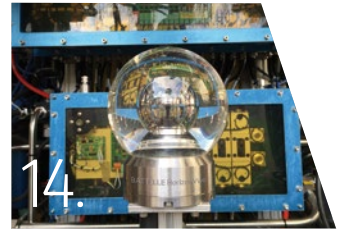


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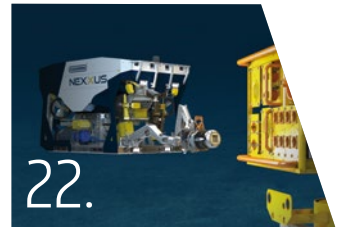
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Extending the Lifespan of the Dan Bravo Oil Complex



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The Subsea Bumble Bee

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The magazine of choice for Subsea Construction and ROV Professionals

ISSUE

Q2 / 2016

ABOUT

With 8000 email distributions and 2000 printed copies delivered to the offices of ROV & subsea construction related companies, oil majors and also distributed at trade shows – ROV Planet aims to become the leading publication, online news portal, and forum of the ROV & subsea construction industries.

ISSUE NO.8: **JULY 2016**

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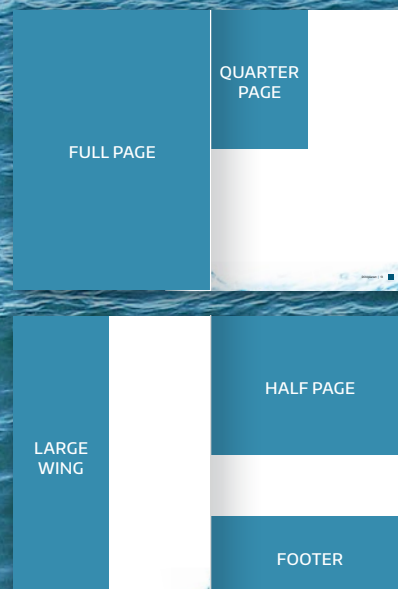
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Bridge & York



WELCOME TO



My name is Richie Enzmann, and allow me to welcome you all to the latest issue of ROV Planet!

Dear Reader,

We have a busy show season behind us. ROV Planet was visiting numerous events around the globe: the Subsea Expo in Aberdeen, the Underwater Intervention in New Orleans, and the Oceanology International in London. The increase in AUV related products and solutions were a common theme of these events. Unfortunately there was also a rapid decrease in work class ROVs, which is obviously due to the weak demand from the offshore oil and gas industry. Meanwhile, there seems to be a renaissance of mini-ROVs with a lot of interesting new models entering the market from all corners of the world. This was especially visible at Oceanology this year.

In this issue Quest Offshore analyses the marine construction market and the recent events in their deepwater market summary. Matt Gusto from Battelle introduces their truly innovative 360degree camera that is depth rated to 4,500 meters!

Then we caught up with Lance Williams, ROV Engineering Manager based in Morgan City, to discuss the new innovative technologies like remote piloting, intelligent diagnostics, tool instructed path control, and the ROV integrated pumping system that have all been utilised in the design of the new NEXXUS ROV. The NEXXUS is now the flagship ROV of Oceaneering.

Finally, we sat down for a cup of coffee with Chris Bird, an oil exec based in Aberdeen, to have a chat about how he sees the future of the UKCS. He gave us an insight into how investors evaluate projects and expressed his opinion on how the industry should tackle this current downturn: focusing on unit costs.

We've got a lot to look forward to, so sit back and enjoy our seventh issue!

Best regards,
Richie Enzmann

UPCOMING EVENTS

26–28 April, 2016 – Offshore Well Intervention Conference – Aberdeen, UK

High-level, strategic conferences for the offshore oil & gas community.

02–05 May, 2016 – OTC Houston, TX, USA

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23–25 June, 2016 – MATE International ROV Competition – Houston, TX, USA

19–23 September, 2016 – MTS/IEEE OCEANS'16 – Monterey, CA, USA

World class technical event focusing on marine science and ocean technology.

24–26 October, 2016

ATC Arctic Technology Conference – St John's, NL, Canada

OTC's event focusing on the development of offshore resources in the arctic.

29 Nov – 2 Dec, 2016

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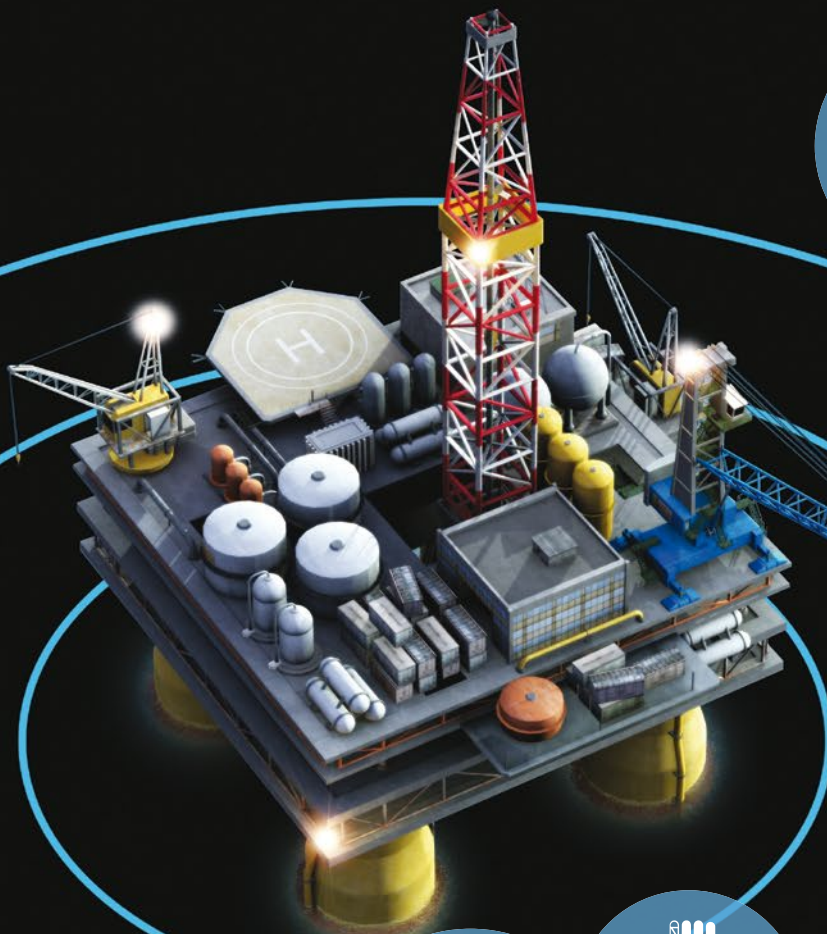
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DEEPWATER OIL AND GAS MARKET

By Krystal Alvarez, Senior Market Analyst,
Quest Offshore Resources

The global deepwater oil and gas market is facing arguably the worst downturn in remembered history. The need for a fundamental and structural change to the way deepwater reserves are developed is pushing members of industry to work together to reduce cycle time, increase efficiency and innovate with a common goal of reducing overall development cost. The marine construction market, like all others, has had to adapt to ever-worsening market conditions while keeping an eye on the inevitable recovery and strategically developing plans for, what could be, a very different subsea landscape in the future.

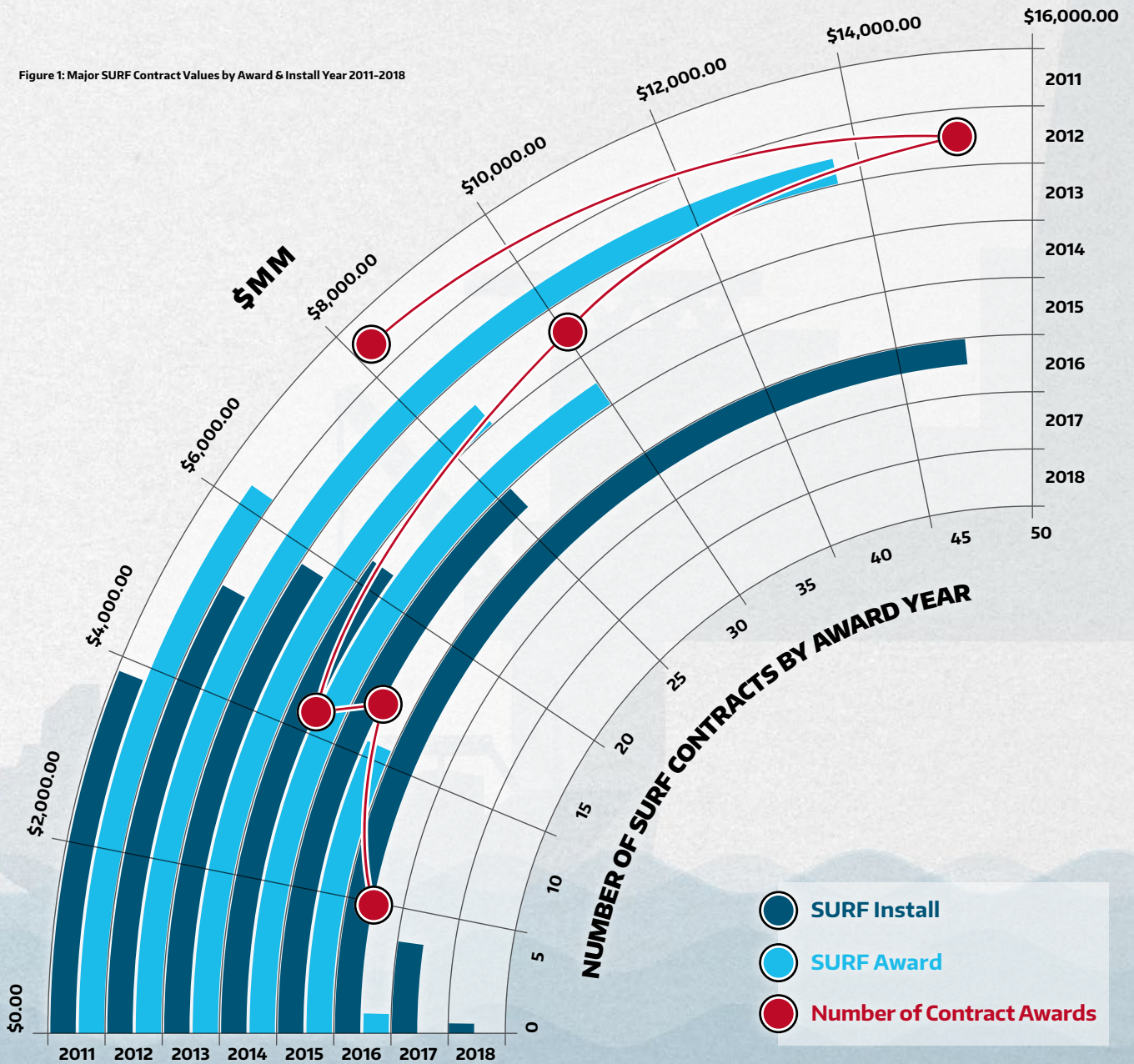
Quest Offshore comprehensively analyzes the marine construction market as it plays into the overall development cycle of the world's deepwater projects. Vessel demand for marine construction services is driven by new project development, the operational requirements of existing fields, and the decommissioning of infrastructure no longer used for oil and gas production. "Greenfield" demand is defined as work for new projects or expansions of existing projects. "IMR" demand (inspection, maintenance, and repair), encompasses a large variety of work on existing fields, ranging from visual inspection, testing, and the repair or replacement of components. The third category, decommissioning work, takes place at the end of a project's lifecycle as operators decommission and permanently remove or abandon subsea equipment on fields which are no longer producing.

Subsea construction vessels are best described as the generalists of the subsea oil and gas industry. They are capable of fulfilling demand from a variety of sectors, which historically allowed these flexible vessels to maintain higher utilization rates. In contrast to specialized vessels such as pipelay or heavy lift assets, subsea construction vessels are capable of working on a larger variety of tasks, enabling them to shift their focus depending on market conditions, pertinent opportunities and client-specific requirements. Of the three demand categories identified, IMR accounts for the largest portion of global demand days, followed by greenfield (new construction) and decommissioning.

It is important to note that different regions see different levels of demand for subsea construction vessels relative to the amount of work required for a variety of factors, ranging from the age of infrastructure (newer wells are less likely to be inspected or repaired in a given year), operator preference (large operators such as Statoil, BP, and Shell, are more likely to undertake these services on a regular basis), and the availability of vessels, which can lead to operators taking vessels on long-term contracts and underutilizing these vessels while paying a continuous day-rate. Contracting models for subsea construction vessels vary, with some operators contracting vessels on multi-year terms for IMR and light construction activities and other operators contracting vessels on a job by job basis in the spot market.

Low oil prices and significant cuts in planned capital expenditures have led to some projects coming to a halt and others shifting further out in the forecast period. This dynamic is perpetuated as international and national oil companies review the economics of deepwater projects and explore ways of making their prospective investments viable in currently unfavorable market conditions. This has slowed down tender activities in the marine contracting segment leaving marine contractors dependent upon their strong backlogs. However, as these backlogs are exhausted and tender activity remains muted, contractors are expected to bid increasingly aggressively

Figure 1: Major SURF Contract Values by Award & Install Year 2011-2018



for work. Decreased demand coupled with the increasing supply of vessels in the offshore subsea construction and ROV market segment will more than likely lead to low utilization rates in a deteriorating market pushing day-rates to a more favorable level for operators.

The challenging downturn has had a severe effect on several subsea vessel contractors who have been forced into Chapter 11 Bankruptcy. Ceona, which was created in 2012 and announced bankruptcy in the third quarter of 2015, is currently trying to sell the newbuild vessel Ceona Amazon. Reef Subsea, established in February 2010 and owned by HitecVision, filed a bankruptcy petition to Bergen District Court in the first quarter of 2015 and is likely to be Norway's first major oil service company to become a casualty of the ongoing oil market plunge. In the second quarter of 2015, Cecon

ASA requested the City Court of Aust-Agder to declare the company bankrupt having failed to present a plan for a compulsory composition. Havila Shipping is in jeopardy after a revised restructuring proposal was not supported by the required two-thirds majority of holders of the unsecured bonds which has put the company in a challenging position in which they are working with financial creditors in order to reach an agreement. In addition to these companies filing Chapter 11, some contractors have started cancelling newbuild vessel orders. Boa Offshore cancelled two multipurpose PSVs with Chinese yard Nantong Mindge Heavy Industry in July 2015 and Boa IMR AS also sent a cancellation notice of the shipbuilding contract for an IMR/OCV vessel with Noryards Fosen AS in Norway. Petrofac cancelled the shipbuilding contract for the JSD 6000 from ZPMC in October of 2015. We are likely to see more of these cancellations as the market conditions do not improve.

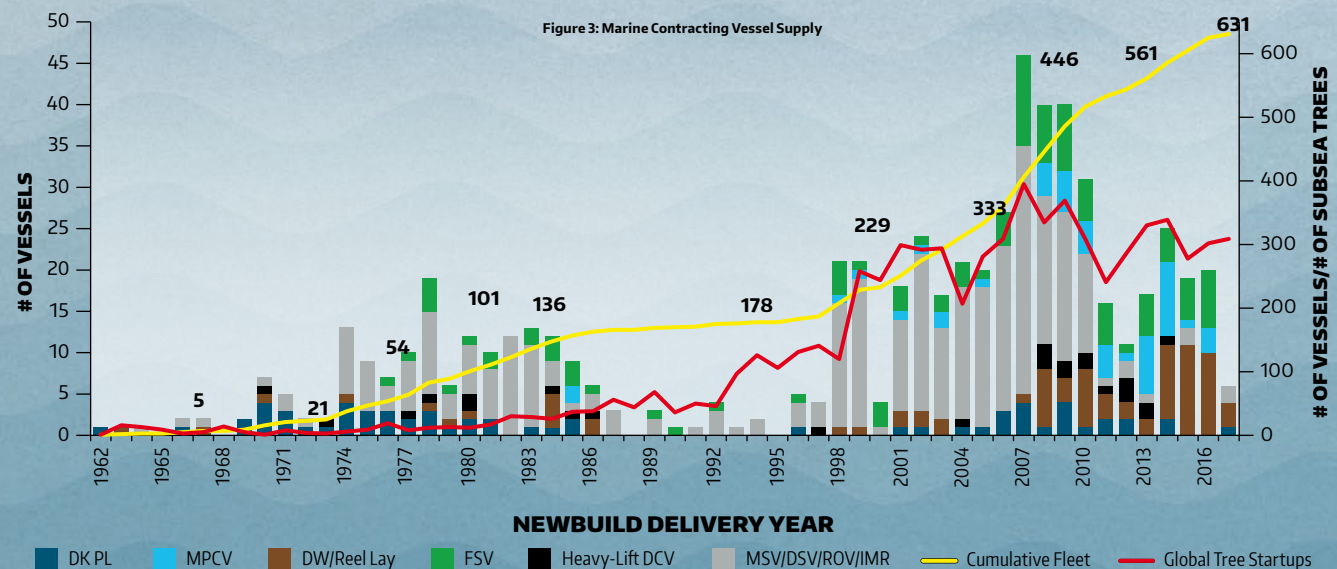
Figure 2: Number of Vessels with >1 ROV by Delivery Year	2011	2012	2013	2014	2015	2016	2017	2018	GRAND TOTAL
REEL LAY	2	1		6	3	5	2		19
MULTI-PURPOSE CONS.	3	1	6	5		3			18
FIELD SUPPORT	4	1	3	1	3	2			14
DEEPWATER PIPELAY	1		2	1					4
INTERVENTION				2		1	1		4
MSV/DSV/ROV	1	1	1		1				4
HEAVY-LIFT DCV		1	1						2
DSV								1	1
GRAND TOTAL	11	5	13	15	7	11	3	1	66

In 2014, fifteen newbuilds were delivered into the SURF market, four of which were are contracted to Petrobras. Five of the newbuilds from 2014 are considered by Quest to be multi-purpose construction assets targeting subsea construction work. 2015 saw the delivery of seven newbuilds with ROVs in which three were Reel Lay vessels, three were Field Support Vessels and one was categorized as a MSV/DSV/ROV vessel. Quest is tracking an additional 15 newbuilds with ROVs to be delivered between 2016 and 2018, six of which will be delivered to long term contracts in Brazil.

Quest estimates that by the end of 2017, Petrobras will have a total of 24 flex-Lay and Subsea Construction/ROV vessels under long term contract. South American pipeline installation, which is overwhelmingly focused offshore Brazil and operated by Petrobras, is expected to account for over 8,000 demand days for the period of 2016–2020. However, Petrobras is currently facing a variety of issues centered on corruption around tenders of FPSOs and other marine assets as well as financing. This is leading to delays in project tendering and construction which will delay South American demand for pipeline installations.

Quest expects to see contractors divest older vessels in the coming months and years. Subsea 7 recently announced the divestment of 11 vessels by relinquishing long term charter contracts and cold stacking of wholly-owned vessels. Technip has been divesting a large portion of their fleet since 2013 releasing three vessels in 2013, eight vessels in 2014, two in 2015 and another planned divestment of two vessels in 2016 and 2017. Quest expects further divestment activity in the near future, with a high grading of the fleet leading to both increased vessel retirements and sales of vessels into less challenging markets.

As with most other oil and gas sectors the offshore construction vessel market is facing near term struggles, exacerbated by the poor timing of newbuild deliveries. Current market conditions both create opportunities for operators looking to execute projects at reduced costs as well as lead to hope that the retirement of older assets coupled with a future recovery will lead to a balanced market. However, despite long term optimism based on increasing demand for subsea services and a slowly rebalancing market, the near term excess supply coupled with dwindling backlogs will result in ongoing challenges, increased consolidation and heightened industry collaboration.





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OIL PLATFORM

TLC: EXTENDING THE LIFESPAN OF THE DAN BRAVO OIL COMPLEX

Bert van der Velden,
Commercial Director,
Subsea Services, Boskalis



DSV Constructor working on site the Maersk Oil Dan complex. (Courtesy of Boskalis)



When it first came on stream in 1972, the Dan Bravo Complex – Denmark's first productive offshore oil field – was expected to produce oil for up to 25 years. However, this initial estimate has been boosted quite dramatically in the recent past. This is thanks to an intricate, multi-year subsea structural reinforcement campaign involving the installation of 136 tonnes of new steel over the course of over 200 diving days. Once this work has been completed the life of the Complex's wellhead platform, Dan A, is expected to have nearly trebled from 25 years to 70. Jakob Knudsen, DABRAT project manager for Maersk Oil, explained the rationale behind the project. He said, 'Had nothing been done, the platform's life would have been shortened.'

A MOST PUZZLING CHALLENGE

The work itself would not prove to be easy. The structural overhaul of the Dan A platform's jacket – which was undertaken by Dutch offshore contractor Boskalis, in close partnership with operator Maersk Oil – involved a number of firsts, many of which were carried out beneath the waves.

This complicated project – akin to constructing a 3D puzzle underwater – involved a large subsea photogrammetry campaign, extensive site clean-up, preparation work, and the installation of temporary cranes on vertical platform members. This last procedure was necessary in order to help manoeuvre the new steel into place at depths of between 10–41m. And all of this, while the platform was still in production.

The Subsea Services business unit of Boskalis was contracted for the installation, fabrication, procurement, equipment testing, and structural examinations of components on Dan A. They were also tasked with installing a new boat landing ladder on Dan B, and removing obsolete equipment from Dan A and B as part of the Dan Bravo Rationalization (DABRAT) program. 'This had not been done before: fortifying underwater structures in this way on this scale,' said Captain Bert Kamsteeg, contract manager for Maersk DABRAT at Boskalis.

THE HISTORY OF THE DAN FIELD

The Dan field was discovered in 1971 about 125 miles west of Esbjerg, Denmark. On this site the Dan Bravo Complex was established, and was comprised of three components: Dan A and C are wellhead platforms and Dan B is the process platform for the Complex. The Dan Bravo complex had in fact been ordered from the US for the Kraka field, but it was installed on Dan when this field was found to be larger.

Boskalis' involvement in the DABRAT project commenced early in 2013, with preparation work starting that February. The main scope of the project was to reinforce Dan A's jacket, using 10 clamps – called K-node clamps – and to install a new conductor guide level. Both of these would require carefully manoeuvring 15 pieces of 4–5-tonne fabricated steel sections through slots in the platform's structure, whilst being guided by divers.

PLANNING AND PREPARATION

The first challenge was mapping the existing structure, which, over the years, had been extended by assessing existing inspection data and acquiring new data. From July to September 2013, a huge photogrammetry exercise – the largest ever of its type – was carried out beneath the waves. Subsea, air, and saturation divers first marked out the structure, using 3,000 magnetic, coded markers. Then some 20,000 high-definition, overlapping photographs were taken over a 70-day campaign. The photographs were then converted using computer software into an exact geometric 3D model, using the information from the markers from which the K-nodes and conductor level guide could then be designed. Next, inspection work, surface cleaning, and preparation work all had to be carried out. This included underwater grit-blasting and measuring member wall thickness prior to installation work. All of this had to be completed whilst having to contend with some unfavourable weather conditions and reduced subsea visibility.

'In winter 2013/14, steel fabrication started in Denmark, and an intense planning period – setting out preparation and procedures for execution – started ahead of the big challenge: the installation work,' said Kamsteeg. 'Divers do not do this kind of work very often. A lot of risk assessment studies and training were done.'

NO CRANE, NO GAIN

One of the challenges the team faced was how to transfer the steel from the ship to the position it needed to be in: beneath the platform and below the water. 'The platform had a small 2.3-tonne capacity crane, but the steel weight in subsea conditions was in some cases 4–5-tonnes,' explained Kamsteeg. 'One of the solutions – actually the only sensible solution – was to build up two temporary cranes, 12m above sea level on to the vertical members of the platform, something which has not been done before.'

'In-of-itself this was a challenge, first having to install a clamp with a pedestal on to the vertical member, and then building up a conventional knuckle boom crane on to it. This itself first had to be dismantled into 2–3-tonne pieces in order for the platform crane to be able to lift them,' Boskalis



The DSV Constructor (SAT-ROV). (Courtesy of Boskalis)

utilised two cranes which were already on vessels in its off-shore fleet. These were modified so they could be remotely controlled from the dive support vessel (DSV), to avoid having to procure new cranes, thus avoiding further delays.

Installing the temporary cranes meant steel could be lowered from one of the two DSVs being used – the Protea and Constructor – then connected to the temporary platform crane's hoist wire. The steel pieces were disconnected from the DSV's hook by divers. They were then moved into place, assisted by divers at subsea level and rope access personnel at the platform.

BRING IN THE REINFORCEMENTS

The next section of the project involved reinforcing the new components. The K-clamps were created to reinforce areas of the jacket structure where a horizontal member is intersected by cross members. Each clamp was comprised of two sections to create a steel-to-steel friction clamp. This is held fast using steel bolts, weighing 10 kilos a piece. To install the 10 clamps some 2,000 bolts were used, each having to be handled and set by the dive team using specially-built hydraulic tensioning gear, and a specially designed tool basket was used for handling the bolts and nuts subsea.

After manoeuvring in and then installing the new conductor guide level, the main section of the new level – measuring 3m x 8m – needed to be lowered, tilted, and slotted through the platform members. This section then needed to be brought back on to the horizontal and lifted into place, before being bolted into place using further sections of steel.

A FIRM HANDSHAKE

All of this work was carried out at about 13m below the surface. The operation involved more than a dozen 'handshakes': switching hooks from the DSV hoist to temporary crane, then to the temporary air hoists, before switching hooks once more. Co-ordination above and below the water line, between divers, rope-access workers and the dive supervisor was therefore crucial. The task was further complicated as the supervisor's only visual link to what was happening in the water was via a camera on the diver's helmet and video from observation class remote operated vehicles (ROVs).

'For our divers, that was the most challenging part of the project due to the volumes of steel involved, in different shapes and lengths,' Kamsteeg says. 'It was also the most time consuming part of the project: getting the steels into position.'

'We knew we had to get it in to position between the six existing conductors. We had to fly it in vertically between the two rows of conductors then flip it horizontally, and fit the out rigging to the vertical members of the platform. Then we had to lift it in to place, fix the bell mouths to the conductors, and bolt it down. It had to be built up from all the pieces of steel to get it into place, and in its proper shape to it would support the platform itself.'

Timing was another key consideration during this stage of the project. 'Everybody has to wait all the time for the other components to be in position or ready. We had two divers in the water, who needed to be in the right position at the right time and they needed to have the right tools at the right time. It is almost like a computer game with various sensor inputs. In our contingency planning we expected to do it in two weather windows. We actually did it in one.'



Diver and ROV working together. (Courtesy of Boskalis)

Once the new conductor guide level was installed, the old levels were removed. As part of its initial remit, Boskalis also replaced a number of anode bracelets. This also involved significant inspection, cleaning, and preparation work, including removing marine growth, grit-blasting, and taking measurements.

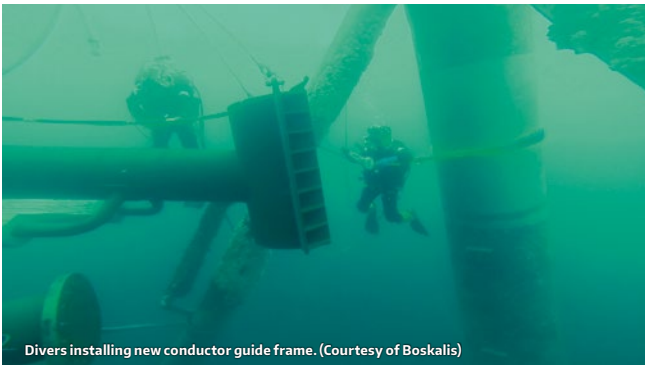
THE FINISHED PRODUCT

The final part of the 2014 offshore campaign was removing the temporary cranes before the winter season. Now that the project has been completed, the result is a comprehensive makeover of the facility below the water, enthused Knudsen. 'The impact on Dan A – achieving a lifespan extension to 70 years in total – is quite an achievement.'

The 2013–14 campaign was also an HSE success. Over the 200-day offshore campaign, there were no lost time incidents. This was sheer testament to onshore planning, preparation, and rehearsal of many of the steps due to be undertaken offshore, said Kamsteeg.

'The planning and preparation was key,' added Knudsen. 'We did as much as we could onshore. Once you go offshore there's a high cost involved, every minute is a lot of dollars. We have had more than 200 diving days over the last two years.'

The project was conducted in close collaboration between the Subsea Services business unit of Boskalis – who set up an office in Esbjerg for the project – and Maersk Oil, including at least one face-to-face meeting each day. 'The project couldn't have been done without this close working relationship,' concluded Knudsen.



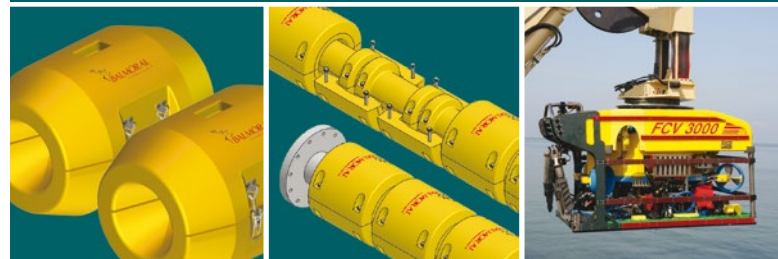
Divers installing new conductor guide frame. (Courtesy of Boskalis)



Courtesy of Boskalis



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REDUCING COSTS

THROUGH MORE EFFECTIVE SURVEYING

By Matt Gusto, Market Strategist and Research Scientist, Battelle

The exploration of more effective surveying systems is emerging as a critical path for operating companies seeking to reduce the time needed for collecting subsea survey data and to increase the quality and volume of data.

The problem is that survey data often is insufficient to adequately evaluate inspected equipment, resulting in the survey needing to be repeated.

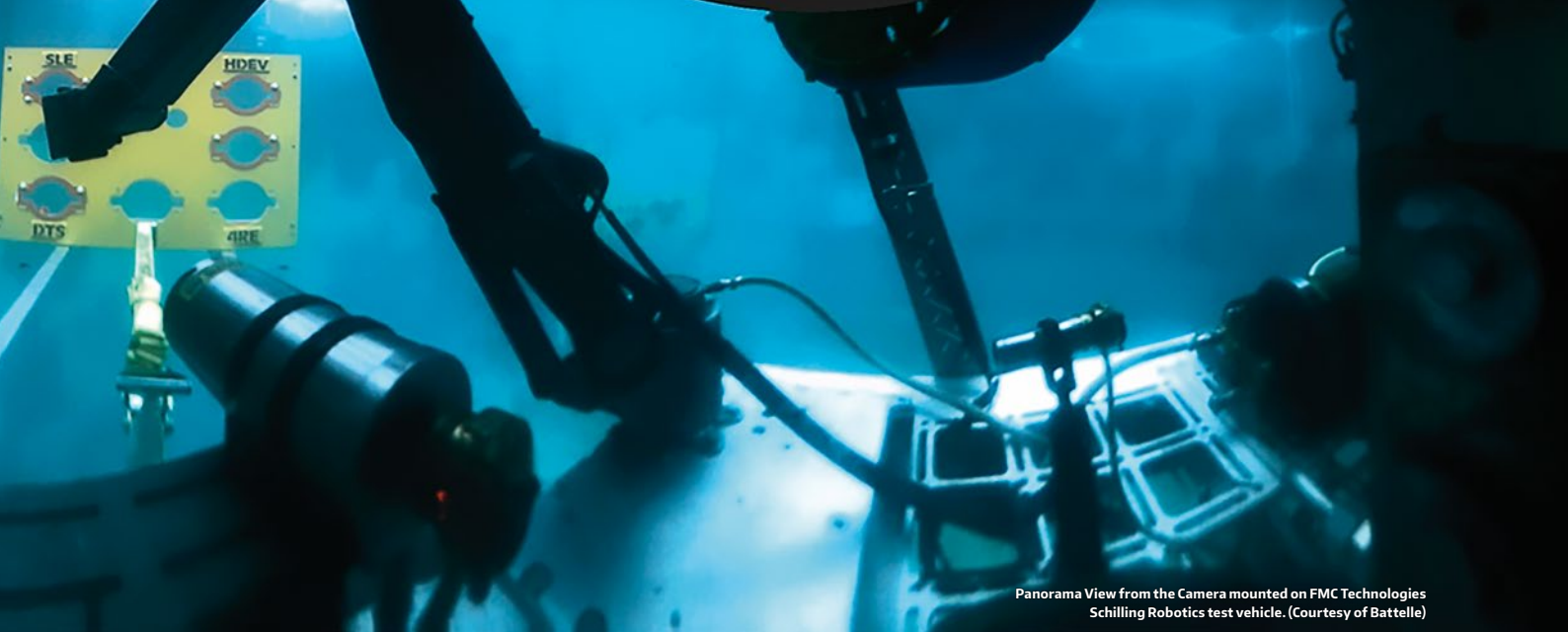
Researchers and engineers at Battelle in response have developed deep water monitoring gear that is earning kudos from stakeholders at all levels of the subsea video supply chain. That's because it provides a video system that goes beyond passive, narrow field of view camera recordings.

What differentiates the Battelle system is that it has the ability to pan, tilt, and digitally zoom in a recorded 360° video stream. This dramatically increases the data available to survey engineers tasked with evaluation of subsea equipment. It also allows better management of the integrity of these assets to improve the life of the field.

Known as the HorizonVue™ M360 Video System, the Battelle equipment records all 360 degrees of a dive simultaneously – with one camera that has no moving parts. During the dive, as well as when footage is analyzed, the user is able to control a digital pan and tilt window to explore the video stream and investigate what is so often missed by the array of cameras typically used.

Battelle and Technip, with installation, training and mobilization support provided by Seatronics, an Acteon company, deployed HorizonVue™ in the Gulf of Mexico's Green Canyon to inspect subsea oilfield equipment. The result was an interactive





Panorama View from the Camera mounted on FMC Technologies Schilling Robotics test vehicle. (Courtesy of Battelle)

survey data package that includes what pan and tilts miss 2,200 meters below the surface. Survey engineers were able to capture detailed footage of subsea equipment and placement of marker buoys in a very deep subsea field.

HorizonVue™ “delivers information that we don’t normally receive in our survey data package,” said Iain Miller of Technip, USA. “The depth of information, and interactivity from 360° imaging software, gives us more information when analyzing the integrity of subsea assets. We can use this tool to communicate the status of equipment on the seafloor, and fuel better engineering decisions for the future of the field.”

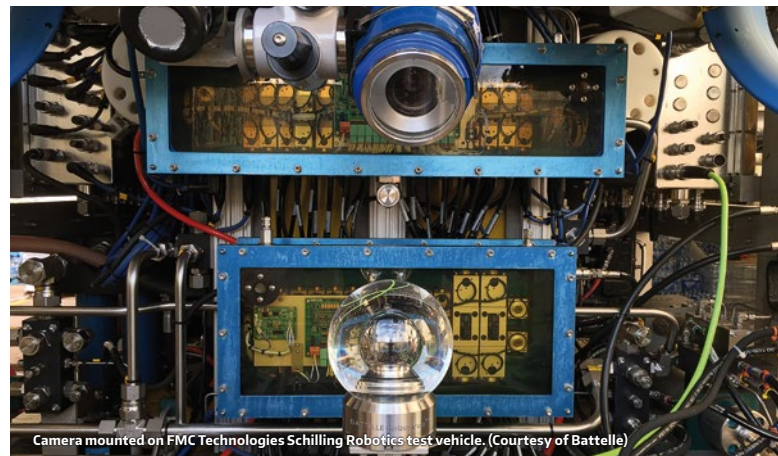
Better decisions translate into lower costs and a higher degree of certainty when evaluating subsea assets. Three-hundred sixty degree imaging solutions can save money by increasing the efficiency of surveys, reducing the chance of equipment damage, and minimizing the likelihood of having to repeat surveys due to incomplete or inadequate information.

Hours wasted reviewing subsea video hoping that a pan and tilt will move toward a valve that needs to be verified open or closed, or searching for information in the data package that would have been captured had the camera view been just a little to the left, can now be significantly reduced.

Recording 360° video ensures that if the object of interest was near the sub it will have been recorded. And once isolated within the software, it can be digitally zoomed in upon to gain a closer look. This approach not only saves time, but will help maintain the sanity of engineers.

While the camera may reduce the number of pan and tilts currently in use, it certainly will not eliminate them completely. Instead, it is an excellent supplement to many of the onboard systems, especially when an event occurs just outside the field of view of the other cameras.

Mechanical zoom and high quality HD images cannot be duplicated by simply adding more pixels over a wider field of view. Close-in inspection tasks are better suited for those systems, but the HorizonVue™ M360 Video System adds capability not achievable with conventional cameras on pan and tilt platforms.



Camera mounted on FMC Technologies Schilling Robotics test vehicle. (Courtesy of Battelle)

NEVER MISS A CRITICAL VIEW

BATTELLE HorizonVue™ M360 Video System

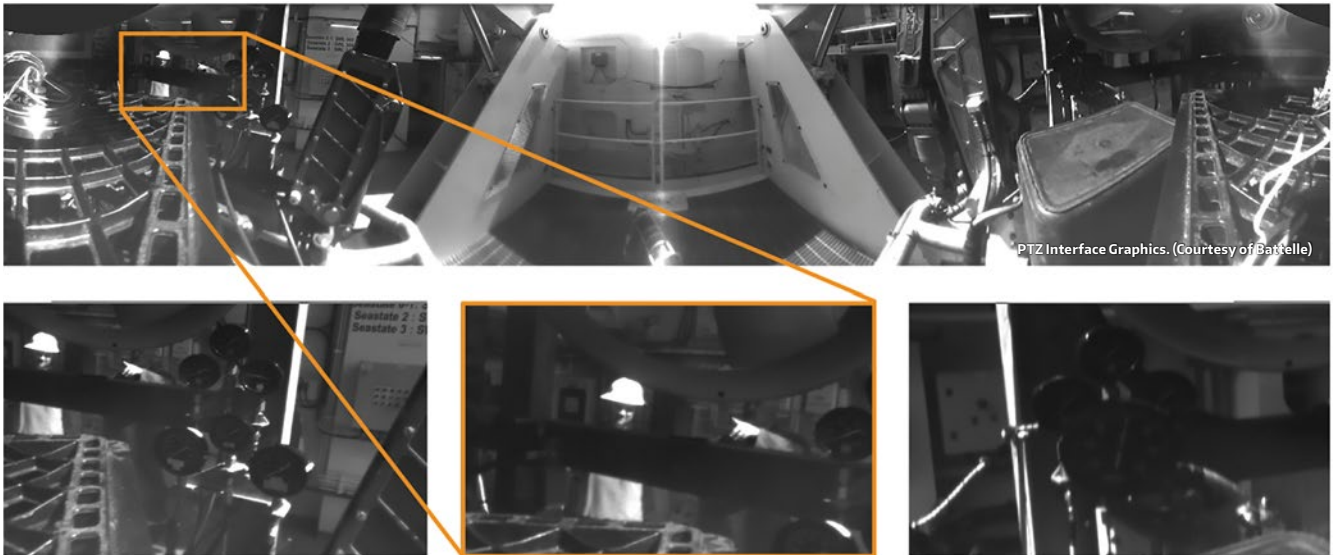
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PTZ Interface Graphics. (Courtesy of Battelle)

EVERYONE WANTS TO CONTROL THE PAN AND TILT

Different people on the vessel use the existing pan and tilt camera systems on the ROV for a variety of tasks. Pilots, supervisors, bridge crew, survey engineers, and clients all have different needs from the onboard camera systems. Pilots frequently have someone in their ear asking them to move the camera one way or another, taking focus away from flying the vehicle or the task at hand.

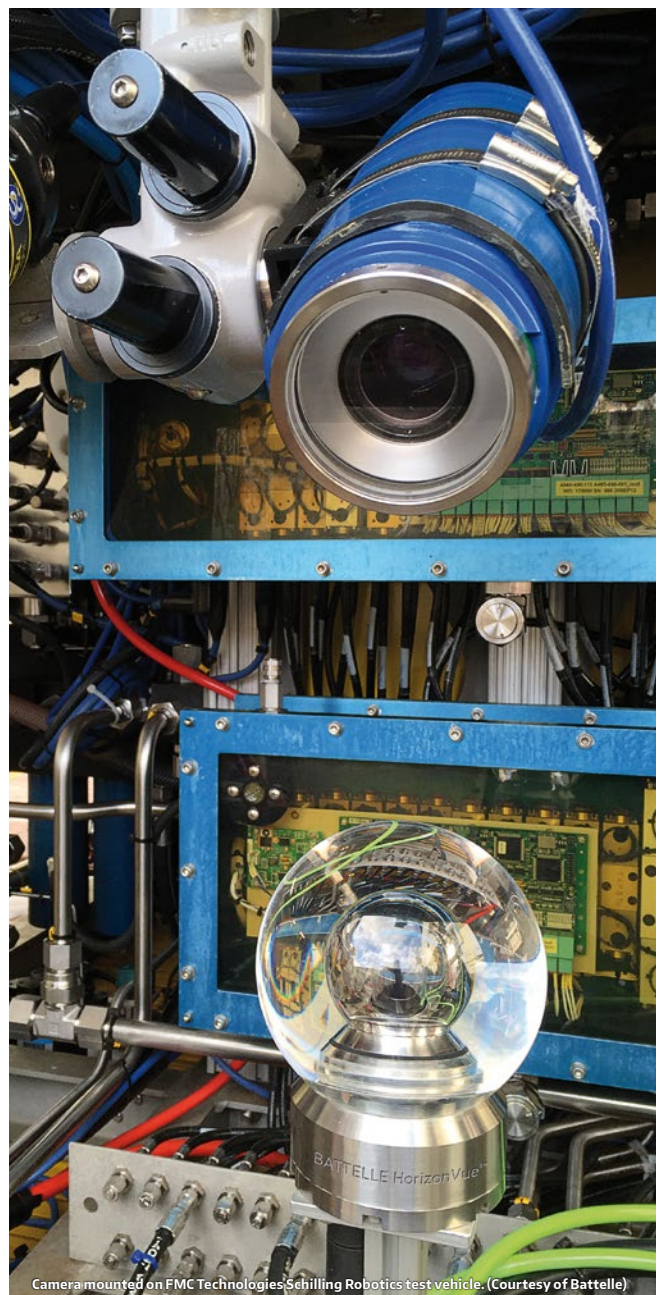
The HorizonVue™ M360 camera works over a gigabit Ethernet connection and transmits up to 10 MP resolution video data distributed over 360 degrees horizontally with a 65 degree vertical field of view. The benefit of using an Ethernet camera is multiple unprocessed streams that can be output from the host computer mounted topside in the rack.

Connecting other computer systems around the vessel using an Ethernet switch allows the control computer to function as a server and stream unprocessed 360° video to additional devices around the vessel. Once HorizonVue™ software package is installed on the computer, any number of users (within the bandwidth limits of the server) can access the stream and manipulate up to three pan and tilt windows simultaneously without affecting other users.

Video is recorded using the same method. Raw, unprocessed imagery is stored on a hard drive to be opened later with the viewing package to produce the same interactive environment as the live video stream. Hosted viewers are also available, requiring the user to simply open up their web browser, similar to the technology used to view interactive 360° videos on YouTube.

RECORDING AND DELIVERING THE VIDEO

The majority of popular DVR manufacturers currently support coaxial inputs and the standard passive camera systems that dominate the ROV industry. Overlay and appropriate archiving are required components of the survey data package. Recording 360° video through these sys-



Camera mounted on FMC Technologies Schilling Robotics test vehicle. (Courtesy of Battelle)

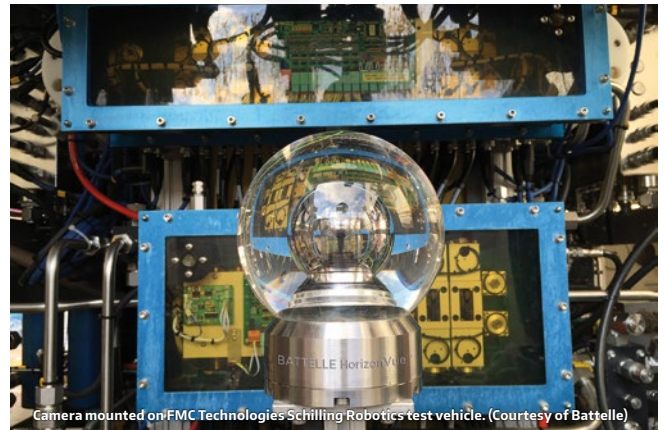
tems is currently limited to a screenshot type approach and the interactivity, or the resolution, is lost.

But more Ethernet sensor solutions are quickly becoming available in the industry. The benefits of data collection over passive video are being more widely recognized as software is developed to transform these data sets into powerful evaluation tools.

Some DVR providers have already gone this route, and it is only a matter of time before others follow suit. Overlay is being stored as metadata rather than burned directly onto the image. Independently of 360° video, Ethernet video streams will continue to grow in the industry, and the software systems that use them will continue to mature as well.

Until industry technology catches up with the HorizonVue™ system, network video recording software offers an inexpensive solution through correlation of the time stamp on the 360 video with that of the other sensor systems provided in the package.

The Battelle HorizonVue™ Video System's unique viewing capability and real-time interactive features provide a new level of awareness for survey engineers. Collecting 360° video provides extensive value – and lowered costs – through significantly expanded survey data packages that deliver more information and require less time to analyze.



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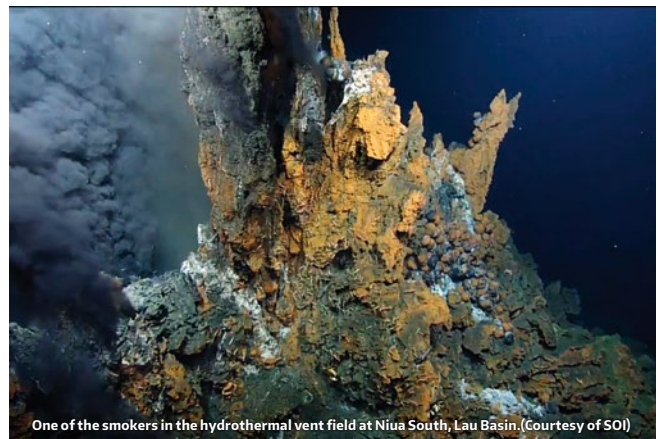
Carlie Wiener, Communications Manager, Schmidt Ocean Institute

Scientists aboard Schmidt Ocean Institute's research vessel *Falkor* have developed the first 3D model of an entire hydrothermal vent field for Virtual Reality, covering the largest area of seafloor ever imaged that way.

After 13 days at sea, chief scientist Dr. Tom Kwasnitschka from GEOMAR Helmholtz Centre for Ocean Research Kiel, along with other members of the team, departed research vessel *Falkor* making history. Over 48 hours of underwater robotic diving with ROV ROPOS allowed the science team to study a rarely visited hydrothermal vent field at the Niua volcano in the Northern Lau Basin. Using newly constructed imaging equipment, the science team was able to reconstruct the vent site in 3D using virtual reality technology. This will allow scientists all over the world to study this unknown environment without having to leave their labs.

"There are still many mysteries surrounding seafloor hydrothermal vent complexes," said Dr. Kwasnitschka. "The biological, chemical and geological relationships in these areas are complicated and intricate, in ways that are not completely understood. Being able to view the whole system has evaded most scientists as they are unable to experience this deep sea environment, until now."

The scientists mapped the entire vent region and captured 4K video sequences for immersive hemispherical or virtual reality display in real time. The primary goal of this study was to create a series of 1-cm resolution 3D models of vent groups that can be used as an environmental map at unprecedented resolution. Simultaneously, the team was also able to characterize the geological, biological and hydrochemical features of the Niua site.

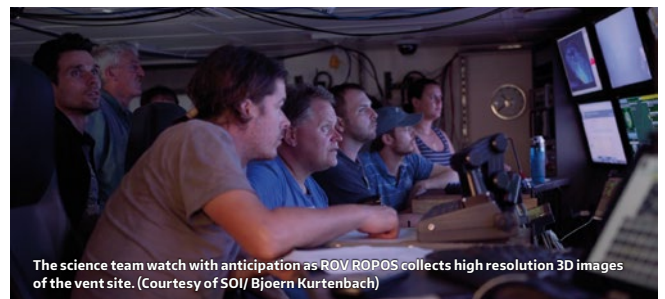




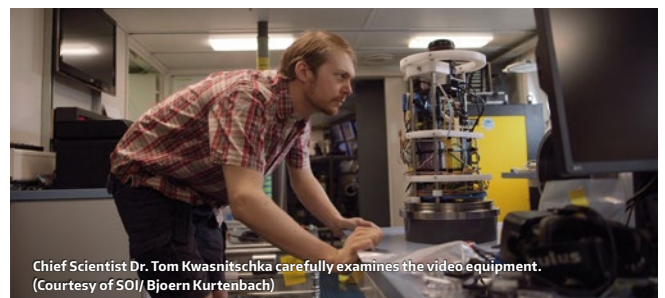
The *Falkor* crew work to bring ROV ROPOS back on the aft deck. (Courtesy of SOI/ Bjoern Kurtenbach)

To better protect deep-sea hydrothermal systems, new survey technologies are needed that will allow quantifiable and high-resolution monitoring for investigations of these remote environments. Huge changes for the ecosystems and geography of seafloor hydrothermal vent systems could be in the very near future. However, if these areas are not explored, investigated, and recorded before change arrives, then we may never know what was there. By using the cutting-edge 3D survey tools, the “Virtual Vents” team has opened this remote environment to the public in a way that has never before been possible.

This innovative research approach has sparked a new strategy for ocean floor research and created an immersive tool for public engagement. The team shared this experience with the public in real time, making all ROV dives publicly available, and drawing in over 16,000 viewers from 95 countries.



The science team watch with anticipation as ROV ROPOS collects high resolution 3D images of the vent site. (Courtesy of SOI/ Bjoern Kurtenbach)



Chief Scientist Dr. Tom Kwasnitschka carefully examines the video equipment. (Courtesy of SOI/ Bjoern Kurtenbach)

Schmidt Ocean Institute is back in the Lau basin with chief scientists Dr. Peter Girguis, Dr. Charles Fisher, and the rest of the science team to examine the ecosystem dynamics and biological activity of a similar hydrothermal vent system.

Schmidt Ocean Institute was created by Eric and Wendy Schmidt in 2009 to enable research that expands understanding of the world’s ocean using advanced technology, intelligent observation, and the open sharing of information. Annually the organization invites select scientific teams from around the world to carry out collaborative oceanographic research and technology development aboard its 272-foot research vessel, *Falkor*, launched in 2012.



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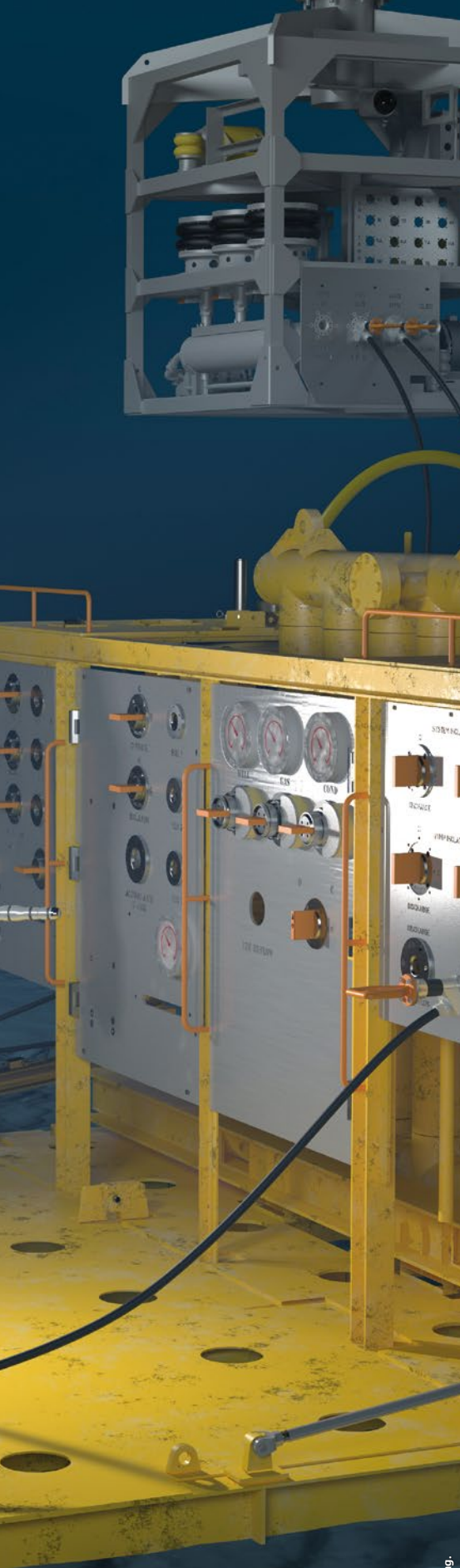
Research Vessel *Falkor* of the Schmidt Ocean Institute (SOI/ Mark Schrope)



THE NEXXUS ROV: REVOLUTIONIZING OPERATIONAL EFFICIENCY

By Richie Enzmann





Courtesy of Oceaneering.

The NEXXUS ROV is definitely one of the most technologically advanced ROVs in the world. We have taken a look at this new ROV and caught up with Lance Williams, ROV Engineering Manager, Oceaneering International, Inc.

'As a designer, manufacturer, and operator of our own vehicles, the engineering approach is much different than that of other ROV manufacturers. We are faced with the challenge of cost effectively designing a product that reduces repair, maintenance, and spares while increasing safety, efficiency, and operational reliability. This means gathering feedback from the offshore techs, analyzing downtime reports, and really understanding the system from an operational standpoint. With that knowledge, we are able to design a best in class ROV such as the NEXXUS.

'We took our extensive knowledge of the tools required to perform various ROV operations and designed this vehicle to be the actual tool. This tremendously decreased the need for bolt on skids and additional tooling integration. For the remaining tools, we collaborated with our tooling group and designed standard interfaces improving installation and integration time subsea and on deck.' said Williams.

The NEXXUS ROV has some remarkable features such as remote piloting, automated tool instructed path for easy manipulator control, sharper video, and enhanced pumping capabilities including compliance to API S53.

SHARPER VIDEO WITH 4K

Oceaneering was first in the industry to provide HD Video and 3D video. Now they provide even sharper footage with the 4K Video technology for their ROV systems – providing clear and ultra-high-resolution real-time video. 4K takes video detail to a whole new level. With four times the resolution of standard HD Video, 4K provides stunning footage with an incredible degree of detail. 4K features higher image definition quality, a much more detailed picture, better fast-action and larger projection surface visibility.

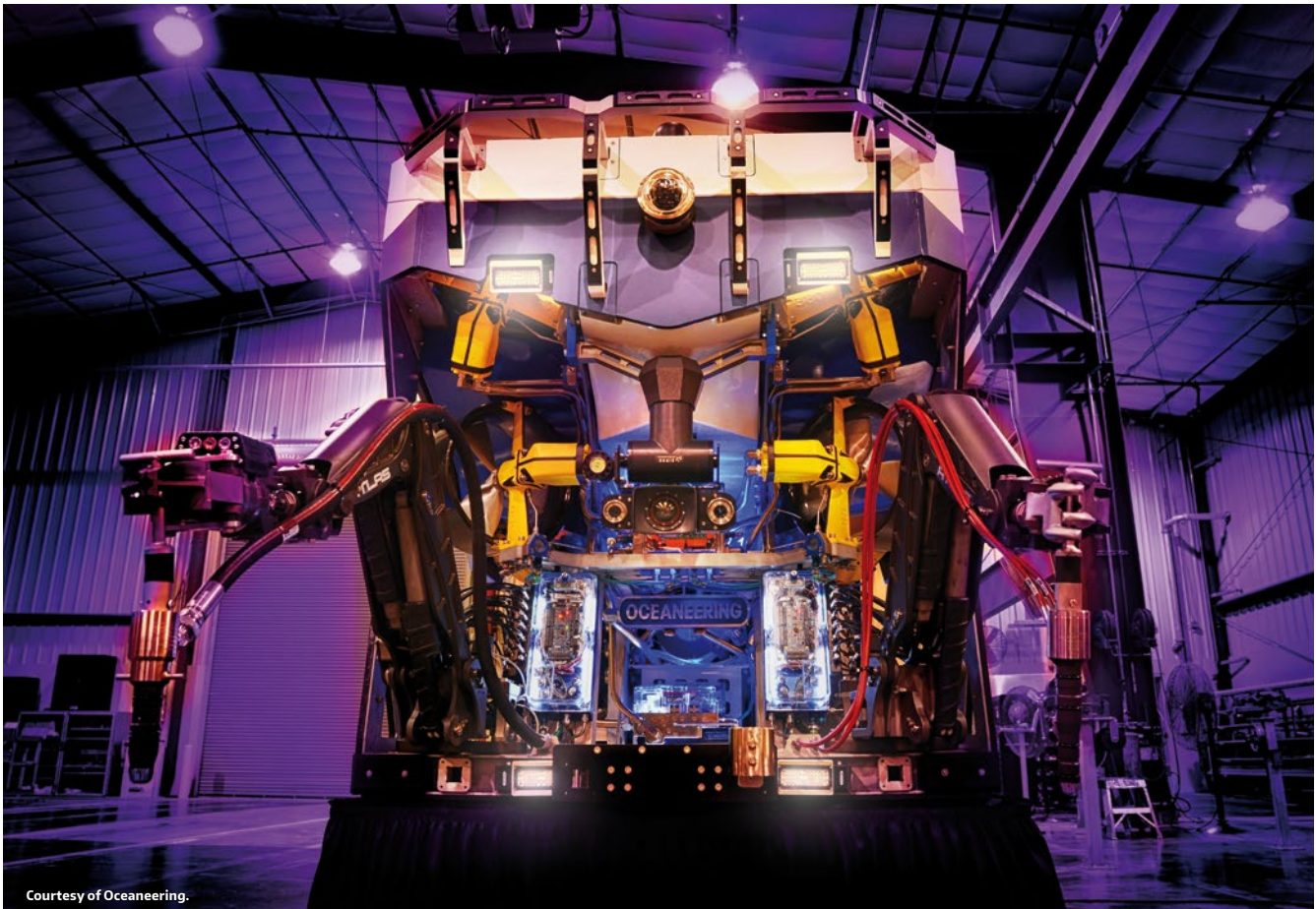
REMOTE PILOTING

The system is capable of providing live offshore video streaming and custom application support for oilfield applications. This technology enables Oceaneering to pilot ROVs from anywhere in the world. The high-throughput, low-latency connection is established via infield high bandwidth wireless or satellite link that provides a user experience of piloting directly from another vessel, rig, even the beach. This feature allows support and guidance for complex or long duration missions. In the event of an emergency on a vessel, a second pilot is able to assume control of the ROV and operate it safely from a secondary vessel, or from onshore.

'Being the largest ROV operator in the world allows us to evaluate our pilots and identify those with exceptional skills at high risk/complicated tasks. We are then able to leverage his or her expertise by remotely controlling a system to perform the operation. This greatly increases efficiency resulting in reduced costs for our end customers.' explained Williams.

Another feature is the fly-by-wire piloting where the pilot can select a point on the screen, as opposed to manual "flying" with the joystick, and the ROV automatically makes its way towards the waypoint. This feature also allows for station keeping and auto-depth hold. This type of approach has also been implemented in the manipulator controls.





TOOL INSTRUCTED PATH FOR EASY MANIPULATOR CONTROL

The hands free piloting and manipulator control allows safer operations, by reducing the potential damage to tooling, manipulator and the subsea assets. Integrated with the Automated ROV control system, Tool Instructed Path (TIP) Control allows easy acquisition, deployment, operation and docking of tooling. The spatially correspondent manipulator arms can be operated via rate control, spatially correspondence and TIP. TIP control simplifies and quickens pilot manipulator tasks by enabling the user alternative controllers, such as a 3D ball mouse, to control the path of the manipulator and tool without the need to individually control each joint.

‘The combination of our latest vision technology and advanced manipulator control software minimizes known risks and average times required to perform both common and complex tasks. As we design for the future, we will continue to build upon this technology for the development, integration, and autonomy of ROV tooling.’ explained Williams.

INTELLIGENT DIAGNOSTICS

The Intelligent Diagnostic System (IDS) is a step change compared to previous diagnostic systems. It combines remote sensors, real-time telemetry path, basic equations

of electrical/hydraulic power flow, and the virtual model of the complete power distribution system. This setup can not only monitor the health level of the system, but also predict future high potential failures. Should a fault be detected, the system provides a means to identify and isolate the fault down to a component level. This result is exponential time savings when troubleshooting.

ROV INTEGRATED PUMPING SOLUTION (RIPS)

The NEXXUS has a new form of ROV pump technology that has recently succeeded in closing the blind shear ram on a Gulf of Mexico BOP stack in record time. The direct drive ROV Integrated Pumping Solution (RIPS) was able to close the shear ram in 34 seconds: a full 11 seconds faster than the API required industry standard. These findings were verified when a field test was conducted from the semi-submersible ENSCO 8503, where engineers managed to beat the maximum 45 seconds per closure as outlined by API S53.

In order to conduct this field test, the RIPS system – originally designed for the 250hp NEXXUS heavy work-class ROV – was integrated into a Millennium class ROV. This demonstrated the new pumping kit’s backward compatibility with legacy Oceaneering ROV systems.



Dual ROV System Control Room on board Oceaneering Vessel. (Courtesy of Oceaneering)

One formidable advantage of this new skid-free system is its ability to deliver tremendous flow rates, while simultaneously controlling pressure levels. This allows it to generate an incredible output without risking extensive damage to the BOP stack. In order to ensure that these safety parameters were met, the aforementioned Gulf of Mexico test was conducted under the supervision of both the operator and contractor, in addition to a representative of the US Bureau of Safety and Environmental Safety (BSEE). Under their supervision, the pumping system generated 62gpm at required pressure.

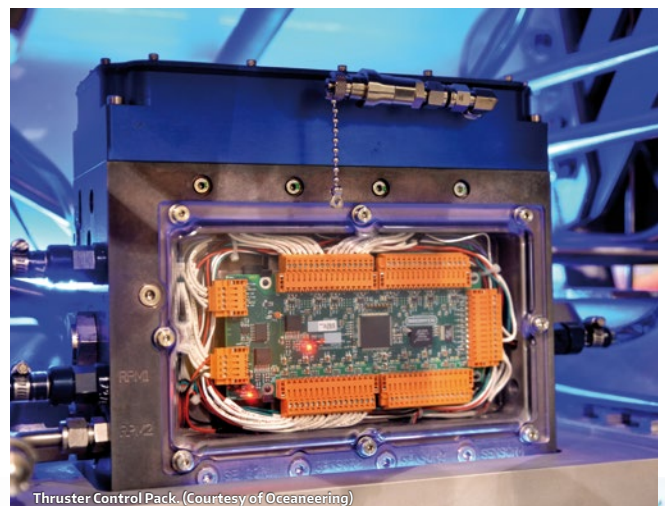
These results highlight another crucial capability of this system: the ability to deliver 20% higher flow rates than any other ROV pumping solution. This advantage could be integral in an emergency scenario where the primary BOP system is unavailable. Such a rapid closure rate helps to ensure that excess fluid and debris will not wash through the BOP seal during a ram closure.

POWER DELIVERY

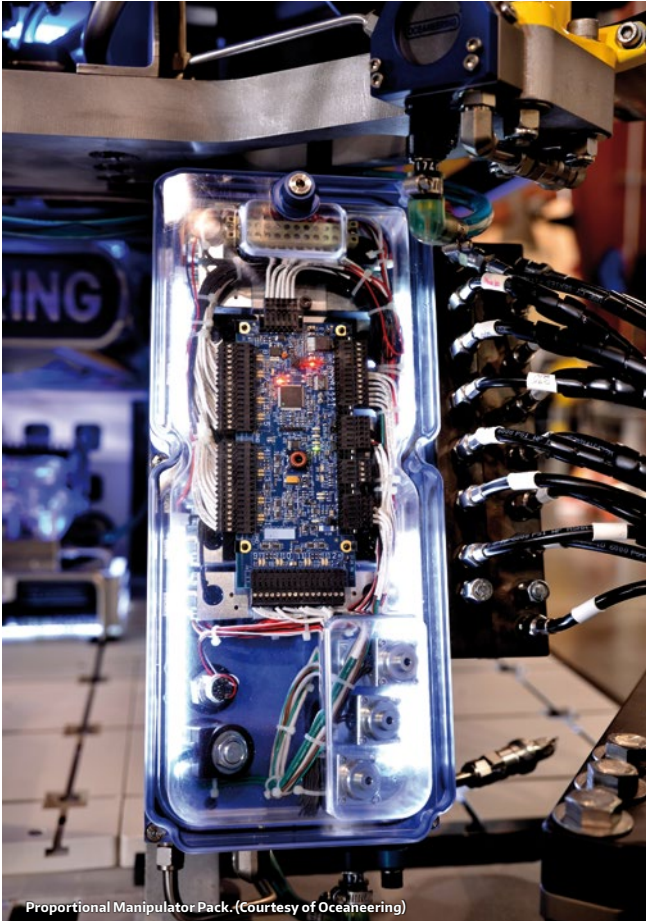
One of the technical issues that engineers wished to address through the development of the RIPS system was the power delivery mechanism. Traditionally, single HPU systems with fixed displacement pumps have relied upon hydraulics-to-hydraulics for power distribution. This reliance on a hydraulics system for power input can reduce efficiency by nearly half, and thus makes it impossible to close a ram quickly.

The 3000 V RIPS system, on the other hand, provides 250 horsepower directly from dual electric motors. This means maximum power is available, allowing for unprecedented pressure and flow rates.

Let's put these developments into context. Other BOP intervention systems which employ, say, a 250 hp ROV would require 6,000V in order to drive their pumping kit. This redirection of power means that only 150 hp of transmission fluid is actually delivered to the BOP.



Thruster Control Pack. (Courtesy of Oceaneering)



'The NEXXUS has a truly isolated ROV pumping system capable of meeting all intervention and injection requirements during both drilling and completions. The direct drive ROV Integrated Pumping Solution allows the operator to test various functions from 0–20,000 psi at flows up to 90 gpm using multiple fluids. By design, the subsea configurability allows the pilot to complete multiple tests without returning to the surface.

'Having the RIPS integrated in the ROV software, the pilot is able to perform the customer required injection test, capture the data points (pressures/flows), and provide a standard print out of the test results on the spot. This is not so easy to accomplish if the ROV operator is using a third party supplied tooling kit for some or all of the tests.' said Williams.

SAFETY MEASURES

Besides being more efficient and powerful than any other ROV BOP pumping system, the RIPS system has been equipped with a number of components to help avoid damage to subsea assets. For example, the RIPS system has an internal pressure controller. Previous systems have relied upon an external pressure relief valve in order to avoid over pressuring. However, this new system relegates this secondary valve to an additional safety measure.

Also, the RIPS system comes loaded with a 'super-charger' option. This allows for high pressure seal testing of BOPs, Christmas Trees, and other subsea components, all of which may be required to operate under pressures of up to 15,000 psi. Typically a third party tooling kit would be required in order to conduct these tests. However, the RIPS system is the only fully integrated ROV system of its kind. As such, it allows for pressure testing between 0 and 20,000 psi – all without the need for third party components.

Finally, the system is expandable enabling the connection to an ROV cage or even a second ROV – in order to increase output flow exponentially. In fact, with two ROVs connected to one another, the RIPS system is able to deliver flows of above 150gpm at up to 5,000 psi. Many competing systems rely on multiple sensors running in perfect synchronization in order to perform certain operations. This would render the connection of more than one ROV practically impossible.

UPGRADING A MILLENNIUM ROV

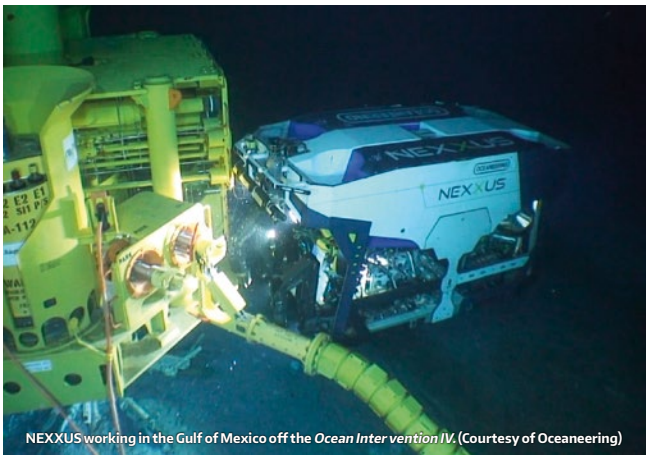
The RIPS system has proven its increased efficiency and additional capabilities over competing BOP intervention and fluid injection systems. However, there was an additional consideration that the developers of the NEXXUS wished to investigate through the Gulf of Mexico field tests: could this system be integrated into a Millennium class ROV without the need for a skid?

To date, several Millennium ROVs have been upgraded to incorporate the RIPS.

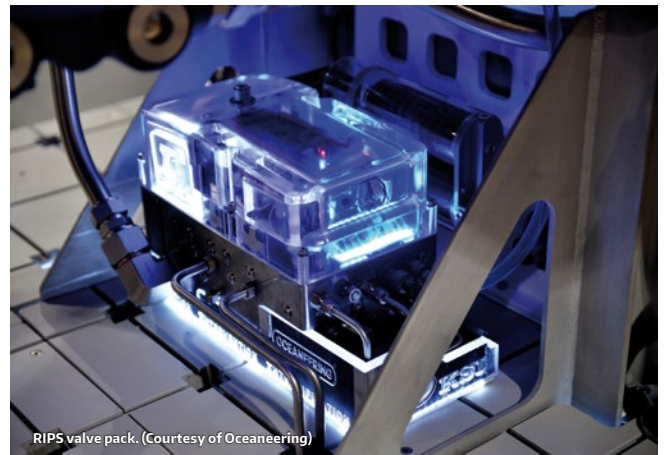




Upgraded Millennium ROV with RIPS and 80 gallons of intervention fluid. (Courtesy of Oceanering)



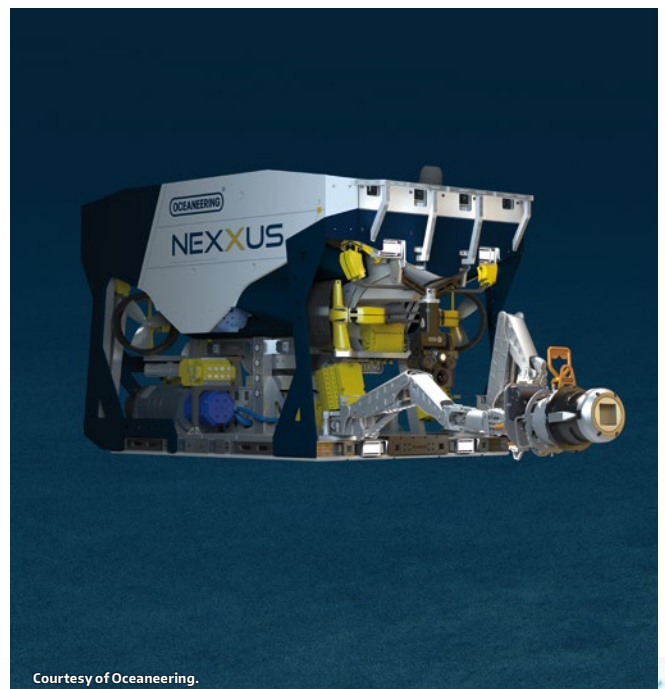
NEXXUS working in the Gulf of Mexico off the Ocean Intervention IV. (Courtesy of Oceanering)



RIPS valve pack. (Courtesy of Oceanering)

As you might expect, the results have been quite impressive. Over its previous incarnation, the newly retrofitted Millenniums have produced a six-fold increase in capabilities, with an increase in flow from 10 to 60 gallons per minute at maximum pressure. And without the skid, these retrofitted Millenniums are still able to carry 80 gallons of intervention fluid on board.

Apart from its BOP intervention capabilities, it can be said that the newly upgraded Millennium with the additional enhancements can hit up to 90% capability of the NEXXUS. In addition to the impressive NEXXUS ROV, this backward compatibility and upgrade option of the existing Millennium fleet will allow Oceanering, the largest ROV fleet operator and manufacturer in the world, to gain a distinct competitive advantage over its rivals.



Courtesy of Oceanering.



BRIDGE & YORK
CAPITAL PARTNERS

FUNDER RUNNING TOWARDS THE OFFSHORE MARKET, NOT AWAY FROM IT

The ongoing oil price volatility has taken its toll on all aspects of companies who operate in support of offshore work and that includes funding options. However, Bridge & York Capital Partners ("BYCP") takes a much more granular approach in dealing with clients and transactions, and advises its appetite for the right client with the right opportunity is even stronger than previously.

BYCP is a specialist funder and fund arranger with offices in Aberdeen, Belfast, Dublin and Head Office in London. BYCP acts exclusively for a number of specialist lease funds as well as its own fund Industrial Finance and Leasing Ltd. Core supported markets include renewable energy, food and manufacturing processes, offshore support, oil & gas. During 2016 BYCP is on track to write > £250m across various market sectors and geographies

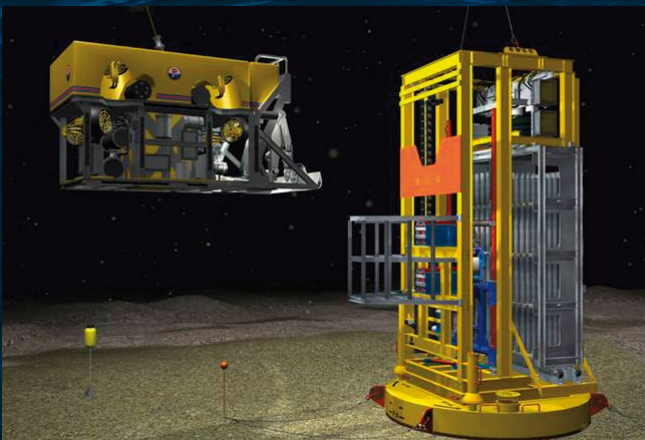
Warren Daley (Head of Sales) stated:

"We have worked with clients in the offshore support market now for over five years and have seen the evolution of businesses as the oil price has dropped, exploration ceased and other work come to the fore. One major change (which we called before it started) was a move to opex rental deals in the space as opposed to capex. This has created an opportunity for clients to build their own "rental pools" as opposed to selling kit, and we have been happy to fund these. Another key opportunity is with clients who have equipment or propositions which save money in the space. We work with a couple of clients with gamechanging products, again using a rental pool concept, and they are going from strength to strength.

We understand the critical risk areas in the space through experience, and our due diligence is thorough, but this actually assists us in getting to a deal, rather than the opposite. By applying this philosophy, we have been the largest funder of ROVs worldwide for the last few years, apply funding terms to match useful lives of kit (so have gone up to 10 years where appropriate), are not stuck on limiting loan to values (we are more bothered with the economic drivers of revenues created by the kit), and can use a range of facilities including operating lease. We can fund across most regions of the world.

Our average deal size currently is c £10m but our sweet spot range is £500k to £25m, and we aim to fund rolling programmes with clients and so are not single transactional. We are open minded to types of kit as long as it serves a business critical function, so we have done everything from workboats, offshore containers, diving pressure chambers, to bespoke cable laying equipment."

BYCP is delighted to announce the appointment of Gordon Malcolm to the team who will cover and service the Aberdeen Oil and Gas and Renewables markets. Gordon comes with 10 years high level industry experience, having worked with both RBS and HSBC's Structured Finance teams.



Warren Daley 07703-193750 | Gordon Malcolm 07468-690071

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BESPOKE ROV TOOLING AND THE STORY OF THE SUBSEA BUMBLE BEE

During the summer of 2015, Subsea Tooling Services was approached by a large and well known Aberdeen based ROV operator to design, build, and test a unique tool to assist them in one of their offshore work scopes. The tool would eventually become the affectionately monickered 'Subsea Bumble Bee', and help pioneer a number of exciting innovations. But all of that would come later.

THE PROPOSAL

Subsea Tooling Services (STS) was given a very tight time scale to engineer a proposal solution in order to extract a stuck controls umbilical from a J tube riser, and present this to their client. There was only one real constraint from the client: under no circumstances was the umbilical to be damaged. This was a newly laid main hydraulic/electrical controls umbilical for a satellite oil field in the North Sea, and damages would incur a high repair cost and considerable downtime for the client.

On being awarded the contract to supply the tool, STS worked very closely with their chosen fabricator to ensure that delivery of the proposed package was achieved. The design went through several stages of evolution before they were satisfied that their concept would stand up to the rigorous forces required to pull out the umbilical.

Using their combined years of experience with ROV tooling, STS came up with the solution: a tool that could be deployed subsea in one of their subsea baskets, before being picked up by the work class ROV and deployed to the worksite.

HOW IT WORKS

As the tool had to be flown over 200m to the worksite from the point of deployment, it had to be designed with enough buoyancy so that the ROV could still fly whilst it was being carried. Various calculations and simulations were carried out on the model until STS were certain that they could meet their client's parameters, both in terms of weight and functionality.

During the design process it became clear that they needed to be split into two separate halves; the size of the tool was becoming too large for one ROV to handle. As a result the FRP (Flying Reaction Plate) and URT (Umbilical Removal Tool) were born.

The FRP would be the first part of the tool to be deployed to the J tube bell mouth. Once there, it would be hydraulically locked to the bell mouth via two locking clamps that would be actuated by the ROV via a four port hot stab. To ensure that the FRP would remain locked to the bell mouth whilst the ROV went to get the second part of the tool, ROV valves and dual check valves were incorporated into the FRP's hydraulic circuit.



Courtesy of Subsea Tooling Services UK.



Courtesy of Subsea Tooling Services UK.



Courtesy of Subsea Tooling Services UK.

Once the FRP was locked to the J tube bell mouth the ROV would then relocate to the work basket, remove the URT, and fly this 200m to the J tube bell mouth at the base of the platform.

Using two work class ROV's the URT was gently lowered down onto the hang off shoulder on the FRP. From this point the umbilical extraction could begin.

BUILDING AND TESTING 'THE BEE'

With the proposal accepted it was time to fabricate and deploy the tool. STS' chief design engineer Cameron Anderson worked very closely with the fabricators during the building and assembly of the tool, and was present throughout all stages of the final assembly leading up to initial testing. Daily meetings with the client were carried out to ensure that STS were on track to deliver the completed tool within a very tight schedule.

On completion of assembly the URT and FRP were taken to Aberdeen University's test tank facility to undergo stability testing. This would allow the team to see how balanced the tools were in water, and to ensure that they were within the parameters set by their client in regards to weight.

To simulate the operation subsea, a mock bell mouth was fabricated to check the tool would lock on to and be able to pick up the umbilical and extract it at the forces expected. STS operated the complete tool through a proportional valve pack that was controlled via a laptop computer. The complete tool assembly was controlled through 1 x 4 port male hot stab that was shared between the FRP and URT. Using mock pieces of test umbilical, STS performed a total of six different trials witnessed by both their client and the oil field operator.

From these trials the STS' tool was deemed the most likely to succeed in extracting the stuck umbilical.

On completion of all testing the URT and FRP were completely stripped down and all components were sent off to be xylan coated to protect the aluminium frame from corrosion. This new appearance combined with the yellow buoyancy led the tool to being nicknamed the Subsea Bumble Bee.

In order to deploy the tool to the seabed one of the STS subsea baskets was modified with special mounting brackets. This enabled the tools to be hydraulically locked into the basket on deck and then safely deployed to the seabed without risk of losing the tool during the descent. At the client's request two STS engineers were provided to operate the umbilical removal tool offshore.

Who better to operate the tool offshore than the men who had originally come up with the concept, and designed, assembled, and tested the tool?

And what was the outcome? Well, everyone at STS and their fabricators ESRUK were proud to report that they designed and built the world's very first umbilical removal tool. They managed to successfully remove a stuck umbilical from a J tube on the 15th of September 2015 with a force of approximately 10 tonnes. This signals a very impressive achievement, and is hopefully an indication of STS' capabilities in providing bespoke ROV tooling solutions for any prospective clients.



Courtesy of Subsea Tooling Services UK.



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DEDICATED TO SURF

With a recent move to head up Maris Subsea Ltd – part of the Global Energy Group based in Moray – Phil Hargreaves (FIRP) has moved with his young family up north lock, stock, and surfboard, in search of a life which balances his commitment to his job in the Subsea Umbilical, Riser and Flowline (SURF) industry, and his dedication to surfing. ROV planet caught up with Phil to find out more about the new role and his passion for all things SURF.

'In life, there is nothing as constant as change. Our industry has recently proven that things can change and fast. Adapt, change, or perish. For me, the opportunity to take the helm of Maris – based 66 miles North of Aberdeen – and move to Moray to capitalise upon its plentiful waves is the culmination of two life goals, and what better time in the industry than now to go for it.

Maris are thirty years old this year, and are the longest standing UK based subsea personnel consultancy. Many years ago, I recall hiring ROV and Survey personnel from Maris during my first weeks in the industry at Rascal. They were an independent consultancy back in those days (nearly 20 years ago), and I learned quickly from the operations and project managers of the day that Maris were highly respected: viewed as a consultancy more than a body shop, and the go-to for quality subsea resources. It's pleasing to find that Maris are very much alive and kicking, and still deserving of every accolade that was previously afforded to them. They remain an understated business reliant on the quality of

their reputation and relationships: not overly marketed or 'in your face', but diligent, financially secure, honest, competent, and reliable.

Global Energy's purchase back in 2009 has built upon that original ethos. Maris remains an independent business stream within the group, but with the added benefits of being 'breathed upon' by a successful group with the wider infrastructure and directorship who are capable of making all things possible.

That support network encourages innovation. For example, it recently helped Maris to develop our bespoke, exciting new competency system – iCAP – which was developed in line with both IMCA and IOGP standards. Covering the entire subsea spectrum, we provide from client safety representative and offshore manager, to rigger alike.

As anyone who's ever been involved with agency recruitment management will testify, the role can be a 24/7 whirlwind of swapping hats; you become a combination of agony aunt, problem fixer, negotiator, networker, salesman,



and business developer. With sales and business development in mind, playing golf and watching football or rugby are perhaps the normal focus. However, for me my passion has always been surfing.

My love of surfing has been anything but detrimental, and as surfing looks set to become an Olympic sport I belong to the new generation. As a matter of fact, having surfed in Morocco with a subsea vessel operations manager, in Devon with a hyperbaric welding superintendent, and Thurso with a diving technical authority it's certainly not holding matters back.

Besides my career, surfing is without question the other main passion of my life: a highly focused activity which has a rejuvenating effect on my personal well-being, getting in the water simply blows all the cob-webs away. I understand that I am experiencing what psychologists refer to as the concept of 'flow', when basically you are completely mentally immersed, enjoying the activity to such an extent that you are completely absorbed. Achieving 'flow' is often colloquially referred to as being 'in the zone'.

I have spent my spare time for the last 10 years travelling around North Scotland in search of waves. Now I live here full time, I am looking forward to introducing my kids to the fun of the ocean without having to travel for hours in a clunky VW van. Moray's ocean provides many good surf spots right on my doorstep, and it's a fairly wave rich environment. That said, waiting for waves is much like the nature of my work in Subsea and SURF Resources Recruitment at Maris, you can't predict exactly when things will happen but you need to be genuinely focussed, 'in the zone' ready and dedicated to SURF 24/7.



This downturn has had its obvious knock on effects. However, it's an exciting time to join Maris and I enjoy the challenges. This has been a fantastic opportunity to demonstrate our innovative nature, diversity, and how our consultative approach is benefiting clients now and for the longer term. Whether our clients are seeking a client safety representative, shift supervisor, bell diving supervisor, ROV pilot technician, geophysicist, lay technician or crane operator, with 30 years of experience Maris have it more than covered.'

Commenting on Phil's appointment, MD of Maris – Global Resources and Global TCC – Steven Dunbar said: 'In the 6 months we have had Phil with us he has been a breath of fresh air to the business, with a variety of new and innovative ideas on how we develop our service and offer greater value to our clients in this downturn and beyond. Phil's experience at the sharp end with the likes of Racal, Stolt, and Acergy (Subsea 7) gives us a unique viewpoint of the challenges facing our customers, and blends seamlessly with our consultative, customer-focused approach. I can't say jumping into the North Sea on a frosty December morning with a surfboard, is something that enthruses me, but the fact that the prospect has tempted Phil north is undoubtedly our gain.'



Phil started in the industry at Racal Survey Ltd back in '98 handling offshore personnel logistics and recruitment of ROV and survey field staff. Moving through the ranks and gaining experience within Stolt Offshore and Acergy (Subsea 7) with saturation diving, trenching, cable / pipeline lay and subsea construction operations. His name is synonymous with the management and supply of highly competent personnel within the Subsea Umbilical, Riser and Flowline (SURF) industry.

INTERVIEW WITH CHRIS BIRD:

AN OIL COMPANY EXEC'S PERSPECTIVE ON THE CURRENT STATE OF THE UK UPSTREAM OIL AND GAS INDUSTRY.

We caught up with Chris Bird to discuss the challenges facing the UKCS and the possible solutions to tackle them. Chris has 20 years of executive leadership experience with most recently being the country MD of MOL Energy UK, establishing the Hungarian Oil company's regional offices in the UK. Previously he acted as the Operations Director of Endeavour Energy, Technical Director of Centrica (initially working for Venture Production), and the Managing Director of Aker Kvaerner UK.

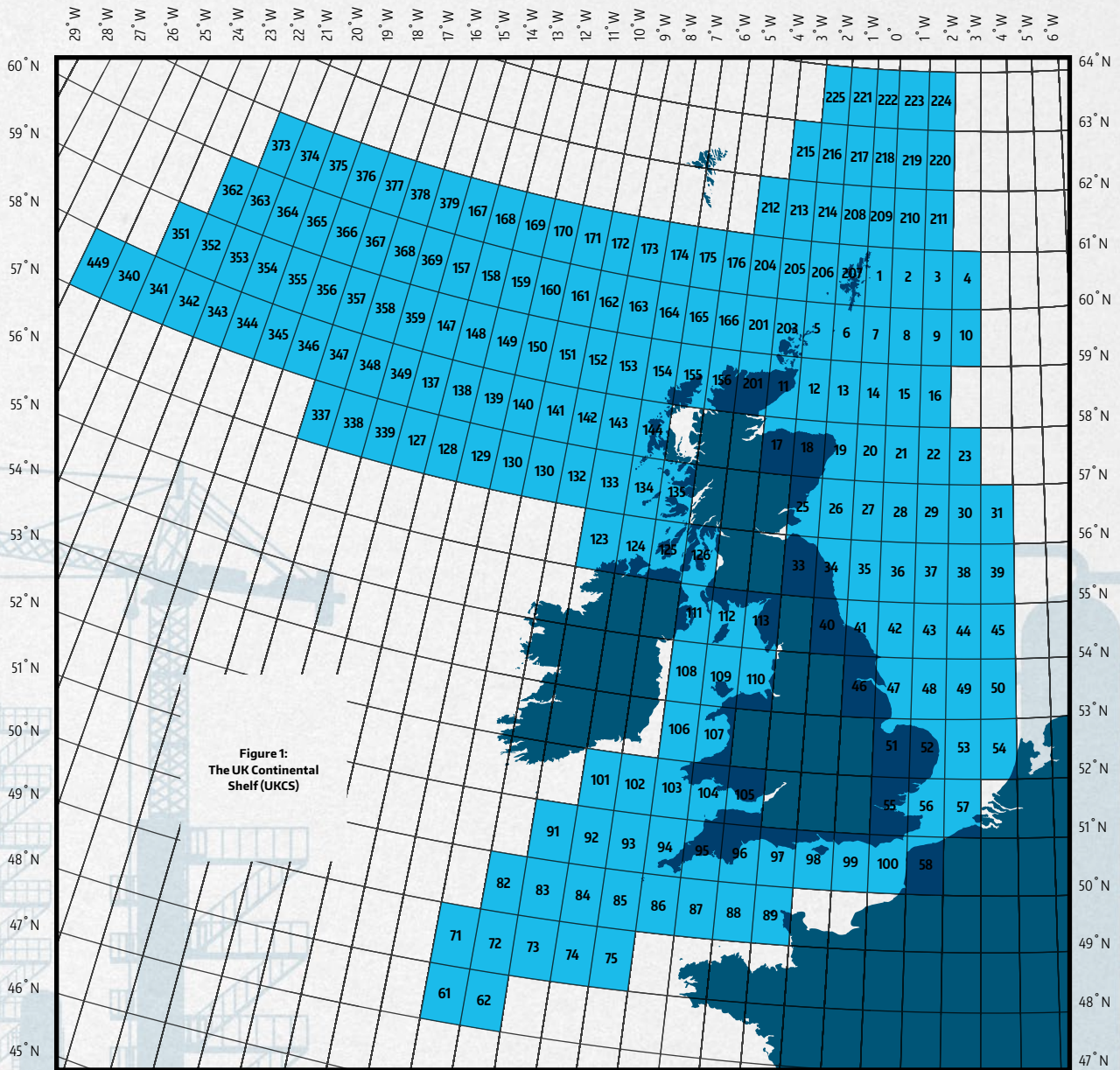
CHRIS BIRD: To avoid relegation we need to consider three things. First, we have to reduce our unit costs to make them acceptable for investors. Operational unit costs are made up of the lifting cost, sustainable CAPEX and G&A (General and Administration overheads). The second element is – if you like – the capital costs. These are the depreciation, decommissioning, and amortisation aspects. And the third key element is tax. So the best way to reduce the unit costs is firstly to accelerate the production: as much production across the assets as possible. And you do that by exploration, you do it by being much more effective in your capital delivery, and you do it by maximising the availability of your assets. Those are the absolute essentials. And then you move onto the capital front; the cheaper and faster we do projects, then the lower the depreciation so that reduces the unit costs. In my Venture days a subsea project [that ran] over a year for us was unacceptable. Today a lot of subsea projects are anywhere between from 2 years to 4 years – all that equates to different costs. Then you have decommissioning and that sits there as another cost associated with it. The final bit is the recoverable reserves. If you can reduce your costs and focus on recovery and extend the life of field, then you produce more reserves which in turn reduces unit costs. So the economic engine is unit costs, not costs. Where most people are focusing at the moment is the overhead margin, or the profit of suppliers... What we should do is get the suppliers to invest more in their people and in making themselves more efficient, in order to deliver a better product. That would be far more beneficial to the industry.

RICHIE ENZMANN: Basically what you are saying is that we are cutting things in the wrong places: cutting the key people who are contributing and making a more efficient service or product.

CB: The focus needs to be on the levers to reduce unit costs, not necessarily actually costs, as this might be the wrong focus for longer term success. And that's in total, not just one element like lifting costs or margins of suppliers, because that doesn't work. Let's focus on unit costs; that's priority number one. The second priority is people. Between 2008 and 2014 because the world's demand for oil and projects were so high, we lost a lot of really good people from the UK to international positions. This reduced the overall competency capability level in the UK. That's now been further eroded because we are getting a lot more people leaving the industry at this point in time. Now we have a number of managers that haven't really experienced a major down-turn before. They focus on things like stopping work, reducing jobs and reducing supplier costs. But this doesn't actually change the performance of the industry. In my view what we need to do is to promote the industry at this point in time, and actually improve the accountability and development of young professionals. A quote from a young professional who was in the downstream industry for five or six years: when he decided to move into the upstream industry his responsibility was cut by 75% compared to what he was doing in the downstream industry. He was not allowed to have that same level of accountability in the upstream industry with his experience, which I completely object to. I think it's crazy that we are not using young professionals in the right way!

RE: Perhaps the reason behind this is that there are higher risks in the upstream environment?

CB: No, I don't think so. The same risks are there in both sectors. I came from a different industry myself. At 22 I was running a major manufacturing plant with 300 staff,



and I was allowed to do that. I was running major projects at 25. Now you would have to be at least 35 to have a responsibility for a £10 million project in the upstream industry in the UK... When I was in Venture, I brought a project manager in with a QS background, who was only 29 years old. We just mentored him, because he was at the beginning of his career. But he had the expertise and the real drive to make it successful and he did a brilliant job for me. What people think is that until you are 45, you can't do a good job, where it's actually the opposite. Another key element is investing in people within the industry. Look at the example of a successful Premier League team. At Manchester United we all know about Alex Ferguson and his management style, but he also always had one exceptionally good guy bringing up the other ten behind him. So if you had a really good mentor, and you had ten young professionals augmented with one really good one, then I'm sure we could do far more better in this industry than we currently do. The final element is delivery...If you look at what we've done since the beginning of 2000, we knew that this prob-

lem was going to occur at the beginning of 2014. So I presented Oil and Gas UK 'Access to Finance' in June 2014. I said we were the least competitive basin in the world. What has happened since then? We have cut costs and jobs. We have focused on the supply chain and set up OGA with the working groups. But the question is: are we doing enough for longer term competitiveness and sustainability? So the key thing is how do we get the transformational change in this industry? It has to be looking first of all at our delivery and our benchmarks: what we used to do and why are we not doing that today in terms of delivery. How come 15 years ago all our subsea projects were less than a £100 million and only took 12 months, compared to today where they are in excess of £200 million and take two to four years?

- | RE: Is it risk aversion as well maybe? Maybe people are afraid to make decisions or they are not really allowed to?
- | CB: Yes. There were also things like Piper Alpha, Texas City, Macondo, and lower level disasters where safety systems should have been in place, but they still occurred

and therefore you've got to ask the question: why? A lot of that has to do with culture; we focus on cost rather than unit costs, we don't really focus on performance, but we also don't give the accountability to people to make the right decision and sometimes we might drive them to make the wrong decisions... So the outcome of that is when we get a failure, instead of focusing on the root cause, we just add more process over that failure and more bureaucracy. We become more risk averse, and that actually increases the costs and makes us less competitive. Therefore we actually increase business risk.

RE: It's quite interesting. We are coming from a risk averse standpoint that actually ends up creating a higher business risk.

CB: That's right... The question is how we access the right finance for investment, because there is very little investment coming into the UK. Globally today there is \$400 billion worth of projects that have been cancelled or delayed. If the oil price starts to come back, high value projects with a lower risk and sustainability are the ones that are going to be invested in first. So if the oil price came back to \$50/bbl this year, at the moment the UK is towards the bottom of the list for that investment to come in.

RE: So there is actually a queue of projects for investment and competition for investor money.

CB: The problem is that all our assets and developments need investment in the next three years to improve performance, reduce unit costs and extend life of field and sustainability. And there is a domino effect with those assets, if they start to fall over. So the key thing is that we can't wait. This is not a disaster that we can overcome by going to the temporary refuge to wait. The key thing is that we are at the bottom end of the league table in terms of investment opportunity. If we don't sort ourselves out in the next 24 months, then we will be relegated.

RE: What do you think needs to be done for the investment to come through?

CB: I was once quoted by a CEO that reimbursable work does not add value, but when asked by the client to jump, I say how high. Everybody in the industry today, no matter what type of contract it is or how you are employed, should always focus on maximising value and keeping us competitive. That way we could create a really good business going forward. And at the moment I think people are more focused on the short term.

The industry became used to \$110 /barrel oil, with predictions of this increasing to \$200/barrel. This led to huge amounts of new work and the focus went away from cost efficiency and value. There was a strain on the industry due to the workload on projects. Then the costs have increased dramatically and the operator profits have dived. Projects didn't deliver. If you look at the UK, roughly 75%

of projects were at least 28% over budget and were at least eight months late, and that really affects investors' confidence... When costs are escalating rapidly and you don't deliver then investors will start getting rid of you. So the key question you asked is how do we turn this around? The only thing that's important is cash in and cash out: how much revenue I'm making and how much I'm spending. If that's negative then we are in a bit of a bad place. You need to get your asset availability up to 90%, and double the speed that you do your projects. That way you get a lot more volume through your assets.

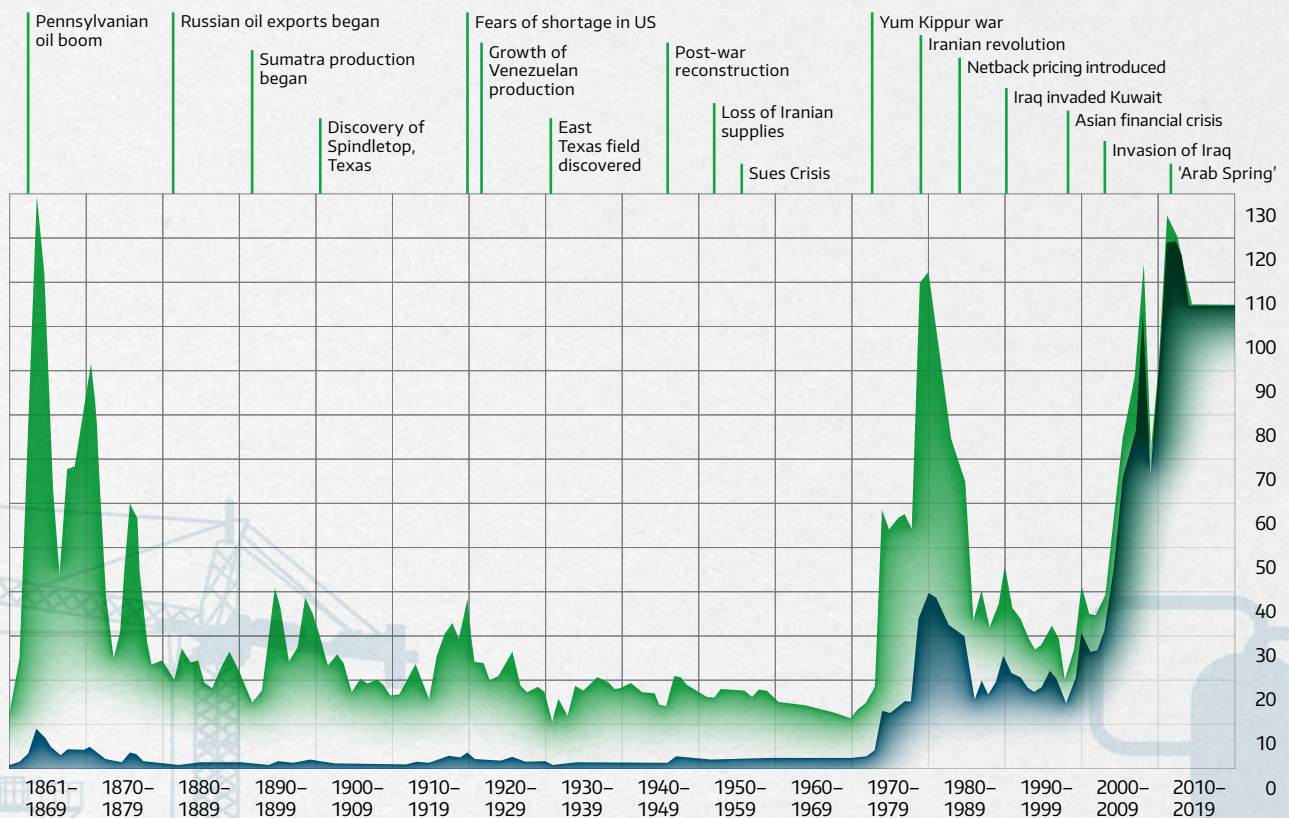
RE: Wouldn't you trigger a lower oil price by doing that?

CB: Not in the UK. We're in survival mode; we're only producing 1.3 to 1.4 million bbl/day out of a 100 million bbl/day overall world production. Adding 0.3 million wouldn't make that much of a difference on that scale. Also, with oil prices now there isn't a convenience fee. It's what the marketplace will tolerate compared with the competition from solar, wind, nuclear, gas, new types of transportation mechanisms, climate change control, and energy efficiency. All of these things are coming into the marketplace. We can't decide any more what the oil price is going to be, because having oil as the only option is gone.

In the last 160 years the price of oil has been averaging at \$40/bbl with only three peaks as exceptions. Even \$60/bbl is a premium. But if we benchmark it at \$50/bbl, we need to look at it where we need to have our businesses to make it work. So then we need gross unit costs at \$40/bbl. If we can sustain that, then we can get investment into oil and gas projects in the UK... To make that happen, we need to get maximum reserves out of the ground, have asset availability for consistent cash flow, and I want to know that my project is being executed the right way. Everybody focuses on costs, but from the NPV (*Net Present Value – looks at the investment rate of return over time) perspective the biggest value on projects is speed. Doubling the speed of projects can create a real impact on my NPV. The second element is quality, so when it comes on stream and I can be on 90%+ availability from day one, then I can make a lot more money. There are projects out there that were started up and shut down because quality was poor. And the third element is cost.

RE: Yes, I think everybody is focusing on costs right now, but failing to realise that investment decisions are actually determined by NPV and IRR, which looks at the element of the value of investment rapidly depreciating over time. Hence, if it takes several additional years to build up the offshore infrastructure, then a huge amount of investment value can disappear even just because of a one year delay.

CB: Yes. But in terms of unit costs, the question is how do I lower my unit costs. Ten years ago Norway was double the unit cost of the UK, today it is around 50% less than the UK. At the end of November 2015, the UK was at \$51.4/bbl,



1861–1944 US average

1945–1983 Arabian Light posted as Ras Tanura

1984–2014 Brent dated

US DOLLARS PER BARREL AND WORLD EVENT

■ \$ 2014

■ \$ money of the day

Figure 2: Crude oil prices 1861–2014

and Norway was at only \$35/bbl. You need to focus on unit cost first, and once you got that down, then make sure that you deliver, and deliver with discipline and efficiency. I think it's as simple as that, but we tend to get carried away and haven't really got it down to the business basics.

| RE: It's quite a different viewpoint that you have from the mainstream 'practitioners', but it does make sense to me.

| CB: That's the way we ran Venture Production. At Venture Production every single penny was a hostage; we had a cheap office, we used BIC pens until they ran out, we paid ourselves lower bonuses, and every single penny went into the development of the business... If you just focus on production numbers and cost then that's usually a recipe for disaster because you need to get unit costs down and cash flow up that would really add value to your business. And then it brings investment in because you have the right story to tell investors.

Einstein once said: 'the definition of insanity is using the same people, the same way, and then expecting different results.' So we need to have a new way of working in the North Sea. I'm going to propose to form a group and get some secondees – under 30s, really smart guys – and give them specific projects to work at to see how we can get ourselves out of this. So you would get one group focused on unit costs. Break down the unit costs, work them through, and look at what we need to do to bring it down to the right level and what the recommendations

from that group. Another would be looking at the resources in the market place, and how are we dealing with those and what are the true capabilities of the UK business and maybe a third group focusing on deliverability and looks at things like norms from 15 years ago. Take offshore construction or drilling a well; looking at what were the norms those days and how did they change. How can we get back to more efficient operations?

| RE: What is your opinion about the cooperation of oil companies? Is there any cooperation on these issues or is everybody going their own individual way?

| CB: I think there are some key things in there which are a lot of rhetoric. But what does collaboration really mean in a business competition? Do we really understand what value really means? And do we really understand what leadership means? There are some key words there, and we can use them to get to the crux of these issues. Leadership is really about trying to understand the future with the end point in mind, and then inspiring people and leading the way. It's nothing to do with management at all. Collaboration is not a squidgy soft, 'let's get together and be friendly and share everything' concept. Collaboration is really tough to do. It is harder than being competitive. It's about alignment, knowledge, and understanding, selecting the right partnerships to work with (not everybody) and it's about creating value... You can't have the whole industry collaborating together. You can have different people col-

laborating together, or an alignment in a specific point in time. The mind-set needs to be on long term sustainability not short term competitiveness and profit, because the world is changing quite rapidly: new technologies and new ways are coming in, and the regulation is changing quite rapidly. The oil and gas industry needs to change and react to these threats that are happening around it.

| RE: Some sort of a transformational change is needed then.

| CB: Correct! There is a key thing that I use called Corporate Transformation Tools (CTT). It's from a guy called Barrett. An organisation and business has two key things: The energy of your organisation and the level of disorder. If the disorder is more than 5% it paralyses the industry or the organisation. Basically, it has seven levels; from level one which is survival and short termism, level four which is transformation, and level seven is value to society if you like. Managers are in level one 'survival mode', but leaders need to be in transformational and longer term mode for survivability. I used this at Venture and then at Centrica as a tool. We came up with two things, when we built up Venture. I came in and had to transfer Venture (because it wasn't in a good shape at the time) business. So I created this new department. Of course the old team saw this as an empire building: the new guy coming in, smart, sharp. So they saw it as a threat and what they did was to start information hoarding so they wouldn't give it to us. So we used this CTT technique... They got it in the end and started sharing information. And Venture production got better and went through this process.

It was a cultural shift, more than anything else. We can talk about collaboration, leadership and behavioural change, and transformation, but the key element is a cultural shift. Without the cultural shift you can't do anything... If the bad parts of your culture are not checked, it will block progress every single time. The key thing I talked about was organisational development and as an industry we're managed by engineers and finance guys. And the engineers love designing things and changing specs and this sort of stuff, and the finance guys love driving the costs down. But when you run a business what you really need to do is to have really effective leadership, and behind that you need really good organisational development... So my view is that the best place to start is to go back to the young professionals.

| RE: Why? Is it because their behaviour can be formed more easily?

| CB: No, I think that they think more differently. I'm one of the baby boomers, but generation X and Y uses the interfaces differently: the social media, their view about the planet and sustainability..., and maybe their ethics are slightly different than some of the old oil professionals. So if you are going to design this business again moving forward, and you've got the young professionals then that's the culture you want in this business going for-

ward... a viable industry going forward that has a huge amount going for it: a lot more upside than downside.

| RE: Yes, it would be a shame to let it go, especially as there are so many opportunities with so many people depending on it in the region.

| CB: Absolutely. So I think there is a lot we can do there. You look at it and think 'Why not come up with what we think the culture is and get four or five different young working groups?' They're focusing on things like regional strategies, supply chain strategies, and exploration portfolio. There is a huge upside potential, because in the current environment up until 2050 we could spend \$500 billion on just keeping the assets going. But if or when we get this right and become more competitive we could easily add another \$200 billion of additional investment. In addition to this, we could retain and build the skills and technologies for export. So the prize is high and a lot of investors are now looking at the North Sea.

Myself, I only have five to six years in this industry and then I'm fully retired. But if you are 30-35 year old then you have 30 years left. That takes you into 2050, so you have a bigger stake in this business than I do. My stake is the survival for my children, or grandchildren actually. You personally have a bigger stake in the UK oil and gas business, so therefore you are more likely to look into the future to see what the benefits are than I am.

I would like to be more radical and say to the top 50 companies 'I tell you what: you pay me just a basic salary... enough to cover my costs to mentor some key young professional groups to actually work the answers in a far better way. That would be great. That would be really, really good.

| RE: Is that's what you have lined up for the future?

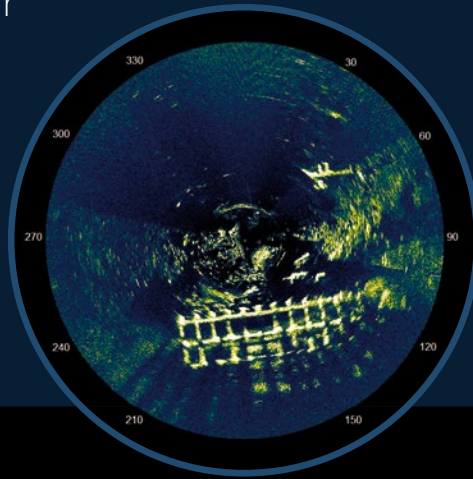
| CB: No. I got two non-exec roles at the moment and I'm just using this time to really think about the industry and try to be constructive for the industry. I spend two days a week trying to construct ideas and things around it. This gives me a lot of thinking time. With my previous roles I turned around Kvaerner, then did an integration of Kvaerner and Aker to create Aker Solutions. Then I moved into Venture, built up Venture and did the integration with Centrica into Centrica Energy Upstream. Then I carried out a strategic review for Endeavour, and started MOL (UK) up from scratch and built that up to 15,000 barrels/day within two years.

These required 100% commitment of what were 12 years of 80-90 hour weeks with high stress and no gaps. And when you are in those roles you have to communicate as a company, and not as an individual. So by stepping out of those roles I can now communicate as an individual and not as per the company line; I can actually speak a bit more openly. For now I will say it exactly as I see it, for the next few months anyway - until I might get into another executive role. But let's wait and see!



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