

THEME: OFFSHORE MARINE OPERATIONS

EXPLORATION AND DRILLING
FIELD DEVELOPMENT
PRODUCTION AND TRANSPORT
MAINTENANCE AND REPAIR



KONGSBERG

THE MAGAZINE FOR USERS OF KONGSBERG PRODUCTS AND SERVICES

THE
FULL PICTURE
MAGAZINE

**FOCUS ON
RELIABILITY**

Solutions from deep sea to outer
space – extreme performance
for extreme conditions.



Exploring extremes

Solutions from deep sea to outer space
– extreme performance for extreme conditions

Page 22



High-technology solutions and advanced applications are imperative for the maritime, oil and gas, defence and space industry. In this issue of The Full Picture we fly you high and take you low into the most extreme environments known to mankind. Our cover story on page 22 gives you a glimpse into the extremes of Christian Fuglesang. The 56 year-old Swedish astronaut has conducted two space shuttle missions, carried out five spacewalks and travelled more than 10 million miles with NASA. Sverre Gylseth, (page 30) a former saturation diver who now works as a Principle Surveyor for Det Norske Veritas (DNV), knows all about trust and reliability. Commercial diving requires a level of trust in personnel and equipment that may only be familiar to astronauts, trapeze artists and tandem skydivers. In some ways, divers are a bit like astronauts performing spacewalks, although astronauts don't run into large fish with big teeth. Though

the ocean depths remain prohibitive to human presence, the oil industry has managed to find solutions to conquer this hostile environment. On page 18 Odfjell Drilling talks about its sixth generation semi-submersibles and Saipem (page 36) about the extreme challenges of going deeper with the industry's biggest pipe-laying ship. Offshore's harsh-weather-exposed production and transport sector is suitable only for the brave. Pages 46 to 57 give an inside glimpse into the operations of leading players Østensjø, Atlantic Offshore and Farstad. Maintenance and repair work demands highly modern fleets, unique skills and client collaboration. The operations of Eidesvik Offshore (page 60) and Rem Offshore (page 64) reveal amazing solutions to extreme challenges. Articles in The Full Picture tell a tale of an extraordinary industrial adventure. It makes for good reading, and we trust that this magazine will leave you with many good experiences.



GUNVOR HATLING MIDTBØ
Kongsberg Maritime
Vice President – Communication

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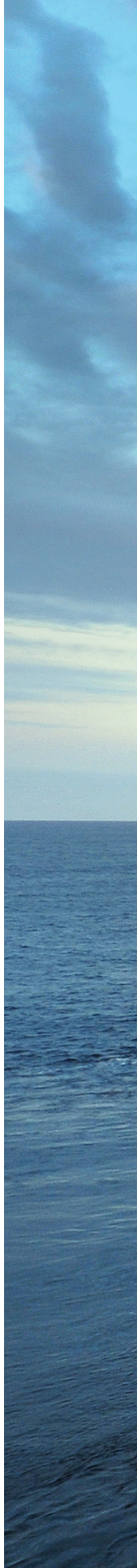
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THE OIL AND GAS SECTOR IS EXPERIENCING UNPRECEDENTED OPPORTUNITY AROUND THE WORLD. FROM DEEP-WATER DRILLING, TO SUPPLY SERVICES, TO MAINTENANCE OF SUBSEA INSTALLATIONS, THE OFFSHORE INDUSTRY IS POSITIONED FOR AMAZING GROWTH.



OFFSHORE MARINE OPERATIONS

Throughout a career at KONGSBERG that already stretches back 20 years, Kongsberg Maritime President, Geir Håøy has always made efforts to talk with customers and get direct feedback on products. As one of KONGSBERG's core values, reliability is a topic often discussed.

FOCUS ON RELIABILITY

Reliability – a competitive

Walking the halls of the maritime industry's large exhibitions can be a challenge, even for a well-known maritime business leader. At any time, a customer can put you on the spot about an obscure technical point or a perceived product issue. But to Geir Håøy, coming face-to-face with the customer is how you truly understand how a product is performing in the real world. "Clients still make direct contact with me at exhibitions to share their experience with our products," says Håøy. "This is highly valuable and genuinely appreciated. Constructive conversations with our clients help us to constantly improve our systems and develop new, innovative and reliable products that improve operations."

GEIR HÅØY
President
Kongsberg Maritime



RELIABLE PRODUCTS FOR EXTREME CONDITIONS

Håøy was appointed president in 2010 and already knew the company well, having worked in many of its different departments, including sales, customer support and management. He believes KONGSBERG has a closeness with customers that is unique in the industry – and he truly deems this to be a competitive advantage.

"We spend a lot of time listening to our clients in both formal and informal settings, and I believe this distinguishes us from our competitors. We value our clients and put their concerns regarding operational requirements at the top of our agenda. While reliability is one of our core values, it is more than just a word. It covers everything from our people and procedures to our products. A reliable product is a user-friendly product, which at the same time ensures safe operations. One of our strongest competitive advantages is that our systems have a wide range of functionalities tailored to our customers' needs. Our clients should always feel confident that our products function the way they are supposed to. However, should anything go wrong, we are always there to provide 24/7 support through our global customer support services."

With a network of 55 offices in 18 countries, Kongsberg Maritime is in the position to provide excellent and timely global support. Our systems and products are put to use in the most extreme and operationally sensitive conditions, where failure is not an option.

"Our systems are employed in operation sensitive conditions, from complicated offshore and subsea operations to the Arctic," says Håøy. "It is our responsibility to develop products that do the job every time and eliminate the chance of failures resulting in human, environmental or economic consequences. The fact that there are 40 year-old KONGSBERG systems installed worldwide that we still service, says something about the robustness of our products."

“We spend a lot of time listening to our clients in both formal and informal settings, and I believe this distinguishes us from our competitors”

GEIR HÅØY
President, Kongsberg Maritime

advantage

RELIABILITY AND INNOVATION – A BALANCING ACT

While developing trustworthy, dependable systems will always be important, Håøy also emphasises the need for innovation in order to improve operations for customers, and at the same time secure and improve KONGSBERG's market position. This can be a hard act to manage.

“Balancing innovation and reliability can be a challenge. Our objective is for customers to know they can rely on today's products while we also focus on innovative solutions for the future. In this regard, Kongsberg Maritime will continue to be a leader. Our tremendous growth during the past five years has resulted in a very high level of activity. However, with dedication and innovation we have been able to meet our deliveries, improve our operation and increase our foot print on a global scale.”

Håøy continues: “We continue to draw on the unique experience of our colleagues within the Kongsberg Group, where environmental monitoring is one of our major priorities. One example is our Integrated Environmental Monitoring project, which provides complete real time monitoring for offshore operations.”

THE ENVIRONMENT – AN INDUSTRY CHALLENGE

KONGSBERG recognises that with a large global workforce comes social responsibility. Within this context, reliability reaches beyond just systems and people. Håøy states: “At all times, we must act responsibly with regards to society. We need to be a trusted corporate citizen. As a global player, we strive to act responsibly in the local communities in which we operate. We are also committed to helping in social projects, as well as working to develop more environmentally friendly, energy efficient products, mirroring the mindset of our customers and the industry at large.

A RELIABLE PARTNER FOR 200 YEARS

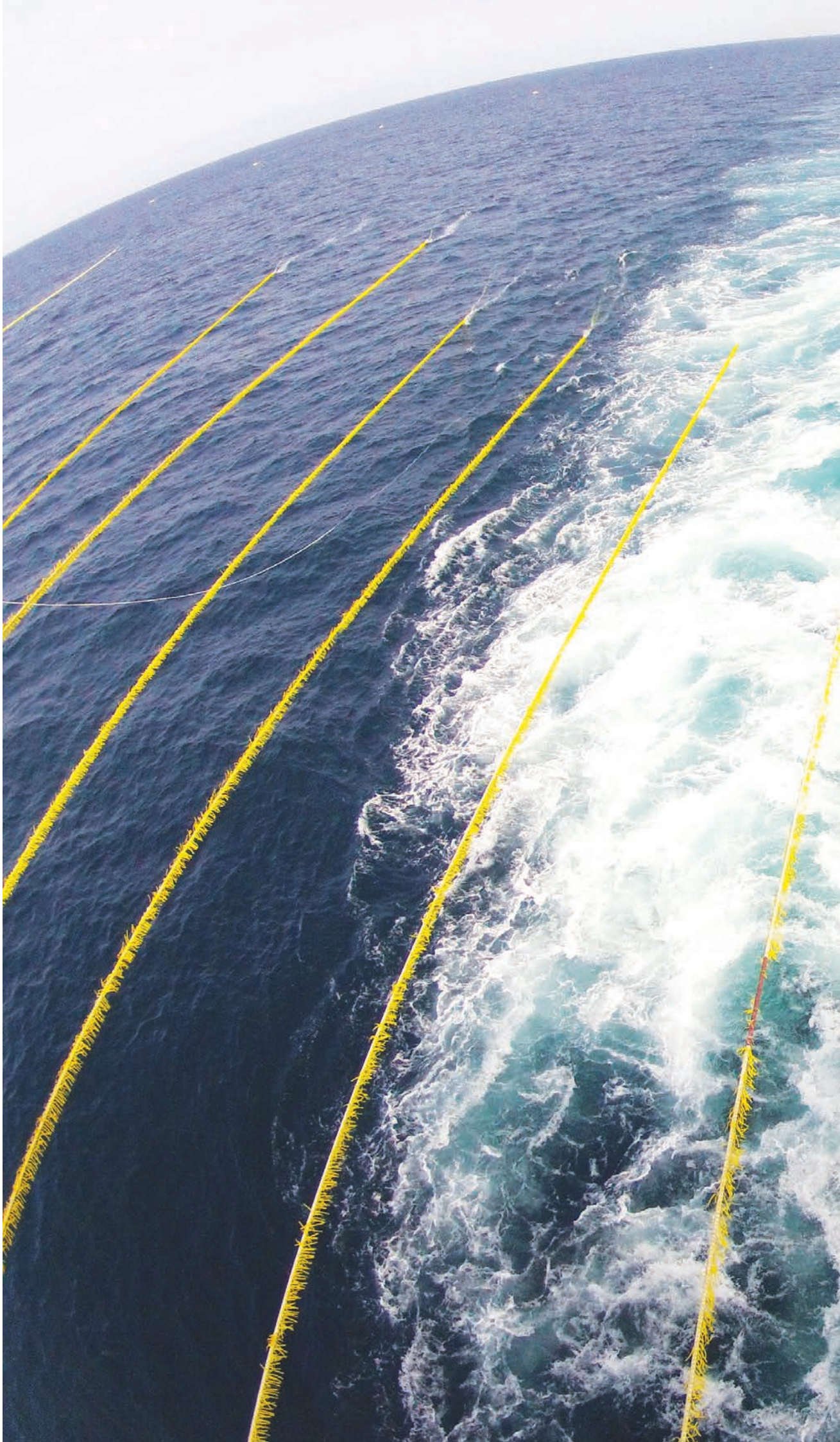
Next year, KONGSBERG will mark its 200th anniversary. While the maritime sector in general has slowed during the past few years, KONGSBERG has continued to expand, and Håøy is optimistic about the future.

“Since 2008, we have experienced tremendous growth, especially within offshore and subsea. During this time, the merchant segment saw a particular downturn, but there are signs that it has reached its lowest point and that a more positive development is not too far away. “These shifts are nothing new. The maritime industry has always been a cyclical one. Despite this, we have expanded our facilities worldwide, employed approximately 1000 new staff and nearly doubled our turnover in the past five years. However, we must not be complacent, but proactive – managing the downturns while preparing for the next upturn.”

Kongsberg Maritime has always sought new prospects in new markets. This is as true today as at any time in its history. The challenge is to recognise the right opportunities and to act at the right time with the right products and services, as Håøy explains.

“We have strong growth ambitions and new and interesting markets for us including West-Africa, Australia and Mexico. It is hard to point out specific products that will be more important than others, but we always strive to expand our portfolio while exploring which products we can integrate with our Full Picture systems delivery.”

However, just having the right products available will not in itself bring continued success to KONGSBERG. It is only one part of the equation, as Håøy concludes. “In order to secure our market position, we still need the brightest minds within all areas of our business – from administration, to technology, to logistics. At the same time, a good market understanding, close collaboration with our customers, as well as an in depth operational understanding, will be very important in the years to come. It is this know-how, combined with commitment and a determination to succeed, that make me optimistic for our future.”



EXPLORATION



Exploration

In 2012, the seismic industry swung back to growth after a five-year down cycle. This upturn was the result of a more balanced supply and demand picture, which led to day rates rising 20 per cent last year with room for a further 10 per cent gain this year.

In addition to solid demand in the North Sea – and gradually increasing demand in the Gulf of Mexico – there was exploration in new regions such as Greenland, East Africa, Uruguay, the Falkland Islands and South East Asia, reflecting the increasingly global nature of oil and gas exploration. Furthermore, the recent announcement of new lease sales in Brazil is a big boost for the industry and should trigger demand for up to 36 months.

E&P spending is set to increase this year and a higher proportion is being allocated to exploration. For continued growth in the seismic market, the oil price needs to exceed US\$100 a barrel. Below that, there would be activity, but not enough to absorb new capacity beyond the current order book of newbuilds.

In addition, limited supply – due to very few orders being made during 2009 and 2010 – brought much-needed balance to the mar-

ket. With just two newbuilds ordered for this year, that balance looks set to continue, and unless newbuilding announcements are made soon, the tight seismic market should extend into 2015. This prediction, however, is based on two assumptions: that there will be continued growth in demand of around 10 per cent and that the big operators follow through with their stated plans to scrap their old vessels when they receive the new ones. With upgrades to existing vessels, there will be a capacity increase of around 7 per cent, so if the old vessels are not retired, that could put strain on the supply side.

The barriers of entry have also become higher in recent years due to the difficulty of attaining finance and the increasingly sophisticated technology employed by the existing players. These barriers – together with recent market consolidation – mean that supply additions will become more structured – making the sector's boom and bust cycles less pronounced, which will in turn provide the basis for a higher sector valuation. ■

With spending on deep-sea exploration reaching all time highs, getting the best seismic information is critical. And with the recent delivery of the first of four Ramform Titan class seismic vessels, Petroleum Geo-Services (PGS) is now able to deliver high-resolution data from more complex geology, faster than ever before.

PETROLEUM GEO-SERVICES

Content is king

Rising global demand for energy has resulted in more spending on exploration in established fields in the North Sea, Gulf of Mexico and Brazil, and in new frontiers such as offshore Greenland, East Africa, Uruguay, the Falkland Islands and South East Asia. And with the energy industry seeking oil and gas in deeper waters and in more complex geological structures, the offshore industry increasingly relies on obtaining quality seismic data from reliable suppliers.

SEISMIC BOOM

Magne Reiersgard, Executive Vice President Operations for PGS notes that new technologies, such as horizontal drilling, have created demand for data not only related to the discovery of new reservoirs, but to appraisals, development and production on existing fields. "Improved seismic data has allowed energy companies to take a second look at subsea fields once considered marginal or nearing the end of their life cycles," he says. "In my view, the two key drivers in our industry right now are rising global demand for energy, which has spurred more exploration in remote areas, and new technologies which have provided energy companies with access to new sources of oil and gas in existing fields where subsea infrastructure is already in place."

vessels from the Mitsubishi Heavy Industry yard at Nagasaki, Japan. These giant, purpose built vessels feature a back deck that spans 70 meters, supporting no less than 24 streamer winches – an industry first. To tow this massive array requires a power plant that produces 1.8 MW from three variable pitch propellers, each providing 6000kW.

In addition to greater streamer capacity, the vessel's broad stern offers a safe, flexible workspace that enables the crew to undertake maintenance without interrupting vessel operations. Power generation and auxiliary systems are completely separate, and with two separate engine rooms, the vessel is fully operational with just two of her three propellers in service. She's built to ensure reliable operations – even in marginal weather.

Reiersgard says that the vessel was specifically designed to meet the evolving demands of the offshore industry. "Usually, exploration licenses are limited to three to five years," he explains. "In harsh environments such as the North Sea, the weather window for conducting seismic surveys is relatively brief. However, Ramform Titan's ability to cover a large area and operate successfully in marginal weather can often make the difference between getting the job done in one season instead of two or three. That represents a significant cost saving."

EVOLUTION, NOT REVOLUTION

Since the first Ramform seismic vessel was delivered in 1995, its delta-shaped design has become a trademark for PGS. Indeed, over the years, the Ramform fleet has broken almost all



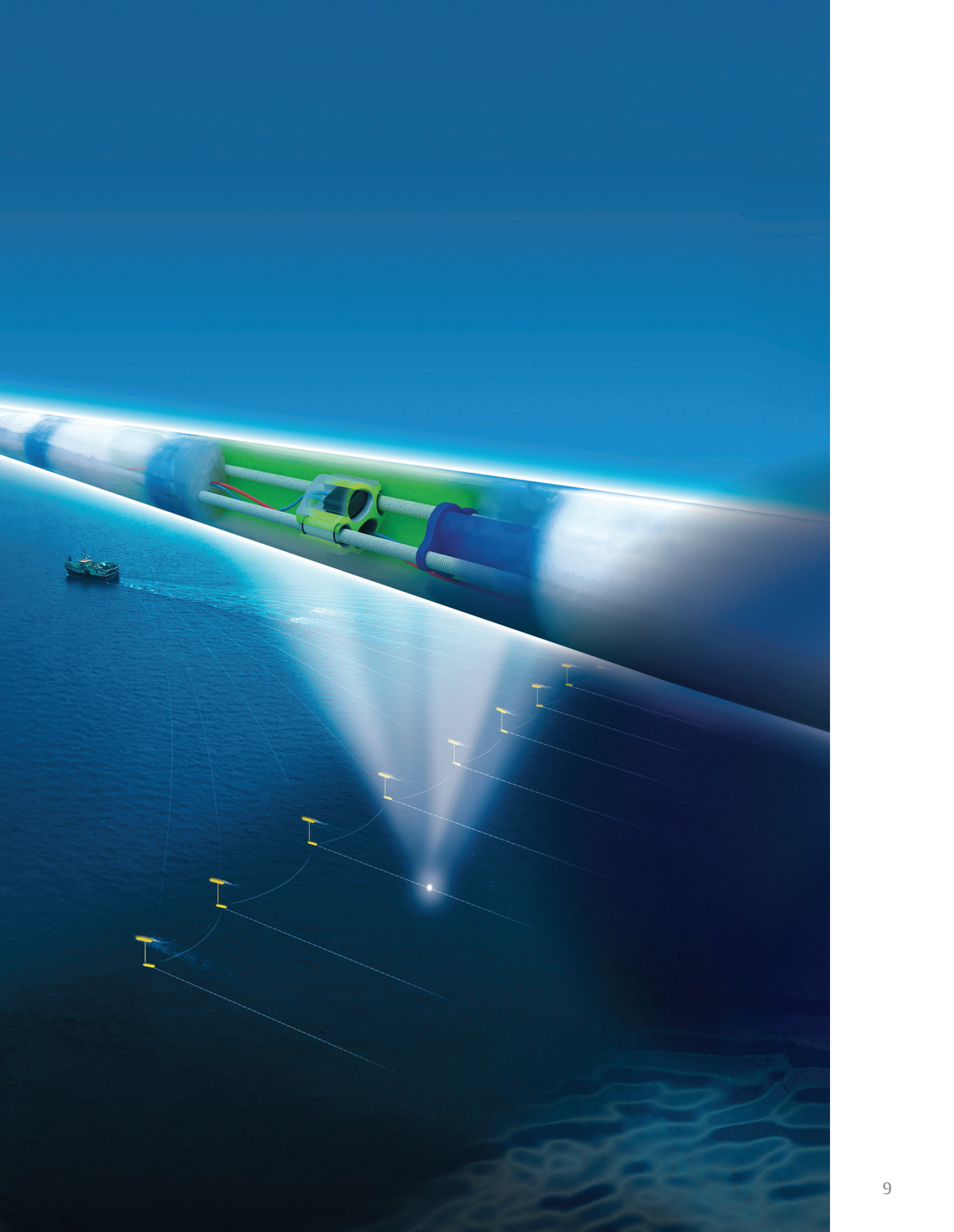
MAGNE REIERSGARD
Executive Vice President Operations
PGS

In 2011, PGS released GeoStreamer GS, which provides ghost-free seismic imaging on both the receiver and source side.

SIZE MATTERS

For PGS, the boom in demand for seismic data corresponds neatly with the recent delivery of the first of four state-of-the-art Titan Class Ramform seismic







“There is excellent match between PGS as a pioneering and innovative seismic company and what KONGSBERG can offer as an advanced technology and systems provider. We feel that our innovative solutions are highly appreciated and bring value to our customer”

GARD UELAND
President, Kongsberg Seatex

» seismic production records, being the first to tow eight, ten, twelve, fourteen, sixteen and seventeen streamers. The Ramform Titan is no exception: the vessel is equipped with no less than 24 streamer reels. 16 are placed abreast across the stern, with eight positioned in a second row on the same deck. This configuration enables faster deployment and provides PGS with increased survey flexibility, improved efficiency and operational safety.

The Ramform Titan is also optimised for eBird Technology, which allows operators to control streamer roll orientation, depth and separation during the survey, including deployment and retrieval. Reiersgard explains that tidal forces or currents often cause streamers to move in different directions – an effect known as “streamer feathering.” These can result in gaps in the data (infill), which may require that the vessel re-survey the same area – leading to delays. “By having more control over the streamers we can offer a more consistent, reliable survey and avoid the risk of downtime,” he says. “We understand that it’s not simply a matter of the area we can survey but the comprehensive quality of the coverage.”

GHOSTBUSTER

The Ramform Titan can offer reliable coverage, but the vessel itself cannot deliver quality data. To achieve this, PGS has developed broadband streamer technologies that provide more accurate 3D and 4D subsurface images of deep and complex subsea geological formations. For years, seismic data had been subject to distortions or “ghosts” caused by sound waves reflecting off the under-surface of the water. Following a multiyear development process, PGS launched GeoStreamer in 2007, a dual-sensor streamer that eliminated sea surface reflections. And

eBIRD

CHALLENGE: It is easy to imagine a survey vessel sailing along the seas with streamers towing directly behind it. But this is often not the case. Tides and currents usually cause the streamers to move in various directions, an effect known as ‘streamer feathering’ in the industry. Such streamer displacement has little or no effect on the success of 2D surveys, but it is important in both 3D surveys and 4D surveys. As the industry heads towards the later, it is becoming increasingly important to control streamers and keep them stable in all weather conditions.

SOLUTION: In order to overcome this challenge, KONGSBERG developed eBird. eBird enables the surveyor to control streamer roll orientation, depth and separation during the whole operation including deployment and retrieval. The actual body of eBird is flush with the streamer, reducing turbulence around the cables so they do not generate acoustic noise, which would interfere with the surveying process. The three-wing configuration provides superior manoeuvrability, without having to rotate. The wings are easy to connect and disconnect for an efficient deployment and retrieval of the seismic cable and the short and slender body also helps to avoid any damage when winding up and off the streamer drum. With no connector between body and wings, the eBird will be suitable for use in a variety of operational conditions.

RESULT: The eBird helps surveyors conduct safer and more cost-effective seismic operations. Weather conditions and currents have less of an effect on the success of a survey, which reduces risk for surveyors. The increased accuracy of the streamer shape enhances acquisition of data and provides the possibility to replicate streamer shape for later survey of the same area to better compare data.

in 2011, PGS launched GeoStreamer GS, a unique source technology that significantly improved image quality.

“GeoStreamer has been a real game-changer,” says Reiersgard. “The technology enables far better data on promising subsea fields and provides our customers with the opportunity to upgrade their existing seismic databanks to dramatically improve their imaging and understanding of existing reservoirs.”

PARTNERING FOR SUCCESS

When paired together, GeoStreamer and the Titan Class Ramform vessels make a powerful combination. But while the streamer technology and the vessel design are unique to PGS, the company depends on a network of trusted suppliers to achieve the best results. “We tend to favour long-term relationships with suppliers who share our focus on innovation and reliability,” says Reiersgard. “Kongsberg Maritime’s focus on product development, efficient project execution, systems reliability and their global presence made them a natural choice for supplying the systems we needed for the Titan Class Ramform newbuilding programme.”

Gard Ueland, President of Kongsberg Seatex, says that Kongsberg Maritime's relationship with PGS has intensified over the last six years. "As the complexity of their vessels has increased, the scope of systems we have supplied to them has grown," he says. "We recognise that they have zero tolerance for downtime, so we have worked to provide them with a broad range of proven, fully-integrated systems and equipment to ensure reliable and efficient operations."

FULL SPECTRUM DELIVERY

The systems KONGSBERG supplied to the Ramform Titan include integrated navigation and bridge control systems (K-Bridge), Thruster Control Systems, Dynamic Positioning (K-Pos class II), fully integrated hydraulic and winch control systems developed by Kongsberg Maritime subsidiary, Kongsberg Evotec, and eBird streamer control, delivered by Kongsberg Maritime subsidiary, Kongsberg Seatex. While most of these systems required minimal adaptations, the sheer size of the streamer spread meant some modifications to the back deck handling systems. "Supplying PGS with such a broad suite of systems for its Ramform Titan is an acknowledgment of KONGSBERG as a supplier to high-end seismic industry," says Ueland. "We are very pleased that PGS has selected our innovative solutions and recognises how these systems will benefit their operations."

For Ueland, working with PGS has been a highly constructive experience. "There is excellent match between PGS as a pioneering and innovative seismic company and what KONGSBERG can offer as an advanced technology and systems provider," he says. "We feel that our innovative solutions are highly appreciated and bring value to our customers."

While the DP II system aboard the Ramform Titan is fairly standard, it remains critical to avoiding

down time. According to Nils Albert Jenssen, Vice President of Business Development at Kongsberg Maritime, the DP system aboard a seismic vessel enables the vessel to travel on autopilot. "Station keeping remains the most challenging aspect of any dynamic positioning system, but for seismic vessels, the capability to stay on course is critical," he says. "The integrated sensors on KONGSBERG DP systems account for wave action and current, correcting for variables to ensure the vessel and streamers are optimally aligned at all times."

A SHIFT IN DEMAND

PGS derives income from two primary sources: performing surveys for individual clients (marine contracts) and developing and acquiring high quality surveys and licensing these to a number of different customers (multi-client). In the past, PGS was more active in marine contracts, but today the mix is more balanced, with a shift toward multi-client. Investing in new streamer technologies and sizing up the capacity and efficiency of a proven vessel's design, offers advantages in both markets.

Reiersgard explains that the investment focus is driven by market forces: growing demand for oil and gas has kept energy prices high, encouraging more investment in exploration. However, he notes that unlike most shipping companies, PGS's core offering has little to do cargo space or the number or size of vessels in its fleet. "The quality of our vessels and personnel are essential to our business, but our clients come to us for one reason: good information. To make business-critical decisions, they need reliable, quality data as soon as they can get it. So long as we can meet this demand, we will continue to succeed. Content is king."

GEOSTREAMER

CHALLENGE: The surface of the ocean acts as an almost perfect acoustic mirror, causing "ghost" effects in recorded seismic data. These unwanted effects are unavoidable when using conventional source arrays and conventional hydrophone-only streamers. Ghosting is a common problem in seismic data and has plagued offshore seismic acquisition for decades. The worst "ghosts" appear as false or misleading seismic "events", hiding or obscuring the real geology, or even creating false geology. Rendering the overall seismic result confusing and ambiguous.

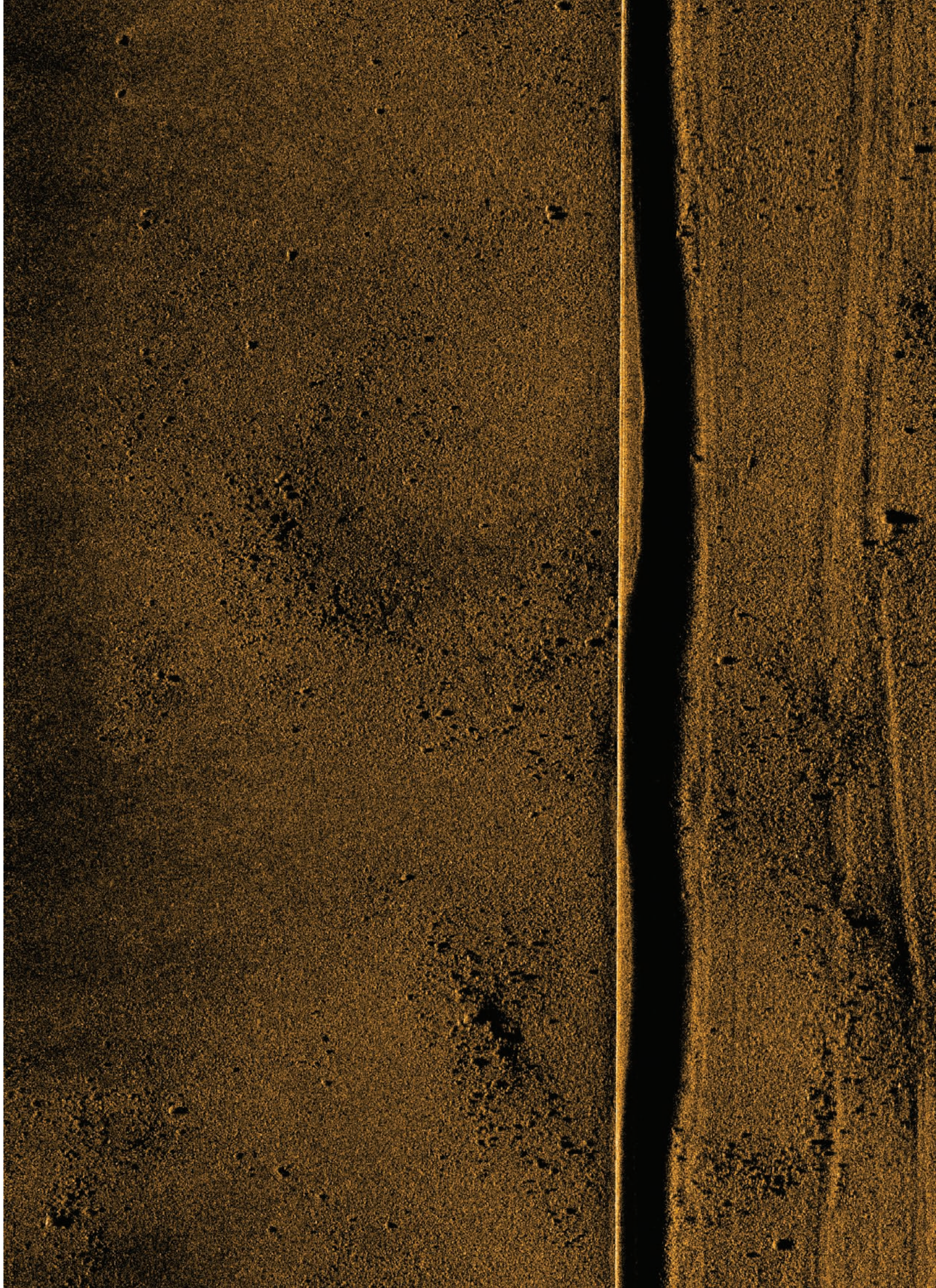
SOLUTION: Industry participants began looking for solutions to the ghost problem in the early 1990s. In 2007, after years of development, PGS launched GeoStreamer, which enabled the removal of the receiver sea surface reflection from seismic data. GeoStreamer enables unique data processing and imaging that are unavailable to hydrophone-only streamers. This results in better reservoir delineation, more accurate reservoir characterisation and more effective reservoir production monitoring. However, seismic data contains two sea surface reflections; one on the receiver side and one on the source side. In 2011, PGS released GeoStreamer GS, which, when used in conjunction with GeoStreamer, provides ghost-free seismic imaging on both the receiver and source side.

RESULT: PGS has demonstrated that GeoStreamer provides a four to five-fold boost in the low frequency signal content, about three times the high frequency signal content, and a higher signal-to-noise content for all frequencies and for all depths. GeoStreamer has been highly successful, delivering significant seismic data improvements in varied operating environments and geological settings. It has revealed hidden and unknown prospects in even the most challenging settings: Below salt, in traditionally "poor data" zones and in some of the harshest climates and environments. The technology has also provided oil and gas companies with increased efficiency and confidence in geological structures. This reduces risk and gives these companies more comprehensive and trustworthy information on which to make investment decisions.

"Ramform Titan's ability to cover a large area and operate successfully in marginal weather can often make the difference between getting the job done in one season instead of three"

MAGNE REIERSGARD
Executive Vice President Operations, PGS





Subsea pipelines are critical infrastructure components for the oil and gas industry. They are also expensive. So expensive in fact, that there is often little or no redundancy available should things go wrong, so inspection and maintenance are vital ingredients to ensure that oil and gas continues to flow.

“The AUV must autonomously perform many tasks that were previously carried out by the ROV operator. This includes actually detecting and tracking the pipeline from the sensor data, and positioning its sensors optimally relative to it”

PER ESPEN HAGEN,
Senior Principal Engineer,
Kongsberg Maritime

Aerial view of a pipeline in the desert. Over the last several years, Kongsberg Maritime has been developing a concept for pipeline inspection using the HUGIN autonomous underwater vehicle (AUV).

ENERGY INFRASTRUCTURE

Pipe Dreams

Any disruption to oil and gas flow could have formidable financial and social repercussions, not to mention the environmental consequences of a possible leakage. To ensure a high degree of integrity, subsea pipelines are therefore designed and built to a very high standard, but this must be complemented by rigorous and extensive inspection programmes.

“The main threats to a pipeline differ with location and water depth,” explains Per Espen Hagen, the Senior Principal Engineer in charge of System Architecture at Kongsberg Maritime Subsea AUV department, whose job it is to understand the challenges of ensuring subsea pipelines continue to work.

“Natural phenomena such as hurricanes, seismic activity and sediment shift may be of vital concern in many parts of the world. In other areas, human activity such as bottom trawling or anchoring may pose the greatest risk to pipelines. Regardless of the local challenges, a robust, economic and efficient inspection regime is needed in order to maintain pipelines to a high standard.”

According to Hagen, the main objectives of an inspection programme vary with the threat scenario, but can typically include factors such as determination of burial, free span and buckling, as well as any kind of damage to the pipeline.

“In addition to the pipe itself, it is normally also of interest to gather data from its surroundings, to scan for debris and evidence of potentially damaging human activity. These diverse tasks are best solved by recording data with a variety of sensors, both acoustic and optical,” he adds.

GOING AUTONOMOUS

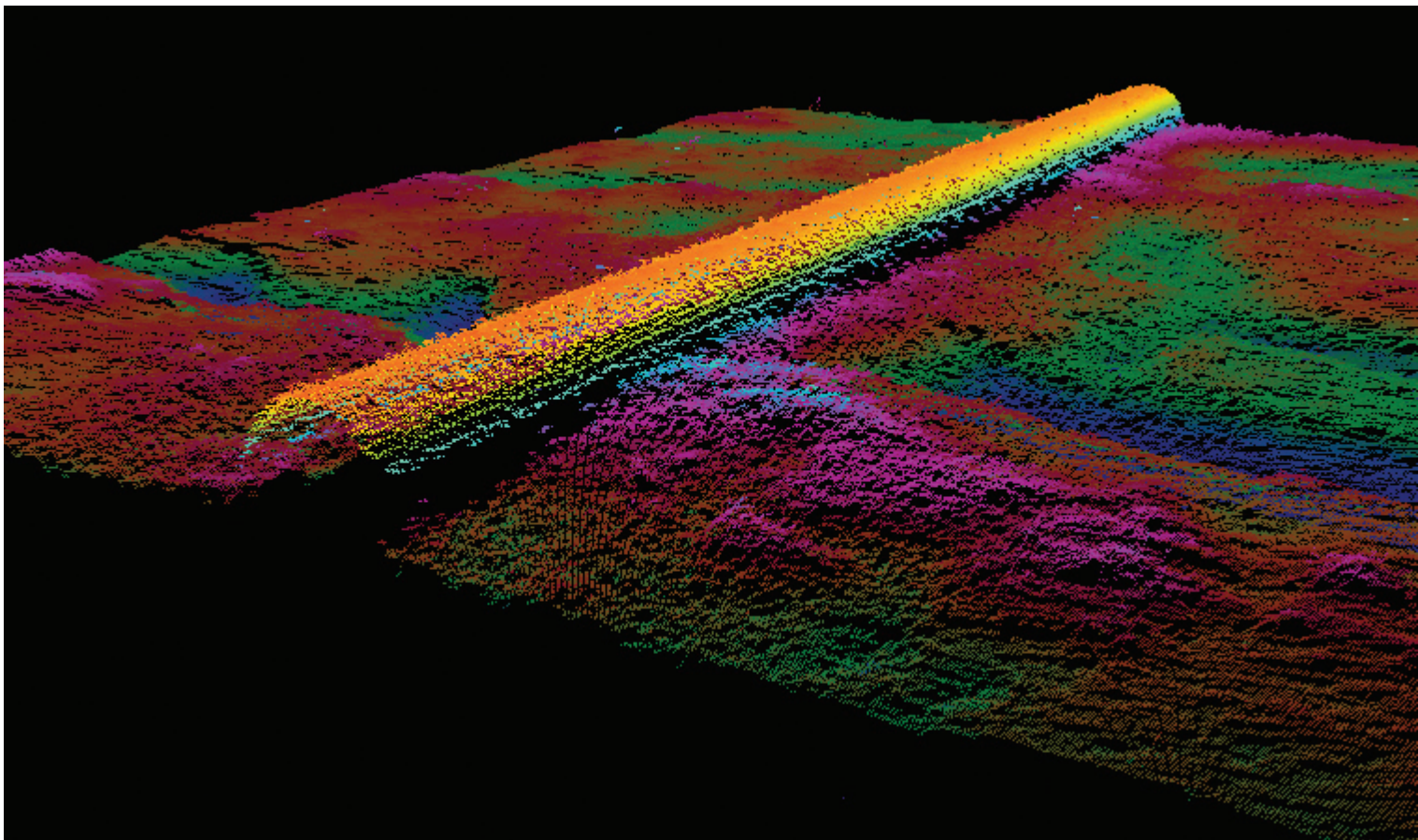
Today, external pipeline inspection is often performed with towed or Remotely Operated Vehicles (ROVs). For the past several years, however, Kongsberg Maritime has been developing a concept for pipeline inspection using the HUGIN autonomous underwater vehicle (AUV).

The primary advantage of using an AUV for this task is that it can operate at substantially higher speed – typically 4-5 knots, compared to 1-2 knots for a ROV. Secondly, AUVs can carry out their mission without being followed closely by a large surface vessel. Thirdly, the higher stability of AUVs means that they can effectively collect more advanced types of sensor data, such as Synthetic Aperture Sonar (SAS). The switch to using AUVs for pipeline inspection isn’t an easy one though.

“The AUV must autonomously perform many tasks that were previously carried out by the ROV operator. This includes actually detecting and tracking the pipeline from the sensor data, and positioning its sensors optimally relative to it. The technology exists though, and we have developed a solution that allows the autonomous, relatively high speed inspection of subsea pipeline,” says Hagen.

He is referring to a joint project with the Norwegian Defence Research Establishment (FFI), where Kongsberg Maritime has developed advanced algorithms for robust detection, tracking and following of underwater pipelines and cables using HUGIN. FFI leveraged 15 years of experience in sonar data analysis





» developed for other applications, such as automated target recognition (ATR) in mine countermeasure applications, as part of the project and trackers have been developed for side scan or SAS imagery, and for bathymetry.

This concept for multi-sensor AUV pipeline inspection has been field tested in various scenarios since 2009, with a full scale test of the complete system performed in the North Sea in July 2012.

SUCCESSFUL TRIALS

The HUGIN AUV was mobilised on the ship M/V Icebeam, owned and operated by the Swedish survey company Marin Mätteknik (MMT). A portable HUGIN system, which comes in a 20 ft container (including the launch and recovery system) with a separate 10 ft operations container was used for the trial. The system also included a portable HiPAP system for acoustic positioning, a Seapath navigation system, acoustic, RF and satellite links, as well as all necessary maintenance equipment.

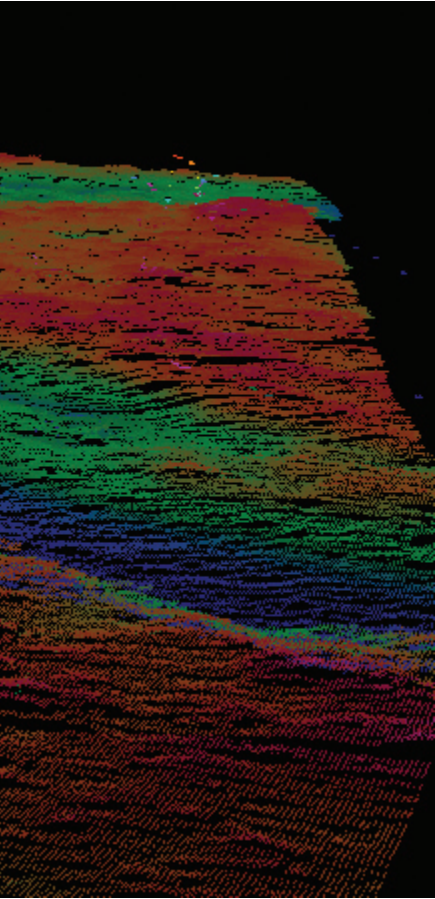
The complete system was mobilised on M/V Icebeam in a day, including HiPAP calibration at sea, which demonstrated high flexibility for commercial deployment in the future. Following mobilisation,

the ship transited to the area of operations and a comprehensive four hour HUGIN test dive was executed. The AUV then performed two 13-hour dives over the next two days. After transit back to port, the entire system was demobilised in half a day.

The main sensor instrumentation for pipeline inspection with a HUGIN AUV is the HISAS 1030 interferometric SAS, the EM 2040 high-resolution multi-beam echo sounder, and the TileCam still image camera system, all of which were utilised during the sea trials.

Hagen describes the operations: "In the first survey mission, HUGIN tracked and followed the pipeline continuously with HISAS for almost seven hours, covering a 49 km section at 4 knots – twice as fast as an ROV, and without the need for an operator of course. HUGIN then turned around, and tracked the same pipeline section using an EM 2040 multibeam and TileCam continuously for around 4 ½ hours, covering a 30 km section at 3.8 knots. In this phase, the AUV operated at 3.5 metres above the seabed, and excellent camera images were collected."

Various combinations of AUV speed, altitude and sensor settings were tested in order to optimise multibeam coverage and sounding density during the trial. The EM 2040 achieved ping rates exceeding 40 Hz, providing approximately 5 cm sounding spacing both along-track and across-track, which is more than enough definition for



PER ESPEN HAGEN
Senior Principal Engineer
Kongsberg Maritime Subsea AUV

The main sensor instrumentation for pipeline inspection with a HUGIN AUV is the HISAS 1030 interferometric SAS, the EM 2040 high-resolution multi-beam echo sounder, and the TileCam still image camera system.

a high-resolution inspection. The stable environment on the AUV allows practically every single sounding to be used, facilitating DTM production at cell sizes of 10x10 cm or even smaller.

NEXT STEPS

Analysis shows that the concept will provide considerable cost and time savings compared to the traditional methods for pipeline inspection. One obstacle to the adoption of the technology is that while the data set collected is very rich and of excellent quality, it differs from the products gathered by ROV inspection, so changing the way the industry operates pipeline inspections will not happen overnight.

“We see that acceptance is growing, and it is fair to assume that AUVs with this technology will be a major contributor in pipeline inspection in the future. Furthermore, the concept can also be extended to other, similar forms of subsea infrastructure, such as cables, so we are confident that our work can enhance inspections in a number of subsea application areas.”



PER ESPEN HAGEN,
Senior Principal Engineer, Kongsberg Maritime

DIFFERENT APPROACHES

The operational concept of Multi-sensor AUV pipeline inspection may involve passing to the side of the pipeline, directly above it, or both.

LATERAL PASS

If the position of the pipeline is not well known, and especially if sections of it are buried or otherwise difficult to detect, a first pass will be performed with a lateral offset of 50-100 m from the best estimate of the pipeline position.

HUGIN will operate the HISAS, recording very high resolution sonar imagery (better than 5x5 cm) as well as bathymetry from a continuous (one side) swath of 100-200 m. The HISAS data is also used for real-time tracking of the pipeline. When tracked, the vehicle will automatically adjust its position to a fixed lateral distance from the actual position of the pipe. If track is lost e.g. due to the pipeline being buried, the vehicle will slowly revert to the prior pipeline position estimate. The automatically computed pipeline position will also be stored in the vehicle.

This pass may also be performed with regular side scan sonar (SSS). The operator will then be faced with the standard SSS trade-off: Using a low-frequency SSS (100-200 kHz) provides a wide swath (similar to that of HISAS), but resolution will be poor – potentially insufficient for the pipeline inspection task. Using a higher-frequency SSS (400-600 kHz) provides better sonar data quality, but the narrow swath means that the system is more vulnerable to loss of track, e.g. after long sections of burial.

In some scenarios, this lateral pass may be sufficient. The very high resolution HISAS data allows detection of free spans, burial, lateral shift of the pipeline, as well as many types of human activity near the pipeline.

PASSING ABOVE THE PIPELINE

The other approach is to pass directly above the pipeline. If the pipeline position is well known before the operation, a pass directly above the pipeline will often be sufficient. In this mode, HUGIN will operate the EM 2040, typically at an altitude of 4-10 m above the pipe. Depending on visibility, the optical camera can also be operated. In addition, HISAS can be operated to increase the acoustic coverage to the side of the pipeline.

“We see that acceptance is growing, and it is fair to assume that AUVs with this technology will be a major contributor in pipeline inspection in the future”

DRILLING



Drilling

The macro-economic outlook for exploration drilling is positive as the industry moves on from the risk of a global double-dip recession to meeting demand growth from many countries including China and India. The coming decade will see Asia's appetite for oil and gas increasingly satisfied from unconventional and deep-water resources, as operators are now able to explore and test for resources that would not have been feasible 10 years ago.

An overall increase in exploration investment has meant that the number of global oil discoveries has grown exponentially. The many deepwater discoveries made over the past year, particularly in the South American region, are typical.

However, there is a tendency for gas demand to be displacing oil, particularly in Asia. As shallow water Asian fields mature, the gas reserves of the deeper, more contentious areas of the South China Sea are being viewed as worthy of further investigation. Border disputes and a shortfall in local deepwater competence are balanced against the relative profitability of the region compared to, for example, the Arctic.

There is huge development potential in the Arctic but it is likely

to be costly. Meanwhile, new discoveries on the Norwegian continental shelf, coupled with the opening up of the Barents Sea to exploration, have sustained activities in the northern hemisphere. The Norwegian mobile offshore drilling unit fleet, for example, has recently experienced 100 per cent utilisation.

East Africa is just starting to be talked about, but already the oil majors are queuing up to get in there. More hydrocarbons have reportedly been discovered in East Africa in the last two years than anywhere else in the world. Offshore this has included world-class gas discoveries off Tanzania and Mozambique.

The exploration fleet is changing. Most of the mid and deep water drilling units currently in use were built in the 70s and 80s and they are now being crowded out by more modern units. Older offshore support vessels are also being crowded out of the market. DP2 capability has become the new standard and many charterers will not accept vessels over 10-15 years old. More platform supply vessels are entering service in response to deep and ultra-deep water drilling.





ODFJELL DRILLING

The power of performance



DRILLING

Few industries are as demanding and as regulated as offshore oil and gas. Rapid technological advances, the world's most stringent safety regulatory environment and across-the-board calls for quality, mean drilling companies must remain ever-vigilant in their focus on performance and outcomes.

HÅKON KLEPSVIK
Vice President
Technology & Projects
Odfjell Drilling

The company has established, developed and maintained its position as a preferred provider.



“We have one of the most modern fleets in the drilling industry”

HÅKON KLEPSVIK
Vice President Technology & Projects,
Odfjell Drilling

Odfjell Drilling, noted for being one of Statoil's top tier suppliers, has been involved in international drilling since the early seventies. Today, the privately-owned company has an impressive fleet of semi-submersibles and drillships and over 3,000 employees operating in 20 countries worldwide.

The question is, just what is Odfjell Drilling doing differently in the crowded and extremely competitive offshore drilling market to make it a top ranked player? The Full Picture talked to Håkon Klepsvik, Vice President Technology & Projects at Odfjell Drilling to get the inside story.

RENEWAL, RENEWAL AND RENEWAL

Odfjell Drilling's gross capital expenditure in new rigs has been in the range of NOK 20 billion. The company has two sixth generation semi-submersibles in operation and one newbuild under construction. With one exception, the company's entire portfolio of 11 rigs is less than four years old.

“We have one of the most modern fleets in the drilling industry,” says Klepsvik. “Combined with experienced and skilled employees, we provide oil majors with the industry's safest and most effective drilling operations.”

The company has established, developed and maintained its position as a preferred provider, as witnessed by a pre-contract award with BP for the provision of a newbuild, semi-submersible drilling unit for use in the UK's West of Shetland region. The contract value is approximately USD 1.2 billion and is the largest contract in Odfjell Drilling's history.

Currently under construction at Daewoo Shipbuilding



“The industry sees that we have focus and do a safe job”

HÅKON KLEPSVIK
Vice President
Technology & Projects,
Odfjell Drilling



» & Marine Engineering (DSME) in Korea, the unit, Deepsea Aberdeen, is fixed with BP for seven years and is expected to drill more than 25 wells between 2014 and 2022.

“This unit, together with Deepsea Atlantic and Deepsea Stavanger, are of GVA 7500 design and are the most modern and efficient dual derrick, dynamic-positioned semi-submersibles in the market. This agreement with BP demonstrates that Odfjell Drilling’s commitment to building a modern fleet is definitely paying off,” says Klepsvik.

MOVING THE TRADITIONAL BOUNDARIES OF OPERATION

Klepsvik sees success as an incremental process. Can this lead to true differentiation in the market place? “Well, it’s more about evolution than revolution,” he says.

“We never begin from scratch. When building a rig or a series of rigs, we integrate 40 years of rig knowledge and market understanding with the latest offshore technology and future demands of users to make a complete, highly functional and operational unit,” he says. “Simply, we take what we had, and make it better. Much better.”

Such is the case with Odfjell Drilling’s sixth generation semi-submersibles. There is not much difference in basic design and some onboard technology compared to earlier generations, but the operational capabilities of sixth generation units are light years ahead.

For example, the rig capacity of a sixth generation semi-submersible is twice that of a third generation rig, enabling it to be engaged in a spectrum of operations including drilling exploration, production, well completion and workover operations.

Deepsea Aberdeen has a massive operating displacement of 55,122 metric tons and upper hull dimensions of 90 x 78m. These features will help ensure good motion characteristics in heavy seas. A variable deck load capacity of 7500mt ensures generous storage facilities under all operating conditions. Full winterization can be provided for operations in arctic environments. This means Odfjell Drilling’s sixth generation semi-submersibles have a high degree of logistical independence, which is necessary for cost-effective operations in the remote North Sea and other challenging areas around the world.

“Our new multi-purpose sixth generation units are built with the objective of improving performance considerably and are designed to fully meet the challenges of the future,” says Klepsvik.

The rig design focused on achieving the highest standards in the industry for:

- Motion characteristics
- Natural heave period
- Increased deck area and storage capacities to ensure efficient logistics
- High air gap in operation condition and in survival
- Arctic design
- Environmental care

AUTOMATION: A CATALYST FOR CHANGE

While some in the industry argue that automation cannot be applied to drilling because it is an art form that needs human guidance, Odfjell Drilling sees a new track emerging. Intelligent automation and software control is rapidly increasing in sophistication and scope. Power management systems, drilling control systems and BOP control systems are just some of the areas where technology is taking on a space-age level of performance in safety and reliability.

“The largest difference between our newest rigs and previous generations is the demand for automation. Automation is not a goal in itself but a consequence of operators having to meet their goals for zero workers hurt on the job, reduced costs for extracting hydrocarbons and robust protection of the main asset, the drilling rig itself,” says Klepsvik.

Deeper waters (Odfjell Drilling’s sixth generation semi-submersibles are capable of operating in depths up to 3,000m), highly integrated systems and multiple concurrent activities, and even outer threats, such as piracy, are additional factors making automation a key variable in the future.

“Our strategy is to take on more responsibility in the value chain by offering a full range of integrated and automated marine systems,” says Klepsvik. “And to do so we partner extensively with KONGSBERG.”

Close collaboration and a commitment to understanding the extreme contexts in which drilling technology is applied are important driving forces behind Odfjell Drilling’s partnership with KONGSBERG.

“We have contracted KONGSBERG’s ‘Full Picture’ solution for all our sixth generation vessels. It offers a comprehensive scope covering systems such as DP 3 Dynamic Positioning, thruster control, bridge navigation, vessel automation, safety systems, riser management and Helideck Monitoring & environmental monitoring,” says Klepsvik.



Sixth generation semi-submersible.

CRITICAL MASS

The competitive advantage associated with a larger capital base and greater asset diversification is key to market share. Basically, the larger the company, the greater degree of diversification possible by geography, rig class, rig quality, contract duration and customer base.

To benefit from greater asset diversification, financial resources and economics of scale, Odfjell Drilling has created two subsidiaries: Odfjell Drilling & Technology and Odfjell Well Services. The former is a leading contractor in the production drilling and engineering market, while the latter supplies a wide range of services to the oil industry.

“Though our core business is the design, ownership and operational management of semi-submersibles, drillships, jack-ups and modular drilling units, our subsidiaries play a strategic role,” says Klepshvik, “Not only do they keep us at the forefront of offshore services, they create a critical mass to sustain company growth, operational efficiency, technical edge and profitably.”

THE HUMAN FACTOR

Odfjell Drilling & Technology has the people and services to take a project from field development to commissioning and operations. These people are united within a system of shared values. Safety is central in every undertaking.

“40 years of management experience resides within these walls, united and committed,” says Klepshvik. “This environment, where knowledge is shared and passed on through best practice, is highly valued by our clients.”

Odfjell Drilling does not outsource. Each project maintains a core team and unlike many in the industry, where there is no experience loop from operation back to design, the company is systematic about continuity and communication.

Committed and motivated people are central to achieving the company’s goals. But deeper waters, more challenging geology and greater complexity take more than this. Creativity is actively encouraged, maintains Klepshvik. “We are always looking forward. This is a necessity in an industry that can change virtually overnight.”

UNIT MANAGEMENT

During its four-decade-long history, Odfjell Drilling has provided

management services for owners of semi-submersibles, drillships and jack-up drilling units worldwide. The services include project management and follow-up during the construction phase, management of regulatory requirements, marketing and client relations, commissioning and operations.

Most recently, Odfjell Drilling has entered into an agreement with Marine Accurate Well (Maracc) for the operation, project follow-up and marketing of the rig Island Innovator, which will be ready for drilling operations on the Norwegian continental shelf from summer 2013. This sixth generation unit is capable of conventional drilling to 1300m water depth and through tubing rotary drilling and heavy well-intervention to 3000m.

Odfjell Drilling has a team mobilized at Cosco Shipyard in China to ensure progress and the quality of the work. “We use a combination of operationally experienced people and engineers. Both are focused on understanding our clients and building good relationships with suppliers,” says Klepshvik.

SMART ACQUISITION

There is a continual technology drive within the company, extending core business capabilities and maintaining leadership as the complexity of technology increases. The recent acquisition of Zenon Well Technology in Dubai represents such a step up in in-house technology development. Zenon’s solutions for wellbore cleanup represent a complementary range of services to those already offered by Odfjell Well Services.

“We have accelerated the growth of our internal technology development unit,” says Klepshvik. Both the product solutions and Zenon’s team of innovative people are important acquisitions, all part of the plan for continued global expansion.

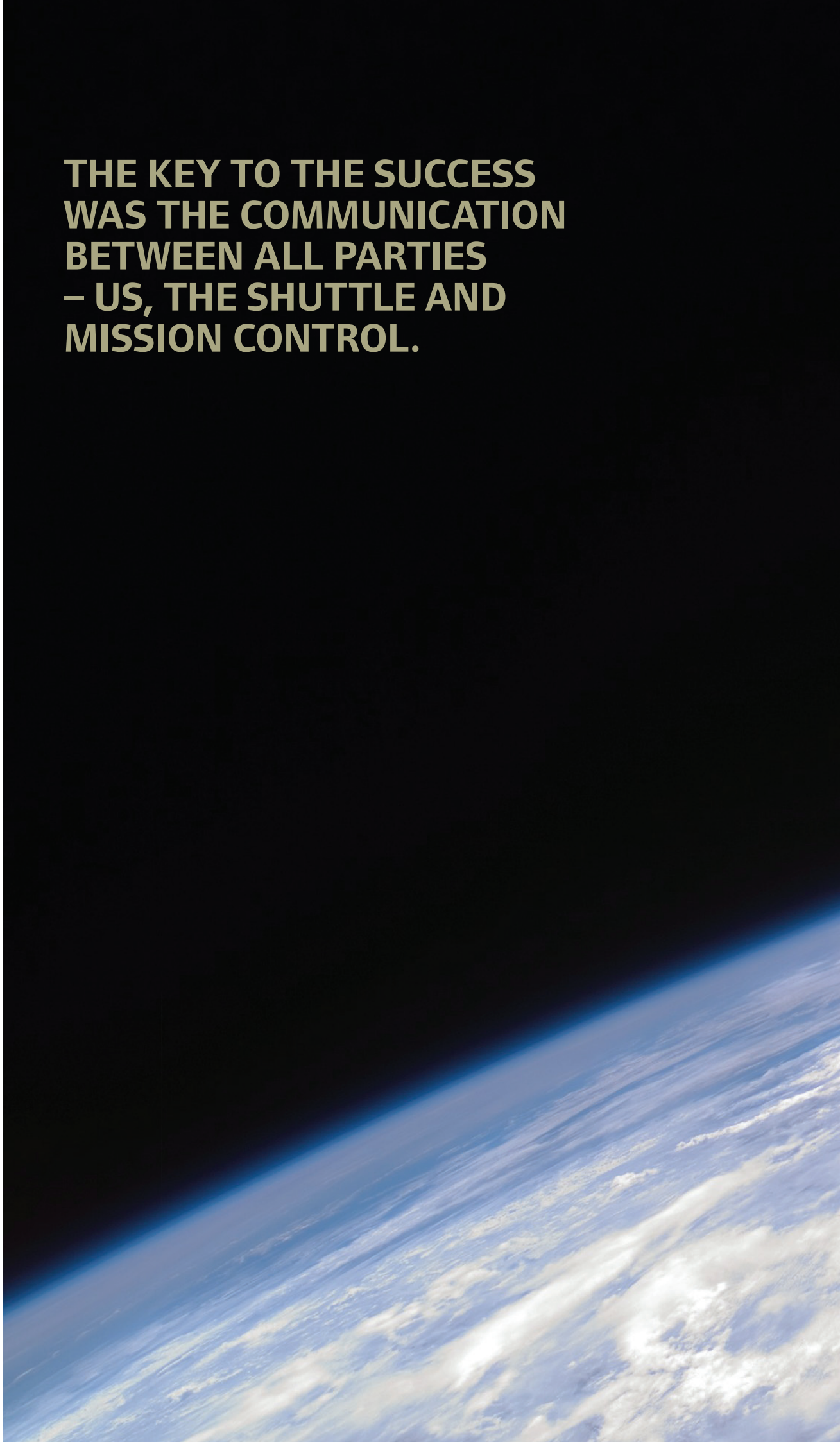
“It is important to have a critical mass of skilled people. That is one of our greatest assets in itself,” believes Klepshvik. “As this critical mass increases, so does our ability to tackle the larger, more complex challenges of the future.”

Odfjell Drilling has already established its presence in Norway, UK, US, Holland, South Korea, Philippines, Angola, Romania, UAE, Saudi Arabia, Turkmenistan, Kurdistan, Thailand, Tanzania and more. A focus on technical competence has earned them their position amongst the top three drilling companies worldwide.

“The industry sees that we have focus and do a safe job,” says Klepshvik. “We do things right the first time.”

FEATURES

**THE KEY TO THE SUCCESS
WAS THE COMMUNICATION
BETWEEN ALL PARTIES
– US, THE SHUTTLE AND
MISSION CONTROL.**





Christer Fuglesang has dived to the depths and danced with the stars; performing mission critical operations underwater and above the Earth. The Full Picture Magazine blasts off with the acclaimed ESA astronaut for an extraordinary insight into conducting spacewalks, training under pressure and the need for absolute reliability when exploring extremes.

EXPLORING EXTREMES

Out of this world class

Christer Fuglesang stood alone: outside, in space, perched on the very top of the International Space Station, travelling at a speed of almost 28,000km/h. The smile that dawns across his face as he describes that experience lights up the room like a solar ray.

“I looked down on this 100m wide structure below me, and far, far beneath that, the clouds, oceans and outlines of continents silently rolling by. I felt, I don’t know,” he says, shaking his head gently in awed recollection, “like I was standing on the top of a mast, riding this enormous ship right around the world.”

The power of the memory renders him silent for a second. Perhaps he’s struggling to describe the indescribable; what it feels like to be higher than any other living thing, watching the world from an orbital altitude of approximately 360km above sea level. He gives up. Smiles again, shrugs and moves on.

It’s probably, understandably, one of those ‘you had to be there’ experiences.

THE STAR ATTRACTION

Christer Fuglesang *has* been there. The 56 year old Swedish particle physicist and European Space

Agency (ESA) astronaut has conducted two space shuttle missions (the STS-116 in 2006 and STS-128 in 2009), carried out five spacewalks (he was the first astronaut outside the US and Russia to complete more than three) and travelled more than 10million miles with NASA. He has spent almost 27 days in space and 31 hours and 54 minutes on EVAs (extra vehicular activities, the space industry’s name for spacewalks). He, more than almost any other person on this planet, has watched from afar, and knows exactly what it means to explore the extremes.

The Full Picture meets him in his offices at the Royal Institute of Technology (KTH) in Stockholm for a rare insight into the mind of a man that embodies the key KONGSBERG qualities of reliability, determination, innovation and collaboration.

His story is, quite simply, inspirational.

WATCH THIS SPACE

Fuglesang, which appropriately enough for someone destined to fly so high means ‘bird song’ in English, didn’t follow the cliché of dreaming to be an astronaut from an early age. Physics was his first love, along with Frisbee (more on that later), leading to an Engineering Physics Master in 1981 and a PhD in

CHRISTER FUGLESANG
European Space Agency astronaut

Fuglesang’s EVA experience

Mission one: STS-116, 9th to 22nd December 2006, Space Shuttle Discovery
Total distance travelled: 5.3 million miles

Total EVA time: 18 hours, 14 minutes

All EVAs were conducted with US astronaut Robert Curbeam

EVA 1: Installing a segment of the ISS truss (P5), often referred to as the backbone of the ISS

EVA 2: Carrying out rewiring duties on the ISS power system

EVA 3: Unplanned EVA, the successful retraction of a solar panel that was not folding correctly

Mission two: STS-128, 29th August to 12th September 2009, Space Shuttle Discovery

Total distance travelled: 5.75 million miles

Total EVA time: 13 hours, 39 minutes

Both EVAs were conducted with US astronaut Danny Olivas.

EVA 1: Installing a new ammonia tank assembly

EVA 2: Installing various hardware items to the ISS, including GPS antennas and pre-routing cables for the upcoming European built Node 3 module

Following the success of both missions, Fuglesang was awarded the NASA Exceptional Service Medal in 2010.



The business suit: Fuglesang poses in his EMU spacesuit prior to his first Shuttle mission in 2006. Photo: NASA



» Experimental Particle Physics in 1987. From here he quickly moved on to arguably the pinnacle of any scientific career by obtaining a position with CERN, initially working on the CPLEAR project before beginning preparations for the ATLAS experiment at the Large Hadron Collider. This, for the uninitiated, is the world's largest ever experiment (still on-going), with an international team of thousands searching for the elusive Higgs Boson, or God Particle as it's more commonly known, by recreating the conditions found in the immediate aftermath of the Big Bang.

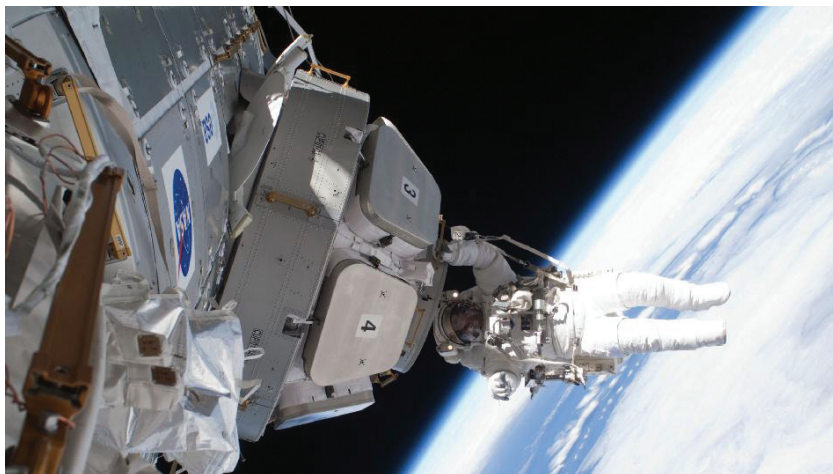
He loved space, was interested in going – “well, I like to travel” he explains, with what is fast becoming a trademark smile – but it was something of a distant pipe dream, rather than a realistic objective. Until 1990 that is, when a friend jokingly handed

him an advert from a newspaper, noting ‘I think I’ve found you a new job’.

Surprisingly this ‘situations vacant’ ad was for ESA astronauts. What started out as a bit of fun, rapidly progressed to a serious application (he was one of over 300 applicants from Sweden), a selection process at ESA with 65 international hopefuls, and an eventual trainee position at the agency as part of a final intake of six.

Fuglesang had begun a journey that would see him attain a Space Shuttle Mission Specialist role in 1996, his first seat on Discovery ten years later and a place in the record books forever, as the first Swede, in fact the first Scandinavian, in outer space.

“From that point,” he imparts, “I had a new goal – I wanted to spacewalk.”



MISSION CRITICAL RELIABILITY

THE EXTRAVEHICULAR MOBILITY UNIT (EMU) SPACESUIT

When operating in extreme environments reliability – of technology, tools and team members – is absolutely imperative. For Christer Fuglesang, having complete confidence in his EMU spacesuit is the cornerstone of all EVA activity.

“It is the key thing that your life depends upon,” he stresses. “It’s very much your own self-contained spaceship when conducting EVAs. It is checked time and time again and you quickly learn how it operates and what to do in case of failure.”

A leak is the biggest danger, he explains, but thanks to rigorous checks this has yet to occur on a NASA EVA. A more likely problem may be a malfunctioning cooling system, which can cause the astronaut to overheat and the visor to fog, effectively blinding him or her and endangering not just the success of the EVA, but the astronaut themselves. Radio and power issues are also critical, as is the oxygen supply and CO2 scrubbing capabilities.

All these elements are monitored by Mission Control, while built in alarm systems alert the astronaut to any potential issues as soon as they become apparent. This should leave them enough time to make their way back to the airlock and the safety of the shuttle/space station. Countless science fiction films, and the active imaginations of little boys everywhere, have impressed another nightmare scenario into millions of minds – that of drifting off into outer space. If there is a serious tethering failure, or critical entanglement, the astronaut may have to disengage, or find themselves disengaged, from their lifelines. If they begin to drift they are left with one option – a final safety mechanism offered on the EMU, called SAFER (Simplified Aid for EVA Rescue).

This is effectively a small, self-contained propulsion system underneath the astronaut’s backpack that, theoretically, allows them to fly themselves back to safety. It is operated by a ‘manoeuvre box’ mounted on a quick release handle, which flips out into reach when required. Extreme environments demand such extreme measures, Fuglesang believes, to ensure peace of mind for these stellar pioneers.

FROM UNDERWATER TO OUTER SPACE

It’s the extensive spacewalk experience that really sets Fuglesang apart, and what has attracted The Full Picture to him today. Specifically, the connection between subsea diving operations and EVAs is of key interest, and something that he himself is quick to acknowledge. The similarities start from the outset.

“Each spacewalk is replicated in underwater conditions first,” he explains, referring to what is called The Neutral Buoyancy Laboratory near the Johnson Space Centre in Houston, home to the world’s largest indoor swimming pool (measuring 62m by 31m, with a depth of 12m).

“The pool contains full scale models of relevant sections of the International Space Station (ISS),” the destination of both his Discovery expeditions and all five spacewalks, he clarifies. “We use these to practice the duties we will conduct on the EVAs. Each astronaut that will undertake an EVA does this, wearing exact copies of our spacesuits, only modified for use in the water. The suits are balanced so we don’t float up or sink down, creating a very similar sensation to weightlessness.

“The duration of the time we spend underwater is roughly the same as a spacewalk, about six hours. Depending on the difficulty and criticality of the spacewalk it will be rehearsed as a mock EVA between three and seven times, so we know the operations pretty much by heart. During this time we are in constant communication with a designated team member sat in a control room beside the pool. That’s the same person that will be our main point of contact in space – they will be sat in the shuttle, while we conduct the EVAs. The reliability and clarity of communication between us is absolutely

fundamental to the success of the EVA.”

In the same way as the subsea diver is the very ‘tip of the tool’ – with all the other operational components, including the team in the DSV (dive support vessel) and those in the diving bell, feeding expertise and real-time information to ‘the hand’ conducting the assignment – so is the astronaut. In his, or her, case they are supported by the team in Mission Control, observing from a live video stream captured via a helmet top camera, and the immediate support person in the shuttle, taking the astronaut through the EVA step-by-step.

Fuglesang even says that the sensation of walking in space is somewhat akin to diving, with the mutually existing yet contradictory feelings of constraint “within the somewhat clumsy suit” married to an “incredible freedom” as you’re operating at the very extreme limits of human understanding, with full responsibility for mission critical tasks.

“It was great - a privilege,” he surmises, as his thoughts seemingly wonder back up to the ISS, which has now surpassed Mir’s record for the longest constantly inhabited space station (first occupied back in 2000).

FEELING THE PRESSURE

The similarities with diving continue. Both astronauts and divers are in danger from the dreaded ‘bends’ (a condition whereby dissolved gases come out of solution into bubbles inside the body as a re-

sult of depressurisation) with both therefore having to take precautions, although at different junctures. Divers enter decompression chambers post-dive, whereas astronauts conducting EVA’s utilise them pre-spacewalk, as the pressure drops on their assignments.

The pressure inside a spacesuit is, Fuglesang remarks, only a third of standard atmospheric pressure. He and his fellow EVA astronauts – every EVA features two individuals for safety reasons – entered into a pressurised airlock the day before the spacewalks to acclimatise, conducting equipment checks and even sleeping there prior to exiting the space station.

“It was actually a very positive experience, meditative rather than stressful,” he reveals, before revealing a little bit too much with a story about the lack of toilets in airlocks and the need for nappies. We’ll leave that story there.

While divers are connected to diving bells with umbilical cords, astronauts have tethers securing not just themselves, but also all their equipment and tools, to avoid them floating frustratingly, and dangerously, out of reach. These are prone to tangling both under the water and above the atmosphere, and require the requisite, much practiced, expertise and attention to keep them floating freely.

This focused attention, this constant sense of awareness – both situational, in terms of positioning on the structure of the space station, and of set duties – is, Fuglesang notes, perhaps the hardest thing about any spacewalk.



Fuglesang was awarded the NASA Exceptional Service Medal in 2010.

“Each spacewalk is replicated in underwater conditions first. The pool contains full scale models of relevant sections of the International Space Station”

CHRISTER FUGLESANG
European Space Agency astronaut



» “Physically, the strains on the body are not severe, although that depends on the task you’re carrying out,” he says, relaying that on his EVAs, which were primarily maintenance and construction related, there was the occasional need to break sweat to free up bolts etc. “However, mentally it is exhausting. You are out there for six hours, in an extremely high-pressured environment, with a whole world watching you, while you’re conducting a task that could be, in some cases, the highpoint of your career and training. It is very intense,” he opines, with a degree of understatement.

UNPLANNED SUCCESS

Fuglesang is candid when describing his three EVAs on the STS-116 mission and the two that followed on STS-128 three years later. Naturally, he says, he is of a creative disposition, relishing the challenges of problem solving, so being told exactly what to do – both by Mission Control and his colleague on the Shuttle – was not (perhaps) an ideal scenario. However, when describing his third EVA in 2006 that solar ray smile illuminates once again.

“That was unplanned,” Fuglesang beams, mean-

“I looked down on this 100m wide structure below me, and far, far beneath that, the clouds, oceans and outlines of continents silently rolling by”

CHRISTER FUGLESANG
European Space Agency astronaut



Home base: The ISS, which orbits the Earth approximately every 90 minutes, has been constantly inhabited by teams of astronauts since 2000. Photo: NASA



ing there was no time to take a dip in the pool for practice.

“A solar panel on the space station hadn’t retracted properly, it was supposed to do that by electrical command, so we (Fuglesang and experienced US astronaut Bob Curbeam) had to go out to try and fix the problem. We were thinking on the spot, with tools that we’d basically put together ourselves, in the airlock, from the existing tools we had. There was much greater independence, but the key to the success was the communication between all parties – us, the shuttle and Mission Control – suggesting solutions, advising us where possible, as we tried, step-by-step, to retract this piece of equipment.”

It was an ad-hoc task that, after six hours and 38 minutes of activity outside the ISS, was a complete success.

“That was even more fun than the others,” Fuglesang exclaims.

TAKING FLIGHT

This Full Picture interviewee is a special breed of human being that has reached the heights, both figuratively and literally, in an unquestionably stellar career. But he has also retained a sense of fun and is obviously passionate about communicating the benefits of scientific exploration to new generations (although still employed by ESA he is now running a Masters programme in Aerospace at KTH and will launch a course christened ‘Human Space Flight’ as part of that proposition next year). This was clear when, on his first shuttle mission, he achieved a new



‘galactic record’.

In a bid to demonstrate the concept of weightlessness to those trapped by the Earth’s gravitational forces, Fuglesang took a Frisbee into space. A Swedish national Frisbee champion in his youth, he spun the disc in the microgravity conditions of the ISS to replicate a record he set in 1978 for ‘maximum time aloft’ (the time a Frisbee stays airborne between throw and catch). His new record of 20 seconds smashed the previous best and was recognised by the World Flying Disc Federation as a record, albeit it a ‘galactic’ one.

“It was just something personal,” he muses, “an idea to help connect the space mission with a broader audience. That was fun too.”

Which goes to show that Christer Fuglesang, no matter if he’s riding the ISS 400km above the earth or playing Frisbee with fellow astronauts, is probably one of the most down to earth astronauts you could ever hope to meet.



Exploring extremes
under pressure.



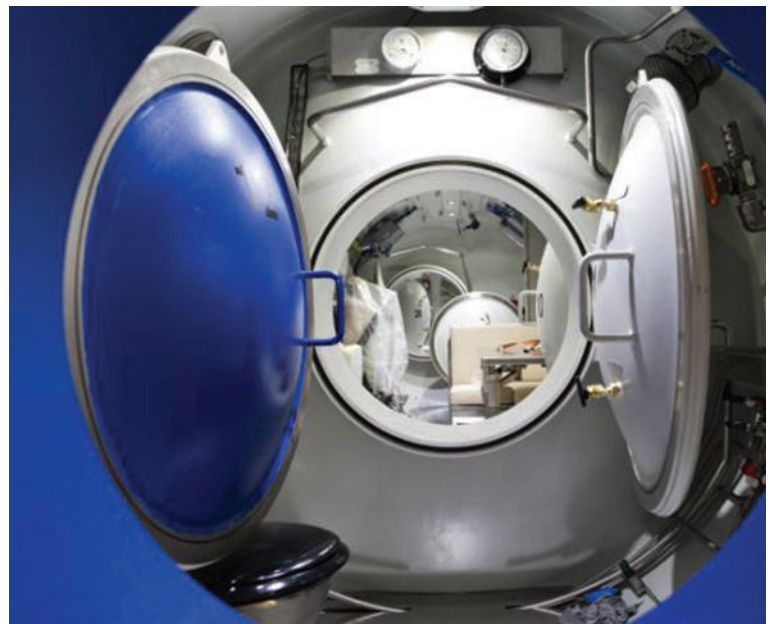
FEATURES

Evolving technologies have enabled the offshore industry to operate in ever-harsher environments, more remote locations and at greater depths. But for the elite saturation divers reliable technology isn't just a benefit – it is matter of life and death.

UNDER PRESSURE

Perils of the deep

The Seven Falcon is equipped with two diving bells, which can ferry divers to the worksite in shifts. A second dive bell also helps avoid downtime in the event of a system failure in the first bell, or can serve as a rescue bell if the first bell is compromised.



“In the world of dynamic positioning, the two greatest challenges for reliable station-keeping are deepwater drilling and Diving Support Vessels. However, while a system failure for a deepwater drill rig might result in downtime, a DP systems failure on a DSV could result in a fatality”

SVERRE GYLSETH
Principle Surveyor, DNV

» Today, there are about 60 purpose-built Diving Support Vessels (DSVs) in the world fleet, supporting about 3,000 commercial divers and crew working in subsea environments all over the globe. Many of these divers operate in shallow water, but those at the top of their profession are known as saturation divers, highly skilled personnel who can work at depths of up to 300 meters. While no part of the offshore industry tolerates downtime due to mechanical failure, for divers, systems reliability is matter of survival.

According to Sverre Gylseth, a former saturation diver who now works as a Principle Surveyor for Det Norske Veritas (DNV), commercial diving requires a level of trust in personnel and equipment that may only be familiar to astronauts, trapeze artists and tandem skydivers. “While most people think of sat divers as daredevils, most are very cautious – they have to be to function in such a dangerous workspace,” he says. “But there is only so much a diver can do to ensure his own safety – they have to rely on equipment and their dive support team for their survival – especially if something goes wrong.”

A RISKY PROFESSION

And things do go wrong. According to the US Center for Disease Control (the most recent study to include commercial diving was released in 1998), “sat diving” was the third most dangerous job (behind logging and fishing) for “occupational fatalities.” Commercial diving is an insular community, so accurate figures for annual diving fatalities are hard to come by, but they do occur with depressing regularity. However, new technologies are being introduced to manage risks. “Apart from the coffee maker, pretty much everything aboard a Dive Support Vessel has one purpose,” says Gylseth. “To deliver a man to a subsea pipeline or installation, and return him safely back to the surface.”

Unlike shallow water dives, preparations for deep sea diving begin in a “dive system” either installed into a DSV or mounted on a rig. A dive system looks a bit like a small space station and usually has four main compartments: living chambers, which resembles a berth of a submarine, small compartments that contain a toilet, a sink, and a showerhead, diving bell(s) and hyperbaric rescue chamber(s) – a capsule which has enough breathing mixture to last the crew for three (or more) days. Dive systems come in different sizes, with a capacity ranging from six to 24 divers.

UNDER PRESSURE

Once the divers enter the dive system, the inner environmental pressure is increased until it matches the

pressure at the job’s working depth – this generally takes less than 24 hours. In addition, the breathing mixture inside the complex is also adjusted correspondingly – the deeper the job, the more helium will be added to the breathing mixture. “Helium is easier to breathe under pressure because of its low density and helps divers avoid nitrogen narcosis,” explains Gylseth. “Breathing nitrogen at depth is like being drunk, and represents a genuine occupational hazard.” Indeed, some divers refer to nitrogen narcosis as the “Martini Effect”, calculating that every ten meters of depth is the equivalent of drinking one martini.

MAN VS. MACHINE

Once pressurized, the divers can get to work. Two or three-man teams enter the diving bell, which is lowered to the work site on the seabed via a “moon pool” cut into the bottom of the DSV. The bell man stays in the diving bell while one or two divers swim to their work-site, which can be anything from subsea installation to risers and pipelines. While Gylseth notes that some of this work can be undertaken by Remote Operated Vehicles (ROVs), divers are necessary for more complex jobs. “So far, no technical solution has been developed that can compete with an experienced diver,” he says. “The ability of a diver to process information and utilise the dexterity of his hands cannot be easily replaced with a machine.”

Gylseth says that underwater working conditions are often very difficult. “Below 60 meters, there is no natural light, and despite dive suits insulated with warm water, it can get chilly,” he says. “Also, because sound is transmitted easily below the surface, the noise from engines and thrusters is very loud – a bit like working at a engine factory. With senses limited to sight and touch, it can be very disorientating.”

SEAFOOD

Currents can make navigating around complex structures difficult, especially since divers are tethered to the diving bell by a thick umbilical cable, which carries breathing gas, warm water and electronic systems and sensors. “In some ways, divers are a bit like astronauts performing a spacewalk, although astronauts don’t run into large fish with big teeth,” he says. “It’s hard enough to concentrate underwater as it is without having to worry about barracudas, 100 kilo groupers, wolf eels and manta rays that may linger around subsea structures.”

Gylseth adds that communications with the diving supervisor topside are complicated by the helium in the breathing gas. “Divers sound like Donald Duck, or like

kids who have inhaled helium from balloons at a birthday party,” he says. “It may sound comical, but the risk of misunderstandings can result in mistakes. Some control panels are equipped with ‘Helium Speech Unscramblers’, a device that slows down the speed of the divers’ voices to improve coherency and thereby safety.”

WORKING IN SHIFTS

Dive crews can work without interruption in consecutive eight-hour shifts, making possible twenty-four hours of continuous work, with three different dive crews rotating into the bell from the dive system topside. Indeed, some of the larger, more advanced DSVs are now equipped with two diving bells, which can ferry divers to the worksite. A second dive bell also helps avoid downtime in the event of a system failure in the first bell, or can serve as a rescue bell if the first bell is compromised.

While divers rely on a broad range of systems aboard a DSV to get to and from work safely, ensuring the vessel remains in place (station-keeping) during dive operations is perhaps the most challenging. As a recognised pioneer in the development of DP systems, Kongsberg Maritime is a market leader in supplying DP systems to operators of DSVs. Unlike most offshore vessels, DSVs often operate in open water, without easily visible reference points that can be detected and processed by sensors that feed information into a Dynamic Positioning (DP) system. Furthermore, station-keeping for a DSV is further complicated when the bell is deployed.

According to Nils Albert Jenssen, Business Development Manager for Kongsberg Maritime, a deployed diving bell acts as a sea anchor, subjecting the vessel to subsea currents not detectable on the surface that can impact a vessel’s ability to stay in place. “In the world of dynamic positioning, the two greatest challenges for reliable station-keeping are deepwater drilling and DSVs,” he says. “However, while a system failure for a deepwater drill rig might result in downtime, a DP systems failure on a DSV could result in a fatality – there is little margin for error.”

REDUNDANCY, REDUNDANCY!

Jenssen explains that a DP system on a Platform Supply Vessel (PSV) might typically rely on data provided by differential GPS satellite telemetry and another relative system, such as a laser-based reference system, which can be pointed at a fixed structure such as a rig or platform, to calculate relative distances. When combined with radar and sensors measuring wind, current and wave action, a PSV can retain its position within a few metres.

However, DP systems aboard DSVs rely on a number of additional sensors, such as hydro acoustic positioning systems with acoustic transponders placed on the seabed and taut wire systems. In addition, DSVs must be equipped to track the position of a deployed bell. “The more reference points the better,” says Jenssen. “For DSVs, the name of the game is redundancy.”

Indeed, DSVs are required by the authorities to be equipped with DP2 or DP3 systems. For DP2, class rules require built-in redundancy so that no single fault in an active system (such as generators, thrusters, switchboards, etc.) will cause the system to fail, but may occur after failure of a static component, such as cables, pipes, manual valves etc. The same rules apply to DP3, but the system must also be able to withstand fire or flood in any one compartment without the system failing, which means that also static components as mentioned above must be taken into account. “We recognise that commercial divers depend on Kongsberg DP systems for their survival, and continue to develop better, more reliable systems to ensure their safety.”

DIVERS IN DEMAND

In the meantime, there is more and more work for commercial divers. Global demand for oil and gas has encouraged energy companies to seek reservoirs in new areas, expand operation in existing fields and contract oilfield services companies to build, maintain and repair subsea infrastructure. At the same time, growth in offshore wind will create demand for new kinds of shallow water dive systems while more divers will be needed for subsea well decommissioning.

For Gylseth, the segment faces some challenges. “It’s a good time to be a commercial diver, but it remains a very specialised profession that takes years to master,” he says. “There is some concern that a new generation of divers, lured to the job by the promise of big pay checks and lots of vacation time, will lack adequate training.”

However Gylseth notes that in addition to investing in new training facilities, a number of different industry stakeholders are working together to minimise risk and improve safety. Indeed, DNV, Kongsberg Maritime, Statoil and Subsea 7 (a leading subsea oilfield services company) are working together in a Joint Industry Project to address issues unique to this specialised segment. “We are looking at how risk management tools, such as Environmental Regularity Numbers and Capability Plots, can be applied to the design, construction and safe operation of DSVs,” he says. “As an ex-diver myself, I am pleased that the industry has not only recognised the value of experienced divers, but is working together to prevent accidents. Commercial diving will always be dangerous, but it should never be fatal.”



Subsea 7's Seven Falcon is one of the most advanced diving vessels in the world, featuring a 24-man twin bell saturation diving system rated to 400m and equipped with a Kongsberg K-POS DP 21 with back-up K-POS DP11.

“Apart from the coffee maker, pretty much everything aboard a Diving Support Vessel has one purpose. To deliver a man to a subsea pipeline or installation and return him safely back to the surface”

SVERRE GYLSETH
Principle Surveyor, DNV

FIELD DEVELOPMENT



Field Development

Many major development projects were delayed as a result of the global economic crisis and low crude oil prices. Now that oil prices have improved, activity levels have increased. Green field development is important, but new techniques such as Enhanced Oil Recovery (EOR) are also providing the opportunity for a return to depleted fields.

Domestic consumption exceeds production in Asia and the region is looking to reduce their import dependency. This is the case not just for China and India, but also for Thailand, Malaysia and Indonesia. Offshore capex is expected to grow significantly in the region over the next five years as exploration and production activity grows.

This expenditure is expected to involve a significant component of fixed platform development in Asia. In contrast, in Australia, a large component will be associated with pipelines and also floating LNG (FLNG) facilities.

The overall increase in water depth and field complexity around

the world has led to a dramatic increase in the number of subsea solutions. By 2020, over 11,000 subsea wells are expected to be in operation worldwide, both for deep water green fields and for the tie-back of satellite reservoirs to existing facilities at shallower depths. Processes like the separation of oil, gas and water and the re-injection of water back into the reservoir are likely to move from the surface to subsea too. The ROV market is growing apace with these opportunities.

Engineering, procurement, installation and commissioning contractors have been entering into joint ventures as new players gain entry into the market. Often these companies have already been subcontractors and they are looking to expand with the support of partner offshore construction vessel fleets. This fleet is expanding globally and growing in complexity. It is a trend that is expected to continue well into the future as a result of large projects and larger subsea structures at increasing water depths.





Saipem's new flagship vessel, the Castorone, is not only the largest vessel of its kind in the world. It can also lay pipes deeper, faster and in harsher conditions than any other pipelayer to date.

FABRIZIO FANTACCI
Commissioning Manager, Saipem

The Castorone has the ability to lay pipes up to a water depth of 3000 metres.

PIPELAYING

Saipem Goes Deeper with Castorone

The Full Picture Magazine was invited to visit Saipem's latest new-building vessel, Castorone only a few days before its scheduled departure from Singapore. The vessel then underwent extensive sea trials, which lasted for several months due to the ship's complexity. With its 330 metres in length, excluding the stingers, Castorone is an impressive sight and comparison to any other pipelayer is almost impossible.

"This has been a long process, but we are nearly there," says Commissioning Manager, Fabrizio Fantacci, underlining that due to its complexity on several levels, the Castorone has taken no less than five years to complete.

"The concept design started back in 2006 in Milan. While the hull was initially built in China, it was brought to Singapore for final outfitting and commissioning in early 2012. During the busiest time of construction in Singapore, approximately 3500 workers were aboard on a daily basis, constituting 12 million hours of work during the project period in Singapore alone," he explains.

PREPARING FOR FUTURE OPERATIONS

Castorone will replace Saipem's Castoro Sei as the company's new flagship pipelayer. As a world leader in the oil and gas contracting services sector, both onshore and offshore, Saipem has been operating within the industry for more than 60 years. After a period of low investment, Saipem made the decision to build a series of vessels and initiated an investment program in 2006. The program was aimed at reinforcing and expanding the company's drilling and construction fleet in order to meet the future challenges of drilling in ultra-deep

water. Castorone is the largest of these newbuildings both in terms of investment and vessel size. With this new asset in its fleet, Saipem wishes to be ahead of the curve both in terms of water depth capabilities, efficiency and environmental conditions.

"The market trend points towards deeper and deeper waters, and Saipem's design strategy has followed this. With the S-lay stingers, the Castorone has the ability to lay pipes up to a water depth of 3000 metres. In addition, it is a DP ice class vessel, meaning that we can operate in Arctic waters, which is where we anticipate a big part of the future market to be," explains Fantacci.

The vessel is currently fitted with stingers for S-lay operations. In two years time, however, a J-lay tower will be installed, enabling it to reach even greater depths. Another important feature is that the vessel will use new welding and field joint coating technologies, providing for future operations in the pipelaying industry. Instead of the usual two pipes, the Castorone can connect three pipes of 12 meters, resulting in more efficient and faster operations.

"Since the Castorone can lay triple joints, which means three pipe-lengths at a time, it can operate up to three times faster than a regular pipelayer and 50% faster than a double joint pipelayer. This new laying configuration is also a means of preparing for future operations in double joint configuration with pipes expected to be 50% longer than what they are today," explains Fantacci.

Castorone also has a storage capacity of 20,000 tonnes of pipe, corresponding to approximately four days of operation. This means that it does not need to load pipes as often as a regular pipelayer. In case of extreme weather where it might be difficult for a supply vessel to approach the Castorone to transfer pipes, operations are not interrupted, something which ensures time and cost efficiency. »



During normal operations there will be 450-600 people onboard.

A pipelayer is absolutely dependant on keeping stable positions.



» MAJOR CONTRACTS SECURED

Several contracts had already been secured well ahead of completion. The vessel arrived in the Gulf of Mexico in April 2013 for its first operation. Saipem has been awarded a contract for the transportation and installation of a 20 inch-diameter, 350km gas export pipeline in waters ranging from 100 to 2100 metres deep. The contract is for Keathley Canyon gas export pipeline. As soon as this operation is completed, another contract awaits for the 20 inch-diameter, 60km long Big Foot lateral export pipeline for Enbridge in 2200m maximum water depth, also in the Gulf of Mexico. A third contract in this region is signed with Amberjack Pipeline for a 219km, 24 inch-diameter pipeline at 2140 metres depth. The pipeline will run from Chevron's deepwater Jack-up rig to a Shell-owned and operated platform in Green Canyon.

"The fact that we have secured so many important contracts in important regions proves that there is definitely a market for this type of vessel," says Fantacci.

In 2014, the vessel will move on to Australia to install an 889 km pipeline of 42 inch-diameter pipes down to 275 metres deep. The pipe is for the Ichthys LNG project, which is a joint venture between INPEX and Total and will connect the offshore central processing facility to the onshore processing facility in Darwin. Saipem is responsible for the entire engineering, procurement, construction and installation in the Ichthys Project, which is expected to produce 8.4 million tonnes of LNG and 1.6 million tonnes of LPG per year, as well as approximately 100,000 barrels of condensate per day at peak times.

THE BEST OF EVERYTHING

For this exceptional construction, Kongsberg Maritime has provided a Full Picture Delivery, comprising of DP-3 system (K-Pos 32 and K-Pos 12 BU), cJoy Independent Joystick System, K-Chief 700 Vessel Management System incl. Power Management System, Auxiliary Machinery & Control and Ballast Control System, K-Thrust Thrusters Control System, K-Bridge Integrated Navigation System and Inte-

grated Safety Management System. The size and complexity of the vessel can be illustrated by the 11,500 electrical input/output (I/O) points fitted on board, something which is comparable to an oil rig. A normal pipelayer would only have about half the amount.

"We want to achieve excellence, and there are no standard solutions onboard this vessel. We have chosen the best of everything," says Captain of the Castorone, John de Hartog. He emphasises the importance of keeping a stable position for the complex task that the vessel will perform.

"A pipelayer is absolutely dependant on keeping stable positions otherwise the pipes may break or be damaged. An excellent DP system is vital in order to achieve this. KONGSBERG and Saipem have had a very long and good working relationship, and we know that the KONGSBERG systems are reliable. They are a market leader in DP systems, and after some good discussions, we arrived at a custom made DP system that is suited for the 11 thrusters onboard, and for the complex operations that this vessel will perform. The level of professionalism that KONGSBERG provides made us feel safe," he comments.

A SAFETY LEADER

In addition to being a leader with regards to size and capacity, Saipem also had the goal of building the safest pipelayer in the world.

"Our main concern is that all the colleagues who live aboard this vessel go home safely after a shift. We want to ensure that nobody gets hurt, and we should be equally proud of our safety measures as we are the other features of this vessel," says Captain de Hartog.

One of the measures taken to ensure the highest level of safety is to install Kongsberg Maritime's Integrated Safety Management System (ISMS), currently only used aboard passenger vessels. With as many as 702 crew members on board at one time, the Castorone is in fact classified as a passenger vessel. Keeping track of so many crew members is complex but important, which is why Captain de Hartog, took the initiative to install ISMS from KONGSBERG. The system includes the four main applications safety desk, passenger tracking system for emergencies, emergency crew mustering and a



fire patrol system. It enables distribution of critical information to all designated channels as fast and as efficiently as possible.

“During normal operations, there will be approximately 450-600 people onboard, maybe more. This means that we have to master a lot of people. We looked around in the market for products that could handle this, and found no solution other than Kongsberg Maritime’s system. It is impossible to master and keep track of so many people in any other way than by using a good tracking system. The Integrated Safety Management System is also compatible with the rest of the equipment from KONGSBERG. Having one supplier for several systems is a great advantage because it is easier to interface and because you only need one contact person with the supplier,” says the Captain.

GLOBAL PRESENCE

Captain de Hartog also emphasises KONGSBERG’s global presence as an advantage for Saipem, both throughout the project period and in terms of local support. From Kongsberg Maritime’s side, the project has mainly relied on local resources from the Singapore office in collaboration with staff from other locations.

“We are very happy to contribute to this milestone project,” says Stene Førsund, Managing Director, Kongsberg Maritime, Singapore. “Kongsberg Maritime has enjoyed a very long and good working relationship with Saipem, and we appreciate their trust in our products for the intricate tasks that this unique vessel will perform. This project is also a good example of Kongsberg Maritime’s global presence, involving close collaboration between our offices in Europe, China and Singapore as well as with the client and yard. We hope to continue our good cooperation with this important client for years to come.”

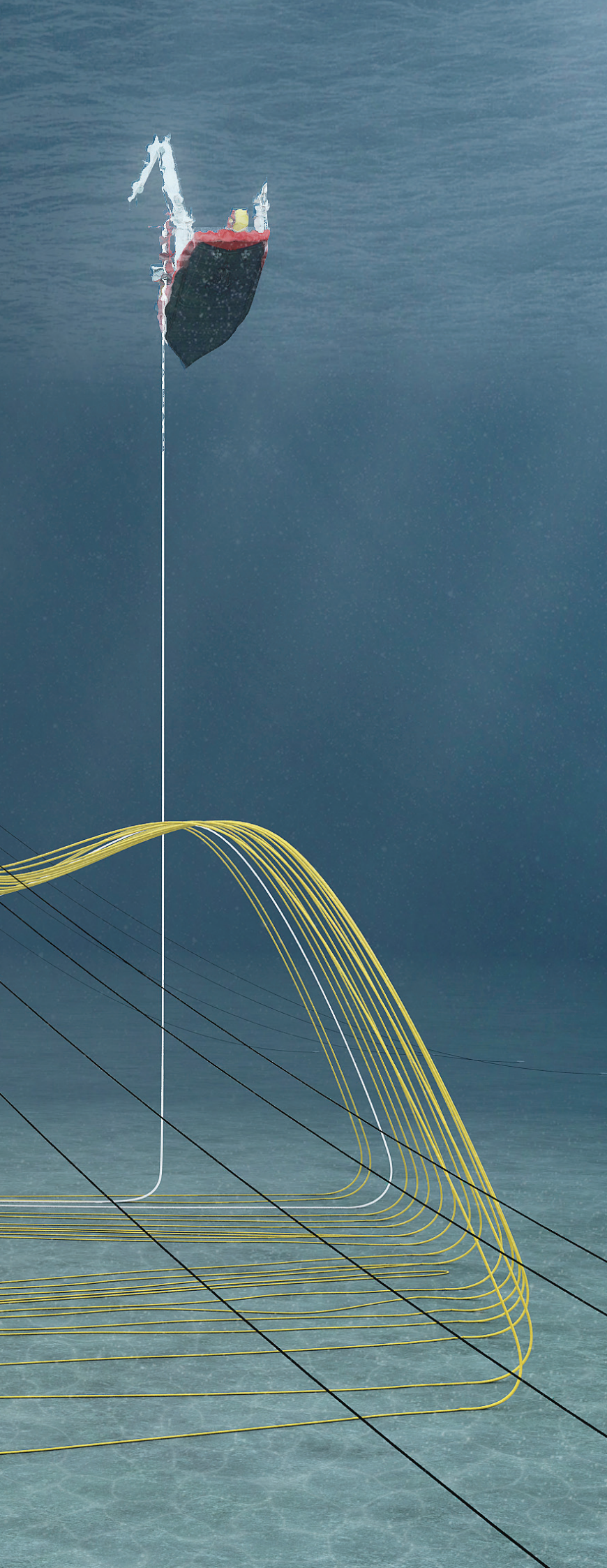
“The market trend points towards deeper and deeper waters, and Saipem’s design strategy has followed this”

FABRIZIO FANTACCI
Commissioning Manager, Saipem



SUBSEA CONSTRUCTION

Positioned for subsea success



FIELD DEVELOPMENT

When Statoil needed to install new rig seabed risers on the semi-submersible production and drilling platform, Visund, it turned to EMAS AMC. This should be no surprise, considering it manages one of the largest and most advanced subsea installation construction vessels in the world.

EMAS AMC is part of EMAS, a leading, full-field contracting group providing specialised marine support services, subsea construction and offshore installation, floating production, fabrication and well services to the offshore energy sector. Its modern fleet comprises over 65 marine support and offshore construction vessels, supported by over 5,000 employees across five continents.

EMAS AMC is the division in EMAS which delivers subsea construction and marine services to the offshore petroleum and energy industry.

A BESPOKE VESSEL

A recent addition to the EMAS fleet is the Lewek Connector, which is one of the largest and most high-tech, subsea installation and construction vessels in the world. With two offshore cranes with a capacity of 400 tons and 50/100 tons and with the ability to reach down to 3000 metres, Lewek Connector is specially designed for deepwater construction.

Øystein Fyrvik, Survey Manager, Operations, at EMAS AMC explains that for the Lewek Connector EMAS AMC charged Kongsberg Maritime with supplying both underwater and dynamic positioning (DP) systems - equipment that is integral to the effective operation of the Lewek Connector. He said: "The vessel is equipped with the latest DP3 vessel technology, which provides great stability in offshore operations, and allows us to carry out installation and construction work near offshore installations and in harsh weather conditions such as that found on the Norwegian Continental Shelf (NCS)."

KONGSBERG's DP system is operating in conjunction with cNODE® transponders for underwater acoustic positioning and data links. They have more than 100 channels available and can all be positioned using HiPAP® underwater positioning systems. The HiPAP® technology consists of the world's most successful underwater positioning systems, developed for use in deepwater and in accurate seabed survey applications. As a result of the latest developments of HiPAP® and cNODE® products, the onboard HiPAP® system can be used in the operation of high accuracy positioning tasks related to subsea positioning. By use of a Long Base Line (LBL) transponder ar-





ØYSTEIN FYRVIK
Survey Manager, Operations,
EMAS AMC

EMAS AMC is the division in EMAS which delivers subsea construction and marine services to the offshore petroleum and energy industry.



LEWEK CONNECTOR

SPECIFICATIONS

- SHIP TYPE – Subsea construction vessel
- YEAR BUILT – 2011
- LENGTH – 156.9M
- BREADTH – 32.0 M
- PROPULSION – 25,747 BHP
- GROSS TONNAGE – 19816
- TRANSIT SPEED – 14kts
- DECK AREA – 2100 m²
- ACCOMMODATION – 140 men
- ROVs – 2 Schilling HD wire class
- CRANE – 400 MT AHC Crane to 3000 M
- CAROUSELS – 6000 MT above deck / 3000 MT below deck

» ray at the seabed, the remotely operated vehicle (ROV) is equipped with a KONGSBERG cPAP®, and can position itself within a few centimetres accuracy.

Fyrvik continued: “After delivery of the Lewek Connector from the yard in 2012 it was decided to upgrade the HiPAP system to the highest levels of accuracy for underwater survey purposes. All sensors were re-calibrated and the latest development of hydro acoustic software was implemented. Today the HiPAP® system acquires a global position of <0.2 percent of water depth – a figure which is close to the “white noise” of hydroacoustics, and a very impressive underwater positioning accuracy for Lewek Connector.

THE VISUND PROJECT

Once fully operational, one of the first projects undertaken by the Lewek Connector was the replacement of flexible risers on the Visund semi-submersible rig. The platform itself is located directly above the completed subsea wells, operating in a water depth of 335m.

An essential element of the Visund riser replacement project is the use of a Schilling HD ROV. It is at this point that Kongsberg Maritime’s technology comes into its own. The ROV acts as the eyes of the operation as the 900-metre long, 30 centimetre diameter flexible risers are both recovered and installed in-between neighbouring risers a few metres apart, thus precise position is crucial. EMAS is among the first operators to use KONGSBERG’s new cNODE® and cPAP® technology.

Fyrvik describes the benefits of working with KONGSBERG systems. “Using the HiPAP and DP technology, we are able to perform

an installation which is extremely demanding for both vessel positioning on the surface and product positioning at the seabed. On this riser replacement project, the vessel is working in between risers and anchor lines with a position envelope of +/-1m, and at the seabed, 320m down, the riser is installed within a 1m target area. To achieve this, the vessel’s DP system is linked to the survey and navigation system which continuously monitors the surface position of the platform and vessel, as well as the subsea position of several anchor lines, risers, ROVs and crane wires.”

He continued: “To install flexible risers over 300 metres below the surface to within a metre is an incredibly complex task. You have vessel motions, several hundred metres of flexible riser product and a great deal of hardware on the seabed that can get in the way of the operation.”

The Lewek Connector has proven to be a highly efficient vessel for such demanding operations. This vessel is one of the world’s most advanced and flexible subsea construction vessels, and the largest. No other construction vessel can load as much product as the Lewek Connector: some 9,000 tonnes. The vessel also has two cranes with capacities of 400 tonnes and 50/100 tonnes respectively, which can operate at depths of up to 3,000 metres. Furthermore, the vessel is fitted with both a Vertical Laying System (150 tonnes) and a Horizontal Laying System (70 tonnes).

The Lewek Connector is equipped for laying products from the side of the vessel. Combined with very good movement characteristics, this allows the Lewek Connector to lay cables in tougher weather conditions than competing vessels. This, in combination with it being a highly stable vessel, having a state-of-the-art DP and positioning system and experienced on-board crew, ensures both

“To position riser cables over 300 metres below the surface to within a metre is an incredibly complex task”

ØYSTEIN FYRVIK

Survey Manager, Operations, EMAS AMC

efficient and safe offshore marine operations.

Jan Erik Faugstadmo, Vice President, Underwater Navigation, at KONGSBERG, added: “We worked particularly diligently to ensure the effectiveness of the transponders using a Multi User Long Base Line positioning system. The use of this technology is increasingly important due to the amount of equipment now being placed on the seabed. At the same time, several vessels and ROVs can position themselves using the same seabed transponder array, reducing costs and simplifying operations.”

The Lewek Connector always operates at a safe distance from the platform where environmental conditions such as wind, current and waves are taken into account. However, due to the efficacy of managing the positioning and movement of the vessel, this distance has in some cases been reduced to as little as 12 metres.

This is an example where the ultra-modern installation and construction vessel, Lewek Connector benefits from superior manoeuvrability and excellent station-keeping capabilities.

A CHALLENGING PROJECT

Of the association with KONGSBERG, Fyrvik has nothing but praise, though the relationship was a challenging one, particularly in the early phase. “To begin with, we were finding that Long Base Line positioning at Visund was not performing as expected. It appears there is a tidal wave of cold water along the seabed that impacts the acoustic LBL calibration. But the input of KONGSBERG’s software engineers was invaluable as they worked tirelessly to develop software to compensate for this phenomenon, and the end-result is a stable LBL system which positions the ROVs at the seabed within 5cm relative accuracy.”

He continued: “The process was also significantly aided by KONGSBERG appointing a single contact person to manage our account on a daily basis. This means that our manager has in-depth understanding of the technical issues relating to our vessel and the project.”

A further advantage of EMAS AMC partnering with KONGSBERG is that KONGSBERG was and is able to undertake total systems integration, aided by technicians with comprehensive hydro acoustic knowledge. This makes projects much more cost-effective and reduces timelines. Additionally, Kongsberg Maritime is able to equip vessels with equipment from multiple suppliers, providing customers with significant flexibility in meeting their project demands.

As a marine operations specialist engineer and Survey Manager in EMAS AMC, Fyrvik is part of the EMAS AMC operational team and in daily contact with the Lewek Connector personnel on-board the vessel. He also tries to spend some of his time on-site to under-

stand the issues involved in the job. “It is a very innovative environment and one that changes quickly, so it is important to be in-situ to understand the changes taking place.”

He concluded: “Each job has its own challenges which need innovative solutions and good planning. A project is never the same in theory as in practice, but on the Visund project the Lewek Connector – aided by the systems from KONGSBERG – performed well in testing and now in operation. The Lewek Connector will now move on to work at Njord and I’ll soon move on to working with nearshore activities and challenges for cable installation from Troll platform to Kollsnes, part of the Troll gas development. I hope and expect just as exiting and successful a project!”

ABOUT EMAS AMC, PART OF EMAS GROUP

EMAS AMC delivers subsea construction and marine services to the offshore petroleum and energy industry. The company employs more than 600 experienced, highly qualified specialists, and operates a modern, technologically advanced fleet of vessels. EMAS AMC has offices in Oslo and Stavanger, Norway; Houston, USA; Perth, Australia; and Singapore. More than 200 EMAS AMC employees are based in Lysaker, Oslo – the head office for EMAS’s European and African operations – and in Stavanger.

EMAS AMC installs subsea systems for oil and gas companies all over the world, within the SURF (subsea, umbilical, riser and flowline) segment. EMAS AMC installs structures (templates and manifolds), flexible and rigid pipes, umbilicals and risers, as well as testing of subsea systems. EMAS AMC also undertakes purchases of subsea systems and is increasingly focusing on SURF EPCI (engineering, procurement, construction and installation) deliveries.

EMAS AMC also installs mooring systems for floating installations, conducts maintenance and makes modifications, and installs and removes floating and fixed platforms. Furthermore, EMAS AMC installs subsea power cables – for example for the electrification of oil and gas production platforms, export cables for transferring offshore wind power to the electricity grid, and cables for transferring power between countries.

These installation projects involve various tasks, including studies, engineering, project management, purchasing and manufacturing follow-up. Not least, they involve operations at sea, for which EMAS AMC uses a modern, technologically advanced fleet of construction vessels, ensuring safety throughout the entire project.

EMAS AMC is part of EMAS, the trading brand name of Ezra Holdings Limited, a leading global supplier of offshore construction, production, well intervention and marine services. The EMAS Group has almost 5,000 employees globally, across 16 locations in Africa, North America, South America, Europe, Asia and the Pacific region. EMAS’s head office is located in Singapore. Ezra Holdings Limited is listed on SESDAQ (Singapore Exchange Securities Trading Limited).

PRODUCTION AND TRANSPORT





Production and Transport

Floating LNG technology is making formerly stranded gas fields viable for development. The technology is considered to be relatively environmentally friendly, and a number of projects are now underway around the world. The most advanced projects are in Australasia but North and South America, Africa and the Middle East are expected to follow in the future. The LNG carrier market is also forecast to experience strong expansion over the next five years, reaching record levels of vessel output and capital expenditure.

Fixed platforms are characteristic of the mature fields of Asia, Europe, the North Sea, the US Gulf of Mexico and the Middle East. The future may see this production technology becoming more limited as production declines in shallow water assets and remote deepwater production becomes increasingly dominant. However, the Gulf of Mexico, Norway and the UK are expected to maintain fixed platform demand for the next couple of years. The demand for fixed platforms is also expected to remain strong in the Middle East. This region has played a central role in oil production for

decades and has nearly half of the world's oil reserves and most of the world's spare oil production capacity.

Fixed platforms are not considered suitable for places such as the major pre-salt discoveries offshore from Brazil and Angola, or the offshore deposits recently discovered off East Africa. Here a lack of existing infrastructure and greater water depths are likely to make floating production more suitable.

The number of floating production, storage and offloading (FPSO) vessels has grown steadily over the past 20 years, but this type of installation is relatively capital intensive and has suffered during times of oil price decline. Rising global energy demands and the ambitions of emerging countries in Africa and Latin America has created a positive outlook for the future of such vessels. Local content requirements in places such as Latin America and West Africa is challenging construction companies to create employment opportunities for local workforces and this is expected to impact on costs and timescales in the medium term. ■



EDDA FIDES

It is fitting that Østensjø Rederi should have its newly renovated offices beside a channel that runs into the North Sea. This harsh ocean area and its offshore industry has been the company's lifeline since 1973 when owner, Johannes Østensjø, signed the firm's first deal for two supply vessels.

OSTENSJØ REDERI

Rock Solid with Rokstad

Johan Rokstad is in his corner office typing and talking on his mobile. The room is inviting and bright, brought to life with a picturesque view of a sea channel and old wooden buildings, remnants of Haugesund's traditional architecture and culture.

Tucking a mobile between a left shoulder and ear while punching feverishly at a keyboard could be both intimidating and challenging for most people. Not for Østensjø's CEO. If there is a possibility, there is a way. And challenges ... well he thrives on challenges, seemingly the more, the better.

"I became a deckhand at the age of 15. I didn't see my parents for two years. At 19 I enrolled in the maritime academy and some years later at the age of 27 captained my first offshore support vessel (OSV) for Østensjø," says 64-year old Rokstad with a boyish grin. "Life has been an adventure."

In the Captain's chair for over five years, he jumped ship and joined Swedish-owned Consafe, the leading name in the design and building of semi-submersible floatels, gaining valuable management experience in offshore accommodation and rigs.

Somes years later in 1985 at the age of 38, the Master Mariner once again joined Østensjø, this time as operations manager for the company's growing, high-end tug fleet. He would never change companies again.

TUG OF WAR

"We had some frustrating involvement in the past with tugs, but 1985 was pivotal for Østensjø. We secured a major oil and gas service contract for towage, pollution control, fire-fighting and mooring opera-

tions," says Rokstad.

Today, Østensjø has a fleet of 15 tug vessels, including tractor tugs, reverse tractor tugs, harbour tugs and mooring boats involved in escort, oil spill recovery, towage, salvage and shore operations.

POWER IN PSV

While building up its tug fleet, Østensjø also became a leading player in the Platform Supply Vessel (PSV) market and today has a fleet of four robust vessels.

Never afraid of investing in its fleet or pioneering new technologies to make ships safer, greener and more efficient, Østensjø has pioneered dozens of innovations, which have become best in breed across the rest of the industry and the world.

"Østensjø's relentless pursuit to be in the forefront of vessel operations has pushed PSV technology and safety further and further," says Rokstad.

Østensjø was the first company to insist on high sides on PSV cargo decks. It was also the first company to install the revolutionary vertical Voith Schneider propeller on its offshore vessels, making them more efficient, and making maneuvering several times more responsive.

"Since 1976 we have had at least one to four vessels on contract to Shell each year. Why? Because we've always been at the forefront of PSV design and operations," he says.

His passion for leadership intensifies when, leaning forward over his desk, our conversation focuses on Dynamic Positioning.

"Østensjø was the first company to introduce



JOHAN ROKSTAD
CEO, Østensjø Rederi

The North Sea and its offshore industry has been the company's lifeline since 1973.





SHIPPING IN HIS VEINS:
Johan Rokstad became a deckhand at the age of 15.

By the time Rokstad became CEO in 1998, Østensjø was experiencing the tail end of a major shipping crisis. The market was up and down. Oil prices fell below USD 10, oil majors were reviewing their contracts and the company downsized its fleet to survive.

But despite extreme market turbulence, Østensjø, together with neighboring shipowner Solstad, launched a new company, DeepOcean, to provide innovative services and technology to the subsea industry. The company ordered two vessels, one for Østensjø and one for Solstad. The two vessels were a tremendous success and boosted the company's belief in a future positive offshore services market.

"It was success from day one," says Rokstad, who strongly believes the company's future hinges on specialist services.

SUBSEA ALL THE WAY

"Subsea is very exciting and was a major contributor to the company's best year ever in 2012. PSVs have become a commodity whereas ROV/Subsea vessels have tremendous technology challenges ahead. These types of challenges, combined with Østensjø's years of experience and ideas for new technology, fit us like a glove," smiles Rokstad.

When asked about doubling the existing ROV/Subsea fleet (Edda Flora, Edda Fauna and Edda Fonn) from three to six vessels in five years time, he is quick to respond.

"Subsea will grow further. We want to expand, be better and stay a frontrunner."

The 108 metre, 2008 built Edda Fauna, Østensjø's largest and most advanced inspection, maintenance and repair (IMR) vessel, is specially designed for operation in northern waters, with a high focus on excellent maneuverability and station-keeping capabilities. The vessel is designed for enclosed module handling, and deepwater ROV operations. Both Edda Flora and Edda Fonn are tailor-made multipurpose DP II vessels carrying out survey, inspection and construction support operations.

All three vessels are chartered to DeepOcean and work primarily for Statoil.

"Our goal is to help our customers make the most of the technology for their fields and to achieve operational objectives in a risk-controlled and cost effective way," says Rokstad.

» Dynamic Positioning systems on board PSVs used for conventional cargo operations. We helped pioneer this technology, installing our first DP some 30 years ago. Since then, we have worked closely with KONGSBERG to develop several new DP reference systems," he says.

COLLABORATION

According to Rokstad, leaders in any industry must collaborate with the best to sharpen their edge over competitors.

"We have been, and will continue to be, frontrunners in technology. KONGSBERG has been our prime supplier and in addition to delivering top technology and equipment, they have been extremely reliable; there when you need them."

Reaching for the company's latest corporate magazine, Rokstad turns to page eight to show a one-page picture of Edda Ferd, Østensjø's newest PSV, hopefully on a long-term contract soon.

"Now this is a PSV. We have developed a new diesel-electric propulsion system that uses less fuel and will set new environmental standards for offshore vessels. There is no other offshore supply ship, either currently in use or in production, which can match this vessel's low level of greenhouse gas emissions."

"Østensjø's relentless pursuit to be in the forefront of vessel operations has pushed PSV technology and safety further and further"

JOHAN ROKSTAD
 CEO, Østensjø Rederi

FAUNA ROV/SUBSEA VESSEL:
Edda Fauna is the largest and most advanced IMR vessel in the Østensjø fleet. Her excellent maneuverability and large hangars make her an ideal choice for operations in challenging conditions.



AMBITIOUS ACCOMMODATION

Østensjø most likely would not have reached its latest investment in a new large monohull accommodation vessel with a total capacity of 800 persons if it hadn't crossed paths with Shell in 2004.

Rokstad explains: "Why accommodation? We did not choose it. The market was crying out for an accommodation unit and we presented Shell with a rather steep, and at the time, an extremely high offer. We got the job but had to reconstruct the multi-purpose OSV Edda Fjord into an accommodation unit."

Taking advantage of its OSV DP experience, Østensjø delivered almost no gangway down time during Edda Fjord's first year of Shell's Bonga deep-water development project offshore Nigeria in 2005. The positive trend continued through BP's Thunder Horse project in the Gulf of Mexico in 2006, right through to UTE CASGAS' Castor Project offshore Spain in 2012.

"After the first year of flotel operation, we realised that we were on to something. Even compared to competing flotels with super modern, telescopic gangways we were way ahead, supplying minimal down time. We decided to go further with this, but it took some years" says Rokstad.

In fact it took seven years before Edda Fides, the only purpose built monohull accommodation vessel in the world, was delivered in 2011. With a capacity for 600 people on board, a 1400 m2 deck and equipped with DP3 (KONGSBERG K-Pos), Edda Fides' most recent contracts for general construction, transport and accommodation support for the construction of new offshore oil and gas installations are worth USD 150 million.

"The advantages of monohull accommodation vessels are significant. Edda Fides operates in wave heights of five meters. The gangway operates 95% of the time throughout the year in harsh North Sea

conditions. Monohull ships provide high quality accommodation services and significantly faster and more cost efficient transits between contracts," says Rokstad. "It's an extremely competitive and safe alternative to semi-submersible accommodation units."

Achieving a proven track record with Edda Fides, Østensjø placed a one + one Multipurpose Accommodation and Service Vessel option with Hyundai Heavy Industries in March 14 this year.

To be delivered in June 2015, the newbuild has 800 berths with 400 single cabins and will be equipped with a heave compensated telescopic gangway at a length of 55.5 meters. The vessel is winterized classed, and in addition, has a cargo deck area of 2000 m2, a 120t rig support crane and two supply cranes, which will make the vessel highly suitable for cargo handling and construction support.

When finished, the vessel will provide construction support and additional living quarters for support personnel during commissioning, maintenance and decommissioning of offshore installations worldwide.

"This will be an amazing accommodation unit. We have developed a unique gangway system which we can operate with just the push of a button. Additionally, we are working closely with KONGSBERG to develop new gangway DP technology. Traditional DP thinks centre of the vessel. We need to have it where the gangway is," says Rokstad.

"Due to a proven concept and significantly lower investment and operating cost compared to semisubmersible accommodation rigs, the new accommodation vessels will be highly competitive in a market with anticipated fierce competition. We expect the additions to our fleet will enhance our position as a global provider of world-class accommodation services", concludes the well-satisfied CEO Johan Rokstad.

CUTTING EDGE

Atlantic Offshore to the rescue





Bergen-based Atlantic Offshore has quickly built a strong position in the niche market segments of field support, standby operations and platform supply. Now, as it looks to consolidate its relationships with oil majors and demonstrate improved environmental credentials, the ambitious business is investing in a fleet renewal programme to acquire cutting edge, and in some cases revolutionary, vessels. Ocean Response, the latest addition to the fleet, is a case in point.

ROY WAREBERG
CEO, Atlantic Offshore

Bergen-based Atlantic Offshore has quickly built a strong position in the niche market segments of field support, standby operations and platform supply.



» Roy Wareberg is excited. The CEO of Atlantic Offshore is holding court in the firm's headquarters in Sotra, near Bergen, Norway and discussing the company's new Multi-role Rescue Vessel (MRV), Ocean Response. His hands are gesturing rapidly, he's struggling to contain a grin, and he's fizzing with energy. One minute he's sat down, then he's standing, then he's grabbing a pen to sketch a configuration of engine blocks on the office whiteboard.

"It's an incredible vessel," he remarks of the NOK 330 million purchase, delivered earlier this year from Bergen Shipyards, "a new breed of MRV."

THE RIGHT RESPONSE

Ocean Response is vessel number 19 in the Atlantic Offshore fleet, with a further six newbuilds scheduled for delivery across the next two years, three of which are MRVs, in addition to three 'standard' PSVs. The firm is one of only five players in the North Sea market with more than ten field support (MRV/FSV- Field Support Vessel) and standby vessels, capable of carrying out a variety of duties such as oil spill response, fire fighting and emergency towing. Its smaller PSV fleet is, as Wareberg puts it, more "commodity" tonnage.

The firm is now looking to secure its leading segment position through fresh investments in high-end tonnage, with the CEO stressing that vessels of the calibre of Ocean Response are a tangible sign of the business' ambition.

The 75m long, 18m wide, 3824-ton ship is powerful – with 12,000 bhp and a bollard pull of 120 tons – and of high specification, boasting Clean Design and a comfort class notation (Comf-V 3). But there's something else that is exciting Wareberg today, something that makes the Ocean Response unique.

"The vessel has an older sister ship called the Ocean Troll (an AHTS). It has the same power output, the same bollard pull and is the same size. However, the emissions are a staggering 90% lower for the new vessel"

ROY WAREBERG
CEO, Atlantic Offshore

EFFICIENT SOLUTIONS

The vessel, he explains, is the first of its kind to use a configuration of varying sized Wartsila engines (two of the Wartsila 6L32 models and two 6L20 generating sets) to maximize fuel efficiency and reduce emissions. And the results, Wareberg states, are startling:

"The vessel has an older sister ship called the Ocean Troll (an AHTS). It has the same power output, the same bollard pull and is the same size. However, the emissions are a staggering 90% lower for the new vessel."

This is achieved predominantly through the engine arrangement, he says, which also delivers huge cost efficiencies, with only approximately 40% of the fuel (compared to the older vessel) used on a like-for-like basis.

He reveals how this is achieved: "In the Troll we have four engines of the same size, approximately 3,000 bhp, whereas in Ocean Response we have four engines of varying size linked by a power management system that chooses what engine, or configuration of engines, to call upon dependent on the power that is required.

"This means that at any given moment you have only the bhp you need - not just increments of 3,000 (dependent on the number of engines employed in The Troll). It's sensational."

Wareberg admits that he was "a little nervous" about the project initially, as the firm were the first to try this with Wartsila engines, but says that the vessel is "performing above all expectations" – an observation that causes his smile to get a little wider still.

DYNAMIC IMPACT

And so it should. Ocean Response's innovative approach to engine, fuel and environmental management isn't just impressing Wareberg, it's also finding favour with Norwegian oil major Statoil, which has engaged the ship on a 15-year long time-charter agreement.

The vessel is now operating in the North Sea in the area of the Gullfaks field, where it is undertaking, and on standby to under-

take, a diverse array of critical MRV and PSV assignments. These include performing specialist maintenance tasks on the network of submerged hoses/pipes that Statoil uses to transfer oil to shuttle tankers, supplying installations (carrying everything from containers to boats), fire fighting, personnel rescue duties, oil spill response and recovery operations, and, if necessary, towing (where the aforementioned 120 ton bollard pull capacity is a real boon).

Alongside the innovations in the engine room, this huge range of activity the ship is custom built to undertake – in the often unforgiving waters of the North Sea – led to Atlantic Offshore investing in cutting edge Kongsberg Maritime dynamic positioning technology (DP II) to ensure impeccable station-keeping operations.

Atlantic Offshore Project Manager Stein Hauger explains more: “When there is a need for DP on our vessels they tend to have KONGSBERG technology installed. It’s a system that we have both extensive experience of and confidence in.”

THE PREREQUISITE FOR SUCCESS

Hauger says that reliable DP is absolutely essential – he calls it “a prerequisite” – for carrying out the type of activity undertaken by the Ocean Response.

“It goes almost without saying that DP is crucial when you’re operating in close proximity to the platforms, charging and discharging cargo for example. But with a vessel like this one, there are further requirements.”

The maintenance of the hoses, for which the Ocean Response has been optimised, is a key consideration he says. Statoil has specially trained personnel aboard the vessel to service these transfer tubes, which have complicated electronic systems at the connection hubs. The hose ends have to be brought on board the ship using a special arrangement at the stern of Ocean Response, enabling the Statoil team to maintain the electronics. However, their robust nature makes them difficult to move/bend. “It’s therefore essential,” Hauger stresses, “to maintain position, making it possible for the team to carry out these critical operations.”

Moving away from such ‘everyday’ duties, DP also comes heavily into play in emergency situations. The vessel has an advanced fire-fighting class notation of FiFi II, meaning it is fitted with a minimum of two powerful fire ‘monitors’ that can throw water to a minimum distance of 180m from the ship and to a height of 110m (the total water distribution capacity for this class is ‘not less than 7200m³/h’). “These monitors are very powerful,” Hauger imparts, “and essentially act as water jets, meaning they can have a huge impact on the vessel’s positioning, which is obviously critical in emergency situations. “We therefore need to use the engines/thrusters to compensate, which is where the KONGSBERG DP system comes into its own.”

With so much at stake, making mistakes is simply not an option and Atlantic Offshore is rapidly establishing a reputation as a reliable ‘go to’ partner for firms of the order of Statoil, Shell, Total and ConocoPhillips. Thanks to high-end new vessels such as Ocean Response, the firm’s already leading position in this niche segment looks set to grow stronger. Something that should make CEO Mr Wareberg even more excited.

MULTI-TALENTED VESSELS FOR CRITICAL OPERATIONS

Multi-role Rescue Vessels (MRV), as the name suggests, are tasked with a wide range of activities in their support roles for energy industry clients. Key tasks include:

PLATFORM SUPPLY: Although valued for their emergency response abilities, MRVs often have similar general design specifications to PSVs, with large loading areas for effective carriage and easy charging and discharging of a wide variety of loads critical to continuous platform operation.

MAINTENANCE: Other equally ‘prosaic’ duties include maintenance operations, such as the transfer pipe servicing carried out by Ocean Response for Statoil in the Gullfaks field. MRVs can be outfitted with workshop areas or specialised equipment for providing technical assistance to other vessels or offshore platforms.

FIRE FIGHTING: Platform fire fighting and cooling are important functions of MRVs. Vessels are graded by a FiFi (fire fighting) class notation, from 1 to 3, with 3 being the highest class. All FiFi classes require that vessels have at least two monitors (essentially high capacity water jets) that must be remote controlled from the wheelhouse of the vessel.

OIL SPILL RESPONSE AND RECOVERY: Oil spills need to be tackled quickly and effectively and MRVs are often custom made for this task. Booms and skimmers can be carried to contain and collect spills (alongside storage tanks for the transportation of recovered oil), while anti-pollution dispersant spray operations are also a central component of a vessel’s clean up activity.

OTHER EMERGENCY DUTIES: Further emergency activity may include the rescue/collection and transportation of personnel from offshore platforms, towing stricken vessels (high bollard pulls are therefore a preference) and general standby and rescue operations.



“It goes almost without saying that DP is crucial when you’re operating in close proximity to the platforms, charging and discharging cargo for example. But with a vessel like this one, there are further requirements”

STEIN HAUGER
Project Manager, Atlantic Offshore

KARL-JOHAN BAKKEN
Chief Executive, Farstad Shipping

Karl-Johan Bakken has been at the Farstad helm since 2006 and has been around long enough to see fluctuating fortunes in various offshore sectors.



Farstad Shipping delivers and operates in a highly competitive industry where requirements for technology and advanced solutions require a constant focus on further development and innovation.

FLEXIBILITY

Farstad pulls no punches with high-end offshore strategy

“There is no stairway to heaven,” remarks Karl-Johan Bakken, the steely Chief Executive of Farstad Shipping ASA, one of the world’s largest owners of sophisticated offshore service vessels. He is referring to the subsea construction market, a sector that promises significant potential and was a key driver behind the company’s latest NOK825m (\$142m) newbuilding contract, signed with Vard in February. Bakken has his own rich maritime heritage – his grandfather was a fisherman and his father was at sea. Trained in Trondheim as a naval architect, he spent time at Ulstein before joining Farstad’s Market and Operations in 1999. He has been at the Farstad helm since 2006 and has been around long enough to see fluctuating fortunes in various offshore sectors.

POSITIVE OUTLOOK

He is broadly optimistic. There are certainly challenges ahead in some offshore sectors, he concedes, but the outlook for high-end subsea construction vessels is positive. By the time the company’s fourth subsea vessel is delivered in 2015, the market could be booming. Bakken, typically, plays down the possibilities.

“When you look at the statistics, under-capacity looks likely,” he says carefully.

As always in shipping, the danger lies in the time lag between buoyant demand and the supply of new vessel capacity. But Bakken points out that the latest offshore construction vessels are amongst the most complex of any craft in the offshore arena. With increasing levels of automation supplied by leading technology companies, this capital-intensive sector has a high barrier to entry.

But more than 50 such vessels are already under construction, with orders for high-end vessels placed mainly by Norwegian owners. A gold-rush type ordering spree is unlikely, however. Finance, for many, is already a constraint. And, as vessels become more complex and their tasks more challenging, the shrinking supply of suitably experienced offshore engineering and marine personnel could well prove a limiting factor in future.

OPERATIONAL FLEXIBILITY

The Oslo-listed but family-controlled company already operates three subsea vessels, including the ground-breaking 2009-built Far Samson, a multi-functional plough, tug, supply and subsea service vessel on charter to Italy’s Saipem in Brazil until 2014 and, with options, possibly beyond. With a bollard pull of 423 tonnes, she is still the most powerful offshore vessel afloat.

“When you look at the statistics, under-capacity looks likely”

KARL-JOHAN BAKKEN
Chief Executive, Farstad Shipping



Like the Far Samson, the hull of the latest vessel is being built at Vard Tulcea in Romania. “We’ve put a lot of work into her design,” says Bakken. “She will be built for flexible operation and will have a 250-tonne crane, as well as a 50-tonne crane on the stern.”

The operational flexibility and lifting capacity of such craft is critical for the future. Subsea offshore installations will be required in deeper and more difficult waters, further from shore and in more hostile conditions. DP3 systems, with complete redundancy, will be required.

ADVANCED VESSELS

Heavy components will have to be handled safely and effectively on the seabed, with an accuracy tolerance of millimetres. Leading charterers will insist on the very latest in vessel innovation and that is clearly the premise on which Farstad’s corporate strategy is based.

The subsea sector may be the talk of the moment, but much of Farstad’s 58-ship fleet consists of other offshore service craft. It includes 29 anchor handlers and 26 platform supply vessels (PSVs) and the company currently has three of each under construction. The existing fleet, together with new-buildings, is worth about NOK21bn (\$3.6bn).

Throughout the fleet, however, the Farstad philosophy prevails – operating the most advanced vessels in each chosen sector. As a result, Bakken and his team have carved a position right at the top of each area and steady disposal of older tonnage leaves a mostly modern and technologically advanced fleet incorporating some of the latest automation and control technologies.

No surprise, then, that Farstad lists a bunch of blue-chip charterers amongst its main clients. They include Shell, Statoil and Petrobras and embrace a range of charter contracts in three key offshore regions: the North Sea – 15 vessels; Far East/Australia – 22 ships; and Brazil – 15 units. In addition, two ships are working for Statoil in East Africa, and four more are in Singapore.

KONGSBERG A “KEY COMPONENT”

“As a leading provider of offshore support services in key locations across the world, our robust relationships with global suppliers providing up-to-the-minute hardware, IT and first-class support systems are a key component of our business,” declares Karl-Johan Bakken, Farstad’s Chief Executive.

“KONGSBERG is a world-class company, a key partner with activities both directly and indirectly related to ours,” he says. “On board our ships, KONGSBERG’s dynamic positioning systems play a crucial role. And, as we train the next generation of DP operators, KONGSBERG’s DP simulation installations at our Australian training centre in Perth are a valuable feature of our preparations for working offshore tomorrow.”

“Less directly but equally as important,” the Farstad Chief Executive continues, “KONGSBERG has within its group leading experts in the development of new oil and gas technologies, particularly in the rapidly advancing subsea sector. We are working in more difficult conditions, in deeper waters often further from land. Pin-point accuracy and faultless operation, with suitable back-up are critical. That is why we value KONGSBERG as one of our key business partners.”

The Farstad Chief Executive explains how the company’s clients have increasingly demanding requirements on shipboard DP installations as energy exploration becomes more challenging. Many charterers now require the redundancy associated with DP2 systems as a minimum standard, he says, and the next generation of subsea construction vessels will have further redundancy built in, with DP3 installations on board.

The company’s Far Samson, still the most powerful multipurpose subsea vessel afloat with a bollard pull of more than 420 tonnes, is already four years old. Anticipating the future, however, Farstad’s operations team demanded that the vessel be equipped with a DP3 system on board. This was achieved by building in two engine rooms, each with its own set of machinery and separated by a watertight bulkhead.

The Rolls-Royce designed vessel, Skipsrevyen Ship of the Year in 2009, can perform a range of complex subsea tasks including pipeline trenching. She is currently working for Saipem off the coast of Brazil.

So what is the market outlook in these other sectors? Bakken is less positive. A tranche of recent PSV deliveries has forced out smaller and less competitive vessels but day rates are failing to reflect fleet modernisation. The North Sea, he says, is suffering from a lack of charterer competition in the Norwegian sector. The result? “Unsustainable rates!”

HIGHER COSTS

According to Farstad’s figures, the anchor-handling fleet comprises 481 vessels of more than 10,000 bhp, and there are 64 on order – 13% of the fleet. But the stats in the PSV sector are more daunting: there are more than 300 units of more than 2,000 dwt on order, equivalent to about 40% of the existing fleet today.

Meanwhile in Brazil, the markets have lost some of their lustre. Ships built in Brazil typically cost

50% more than Norwegian-built units. Labour costs are soaring, resulting in sharply higher operating costs which have risen more than threefold in less than a decade. These increases are not reflected in the day rates available from Petrobras, and Farstad likes to focus, where possible, on relatively short-term deals with international clients.

Brazilian inflation is running at 6.6% and has risen steadily since June last year when it was still under 5%. And to make matters worse, the mandatory drydocking in Brazilian yards of vessels working offshore is another nightmare. It costs around \$30,000 a day just to drydock a vessel before any work is undertaken, according to Bakken. In fact, he says, if one could, it would be cheaper to take vessels to the Canary Islands, repair them there, and then bring them back.

OPPORTUNITIES

Such challenges, however, are all in a day's work for a global shipping executive and Bakken is not keen to dwell on the negatives. He points out a range of opportunities for tomorrow. Australia, he believes,

already offers potential and several new PSVs have been built recently at Vard's Vung Tau yard in Vietnam for operation in Australia and South East Asia. Bakken is keen not to spread Farstad resources too thinly. He says that the strategy to stay out of West Africa, for example, is based on the high landside cost of operation there and the fact that the clients within Farstad Shipping's three main operational Areas are already asking for more resources than they have at hand.

Farstad is holding back on the High North too.

"It's a very harsh environment," Bakken comments. "These are conditions you don't appreciate being in."

He mentions photos of "nice icebergs floating in the sunshine" and notes acerbically that such conditions prevail perhaps five days of every year. Overall, though, he's a typical Norwegian pragmatist. "If it's necessary to go there, it will happen. For the time being, it costs too much."

But you can be sure that when the world's energy heavyweights decide to move north in earnest, Farstad will be amongst them. This year, next year, sometime ...

Farstad's AHTS vessels are specially designed vessels for anchor handling and towing offshore platforms, barges and production modules/vessels.



MAINTENANCE AND REPAIR





Maintenance and Repair

Offshore maintenance activity is driven strongly by global demand and market forecasts are robust. Growth will be driven by the need to maintain a vast and aging infrastructure, high oil prices, rapid new offshore field development activity and price inflation for equipment and services. However, some services such as well stimulation, wireline operations and subsea well intervention will remain highly price sensitive. Their economic viability is dependent upon a number of criteria including oil price, vessel, unit and rig.

FPSOs deteriorate more rapidly than fixed platforms, and their technical complexity requires strict maintenance schedules. Over 35 FPSOs worldwide are approaching the middle or end of their design life, and there are limited numbers of onboard personnel able to perform maintenance operations, so suitable programs catering for this are urgently required.

Approximately USD 77 billion will be spent on subsea vessel operations in field development, inspection, maintenance and repair, and well intervention between 2012 and 2016, an increase of over 60 per cent on the preceding five years. Global vessel demand for these markets is expected to increase 33 per cent on the previous five-years. Long-term growth is expected to continue with the caution that the market is expected to retain its long-term cyclic nature as vessel owners over-react to up-cycles. The global fleet is undergoing an evolution in vessel capability with cranes, deck spaces and dynamic positioning systems increasing in size, complexity and efficiency.

Vessel developments include increasing focus on ability to work year round under demanding weather conditions and the improvement of health and safety features on board. More highly specialised vessels capable of operating in deeper waters are expected to enter the global fleet in the future.

Over the past decade, operators have tended to engage many different maintenance service providers, largely based on price. This is expected to change as they move to reduce their integration burden and select optimised and integrated solutions to reduce overall expenditure.

Permanent well abandonment is expected to move from a niche

market to a multi-billion dollar industry. Driven by environmental concerns, regulators around the world are demanding that unproductive wells are sealed. Globally an estimated 20,000 wells have been targeted for abandonment. In the UK sector of the North Sea around 500 structures with about 3,000 wells are slated for permanent abandonment and the Gulf of Mexico has around 12,000 non-producing wells. The Asia-Pacific region is also expected to experience increased activity levels over the next ten years with around 700 structures around 25 years of age.

Regulators are also increasing their demands regarding the abandonment technologies used and offshore operators are looking to minimise the costs of compliance with their requirements through new technologies such as hydraulic pulling and jacking units and dual-string milling tools. Technologies that can be deployed from monohull vessels are also being developed.

While some platforms are allowed to be sunk to act as artificial reefs, more commonly they are brought to shore in as few pieces as possible. One of the key challenges for decommissioning platforms then is the potentially deteriorated state of the facility and the integrity of the components to be removed. Additional health and safety concerns must be addressed, including the possible use of lead-based paints and asbestos.

The industry therefore is rapidly maturing into a sophisticated and specialist offshore market segment. Intervention and abandonment operations require a number of different services and resources and are increasingly being offered as a package that spans mature-well revitalization, late-stage intervention and final abandonment.

Deep and ultradeep facilities will not be facing decommissioning for several decades yet and the size and age of the super-heavy submersible crane vessels that will be available for the task at that time is currently uncertain. A significant newbuilding investment may be required. However, if industry efforts to improve reserve recovery are successful, decommissioning projects may be pushed further into the future.



COLLABORATIVE INNOVATION

The long view





JAN LODDEN
COO, Eidesvik Offshore ASA

Eidesvik started as a family fishing operation. Today, it operates a modern fleet of 29 highly specialised vessels in three main segments – supply and logistics, subsea, and seismic survey and cable-laying.

COO, Jan Lodden, jokes that he has spent a lifetime working at Eidesvik Offshore. After 25 years in the company, it's not far from the truth. Lodden's career represents the long-term perspective Eidesvik applies in all areas of its business.

Having started out as an ordinary seaman on the Eidesvik offshore supply vessel, Viking Queen, in 1988, it wasn't until 2001 that Jan Lodden moved ashore, taking over as COO soon after. That level of experience is hard to find and gives credence to the company's belief that there is no shortcut to success. Lodden is a great example of what Eidesvik stands for – it is a company that applies a long-term approach to development of partnerships, technology and people. The term 'sustainable business' is apt.

Like many Norwegian offshore shipping companies, Eidesvik started as a family fishing operation. Today, it operates a modern fleet of 29 highly specialised vessels in three main segments – supply and logistics, subsea, and seismic survey and cable-laying.

STRONGER TOGETHER

"Business is all about people and relationships, and creating value for all stakeholders" states Lodden, "We go into new partnerships with the idea that they should last forever."

He believes that it is trust that allows business partnerships to prosper over time. "Trust facilitates innovation by encouraging good ideas to be explored in an open environment," he says.

These observations are based on Eidesvik's long-term partnerships with major players in the oil and gas industry such as Statoil and French geoscience company, CGG. In addition, Eidesvik has maintained long relationships with trusted suppliers like KONGSBERG, which first signed a contract with Ei-



SEVEN VIKING

Seven Viking is an IMR, Survey and Light Construction vessel. It has a crew capacity of 90. The key focus was placed on ensuring that the crew can deliver peak operational performance from this complex and versatile asset, no matter what task it undertakes. The control room features panoramic windows, giving a full overview of this key activity area. It provides a comfortable working environment and is a comfort class COMF-V (3) vessel. As well as typical IMR, and light construction, its work scope also includes scale treatment and pre-commissioning. This broad range of duties necessitated the inclusion of a complex equipment package.

At 106.5 metres long and 24.5 metres wide, the vessel is comparatively compact. This nimbleness, as well as a top speed of 16 knots, allows the Seven Viking to manoeuvre with ease in confined spaces, such as between platforms, accessing difficult to reach areas. But a clever configuration, whereby hull space is maximised and equipment is integrated within the large hanger area, enables it to carry a large crew and all required subsea equipment.



“Good service is so important in offshore work. If you experience a failure during a critical operation, you need to know you can pick up the phone and get help immediately”

JAN LODDEN
COO, Eidesvik Offshore ASA

» desvik in 1990. Initially, it was for a DP system, but it now includes a variety of KONGSBERG’s products across the entire fleet, including service agreements, which Lodden says is vital.

“Good service is so important in offshore work. If you experience a failure during a critical operation, you need to know you can pick up the phone and get help immediately.”

Lodden believes Eidesvik has built trust with its customers by being flexible and providing sound technology.

“Our customers appreciate our problem-solving attitude and willingness to accommodate their needs,” he states. “A customer also has to know that your technology is reliable – especially in the offshore industry, which places importance on high availability.”

The company first went into business with CGG in 1996, and formed a joint venture in 2011, which involved the management of ten high-capacity 3D seismic vessels. The venture is based in Bergen, with 51 per cent owned by Eidesvik and 49 per cent owned by CGG.

TAKING THE LEAD

Statoil, which has held contracts with Eidesvik for more than 30 years, is proof of Lodden’s belief that trust aids innovation. Most recently, Statoil awarded Eidesvik with a two-year extension for the LNG fuelled Platform Supply Vessel (PSV) Viking Energy.

The Viking Energy was the first LNG-fuelled PSV in the world when it was delivered in 2003, and has been on contract with Statoil since delivery. Five of Eidesvik’s vessels are now powered by LNG.

The Viking Energy features dual fuel engines and can run on both LNG and ordinary marine diesel oil in any proportion. Using LNG results in a 90% reduction in the outlet of NOx (approx. 200t a year) as well as a 20-25 % reduction in CO2. Tests have shown that the vessel has a fuel economy rate of 30% better than that of diesel.

Despite the obvious environmental and economic benefits of LNG, the industry has been cautious, but Lodden believes that the performance of these vessels has proven that LNG is a viable alternative. “We have already seen a few companies follow our lead and I believe in the near future there will be

many more,” he says.

Lodden believes that over the years, the partnerships Eidesvik has with its customers have strengthened, to the benefit of all parties.

FRESH THINKING A MUST

“In an industry facing a skills shortage, innovation is a must, both on the human and technology side,” declares Lodden. The latest example of Eidesvik’s innovative spirit is the Seven Viking. Co-owned by Eidesvik and Subsea 7, the inspection, maintenance and repair vessel (IMR) was launched last December. It is now contracted to Statoil and is operating in the North Sea, carrying out IMR work on subsea oil installations, as well as scale treatment and RFO operations.

Statoil provided a rigorous set of contract requirements and together with Subsea 7, and Ulstein, Eidesvik spent two years designing the vessel to deliver on those specifications. Eidesvik drew on the experience of both its onshore and offshore staff in order to develop a vessel that was ideally suited for IMR operations. According to Lodden, the dedicated team from all three parties contributed to the design of the safest, most efficient and most comfortable IMR ship in the industry. He explains that the advance in technology since he last worked offshore in 2001 is astounding.

“Back then there was one big open deck and you were terribly exposed to the weather,” he recalls. “Compare that to Seven Viking, which gathers all operational personnel in one area directly above the hangar. This minimises exposure to weather and aids communication and cooperation between personnel, which is a major factor in ensuring safe and efficient operations.”

The vast cost of downtime in the oil and gas industry means that reliable equipment is sought-after. Lodden says there are several features on Seven Viking, which make it a highly available working platform.

“The weather will always be a challenge in this part of the world, but the high-spec nature of the vessel certainly mitigates its effect. As well as being able to perform most operations from the hangar, the dynamic positioning class 2 (DP2) can operate in 5m significant wave height. That means we can

Seven Viking is designed to have a lifetime of 25 to 30 years.

“A customer has to know that your technology is reliable – especially in the offshore industry”

JAN LODDEN
COO, Eidesvik Offshore ASA

perform complex tasks such as operating the crane and launching ROVs without having to wait for calm weather,” he explains.

Add to that the ability to carry all the necessary maintenance equipment so that the vessel can operate continuously, and operational downtime is kept to a minimum. “Of course,” adds Lodden, “As with all things Eidesvik, long-term planning is key. This vessel has been designed with current and future regulations in mind and will have a lifetime of around 25 to 30 years.”

THE STEADY COURSE

Despite the current oversupply in the PSV market, Eidesvik believes it will become more balanced in the medium to long-term. In the meantime, the company is turning its attention to the lucrative subsea market.

But besides shifting its focus from one of its core areas to another, Lodden predicts a fairly steady course for Eidesvik.

“I don’t think there will be any drastic changes in our strategy. We have been building this company to the benefit of our employees and stakeholders for a long time and we understand the need to stay patient and keep doing what has worked for us.”

In other words, Eidesvik is a company that, if necessary, is willing to go through short-term pain to achieve long-term gain. So far, that philosophy has served it well.



YOUNG CORPORATION OF THE YEAR

In 2012, Eidesvik was awarded the Young Corporation Award by YoungShip, a professional, non-profit organisation for young people working within the global maritime industry. The annual award is given to a company that invests time and money in developing the competence of the young people in its organisation. This may include running development programs and supporting initiatives that promote young people within the maritime community.

The jury was impressed by Eidesvik’s policy of keeping at least 10 per cent of its positions open to trainees. It also lauded Eidesvik’s conviction that business opportunities emerge from developing and investing in young people. In its judgement, the jury said:

“Eidesvik has clear measurements for the development of its employees, and scholarships for students. From the start of their careers, young employees are given responsibility and opportunities to develop their skills through various assignments and projects. Eidesvik has participated in the Norwegian Shipowners Association’s Maritime trainee programme for several years. The company offers internal trainee programmes, actively recruits candidates from schools, and functions as a breeding ground for young professionals, which other companies benefit considerably from.

“Eidesvik invests in the education of Norwegian seafarers through the Cadet programme. As part of a regional partnership, it provides a job guarantee for youth being trained as maritime personnel, and co-founded the Maritime Academy of Haugesund. In addition, Eidesvik offers its own leadership development programme for young professionals, Eidesvik Young Leaders.”

The Young Corporation Award is not the only accolade Eidesvik has received in recent times. It also won the Heyerdahl Award, which was presented by Crown Princess Mette Marit at the opening of Oslo Maritime Week.

OPERATIONAL EXCELLENCE

From strength to strength

With its headquarters situated in the remote west coast town of Fosnavåg, Rem Offshore has a unique story. It has gone from being a small family-owned and operated fishing operation, to establishing itself as a well-recognised offshore shipping company, with major international customers. Listed on the Oslo stock exchange in 2007, Rem is now in the process of carving out a distinguished future.





REM FORZA

KLEVEN
MARITIME





» Rem COO, Steven Rooney, started his maritime career back in 1985 aboard an Åge Remøy-owned fishing vessel. After a few years he moved into the offshore industry, working for a number of Norwegian shipowners. But he always kept a close eye on the progress of his former employer, which had expanded into offshore shipping in 1996 after a long family history in fishing. Rooney returned to the company in 2007 as chartering manager and has not looked back since.

“We have a great team atmosphere and a unique culture at Rem,” he says. “Everyone works well together and our flat structure means that you can make things happen quickly.”

In 2011, Rooney was promoted to COO, a job that he thoroughly enjoys. “No day is the same. I love the dynamism of operating and chartering ships, especially in the subsea and construction market, and being head of all operational activities.”

He adds that having a very modern fleet at his disposal makes this job much easier. “We have one of the most modern and sophisticated fleets on the market. All our vessels incorporate the highest quality materials and the latest technology.”

Rem’s fleet now numbers 15 ships in operation and three under construction – the first of which will be delivered in June this year and two during the first half of 2014. The operational vessels include an anchor handling tug supply vessel, which is trading on the spot market, ten platform supply vessels (PSV) – one of which runs on LNG – and four subsea construction vessels. The majority of these ships were built by long-time partner, Kleven Verft and most run with the help of KONGSBERG equipment.

The company’s relationship with KONGSBERG began in 2004.

Rooney explains that as well as its sound technology, the company’s after-sales capability has also benefited Rem. “You cannot underestimate the importance of after sales support in the offshore industry, especially for critical system components like dynamic positioning (DP). We placed a great deal of emphasis on after-sales when selecting KONGSBERG to deliver our DP systems and they have not let us down,” he states. Having started with DP, Rem now runs a variety of KONGSBERG equipment – including integrated K-Master solutions on six of its PSVs. The newbuilds will also feature K-Master.

MAN AND MACHINE

But it is not just about technology according to Rooney, who believes that Rem’s crew can take much credit for the company’s success. “This balance of high spec vessels and a proficient crew enables us to offer excellent service to our customers, who keep coming back to us.” Those customers include a long list of major industry players such as Fugro TSM, Exxon Mobil, Deep Ocean, Statoil, ConocoPhillips and Canyon Offshore.

Rooney adds that managing its own crew is an important part of the company culture.

“Our crew is made up of highly experienced seafarers, mainly from Norway and other parts of Scandinavia. But, just as important as their competence, is the level of teamwork we have between our offshore and onshore staff. That is such an important aspect and why we will never outsource the management of our crew,” he explains.



Rem Ocean, one of three newbuilds, is on an eight-year timecharter to DeepOcean. DeepOcean was awarded the long term Statoil IMR work with

The company's recent performance supports Rooney's claims. Despite an oversupply in the North Sea offshore market over the last few years, Rem has managed to post strong results throughout. Rooney puts this down to the company's reputation to deliver quality assets and operations.

"The operational excellence we have shown our customers has meant that we have kept our utilisation rates consistently high through this tough period. It definitely gives us an edge in a very competitive market."

A healthy balance between spot market, medium-term and long-term contracts allowed Rem to prosper while many others were hurting. With these vessels performing well, Rem is now looking to take advantage of opportunities emerging in the subsea market.

SUBSEA SHIFT

With the oil and gas industry moving further from shore and into more challenging and remote locations, demand for subsea construction vessels is rising. Rem is working to meet that demand. It briefly flirted with the subsea market in 2006 when it built three subsea construction vessels, all of which entered into long-term contracts. In addition, two larger subsea construction vessels of MT 6022 design – Rem Forza and Rem Clough – were delivered to REM during 2008 and Rem Poseidon delivered to REM in 2009.

At one stage Rem operated up to six such vessels, but a decline in the market in 2009 saw the company shift its focus back to the PSV segment.

Since then, Rem has monitored the subsea market carefully and

STEVEN ROONEY
COO, Rem Offshore

Rem's fleet now numbers 15 ships in operation and three under construction – the first of which will be delivered in June this year and two during the first half of 2014.

"The operational excellence we have shown our customers has meant that we have kept our utilisation rates consistently high through this tough period"

STEVEN ROONEY
COO, Rem Offshore

last year, as market conditions improved, it promptly ordered a new-build on speculation. This vessel, Rem Installer, has now secured a contract and will be delivered in June this year. Rem has two further vessels on order, one of which, Rem Ocean, was contracted from the yard with an eight-year time charter.

The vessels under construction are MT 6022 designs, featuring a powerful offshore crane that can lift 250 tonnes at 650 metres or 135 tonnes at 3000 metres water depth, as well as a 7.2m square moonpool, and three remotely operated vehicles (two Work, one Observation). They have a large deck area and can accommodate a total of 110 personnel. The vessels were designed in accordance with a demanding set of specifications, and also offer reduced fuel consumption and a greener profile.

The three vessels have been built to withstand the demanding conditions of the North Sea, with good station-keeping capability. The second hull, MV Rem Ocean, also features winterisation features.

A BRIGHT FUTURE

Having come from a humble background, Rem has grown into a highly-respected outfit. With recent finds in the North Sea and exploration beginning further north in arctic waters, the offshore oil and gas business does not look to be slowing down any time soon. The competence that Rem has developed in the offshore sector in recent years looks set to provide them with increasing opportunities in this industry in the coming years.

KONGSBERG WORLDWIDE



**KONGSBERG'S GLOBAL
SUPPORT SERVICE MEETS
CLIENT DEMAND FOR AN
ADAPTIVE, PROGRESSIVE, AND
AVANT-GARDE ORGANISATION.
WE WANT TO EXCEED OUR
CLIENTS' EXPECTATIONS
THROUGH SERVICE QUALITY.**

Kongsberg Maritime's new Follow the Sun Customer Support concept ensures better availability and more efficient support, wherever and whenever you need it!

GLOBAL CUSTOMER SUPPORT

Follow the Sun

LENE RØKAAS
Business Support Manager
Global Customer Support

Follow the Sun Customer Support concept ensures better availability and more efficient support.



When dialling the global customer support number, or sending an e-mail to Global Customer Support, there is always someone who will respond. This is ensured by three Front End Coordinators located in each region.

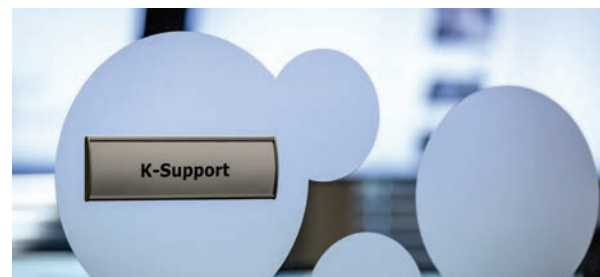
“Our Front End Coordinators are especially trained in the Full Picture portfolio and constitute a valuable contribution to our support chain, both internally and for customers. By having one single emergency contact number and one e-mail address in a Follow the Sun concept, we contribute to making the Kongsberg Maritime world smaller for the customer. All of our technical groups will have a representative in the virtual team to guarantee efficient collaboration and to make sure that each request is handled by the right combination of expertise,” explains Business Support Manager, Global Customer Support, Lene Røkaas.

The new concept entails both new working routines and the implementation of multipoint video conferencing software and online service. The new K-Support centres are fitted with several screens to facilitate communication across and within locations and areas of expertise. So far, all the main locations in Norway (Kongsberg, Trondheim and Horten) as well as Singapore and New Orleans are connected to the system, ensuring better collaboration between regions across product areas and time zones.

“When our customer support employees in Norway come to work in the morning they log onto the virtual collaboration centre to discuss issues with our staff in Singapore who are about to

“This contributes to increased efficiency, continuity and knowledge transfer”

LENE RØKAAS
Business Support Manager,
Global Customer Support



leave for the day. Similarly, when our team in New Orleans logs on for the day, they attend a virtual handover meeting with our staff in Norway. This contributes to increased efficiency, continuity and knowledge transfer. Customers do not have to wait until the next day to get their issues solved, since there is always a team ready to take over unresolved tasks on each continent,” says Røkaas.

In addition to bringing video conference more actively into the everyday work situation, the new tools can also be useful for instruction purposes and customer collaboration, as it allows for meeting invitations with external users.

“The technical system forms the basis for improved communication between various departments, locations and regions, resulting in better use of our internal resources at the various locations. However, the concept is more than a video conference system. It also allows the meeting participants to share applications and documents. This is a great advantage when working on the same issues across continents,” says Røkaas.

An upgrade of the phone system has also produced benefits with regards to monitoring and control, resulting in a more proactive approach towards customers. With an expected 26,000 calls to the main 24/7 number this year, and inquiries via e-mail close to 400,000, the new Follow the Sun model is a highly useful concept, ensuring that there is always someone there to provide the client with relevant and highly qualified assistance, regardless of time and place.

The entire training business is experiencing a shift from proof of participation to proof of competence. For Kongsberg Maritime, this means new courses, models and a very high increase in demand.

TRAINING

Training Trends

Throughout the maritime industry, there is a high demand for competent personnel. At the same time there is an increased focus on assessment, or proof of competence, meaning that the course participants must prove what they have actually learnt at the end of a course program. Previously, no such test was required in order to receive a course certificate.

“For us as a course provider, it is important to follow the market trends. The new emphasis on assessment means that we need to evaluate our courses and ensure the participants can demonstrate a specific set of skills. In order to decide the criteria for the learning outcome, DNV, among others, is involved with a set of competence standards for maritime personnel, to ensure our courses meet the highest quality criteria,” says Global Training Manager, Anne Toril Kasin.

SIMULATED TRAINING

A part of this new trend is an increasing use of simulated training to demonstrate specific practical skills. Kongsberg Maritime’s training department is in the forefront within this field, having provided simulated training for quite some time already.

“Simulators are a very important tool for the maritime offshore industry. It allows students to practice real life scenarios in a safe environment, something which is vital in order to avoid accidents. We know that most accidents are caused by human errors, so having practiced potentially dangerous situations in a simulator increases the likelihood of making the right decision in a stressful situation. The idea is that if you’ve already performed the task on a simulator, you will recognise it when it occurs in real life and act instinctively,” comments Kasin.

Kongsberg Maritime is lucky enough to have its own simulator department, with a long history

of expertise in providing advanced simulators for maritime schools as well as the offshore industry. For KONGSBERG’s training department, this results in exact simulated versions of their onboard systems, and tailor made courses. There is already a close collaboration between the two departments, and Kongsberg Maritime simulators are in use at Kongsberg Maritime’s training centres worldwide. In addition, there is an emphasis on collaboration with external institutions, with regards to research on human factors and technology as well as delivery of courses.

“We have several projects going on together with the simulator department. Examples include the development of course ware for other training institutions and collaboration with academia, such as Vestfold University College. The University College is one of the major players within maritime education in Norway, and features a separate research centre with several simulators from Kongsberg Maritime, including a 360 degrees offshore vessel simulator in a so-called SIMSAM lab. VUC is also involved in a research program with Kongsberg Maritime about human behaviour related to technology, which is highly relevant for us as instructors and modifiers of human behaviour,” says Kasin.

TRAINING THE TRAINER

As a response to the new challenges within the maritime industry, Kongsberg Maritime has recently developed train the trainer courses. This means that personnel or maritime instructors come to one of Kongsberg Maritime’s training centres and learn both the technical and pedagogical tools needed to train their own staff or clients. An example of this is the ECDIS familiarisation course for instructors.

“The intense need for qualified personnel means



ANNE TORIL KASIN
Global Training Manager
Kongsberg Maritime

that new methods have to be employed. Training the trainer is a time saving and cost-efficient method which helps to meet the demand fast enough. We started providing this course last year, and it has been a great success. However, it is important for us to keep an overview of what personnel learn from the people we have trained, so we are still responsible for the assessment, which the participants have to complete online after the local training”, explains Kasin.

WORLDWIDE EXPANSION

The growing demand for qualified personnel means more business for Kongsberg Maritime’s training department, and worldwide expansions. Last year, they opened new facilities in Greece, and their training centres in both Singapore and Brazil have moved into new and larger premises. The combination of the increased demand and new courses means that Kongsberg Maritime Training will stay busy for quite some years to come.

“We are a part of Kongsberg Maritime’s Full Picture portfolio, meaning that suppliers who buy our equipment can also buy a training package. A one-stop shop for support and services is important. In this respect, we aim to make our contribution to increasing Kongsberg Maritime’s global footprint,” concludes Kasin. ■

“In order to decide the criteria for the learning outcome, DNV, among others, is involved with a set of competence standards for maritime personnel, to ensure our courses meet the highest quality criteria”

ANNE TORIL KASIN
Global Training Manager,
Kongsberg Maritime

In 2010, Kongsberg Maritime Singapore expanded its training facilities by adding a new classroom. Since then, the centre has doubled its course activity, hired additional training staff and recently moved into new facilities to meet the growing demand. Their philosophy is simple – they never cancel!

TRAINING

Fully Booked in Singapore



“The increase in demand for courses is related to the steady number of newbuildings in this region”

BJØRN ANDREA MØRKEN

Regional Manager Training and Customer Support, Kongsberg Maritime Singapore

Kongsberg Maritime Singapore is taking bookings from all over the Asian region, offering a range of both tailor made and open courses in its brand new training centre which opened in Q1 2013. The centre features five classrooms dedicated to navigation, automation and DP, compared with three classrooms in the previous training facilities. In addition, there are five technical rooms, giving students the possibility to practice real-life scenarios as realistically as possible in a safe environment. They have also just started a new train the trainer course, where ship Captains come to learn how to use ECDIS.

Bjørn Andreas Mørken, Regional Manager Training and Customer Support comments: “The increase in demand for courses is related to the steady number of newbuildings in this region, meaning that more qualified personnel need to be trained. We can offer custom made courses in connection with specific deliveries, ensuring that our clients get customised training suitable for their specific vessel. In addition, we offer general KONGSBERG type specific courses that are open to anyone interested.”

NEVER CANCEL

The training centre with its team of expert instructors, is aiming to be a central hub for training for the Asian region, also offering support to Kongsberg Maritime’s training facilities in China and Korea. The new training centre has a qualified team of seven instructors who specialise within their respective fields, meaning that the centre has the capacity to offer several courses in parallel. Most weeks, the centre is fully booked in all classrooms, and the philosophy is to never cancel a course, regardless of the number of participants.

“With local training staff at the Singapore office, we ensure that courses are conducted regardless of the amount of participants. We have even conducted courses with only one participant. Our clients book their courses several weeks in advance, so we don’t want to cancel at the last minute just because there is only one participant,” explains Mørken.

STAYING AHEAD

Kongsberg Maritime courses are well known for their practical, hands-on approach by the use of simulators and practical exercises. This is no difference in Singapore. One example is the DP advanced course, where the participants are presented with various scenarios that could potentially occur on board a vessel. DP instructor Surinder Mahandwan emphasises the importance for clients of staying updated with the latest technology, and points to several benefits of staff training.

“KONGSBERG deals with high-end, innovative and cutting edge technologies, and it is important for our customers to stay current. For a client who invests millions in expensive technologies just to stay ahead of competitors, spending a few thousand dollars more on training will ensure that he reaps the full benefits of his investment. First of all, equipment will have fewer breakdowns and less down time. When the crew members know more about the various functionalities of the systems on board, a vessel can operate much more efficiently,” he comments.

CONFIDENCE THROUGH TRAINING

One of the main goals of Kongsberg Maritime courses is to provide confidence through training, in order to avoid accidents and ensure the safety of vessels and crew.

“The majority of accidents at sea are due to crew errors. Although these can be subdivided further, insufficient knowledge about ship systems is a factor. We deliver the latest technologies, and the world wide training centres endeavour to support the clients’ requirements for training, in order that our technology is used to enhance operations and safety. It will ensure that Kongsberg Maritime equipment is exploited optimally worldwide, the correct way and more importantly the safer way,” he says.

Kongsberg Maritime Hellas Opens New Training Room

Kongsberg Maritime Hellas recently opened a new training room in order to meet the increased training demand by Greek and international customers.

The new training room will firstly be used for KC700 training to LNG/ Offshore owners both in Greece and worldwide. Many of Kongsberg Maritime's customers are utilising crew and technical personnel from Eastern and Southern Europe, and the response is very positive to having training possibility in Greece. In the future, this new room will also be used for all of Kongsberg Maritime's equipment as demand increases.

"To open a new training facility here in KM Hellas is another good step towards getting closer to shipowners and to provide them with the training they need. We will do our best to make sure that the demand will be met and we hope that our customers both in Greece and around the world will utilise our new training room," comments Terje Dyhre, Managing Director Kongsberg Maritime Hellas.

TOP EUROPEAN PORT

Kongsberg Maritime Hellas opened the doors to its new facilities in September 2011. As one of the largest ports in the Mediterranean sea, Piraeus is classed as a top ten European container port. More than 24,000 vessels visit Piraeus each year. With a large base of ferry operators and merchant vessel owners totalling more than 4000 vessels, Greece is an important market. Kongsberg Maritime systems are used by a significant number of Greek ferries, among them Blue Star Ferries. Kongsberg Maritime Hellas provides service in the local area and in southern Europe, covering the majority of Kongsberg Maritime's automation and navigation systems. The office currently has 16 staff members.

"There are around 700 shipping companies in the Athens and Piraeus area, so it was important for KONGSBERG to establish presence in Greece to better support our many clients in the country and region. The new training room is an important part of this," comments Dyhre.

"To open a new training facility here in KM Hellas is another good step towards getting closer to shipowners and to provide them with the training they need"

TERJE DYHRE

Managing Director, Kongsberg Maritime Hellas

KM Middle East moves ahead on DP Training

During 2011, KMME opened a DP Training Centre within its Dubai headquarters, with state of the art facilities for DP Operational and Technical courses. The KMME Training Centre is fully accredited by the Nautical Institute for conducting such courses. To date, this facility has been used mainly to provide ad-hoc training courses as required by specific projects, and for internal training.

Due to increasing offshore activity and a corresponding increase in enquiries, KMME have now embarked on a fixed schedule of open DP Training courses for the rest of 2013 and beyond.

The first open DP Induction course was conducted during Week 21 (19th -23rd May) with all participants achieving 85% and higher marks to pass the Nautical Institute tests on their first attempt. There were a total of four participants on the inaugural course, from companies based in Qatar and Greece. It was a pleasant and active session with very positive feedback from the students.

"This is a great facility and the course was very well conducted. I am definitely going to promote this centre to others," commented Mr. Anil Kumar from Halul Offshore Services.

"I was very impressed with the facilities and cooperation extended by the various departments in the KM Dubai office to conduct this successful course, commented Mr. Anders Rogstad, training instructor from KM Norway.

KMME LOOKING TO THE FUTURE

Kongsberg Maritime Middle East (KMME) was established in 2010 with the goal to become a world class provider of customer support, to KM customers in and around the Persian Gulf and Red Sea areas. The Middle East region is an important business area for Kongsberg Maritime. The number of vessels with KM equipment installed which are trading or operating in the region is growing, and increasingly owners are asking for provision of training in Dubai.

"Kongsberg Maritime actively encourages shipowners to invest in training their crews to improve safety, maintenance and efficiency on their vessels, however Middle East owners currently have to incur significant cost and inconvenience to train operators in Europe, Asia or elsewhere," comments David Wilson, General Manager KMME.

"KMME sees development of a sustainable training operation in Dubai as an essential element in supporting our loyal customers in this region. With a growing trend towards training crews on vendor specific equipment, we believe the market here is now ready for this, so we are in the process of securing local instructors which will provide the flexibility we need to adjust our schedule as required.

"In the longer term, it is hoped that provision of training in this region will provide another positive differentiator for KM compared to other vendors. In the meantime, the DP Basic, DP Advanced and DP Maintenance courses scheduled for June are generating a lot of interest with two of the courses already fully booked," concludes Wilson.

KMME have established a dedicated email address for training enquiries (km.training.dubai@kongsberg.com) and are implementing several marketing initiatives to inform the Middle East offshore operators of their training capabilities.

Kongsberg Maritime's training facilities in Horten, Norway have moved into the new research centre at Vestfold University College. This co-location has several advantages for both parties.

TRAINING

Horten Training Centre Relocates to Vestfold University College



RITA KRATHE
Department Manager Training
Kongsberg Maritime Horten

The training department in Horten has experienced an increase in demand for its courses and has doubled its staff number accordingly.



“We are very happy to be a part of the new research centre at Vestfold University College”

RITA KRATHE
Department Manager Training, Kongsberg Maritime Horten

Replacing the previous offshore and merchant marine training centre at Kongsberg Maritime's offices at Bekkajordet in Horten, the new facility at Vestfold University College features five classrooms and a test lab, as well as offices for instructors and administrative staff.

“We are very happy to be a part of the new research centre at Vestfold University College,” says Department Manager Training in Horten, Rita Krathe.

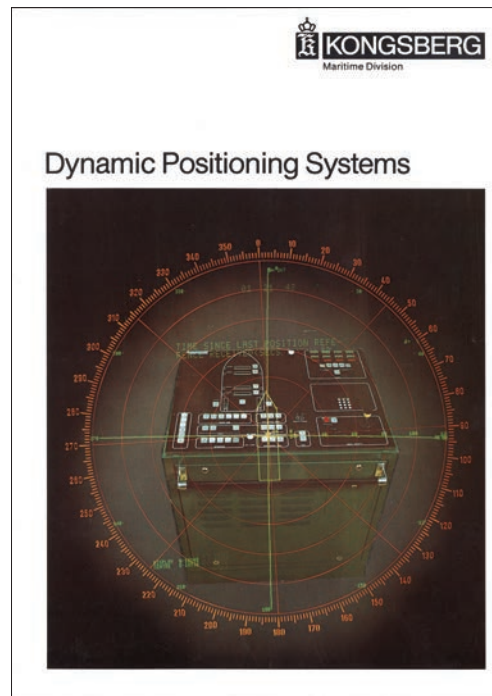
“First of all, the relocation of the training centre in Horten will enable a closer collaboration with the University College. The college features several Kongsberg Maritime simulators and we have several projects going on with VUC in order to integrate the use of simulators into our courses. Similarly, the college will be able to take advantage of our knowledge and experience as a course provider,” she says.

The training department in Horten has experienced an increase in demand for its courses and has doubled its staff number accordingly. The team at Vestfold University College consists of seven instructors offering training on most of Kongsberg Maritime's products, such as navigation, automation, dynamic positioning and simulator products.

In order to document the history of KONGSBERG's Dynamic Positioning (DP) system, Kongsberg Maritime has initiated a book project in cooperation with two professors from the Norwegian University of Science and Technology (NTNU). They are looking for your contribution!

DYNAMIC POSITIONING

Kongsberg Maritime Initiates DP Book Project



The first KONGSBERG DP system was put into operation on the 17th of May 1977 onboard the diving support vessel Seaway Eagle. Since then, KONGSBERG's DP systems have become a worldwide success, allowing vessels to keep a fixed position at sea by the use of the vessel's own propellers and rudders instead of anchors. This technology was first developed and industrialised as a collaborative effort between professor Jens Glad Balchen, KONGSBERG, The Norwegian Institute of Technology (NTH), SINTEF, Simrad and the ship owner Stolt-Nielsen. The system was an essential enabler for advanced marine operations and for the Norwegian oil adventure.

"We are aiming to write a book about DP history, which is interesting, lively and entertaining. It will focus on technology, but also on the DP business and the people behind it. In order to achieve this, we need contributions from those who are familiar with our DP system," says Morten Breivik, chairman of the book committee.

A 20TH CENTURY ENGINEERING ACHIEVEMENT

Today, KONGSBERG is the DP market leader with more than 2500 systems installed worldwide, onboard everything from offshore supply vessels to cruise ships. In 1999, the system came second when the readers of Norway's leading engineering magazine *Teknisk Ukeblad*, were invited to vote for the "Engineering Achievement of the 20th Century".

"This technology is unique in the sense that it conquered a large share of the world market, and Kongsberg Maritime has maintained this market position for more than 35 years. It is vital that we document this history now, since many of those who contributed to the development of the DP technology are getting close to retirement age or have already passed away," explains Breivik.

LOOKING FOR CONTRIBUTIONS

To ensure that the book is of the highest possible quality, Kongsberg Maritime has engaged the two NTNU professors, Per Østby and Stig Kvaal to write the book. In order to do this, however, they depend on input from those who are familiar with and have experience from using the DP system.

"A key success factor for the KONGSBERG DP system has been our close relationship with customers and collaborators. We are therefore inviting them to help us with material for the book. All contributions, such as photos, stories or relevant information, are highly appreciated," comments Breivik.

The DP book is planned for publication in 2015, which is exactly 40 years after the first KONGSBERG DP development started in 1975. To share your contribution, please contact Morten Breivik morten.breivik@kongsberg.com.

"A key success factor for the KONGSBERG DP system has been our close relationship with customers and collaborators"

MORTEN BREIVIK
Chairman of the book committee



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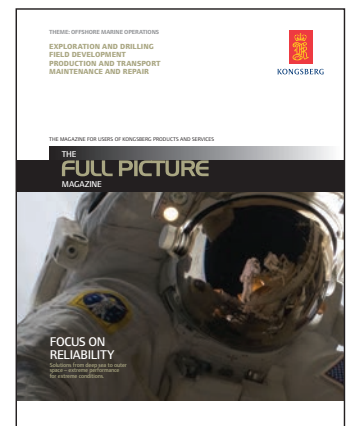
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