tern... long time ago now. In fact was on the Eider at the time of the Piper A disaster

Carl hinds LCP/TAP01/Rigging Supervisor
James McAuley feel the same Pal I still think a lot more could of and should come out of the Piper disaster. I think the industry is close to another disaster. I pray im wrong but the demand that's put on the workforce now is too much. Multitasking , 3 week trips, in competent personnel etc

John Middlemist
Head of Core Banking PMO at Nordea Cleveland Offshore built some of Eider modules, here they are awaiting tow away

Kevin Clark Field Service Support Manager, Subsea Services Asia at TechnipFMC at TechnipFMC
Installed a bunch FMC Wellheads & Trees on here flew more inter-field Bell shuttles than I care to remember though...

Richard Wade Operations Manager at Wayland Additive Limited
Ah, I bet you miss the North Sea from where you are mate. Inguns too I suppose. Never mind, chin up and inspire the team again!

Forry Graham Contracts Consultant at Forrest Graham Consultancy
Takes me back to 1989/1992 when I was the Contractors Rep for 8K on North Cormorant, Eider and Tern

David Kinnear
Supported a few of those installations Kevin. I think you trained me on the hydro mech tool.

Martin Carr Cranes Consultant / Technical Authority/Contract Support Eng’ at EnerMech
Stothert and Pitt cranes Proper cranes, built to last
In 1986, Coflexip’s Continuous Operating Protection System (COPS) completed work on the Gullfaks field, a subsea mattress deployment system envisaged as an alternative to rock dumping. This remote crawler was designed by Colexip and Swiss company VSL as a diverless solution for pipe and cable protection. The operating principle was based on laying a double polyethene fabric mattress on top of the pipe. This bag was continuously filled with grout from the non-specialised surface vessel. The grout entered through a longitudinal Velcro-based sealing strip running along the top of the bag, which was automatically opened and closed afterwards.

After 500m, the machine had to be retrieved to load another mattress onto its reel. On Gullfaks, it was used to protect 3600m of 8in pipeline.
John Middlemist
Head of Core Banking PMO at Nordea

Cleveland Offshore built some of Eider modules, here they are awaiting tow away.
John Middlemist
Head of Core Banking PMO at Nordea

I worked on Shell Eider Jacket at HiFab, here's photo of bent roll up

Eider jacket
In 1987, Heerema set a new world record for heavy lifting, when it placed the 6200t K-12 PBP deck on its jacket for Placid. There, the water depth at K-12 was 27m while the Hermod’s draught was 24m.

This lift followed Hermod being upgraded the previous year, to handle lifts from 5000t to 9000t in a dual lift.

The previous record was the 5800t lift of Hamilton’s Esmond deck by the Balder.

colin hopkins
Managing Director - ONEDECOM

Great photo. Thanks for sharing. Any photos of Tartan Platform

Steven Brown
Head of Engineering - Middle East at Subsea 7

My first pipeline as a young project engineer after completing my graduate program in Stolt Offshore was to K12 in 2002, installed by the Seaway Falcon. The holdback rigging from the return sheave to the platform legs parted on initiation and I thought my career was over with less than 10 joints of pipe out the back of the vessel.

It was fixed within a shift with the help of some divers and the pipeline was completed ahead of schedule in the end. Plenty of lessons learnt but the main one being it’s never quite as bad as you think as long as nobody got hurt.

I continued on to have many more ‘career-enders’ over the next couple of decades, none as bad as they first seemed at the initial moment.

Mr Munroe
Electrical and Electronic Engineer

we all cut our teeth on the Falcon. I remember when the helideck was at the stern, long walk to check in after a bumpy flight in marginal weather.

Wouldn’t be allowed these days. It was the place to work Currently searching for new opportunities!

RIP Hermod! Made a lot of money aboard her

Abdul Quddos
Derrick Crane Operator Up to 4200 tons Crane at Abu Abudhabi

Nic

Rod Munroe
Electrical and Electronic Engineer

If you want something lifting, as the Dutch...

Great picture, tks for sharing

Satish Prabhakar
Senior Engineer (T&I) at Heerema

Staggering, especially if you consider that this level of technology was present over 30 years ago

Peter Landsweers Manager Crewing at Heerema Marine Contractors

I was there!! My 1st offshore job.

Aasmund Levik Fagleder
Struktur i KCA Deutag

Heerema was my first workplace, started as a fresh engineer in 82 in the Oslo/Sandvika office. It was a great professional start for a young man in a great company. I remember very well the installation of Heimdal, Ekofisk and Gullfaks

Freddy P. Senior Operations Technician E/I bij NAM BV Assen / Shell @ K14-C (Offshore)

Nice picture I was on the Hermod for placing the K12-K,I work on the K12-B

Bobby Adams Sr. UAS pilot at SkySpecs

The Hermod, Balder and Thialf. All legendary vessels that worked around the world on record breaking projects. We should have gotten special swag for working on all 3 vessels. lol

Lennard van der Hulst Senior Survey & Positioning Specialist

Creative configuration with SB crane in revolving mode
We have had a few of Morecambe Bay before, but this shows the slant rig better.

Morecambe had a very shallow reservoir. In these days before slant drilling, British Gas had the idea of inclining the actual derrick which enabled drilling into the reservoir at an angle.

A few months ago, Spirit Energy was granted approval to decommission the DP3 and DP4 installations which will be removed by a heavy lift vessel and returned to shore.
Ah yes, that company (British Hydrocarbons?) with the shocking personnel policies like no electric shavers or radio receivers. Bhw, hi Stewart :)

Rod Munroe
- Electrical and Electronic Engineer

Great place to join a boat, especially during the Blackpool Illuminations.

 Experienced my 1st simultaneous Lay Trench job on a small diameter umbilical. No room for error.

We sweated for 48 hrs, job done and a few beers ashore.

Dave Aiton
Senior Pre-Commissioning / Commissioning, Start-up & Decommissioning.

Was involved with the original pre-commissioning of the morcambe bay field hundreds of years ago.

William Turnbull
William Turnbull PMC Field Construction & Quality Professional at KOC/Technip FMC

Before it was fossil fuel LOL.

Dave Aiton
Senior Pre-Commissioning / Commissioning, Start-up & Decommissioning.

William Turnbull
long before anyone really knew what hydrocarbons were.

Steve Oliver
Subsea Client Rep / OCM Diving ROV GWO

Spent over 7 years in the field diving, Tides bad vis all in days work.

Elaine Maslin
Freelance offshore engineering focused journalist and writer

560 degree angle??? (picking up on a mistake in copy Whoops!!!)?

We were good - but not that good!
The highest we got to was 70 Deg - really pushing the envelope back in those days!

Malcolm McPherson
Special Services Supervisor at Gigamesh Oilfield Services

Bawden: Drilling if I remember right crewed them up.

David Alexander Bonar
OSG CLIENT REP / MCA DIVE SUPERVISOR / CONSTRUCTION SUPERVISOR / MIDSH

Remember them well! Worked as an inspection diver with 's on an annual jacket inspection programme onboard the Seaboard Invincible!

Andrew Smith-Lawrence
Risk Management

I was on the derrick first when Bawden brought the rig out of holyhead and then transferred to Flame as crane operator at Petrofac. HLO. rigger.

Glenn Taylor
Sparrows stage 3/4 Crane Operator/Trainer - Assessor/ Deck Supervisor/Rigging Supervisor

We also found out the hard way that differential sticking if you stopped the drill string for more than a few seconds. So very high pressures combined with multi-darcy permeability meant astonishingly productive wells and astonishingly high pressures.

Mike Mckillop
KOC/Technip FMC

Mike was converted to be sent back to the JU via fiber optic cable where the pumps, gen sets, shakers etc were.

Bill Dimmick
Onshore Construction Manager at Independent Oil and Gas PLC

Morecambe Flame and Bay Driller were the two drilling vessels used in Morecambe Bay back in the day. Part of the HGB Team when we built and installed DPH & DOR. Happy days.

David Rodmell
I was there from '95 to '09 so a relative newbie! Bad to see the 3 & 4 go and not in that bad nick really, testament to how you built them back then Bill.

Carl Hinds
OS/TP01/Rigging Supervisor

Was on the hook-up for Blandford Offshore staying on the Divi Gamma 1984. The best hook-up ever.

Alan Munro
Knuckleboom crane operator, Stage 3 Crane Operator/Trainer - Assessor/ Deck Supervisor/Rigging Supervisor

We were good - but not that good!

Jamie McLaren Yes he was Jamie - I remember him well - really good hand

Steve Frankland
steve frankland Director Owner, SKF Consultants Ltd

Blimey there's a blast from the past, I saw them wells developed now I'm seeing them decommissioned...good times working with great guys...hard working long days and nights but tons of laughs.

Chris J Bayly
Chris J Bayly Principal Petroleum Engineer & Training Manager at Oilfield Production Consultants (OPC) Ltd

Spent some time working in Morecambe Bay on those slant wells.
No, not the one on the right but the one on the left, listing in the water. (The semisubmersible on the right is an uncompleted semisubmersible construction vessel).

The Deep Sea Driller was the first Aker H3 design. It ran aground in heavy weather in March 1976 and it was taken to Bergen for temporary repairs to the pontoons and column. It was later towed from Bergen to Aker’s Verdal yard for full repairs. Verdal built the rig in the first place.

Andrew Reid
2nd Engineer at Dolphin Drilling
Later known as Byford Dolphin, sent for scrap only last year. Wouldn’t see a rig nowadays having such a long lifespan.

Rod Munroe
Electrical and Electronic Engineer
The good all days
plenty of piano bars in Bergen in those days
When Conoco started driving piles on its V fields platforms, it discovered the structural vibrations started to shake anodes loose and reduced the fatigue life.

To increase speed, Conoco designed a small light accommodation jacket that could be installed with fewer piles. This meant the piles needed to be larger and required larger hammers.

The 520t jacket stood in 21m of water but was held in place with four 76m, 1.37m piles. The featured a high batter and the piles were driven into a sandy seabed. It took contractor McDermott 51,000 blows to drive the 4 piles.
the fatigue from the piling carry on.

Simon James MSc
Chief Information Officer at the UK Oil and Gas Authority at Oil and Gas Authority

They started life at Howard Doris, which went bust. What a palaver.

Ernst Boon
Superintendent at Bokalis Offshore & Energy

Now these platforms are in the decom phase; Viking platforms are removed, this year Vulcan complex.

Mick Rogers STS HSE Manager at Fendercare Marine

All currently sitting on quayside of Gt Yarmouth outer harbour courtesy of Bokalift 1

Jeffrey Mueller
Part Time Expert Advisor at Endeavor Management

I think there were a couple odd design details. Having the follower chase the pile below the top of jacket leg seemed strange. When the follower buckled in the leg, most of the hammer energy went into the jacket. Also, anode core pipe were welded directly to jacket members without blister plates or stiffeners. Fatigue cracks propagated into the main structure material. If that hadn’t happened, a retrofit could have been contemplated perhaps avoiding jacket removal.

Stanley Paul Mc Ginnis
Project Manager at TechniFMC

I think you are right. Simon, but I might be wrong. I mean Dave Whitcomb! LOL! Not Dave Mc Guiness.

Alistair Coutts
Business Development Manager at Seatronics Ltd

Jamie Mathieson I think you are right. Jamie it was Dave

Tony Gennadopoulos Group Business Development Manager Mediterranean at IPPS LTD

Where was this taken? UAE waters...?

Neil Atkins
Independent Oil & Gas Consultant Southern North Sea

Guthrie Robertson Sales and Business Manager

Happy days Ali. Showing our age now!

Alistair Coutts
Business Development Manager at Seatronics Ltd

Hi Guthrie yes we are! Stevie Smith & Alex Seivwright were on this job too as a number of the jackets were fitted with Subsea Systems Cameras supplied by yourself! Great times and great people at UDI

Mark Beloeil-Smith
Senior Operations Surveyor at Shell, Chartered Hydrographic Surveyor

I was recently involved in ConocoPhillips Decommissioning team in Aberdeen, compiling structural & piping work packs for these platforms. Along with LOGGS and Murdoch fields

Hugh McCallum Ex- Shell Prelude FLNG at Shell Australia

Lost a jacket in Thailand driving piles like these. Union Oil were not best pleased.

Mark Surry Senior Metallurgist, Materials and Welding Engineer CEng

I remember this well, very surprised to see the jackets being sent back to site. As we drove our site car close to the jacket we could see water pouring out of the cracks in the brace members!

Darren Peart Recent Construction Work Pack Engineer at ConocoPhillips

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Hugh McCallum Ex- Shell Prelude FLNG at Shell Australia

Not a lot of room for your hammer

Mike Murphy Looking for work. Good home

Ole Morten Skogland Chief Commercial Officer at SubseaPartner

I continue to be astonished of what’s achieved throughout the years within the oil&gas industry

Thank you all for sharing whatever being done in the past! Personally, I continuously strive to promote manned underwater operation yet again. Sometimes it is wise to regain old ways of doing things, by performing it in todays safety regime of course. Keep sharing old memories gently please (edited)

Hugh McCallum Ex- Shell Prelude FLNG at Shell Australia

DB101 - a big barge. And UDI were a fun company to work for- Ian remains one of the best party chiefs I ever worked under.

I wanted to get basic specs such as water depth etc, (157m) and googled ‘Shell, Eider, Jacket’. Up came a load of fleeces and mountaineering coats!!

I was recently involved in ConocoPhillips Decommissioning team in Aberdeen, compiling structural & piping work packs for these platforms. Along with LOGGS and Murdoch fields.

Our industry was never good at lessons learnt. Combination of fear of bad publicity or regulators or false pride. Suctions piles maybe helped in later jobs.

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The 17,000 t steel jacket was built at Highlands Fabricators for Chevron. The jacket took 1.5 million man-hours to construct. It came in at £60 million and was finished ahead of time.

It featured large mudmats to help it cope with the poor seabed conditions. They were 36 by 31m and weighed 350t. The jacket was designed by Kvaerner Earl and Wright.
You may all recognise a few familiar faces from HiFab - BP SE Forties Jacket 1986 Image: John Middlemist
The Coflexip Stena Offshore vessel Deep Blue receives the main aligner wheel at the Huisman Itrec quay.

José cao alvares Snr Construction Deck Foreman at Emas Group
I had a good time but I also had a bad time that I do not want to remember because of a bad mother’s son who still does his

Lindsay Baxter
Snr Fabrication Manager at DONG Energy
Memories of 2001 to 2007

Bob Barnett
The Bread Van ;)

Jean-Bernard (JB) Blamengin
OFS Executive Account Manager at Schlumberger
Me too Daniel !! lots of good memories !! A huge learning and successful experience... loved that ship and what we did we it... these were the full speed ahead times .

Daniel Sack Chief Operating Officer Gulf Of Mexico at Subsea 7
Some memories....

Alain Latino Engineering Project / Package Services Specialist
Eric Paya/Bro, how are you doing mate. It’s been a long time since we have exchanged words and still smile and holding on fond memories when your name is stated during a conversation with old friends. A+ Alain

Sebastien TESSIER
Sebastien TESSIER EPCI Director - Offshore floating wind turbines Project “Provence Grand Large” chez EDF Energies Nouvelles
Yes!! Great memories!!

Merry Jos Edakkolathur, PMP
Inspiring Energy Transition STEM Women Leadership @ Francois lesclauze et Francois Letournal; remember SOP days, avec Kiran Chennai (edited)

Juan Manuel Sotelo Estevez 1st Assistant Sup, Reel/lay-/lay-Flex/lay, Subsea Construction Professional, Rigging & Heavy Lifting, Project Execution
Great memories, we have broken eleven records with the Deep Blue during Nakika Project in the Gulf of Mexico (edited)

Jean-Bernard (JB) Blamengin
OFS Executive Account Manager at Schlumberger

Juan Manuel Sotelo Estevez yep, and guess who conceptualized and specified the beast at the time ? ;).... with the know how of Erik Hessels to execute it.
The field was discovered by the Blue Water 3 drilling semi in July 1973. The rest is history.
The advanced $75 million Aker H-4.2 semisub - the first of its kind - was launched from Hyundai’s Ulsan yard in 1986 to meet the demands of Norcem drilling. This evolutionary prototype was designed to operate North of 62 deg in waters up to 600m.

The semi had eight 3,800 hp controllable-pitch thrusters and could reach a top speed of 5-6kts.

The lower deck was designed with a flush underside to prevent ice from accumulating.

Donald Muffett LCGLI Multi-Skilled engineering professional with experience in offshore oil and gas initiatives

This rig then became the Arcade Frontier when Sonat purchased the rig in a joint venture with Reading & Bates. It then became the Paul B Loyd Jr when R&B became controlling shareholder in Arcade Drilling. Worked on this rig for nearly 15 years. Great rig and a great bunch of guys past and present worked on this rig. It worked for a long time west of Shetland schiehallion field and still turning to the right.

Nicholas Lorimer Senior Toolpusher at VELESTO DRILLING SDN BHD

Like yesterday. After coming from the Reading and Bates Ron Tappmeyer with 4 man cabins and communal toilets and showers the Sonat Arcade Frontier was luxury.

If you remember Dixilyn field drilling services was taken over by Sonat. I was on the DF 96. Sonat had the Henry Goodrich and the Sonat Arcade Frontier (previously named Norjarl) through Arcade shipping. Reading and Bates became the majority shareholder and took them off Sonat. Transocean took over Sonat as it were then bought out Reading and Bates Falcon. Got the Henry Goodrich and the PBJJ rigs back.

Christopher Borg Subsea Engineer at WellSafe Solutions

Is that similar build to the old Transocean rather

Donald Muffett LCGLI Multi-Skilled engineering professional with experience in offshore oil and gas initiatives

No the Transocean Rathe (Sonat Rather was originally called the Pratt Rather after one of Sonat’s top guys) It was a GVA 3000 (I think) design rig. Same as Richardson which worked in the Gulf of Mexico. Another good rig

Nicholas Lorimer Senior Toolpusher at VELESTO DRILLING SDN BHD

I came off the Jack up Ron Tappmeyer in 1991 and joining the SAF in Invergordon. I remember Meeting Bob Pennington Oim. I thought he was a mechanic. Still remember him doing the wire splices in the mud pump room for the thruster work in the Pontoon. I remember when the 585 got to use the rig as a training ground. All their equip was in the Pump Room. My Driller was Bill Henderson. Colin Mead was Tp. If I remember correctly its first job was off Stornoway for Conoco. Then we went to Norway off Hammerfest. I am sure you remember when the central pontoon flooded. Fortunately the other water doors were closed. Logan Puckett was Oim then.

James Regan Director at SUBC DO BRASIL

Was this the Arcade Frontier for SONAT or Ned 6 Hull???

Johnny Ricketts OIM / PROJECT MANAGER

Looks like it... many changes now though... I was on her again recently as marine rep... great rig James

Andrew Thomson Drilling HES Team Lead at Oxy

Spent 8 years on that rig. Good times with great crews

Frank Wright Senior Toolpusher @ Downhole Wright Solutions Ltd

Was Collin Christie on this build Paul K. Senior Drilling Supervisor at Chrysaor

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At the time of construction, it was the largest semi in the world.

Later called the Stena Dee and the Songa Dee, it was built by Mitsubishi. It was built for Stena as the Stena Challenger but changed its name when coming under the management of Dyvi.

The rig was capable of operating in severe conditions in water depths up to 1500ft.

Matthew Gordon Regional Vice President - Europe at Unique Group
I did my first ever trip offshore on this rig, 23 years ago. Brings back some memories.

Terry Walsh Senior Drilling Supervisor/Drilling Superintendent
Anybody know if it was the same design as the Omega?

David Berryman Looking right now.
The Dee had the look of an African shantytown!

Michael Johnston Looking for either Short or long term contract Project or Maintenance roles in Oil and Gas Sector
Omega was a Bingo 3000, worked on it until it was sold and moved to South Africa, then worked on Dyvi Stena.

Andrew Cooper Assistant Driller at Noble Drilling
I spent 4 great years on the mighty Dee. She was a cracking rig in her day.

Baz Paris Deck Foreman at Bluewhale Offshore
Was on it for 6 years. Happy days. Dunno where it is now. Heard it was stacked in Norway somewhere.

Tommy Sandvik SM/PM hos ??
Baz Paris she sailed out of Norway more than two years ago, heading for China. I believe she is cold stacked in South Korea right now. Owned by Transocean.

Craig Douglas Owner, ICD Training Services
Where it all began really for me in the oil industry 1987 !

Peter Armstrong , Andy Dickinson , Alex (Minty) Reid , Dougie Henderson , Sizzler LOL (!, ( would be OIM)

Malcolm McRitchie , the Jambo from Innerleithen , Iain Boyd , his brother , John Norrie , Les Law, Helge Tosse, Gavin Severn, the welder Al Wylie, Ron Sturrock (OIM, proper one, rescued me as a crane op) Davie Davidson. ( right comedian ) — Simmons (warehouserman) night Capt, lezzaretto ?!

The old Rig Mechanic, originally from Glasgow lived in Nairn, original rig gig, I forgotten his name, Iain Davidson (Odd Job) John Macmillan from the Hebrides

Please excuse if I have forgotten anyone, but I can assure one thing, what a rig !

Craig Douglas

Graeme Somers Fantastic Rig and great crews

Stew Cozens Materials & Logistics

I second that statement Graeme.

Robert Stone blaster/sprayer able seaman noustabout deck crew seeking employment urgently

Seems like an eternity since I was on there good rig to be on.

Scott Neil Mechanical & HVAC Superintendent
The last time I had to work for a living and I left it in 2007 after almost 5 years

Les Allan Available for work
Spent some time on it while docked at Invergordon.…. michelfranco clausi looking for new challenges onshore

Same project for Dyvi Super Yatzy in macae SS-37 from Boelwerf Shipyard

Alexander Frame Subsea Engineer/Supervisor-Available for work. Seeking a New Opportunity
Great rig, great crews and what a work horse it was.

Jamie Airnes Director Of Operations at Ithaca Energy
Loved my time on the Dee WofS. Often working away while many “larger” peers were idle WoW…..

Alex Albuquerque ALQUER BCROSS- Great Semi-submersible hull design! Similar to the ALQUER BCROSS -

Richard Coulter Valve Tech at Emerson Songa dee when I worked on it

Graeme Somers

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GRAYTHORP II

The jacket section of Graythorp II nearing the site in the Fortiesfield with Graythorp I in the background
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