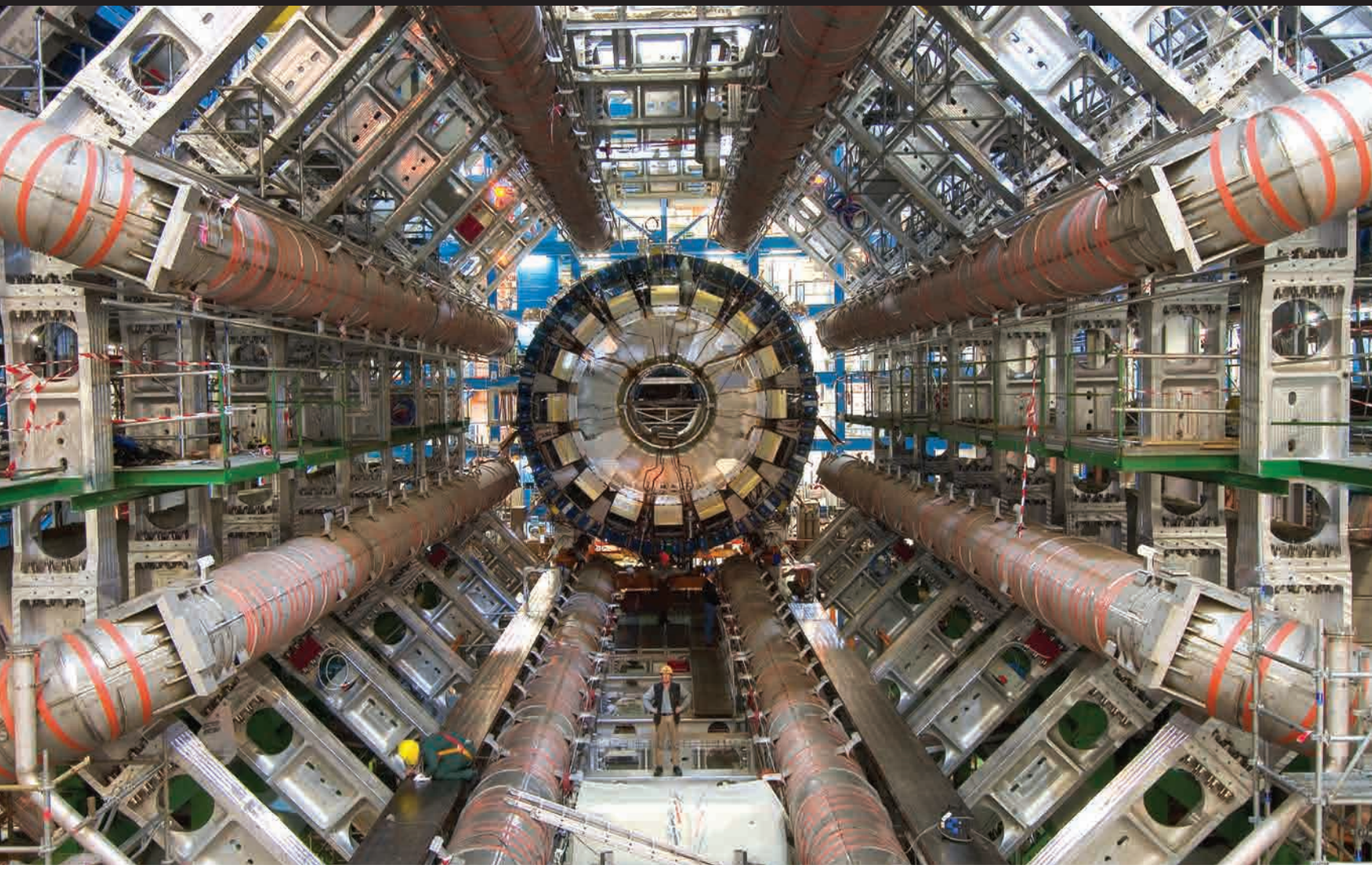
FEATURE STORY: THE LARGE HADRON COLLIDER

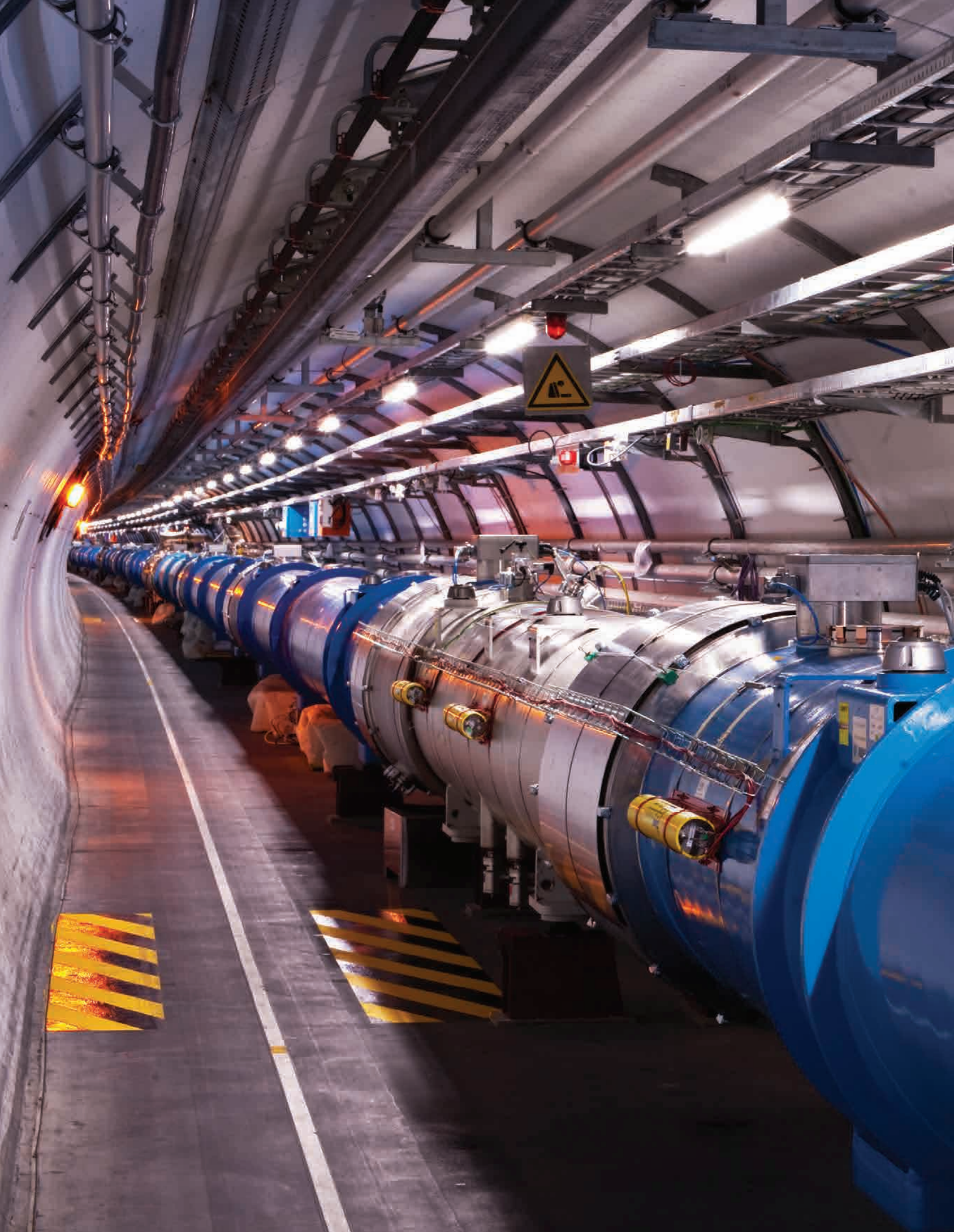
SHIPPING
OFFSHORE OPERATIONS
FISHING AND ENVIRONMENT
TRAINING AND INNOVATION

KONGSBERG

THE MAGAZINE FOR USERS OF KONGSBERG PRODUCTS AND SERVICES

THE FULL PICTURE MAGAZINE





Gunvor Hatling Midtbø
Kongsberg Maritime
Vice President – Communication

The power of innovation

– providing the full picture

In this issue of the Full Picture we meet global leaders who see opportunities where other see challenges – pioneering new ways of operating to access insight, performance and competitive advantage.

From the scientists at CERN in Geneva, aiming to redefine our understanding of the very universe, to shipowners such as UASC, Wilh. Wilhelmsen and BW, utilising the latest maritime technology to gaze into the future and build flexible, efficient and environmentally friendly vessels for the next 20 to 30 years. Our featured offshore industry players such as Allseas and Lundin are ripping up the rulebook to blaze their own trails, while Teekay, Maersk and Heerema demonstrate that investing in tomorrow's training technology delivers powerful benefits today. For readers looking for truly revolutionary ideas, seek out Ocean Farming and KONGSBERG'S MBR, while those eager to get 'a view from the top' can connect with leading shipowner association CEOs. All this and much more awaits.

This magazine aims to give you the full picture of our dynamic ocean industries. Take a look from the perspective of the exciting companies featured here to unlock a whole new world of understanding.

CONTENT

THE FULL PICTURE

Seeing the full picture in the marine world has always been complex, but never more so than today. And never has the picture been changing faster than now.

OCEAN INDUSTRIES

The Full Picture

One way to get perspective on just how much things have changed, and how fast, is to find a relevant comparison. As a technology that for many epitomises the concept of the full picture, what has come to be known as 'Big Data' employs everything from satellites to sensors, it helps drive the driverless car, and it has become synonymous with instantaneous access to limitless information.

All these things those who make their living on, in or under the sea are either doing, or aspire to do: eyes in space watching all ships, unmanned autonomous vessels, a world of information at their fingertips, anywhere, anytime. They are eager to embrace Big Data – a technological concept few in shipping, fisheries or offshore had even heard of less than a decade ago.

Tradition-bound, with millennia of history, marine enterprises are now moving in all directions at once: higher and deeper, slower and faster, bigger and smaller, specialized and flexible – all necessary in order to meet the demands of a changing world, and changing markets.

In order to meet these demands, the technologies and knowledge that will move the ocean industries forward must spring from an understanding of the full picture.

The people who drive development must embrace change while respecting tradition. The solutions must be both daring, and robust. Energy, the environment, safety and economy, all must be considered. Quality, performance and integrity must be the parameters that define success.

The stories in this edition of The Full Picture offer real-life examples of how leading players in the ocean industries are delivering on these lofty terms. Some solutions are spectacular, some simply sensible, but all are highly informed and well founded. Read on to see how they are taking their place in the full picture.

SHIPPING

FOCUSED ON THE FUTURE, PREPARED FOR ANYTHING

In a world where the only constant is change, shipowners and operators need to exploit the latest maritime technology to help them overcome the challenges waiting on the horizon.

Today's innovative technological solutions deliver data, operational knowledge and control like never before - empowering better decision making and helping shipowners, such as UASC, maximise performance.

The future may not be clear, but, with the full picture, shipowners can navigate it with safety, security and efficiency.


EUROGATE
EUROGATE
AL MURABBA
المربع
MAJURO
ماجورو
IMO 9708837

United Arab Shipping Company (UASC) thinks big. The firm, based in Dubai, is in the middle of a fleet expansion programme worth over USD2.3 billion and recently took delivery of its first ultra-large 18,800 TEU vessel, the M.V. Barzan. But while the scale of its plans generates the headlines, it's the thinking behind them that will help UASC make waves far into the future.

UASC

Size matters

The M.V. Barzan tells you everything you need to know about UASC.

Delivered from Hyundai Heavy Industries earlier this year, its most obvious characteristic is its jaw-dropping scale. At 400 m long and 58 m wide, weighing-in a shade under 200,000 dwt, this towering vessel is amongst the world's very largest container ships. This neatly mirrors the magnitude of UASC itself, a global leader in its field with more than 185 international offices and 60 ships, serving 240 ports and destinations worldwide.

But look beyond this mass of steel and you see what really drives both the Barzan and the company – a relentless quest for efficiency. Size is merely a facilitator on the path to the objective of setting new standards in eco-efficiency for the highly competitive container segment. A goal that UASC, in partnership with Kongsberg Maritime, is determined to achieve.

COMPLETE COMMITMENT

At its launch, Barzan was instantly acclaimed as the industry's most eco-efficient container vessel, with a CO2 output per TEU of more than 60% below a 13,500 TEU vessel delivered just three years ago.

That staggering improvement is achieved, Mohamed Zaitoun, Assistant Vice President New Building Technical Projects UASC, explains, partially through scale efficiencies, but also through a concerted effort to think holistically about optimising total vessel performance.

"When it comes to efficiency we consider and address everything we can," he states. "The engine, automation system, propulsion, controls, port operations, navigation, total operational costs… every element. By optimising these individually we create a better whole.

"In theory that's simple, in practice it takes complete commitment."

Commitment is something that isn't in short supply at UASC – as demonstrated by a current newbuild programme that encompasses eleven 15,000 TEU and six 18,800 TEU vessels, all of which are scheduled to be delivered by 2016.

The six larger ships, of which the Barzan is the first, boast an EEDI (Energy Efficiency Design Index) value that is close to 50% below the 2025 limit set by IMO, are constructed 'LNG ready' (with the main infrastructure for LNG fuel supply in place) and boast an array of environmentally friendly solutions. These include shore-to-ship power supply for zero emissions at berth and energy efficient integrated on-board systems, key elements of which have been supplied by KONGSBERG.

THE POWER OF TECHNOLOGY

"Technology is a key differentiator when it comes to achieving greater efficiency and maximising performance on large merchant vessels," comments Zaitoun. "We choose suppliers we know we can rely on – those with both a proven track record and the stability to be

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Mohamed Zaitoun
Assistant Vice President New Building Technical Projects UASC

The full picture according to United Arab Shipping Company
One word: responsibility. UASC has a commitment to uphold the best standards in efficiency, service and environmental stewardship, as seen in the design of its new vessels. Greater responsibility leads to sustainability, and surely there isn't anything more fundamental to the future of the industry than that.

» with us for the long-term future – but also those that are prepared to invest heavily in R&D to find innovative solutions that deliver a competitive edge."

UASC selected Kongsberg Maritime to provide a Full Picture solution for its newbuilds, delivering integrated vessel control systems for navigation, communication, and automation for machinery and propulsion systems (K-Chief). The contract also includes a state of the art, Vessel Performance System, which monitors and provides accurate, detailed decision support advice for operators regarding energy efficiency, fuel usage and optimal sailing. Together these systems integrate with the electronically controlled main engines, maximising fuel efficiency, while reducing noise, vibration and carbon emissions by automatically controlling fuel consumption in line with sailing speed and conditions.

"This kind of advanced solution allows us to be proactive in our decision making, and this leads to cost, as well as environmental, savings," Zaitoun says.

"These days, when competition is fierce and margins are so small, this technology gives us greater control of the vessels and that can reduce operational costs, to the benefit of all our stakeholders."

HIGHS AND LOWS

Of course, 'these days' fuel prices have also plummeted to new lows. Does that not influence UASC's thinking when it comes to the current fleet renewal? Is efficiency still King when operational costs are softer?

Zaitoun's feelings are crystal clear: "We are building these ships for optimal operations over the next 20 to 25 years. The fuel cost »

"Technology is a key differentiator when it comes to achieving greater efficiency and maximising performance on large merchant vessels."

Mohamed Zaitoun
Assistant Vice President New Building Technical Projects UASC

Barzan naming ceremony: Celebrating the arrival of a new age of eco-efficiency.

may be low now, but no one knows what's going to happen over the course of the next few years, or even months.

"Currently fuel accounts for almost half of the total operational cost, so it makes economical sense to control that expenditure as much as possible. All shipowners have to control costs, and UASC is no exception."

Where the firm is perhaps exceptional is in its commitment to the very highest environmental standards. Cost, as outlined by Zaitoun, is important, but so is its image as an eco frontrunner.

Zaitoun, as with all the UASC management team, speak as one on the issue of the environment. Jørn Hinge, the company President and Chief Executive Officer, noted in 2015 that "providing environmentally friendly transport solutions and recognising environmental initiatives around the globe are no longer a choice; they are a necessity for both our organisation and our customers."

Zaitoun explains more: "The future is uncertain, but what we do know is that environmental issues and challenges are going to increase in gravity and scope. We all have a duty to mitigate potential environmental impact in whatever way we can and that commitment is clearly illustrated in all our newbuilds.

"We are not here for the short-term. UASC, and all its customers, are interested in sustainable industry and responsible operations. We do everything we can to ensure that, from helping our customers monitor their carbon footprints through greater transparency and accountability, to enhancing our own bunker efficiency, targeting port punctuality, and conducting regular energy efficiency training across the organisation, co-ordinated by the HSSEQ department.

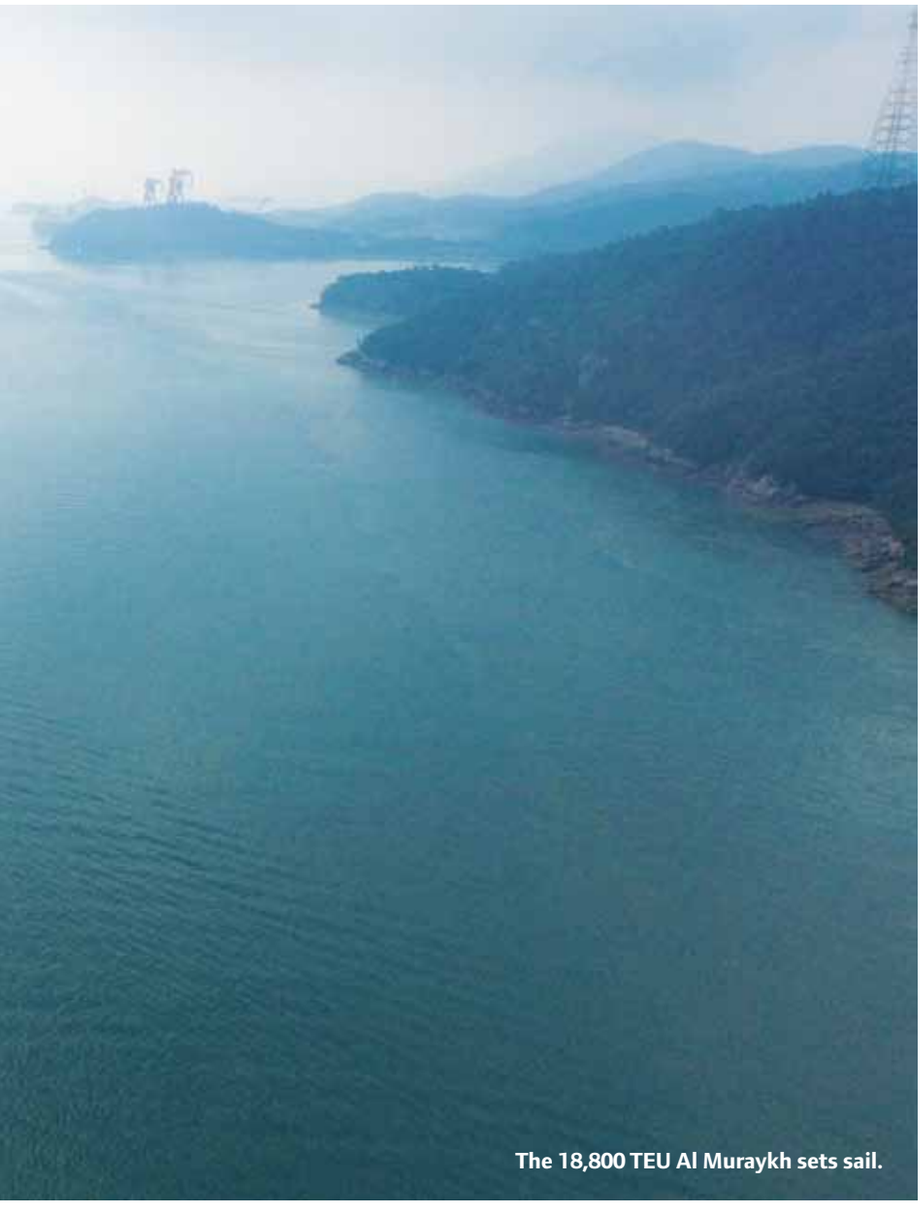
"Eco-efficiency defines what we do," he concludes, adding: "Everybody benefits from that."

The Barzan is now setting out to ply the Asia-Europe trades as part of UASC's Ocean 3 services. There, enabled by the firm's commitment, and assisted by Kongsberg Maritime technology, it will deliver "the industry's lowest per-container levels of CO2 output." And that, without a shadow of doubt, is really big news.

LNG READY

Barzan's 'LNG Ready' class notation (DNV GL Gas Ready Notation) is an industry first and will apply to all of the newbuilds on the USD 2.3 billion+ fleet renewal programme. Through a simple retrofit process, the vessels' main engines can be converted to dual fuel, while the installed auxiliary engines can be operated on gas. UASC plans to conduct the conversions to gas fuel operation when "the bunker infrastructure is ready."


HIGH



The 18,800 TEU Al Muraykh sets sail.

A new star of the container segment was welcomed into the world on 21 August 2015 with the christening of the second of UASC's 18,800 TEU vessels, the M.V. Al Muraykh.

AL MURAYKH

… and then there were two

The ceremony at Hyundai Samho Heavy Industries (HSHI) was attended by key executives from both UASC and the yard, including HSHI management, UASC New Building Technical Project team, DNVGL Class and KONGSBERG representatives.

Al Muraykh, like its sister ship Barzan, demonstrates UASC's commitment to technical innovation and eco-efficiency, driving down CO2 emissions and driving up industry standards for service, flexibility and cost effective container transportation.

When it entered operation on 4 September 2015, the vessel began sailing UASC's AEC1 service, departing from Qingdao, calling at ports including Port Kelang, Felixstowe, Rotterdam and Hamburg.

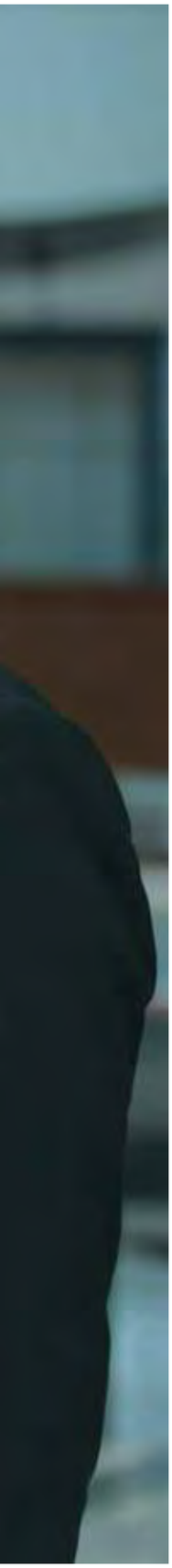

WILHELMSEN
THALATTA

WILH. WILHELMSEN

Super HEROes

A new generation of ro-ro vessels are emerging at Wilh. Wilhelmsen, offering enhanced flexibility, capacity, efficiency and crew facilities. Their mission? Long-term commercial success in a continually changing market. Lars Dessen and Filip Svensson unmask their HEROes.

From left: Lars Dessen and Filip Svensson discuss their HEROes in Oslo.



Lars Dessen
Head of WW Vessel Design
Wilh. Wilhelmsen

Filip Svensson
Vice President Marine Operations
Shipping, Wilh. Wilhelmsen

The full picture according to Wilh. Wilhelmsen
People are at the centre of everything Wilh. Wilhelmsen does. Customer care, flexibility and performance are crucial, but so is looking after its own crews with vessels of the very highest standards. Valuing people creates valued long-term relationships. That's the key to success.

WILH. WILHELMSEN ASA IN NUMBERS

WW group fact box:
EMPLOYEES: 17, 600
ANNUAL INCOME: USD 3 693 million in 2014
GLOBAL FLEET: 140
COUNTRIES OF SERVICE: 125
PORTS PRESENT: 2400

If Lars Dessen and Filip Svensson could have a superpower, it'd most probably be the ability to see into the future.

Sat at a polished boardroom table in Wilh. Wilhelmsen's (WW) Oslo-based headquarters, Dessen, Head of WW Vessel Design, and Svensson, the firm's Vice President Marine Operations Shipping, are discussing the challenges of creating newbuilds that deliver optimal performance over their entire lifecycle, namely some 30 years.

"It's a challenge," admits Dessen, with an air of understatement, "but one we feel we're well-positioned to meet, through our operational experience, commercial success in the segment, and technical expertise. That unique understanding has directly fed into our latest vessel series, the HEROes.

LET'S ROLL

The HERO name stands for 'high efficiency ro-ro' and relates to a series of four Post-Panamax ships from Hyundai Samho Heavy Industries in Mokpo, South Korea. Two of these, the Thermopylae and the Thalatta, have been delivered this year, with their companions scheduled to arrive in January and June 2016. Each vessel is 36.5m wide, 199.99m long and, thanks to a total of 13 decks, five of which are liftable, can transport up to 8,000 car equivalent units.

"The extra width allowed in the new Panama Canal gave us the potential to add the 13th deck," explains Svensson, "which translates to an extra 700 car units. However, by staying under 37m width and 200m length we can service all of the operator's (Wallenius Wilhelmsen Logistics) key ports, while the draft means they can also call at ports with shallower depths, increasing the geographical scope of service. This makes the HEROes very versatile vessels."

That versatility is further enhanced by the liftable decks, which, Dessen explains, allow them to adapt to the changing needs of the industry.

"The moveable decks give us the ability to configure the vessel to meet individual customer requirements," he states, "accommodating cargo of varying sizes and increasing capacity for cars, trucks, equipment, and break-bulk. The decks can be lowered for all-car loads, or raised to fit the requirements of high and heavy cargo.

"Times change and cargo composition changes," Dessen continues, "and this gives us the ability to be as flexible as the industry needs us to be, ensuring the success of our assets for the long-term."

HERO BY NAME, HERO BY NATURE

The HEROes give the industry more, and the environment less while having less impact on the environment. By feeding existing operational data from current vessels into the design process, Dessen and his team provided the yard with a detailed operational profile, allowing them to optimise the hull in line with the vessels' exact needs. In effect this has resulted in a slightly reduced top speed, but greatly enhanced overall efficiency.

When combined with an Exhaust Gas Cleaning System (a first for WW newbuilds), a new propeller and Promas rudder solution, and engines configured for optimal efficiency at a wider range of speeds and drafts, the result is, as Dessen surmises, "an environmentally sound vessel with reduced fuel consumption and less emissions per transported unit."

A win-win then – for both the environment and the industry. And it doesn't stop there.

Like any real HERO, each one is focused on caring for, and protecting, its people. This, Svensson says, is key to understanding the ships and the very philosophy of Wilh. Wilhelmsen itself.

THE PERSONNEL TOUCH

"An important part of long-term success is looking after your people," he comments, going on to state that the business has around 11, 500 crewmembers and a staggering retention rate of 99.8%.

"No one ever leaves," he laughs, before supressing the smile to add, "and that's the key to retaining and continually developing expertise.

"Our people are Wilh. Wilhelmsen's most important asset, so we want to provide them with optimal living and working conditions. The HEROes are proof of that commitment."

Svensson goes on to describe how the vessels have been designed to separate work and rest areas, reducing noise and directing the flow of movement – of both cargo and outside visitors – away from living quarters. In addition, a protected walkway on the upper deck safeguards crew at sea, while the elevator is positioned on the starboard side to ensure people don't have to cross the cargo deck to enter and leave the vessels.

And, if they have to rescue a man overboard or someone in distress, this difficult task is made as easy as possible.

"As in recent designs, the rescue boat on the HEROes is positioned in a recess in the hull, instead of on the upper deck," Dessen notes. "This reduces the drop and makes it much easier for the crew to deploy, especially in bad weather. It comes at the cost of a little cargo space, but is a better solution for crew safety. That makes it an easy choice."

The latest addition to the WW fleet – the 8,000 car unit capacity Thalatta.

MEET A HERO

LENGTH: 199.99 metres
WIDTH: 36.5 metres
DECK CAPACITY: 66,120 m2
CAR UNIT CAPACITY: 8,000
DEADWEIGHT: 24,240 tonnes
RAMP CAPACITY: 320 tonnes, 12 metres wide
MAIN DECK HEIGHT: 6.5 metres
ENGINE: MAN B&W S60ME-C8.2
SPEED: 10 - 20 knots

PARTNERS FOR LIFE

Relationships are clearly important to Wilh. Wilhelmsen. Solid relationships provide a foundation for long-term success – with customers, employees and also, it seems, with suppliers.

The firm has been working with Kongsberg Maritime since 1969, when Norcontrol installed the world's first ever computerised engine monitoring and navigation system on the M/S Taimyr. Today the K-Chief 600 marine automation system provides the HEROes with cost efficient control, management and monitoring solutions, while an on-going fleet-wide service agreement ensures that wherever and whenever the ship-owner needs assistance, Kongsberg Maritime will be there.

"This is another key to optimal, predictable performance throughout a vessel lifecycle – having partners you can trust," comments Svensson. "There are numerous important elements to that.

"Firstly it's crucial to have a supplier that has a global network of facilities and service engineers. We have a global fleet, with global operations, and it's important they can accommodate that, 24/7. Then you have to have a dialogue. By that I mean a supplier that listens to your needs and is always working to supply reliable, user-friendly systems that satisfy them, rather than simply trying to sell what they have. Without that dialogue you have no understanding and no positive development."

Dessen adds, and Svensson quickly agrees, that long-term stability is also a precondition to putting pen to paper: "We use makers that have been around for a long time," he notes.

"These vessels have lengthy lifecycles and we have to know that, in 10 or 20 years time, we'll be able to source the spares and support we need. The alternative is replacing entire systems, which is, obviously, highly inefficient."

Something that definitely does not conform to their philosophy.

Dessen and Svensson may be lacking the superpower to make their lives much easier, but, thanks to a strategy that puts efficiency, flexibility and people first they seem perfectly placed to tackle the challenges arising over their new vessels' lifecycles.

The industry, they believe, needs new HEROes. And Wilh. Wilhelmsen is dedicated to supplying them.

Nobody knows what the future will bring, but by installing cutting-edge maritime automation and monitoring systems BW Group can at least adapt to it in the most efficient and profitable way – for the environment, stakeholders and all company assets.

BW MARITIME

Controlling the future

BW Group's newbuilding programme shows the scale of its ambitions. The global shipping leader, which currently controls over 150 vessels serving the energy industry, is bolstering its fleet with the addition of some 30 ships that are yet to be delivered. Of these, the Oslo-based BW Gas division is overseeing the construction of two LNG carriers, two Floating Storage and Regasification Units (FSRUs), two LPG newbuilding programmes involving 12 VLGCs, and six LR1 Tankers.

It's a huge task, and one that Erik Kardash is relishing.

Kardash is an Electro/Automation Engineer with the Newbuilding and Projects Department at BW Fleet Management, which manages about 80 vessels owned by BW Group. It's his job to ensure that the aforementioned gas newbuilds have the electrical, navigation, communication and automation systems in place to optimise performance and support his employer's ambitious plans. No pressure then.

Erik Kardash
Electro/Automation Engineer
BW Fleet Management

The full picture according to BW Maritime
Knowledge is power. Gathering and analysing vessel operational data gives unique insights into current performance and future potential. Sharing and acting upon that knowledge across a fleet multiplies the benefits. BW is focused on seizing that opportunity, giving it a full picture of operational performance.

FULL STEAM AHEAD

Kardash, in a nice line of understatement, describes BW as "active" in the newbuild market, going on to explain that, despite the firm's heritage of 75 years of segment success, it is more interested in looking forward than back.

"This isn't a company that rests on its laurels," he states. "We're focused on leading the way ahead; pushing new standards for efficient operations and sustainability, and, in short, building the absolute best new vessels we can with the resources available. This approach will help the company maintain its leading position in the industry.

"Advanced maritime technology," he adds, "has a key role to play in that."

BW Group's interest in adopting cutting edge solutions isn't new. BW, through its Bergesen heritage, has a long history with Kongsberg Maritime technology that stretches back over 40 years. Bergesen was an early adopter of engine automation, while BW was the first shipping firm to install a Kongsberg Maritime Integrated Automation System (IAS) on a LNG tanker, the DSME2221 LNG River Orashi, which was delivered in 2004.

More recently, in 2011, the business introduced a holistic Energy Management Programme led by Erle Kristin Wagle, encompassing everything from fuel management, to electrical consumers and new training programmes to increase energy efficiency. In 2014 alone this initiative resulted in savings of USD 50million, while slashing group CO2 emissions by 10%.

It's in this context that BW, and Kardash's, latest efforts should be seen.

FULL PICTURE THINKING

Kardash has ten years of experience in the offshore sector and sees a key trend from that field now migrating to shipping.

"Offshore thrives on data," he comments. "There is a vast amount available and this is »

BW GROUP NEWBUILD PROGRAMME

- Very Large Gas Carriers (LPG):
  HHI **8 ordered, 5 delivered as of end 2015**
- Very Large Gas Carriers (LPG):
  DSME **4 ordered**
- Floating Storage & Regasification Unit (FSRU):
  Samsung **2 ordered, 1 delivered**
- Liquefied Natural Gas Carriers (LNGC):
  DSME **2 ordered**
- MR Tankers:
  SPT **6 ordered, 5 delivered**
- Chemical Tankers:
  Fukuoka **11 ordered**
- LR1 Tankers:
  STX **6**
- TOTAL: **39**

» shared between offshore facilities and onshore control centres to increase production efficiency. Shipping, by its nature, can be a conservative industry and it has taken time for companies in this industry to realise the full potential of data.

"Now, however, we are underway and, over the next five years or so, I can see far more vessels, led by newbuilds and upgraded vessels, implementing ways of analysing and sharing information. This is a key foundation of optimising performance throughout entire fleets.

"The next challenge is to structure the data and use it in a way that can cut fuel cost and emissions, as well as bolster company learning."

He explains with an example: "For instance, if two similar vessels with the same trading pattern consume fuel differently, or in a case where a ship is involved in a near accident, it is now possible to easily gather relevant historical data from the vessels. Having this data is one thing, but you also need a system that can analyse it and contribute to enhanced company understanding. One approach is to have a system to analyse incidents, another is to have a programme that actively searches data from vessels and continuously works to improve each vessel."

BW and Kardash are looking to KONGSBERG to empower this new reality. All BW Gas managed newbuilds will feature K-Chief marine automation systems, while the 12 LPG tankers will also feature the latest Information Management System from KONGSBERG, as a cross functional platform for decision-making and collaboration.

The modular K-Chief system will give the new vessels optimal monitoring and control abilities across key vessel functions such as power management, auxiliary machinery control, ballast/bunker monitoring and control, and cargo monitoring and control. Its easy installation, with extensive cabling reductions and reduced man-hours and building time, is an added boon for Kardash and his team.

K-Chief integrates with other KONGSBERG technology to facilitate a seamless flow of information across vessel systems has been designed to enable continuous access to primary vessel data for both on-board vessels and onshore facilities. Built on a secure, web-based structure it makes information freely available across a ship's administrative network and in selected onshore offices.

Data can be displayed, organised and stored – broken down by sub systems such as engine monitoring or power management – while trends can be mapped, reports generated and information exported to selected third parties, for tasks such as planned maintenance. It bridges the gap between land and sea, capturing information and delivering insights that empower better decision-making.

"This is the future of shipping," Kardash remarks. "By connecting systems and sharing information on board and onshore we can maximise operational efficiency, while minimising environmental impact and enhancing sustainability.

"In the future this information will be made available to every vessel, allowing our land-based organisation to individually moni-

LATEST MARKET MOVE

In August 2015, BW was selected by The Egyptian Natural Gas Holding Company (EGAS) to provide LNG regasification services utilising an FSRU in Ain Sokhna, Egypt. This five-year contract requires a fast track schedule – five months from project inception to first gas – which represents a record short time for implementation, and made possible because of excellent collaboration between EGAS and BW. BW's state-of-the-art FSRU BW Singapore built at Samsung Heavy Industries (SHI) in Korea will be utilised for this project. Delivered end September 2015 in Ain Sokhna Port and ready for operations in October 2015, she offers a low environmental footprint, high efficiency, storage capacity in excess of 170,000cbm and a peak regasification capacity of 750 mmscfd.

tor speed, fuel consumption, trim and determine the best operational practices for any given vessel, on any given day or route.

"While the technology for this has already been implemented in onshore and offshore industries its advent in the shipping industry has been delayed. One of the reasons is that a vessel, by its very nature, is not connected to shore and needs to make its own operational decisions. A land organisation can give guidelines, but it is the Captain on board who takes responsibility for commanding the ship in a safe and efficient manner. A land organisation cannot sit with detailed levels of data and give daily, comprehensive instructions to a vessel, as is common on offshore oil and gas installations. However, a land organisation can learn from vessel data, give advice and assist in the cases when a vessel needs assistance.

GETTING CONNECTED

Kardash sees better connections between vessels and shore as imperative for future success. Communication infrastructure is one thing, with obvious benefits for crews – "in 10 to 15 years everyone will have phones with shore access in their cabins," he says – but the ties that bind operations to onshore support have to be the tightest.

"Expertise has to be on hand when it's needed, and often before the crew themselves are even aware it is needed," he argues.

Kardash sees remote diagnostic support as essential. Online health monitoring of vessel systems and continual data collection allows for remote inspection and investigation, system updates and operational guidance – putting onshore expertise 'virtually' on board, 24/7.

This, he states, improves planning and predictability and that, crucially, leads to reduced downtime and costs over a vessel lifetime.

"All our new vessels with automation systems will be implementing remote support (Kongsberg Maritime's K-Remote)," Kardash says.

"If we have the ability to collect and share information we have to exploit this to its fullest potential. That will lead to the best level of understanding – for us and our suppliers – and therefore, enhanced levels of performance into the future."

The future is, understandably, a recurring theme for a man, and a fleet programme, focused on delivering results over the next 20 to 30 years. While that may be daunting for some, Kardash and BW appear to be taking it in their stride.

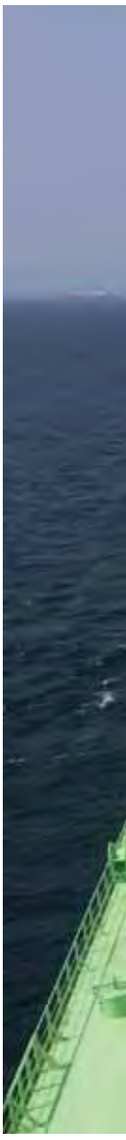
"20 years is not a long time in shipping," he concludes, "at least for a long-term player like BW. Good decisions made in the past have put us in this strong position in the present, and the decisions we're currently making for our newbuilds will hopefully repeat this positive pattern into the future.

"The potential for greater efficiency through technology is huge – and we can achieve this potential by providing the right people with the right technology. By adopting the best solutions now we put ourselves in the best position for what lies ahead."

"This isn't a company that rests on its laurels. We're focused on leading the way ahead; pushing new standards for efficient operations and sustainability."

Erik Kardash
Electro / Automation Engineer, BW Fleet Management

How can one predict the future of technologies at the newbuild stage in order to keep a ship running optimally for 20 to 30 years? If such a crystal ball exists, it gets cloudier when considering the ever-changing world economy and maritime regulatory landscape, and the highs and lows of fuel, global politics and industrial shipping cycles.



INDUSTRIAL SHIPPING

No crystal ball

"We cannot forecast the future of shipping, but we can make calculated decisions based on the shipping experience of our company, the innovation of our equipment partners and OEMs, and choosing the best equipment and engineering at hand to sustain long-term, quality industrial shipping," says Erik Reistad Kardash.

He should know. As project Manager for two FSRUs at Samsung Heavy Industries and the person responsible for electro/automation systems on four other newbuilding projects at BW, Kardash is involved in electrical, automation, communication and automation design concepts, and oversees technical specifications and applicable rules and regulations. He also supervises and ensures that all projects are completed in a safe manner, on time and on budget.

"I have a lot of duties and responsibilities, but most important is to continually promote improvements in safety and quality in accordance with BW's mission and core values," he says.

On a daily basis, Kardash liaises with designers, classification societies, yards, equipment suppliers and other key stakeholders to ensure that the latest innovations and best practices are built into the vessels. He likens his job to that of a UN Secretary General.

"I make many decisions, but I still have to be a diplomat in order to ensure that the interests of all stakeholders are addressed in a positive manner," explains Kardash. "For me the key to achieving this is to continuously involve the right people in all newbuilding processes."

He admits that taking into consideration the various demands of the fleet, top management and key stakeholders can be challenging. These are all over and above the countless hours of communicating with the newbuilding department and negotiating with the yard to secure the best equipment at the best price.

"It's a demanding position, but very exciting and rewarding too."

In many ways, Kardash is one of a new breed of professionals working with newbuilding and projects. Unlike the majority of his peers in the industry, he does not hold a naval architect degree or have sailing experience, but he believes his Electro/Automation Engineering degree allows him to embrace the opportunities that modern

TAKE 3 WITH KARDASH

1. THE FULL PICTURE OF SHIPPING

Shipping today must take a holistic view. Shipping is not only about moving freight at the lowest price using the least possible man hours, but about new demands and regulations, brought on by SOLAS, class societies, IMO, national requirements, and environmental concerns. Our vessel designs and equipment packages sustain quality operations for 20 – 30 years. For me, the full picture includes everything which impacts safe, efficient and economical shipping. Optimal vessel availability and reliability is paramount.

2. SHIPPING AND THE ENVIRONMENT

There is a lot of pressure on shipping to improve its environmental footprint and reputation. Shipowners can construct a green ship with reduced emissions, but this does have a cost impact. BW sets aside considerable resources to understand how their vessels operate and to implement tools to improve efficiency and decrease emissions. Within the next 15 years we will see considerable improvement in data transfer from ship to shore. Ships will be closely monitored from shore for optimal operation.

3. EQUIPMENT SUPPLIERS

We demand a lot from suppliers and we believe the industry benefits from companies competing against each other with similar products. We have helped suppliers enter the market and expect parts and services to remain competitive and not be over-priced. All equipment, including PCs, should ideally function for the lifespan of the vessel itself. Today, for example, one main focus is to find the best navigation package, a competitive mix of quality, price and service network. We see a real demand for improvement in this field.

technology offers to shipping.

The majority of machinery on board a ship is a combination of mechanical and electrical systems. Ships of the future will rely more on automation and electronics, and selecting and exploiting this equipment will require a new generation of technically literate management and crew.

"Up to 15% of the total ship cost is related to electrical, communication, navigation and automation. The focus on IT systems on board, communication, navigation and fuel efficiency has increased exponentially during the past 10 years. The role of a marine electrical engineer has and will become even more important in the years to come," maintains Kardash.

Kardash: Helping pilot BW towards a more efficient future.

OFFSHORE OPERATIONS

STAY CALM AND IN CONTROL, WHEREVER YOU ARE IN THE WORLD

Ocean industries demand full picture solutions to enable precision operations in remote areas and in all types of weather.

Island Drilling together with manager Odfjell Drilling are responsible for the marketing and operation of Island Innovator (pictured), as well as providing project management and supervision during preparation for operation for Lundin Norway.


KONGSBERG
HUGIN

Sometimes bigger is not necessarily better. Lundin Norway has managed to land a couple of solid punches in competition with bigger oil companies, finding major fields where the big guns have backed down. What's their secret?

LUNDIN NORWAY

A nose for oil

"We find oil where others don't believe it exists," says COO Erik Sverre Jenssen in Lundin Norway. "We have a good team of explorationists who know the Norwegian Continental Shelf (NCS) in and out, and they have the freedom to act on that knowledge."

Exploration manager Halvor Jahre echoes the philosophy: "We are responsible for finding more than half of all new resources on the NCS in recent years. That takes experience, together with new thinking, new exploration models, and new ways to use technology."

"Our first exploration manager Hans Christian Rønnevik built up a different kind of organisation based on Eastern philosophy," he continues. "It encourages the knowledge-creating company, embracing freedom of thinking and discouraging hierarchy. It's a network-based model that allows for an element of chaos, but always working toward a common goal."

The network philosophy also reaches outside the company. "We have a core of experienced staff with close relationships to the scientific community, including companies, institutions and universities," Jahre points out. "This allows us to behave like a much bigger company when it comes to trying out new ideas and technologies."

SNIFFING OUT PETROLEUM

One of the technologies they have tried is Hugin, the Autonomous Underwater Vehicle (AUV) from Kongsberg Maritime. Already listening for oil using seismic methods, and looking for it with well data, Hugin allows Lundin to employ one more of the senses to locate oil: the sense of smell.

"One of the things it does is 'sniff' for gas that seeps up to the ocean floor from underground deposits," Halvor Jahre says. "A lot of this is biogas from deterioration of organic material, but some is gas from petroleum deposits, and this adds valuable information to the overall picture."

Hugin was from the start designed to be able to serve both military and commercial customers, thus assuring accuracy and durability, but the selling point for Lundin was the flexible payload system. The standard Hugin payload suite is geared toward imaging, with an echosounder, sonar and sensors painting a vivid and detailed picture of underwater features. But Lundin geologist Harald Brunstad wanted to round out the picture in their Barents Sea exploration efforts. "Harald was seeking a holistic approach to data collection, including the water column, the seabed and shallow geology," Jahre recounts.

The eyes of Hugin have been busy in Lundin's employ as well. "We have taken over one million pictures with Hugin that we will piece together in a giant mosaic," Jahre says. "The authorities require us to do environmental mapping, but we are going one step further and providing a full data overview of the submarine surface environment. Hugin is part of a whole package of instruments and tools that allow us to do that," Jahre says.

DRILL DIFFERENTLY

Once the data is gathered and the decision to drill is made, achieving success is about more than just knowing where to drill. "The reason we have found more oil than others is our commitment to very rigorous data acquisition while drilling. It drives cost, but it gives better results," Jahre states. "Our statistics are not so good on cost per metre drilled, but when you add the barrels found, then we are doing pretty well," he smiles.

Much of that comes down to principles. "We are very adamant about taking core samples, but if we hadn't insisted on being so close to the data, we might not have made one of the most important discoveries in the history of the NCS," Jahre maintains. He refers to the Edvard Grieg discovery, which in turn led to the discovery of the giant Johan Sverdrup field, to date the fifth largest on the NCS. Jahre recalls the defining moments leading up to the Edvard Grieg breakthrough:

»

Erik Sverre Jenssen
Chief Operating Officer
Lundin Norway

Halvor Jahre
Exploration Manager
Lundin Norway

The full picture according to Lundin Norway
Lundin thinks differently. Embracing an element of 'chaos', but working clear strategic goals, the business isn't afraid to innovate, encourage freedom of thought and look for success where others fail to see opportunity. The results speak for themselves – Lundin is responsible for finding half of all new resources on the NCS in recent years.

"Our geologists were on deck when the cores came up, and we made sure they were examining core ends as they became available. They observed granite, but in rounded clast form, and that convinced us that we had not hit the basement proper. The logging tools were also giving a totally incorrect picture due to the mineral content, and showing no oil. But the geologists could see that the core matrix was porous, so they kept drilling. Now that core is part of Norwegian history!"

A SHORTER PATH TO SOLUTIONS

New thinking is one of the traits that has characterised Lundin Norway from the beginning, and it is being joined now by fast growth. "We have built up our production and operation organisations in a very short time, and we could not have done this without experienced people," says Jenssen. "We know the contractors, and we wouldn't be able to move so fast without using them in new ways. They know us too, so there is a mutual trust."

This applies to all phases of Lundin's business, not least their co-operation with the major exploration service companies, where Lundin has proven their willingness to test new technologies and share their learning. "They have come to like us," says Jenssen. "Some big oil companies will send 15 people into meetings, none of them with decision-making authority. With us they meet two or three people who know the business and are able to discuss deals."

It also helps to have owners who understand the nature of your business. "The company was built up around a strong exploration group, but we have owners with the resources and the willingness to take risks," Jenssen explains. "Remember that the start of our success came in an area that had been acquired and relinquished several times by some very respected companies, and Lundin was still willing to invest in our strategy. Without their support on this move, there would have been no Edvard Grieg, and with out that, no Johan Sverdrup."

STICKING TO THEIR GUNS

Lundin drilled the most wells of any company on the NCS in 2014, and repeated that feat in 2015, despite the fall in oil prices. "We are in a very good position right now," Jenssen reports. "We have good assets in projects that will give us the cash flow we need to move forward, and we are exploring in attractive areas. Our main strategy is organic growth, and we are not going to abandon that now."

And they intend to keep getting the most data they can out of each exploration effort. "We would rather drill one less well than sacrifice our strategy," Jahre confirms. "Testing is expensive, but it is the only way to see away from the wellbore, so we will keep testing." He gets full backing from Jenssen: "We hate to leave a well unresolved."

If you are going to succeed where others have given up, you have to bring something different to the table. "You need the right philosophy, the right data, and the right people," confirms Erik Sverre Jenssen, "and you have to be willing to use the latest technology from the petroleum researcher's workbench." One of those technologies, Kongsberg Maritime's Hugin with a nose for oil, would seem to have found its part in Lundin's recipe for success.

The Edvard Grieg platform – a reward for taking exploration risks.


Pieter Schelte

The Swiss-based Allseas Group is neatly summed up by the name of its newest vessel, Pioneering Spirit. With a belief that "if you can dream it, you can do it" the company is pushing the parameters of the possible within the dynamic offshore shipping segment.

ALLSEAS GROUP

Giant ambition

Pioneering Spirit: Getting to grips with the most challenging offshore installation and removal tasks.

Pioneering Spirit doesn't just install or remove offshore installations; it also takes your breath away.

The gigantic, double-hulled, dynamically positioned platform installation, decommissioning and pipelay vessel looks like it is straight out of a science fiction film. With vital statistics of 382m in length (477m if you include its tilting lift beam and stinger), a width of 124m, deadweight of 415,000t, and total installed power of 95,000 kW, Pioneering Spirit looms over everything else on the water with a spine-tingling sense of majesty.

Or, if you happen to be an uneconomical topside facility, replace the word majesty with dread.

OPPORTUNITY ON THE HORIZON

Built at South Korea's Daewoo yard over a four year period and inaugurated in Rotterdam this February, Pioneering Spirit is a demonstration not only of power, but also of foresight. Allseas is already a global leader in offshore pipeline installation and subsea construction and now, thanks to a combination of ageing offshore installations and weak oil prices, it will use Pioneering Spirit to consolidate its position as the go-to expert in decommissioning.

Its early success with contracts demonstrates Allseas' acumen. The vessel will perform its first decommissioning 'pincer movement' around the Yme jack-up production rig in the North Sea this year, encircling the facility in the 59m wide 'mouth' between its hulls and lifting off the 13,000 tonne topside in, if all goes according to schedule, well under a minute. In theory this should be 'easy' for a vessel with a world beating topside lift capacity of 48,000 tonnes. The fact that it can do all this without the need for jacking down the rig results not only in safer, simpler operations, but also significant cost savings for the client.

Something that, in today's volatile energy climate, will be a key selling point.

FULL PICTURE POTENTIAL

Despite the ship's colossal scale, the nature of such complex operations requires control and nimbleness that belies its bulk.

Enter Kongsberg Maritime.

KONGSBERG has been working alongside Allseas since the initiation of the project, signing a contract to deliver an advanced Class 3, fully redundant DP system back in 2008. KONGSBERG products now span the entire vessel.

"The Pioneering Spirit's multi-faceted role within installation, decommissioning and pipelay meant that it required the most comprehensive, reliable and feature rich DP and manoeuvring system available," comments Jon Fredrik Lehn-Pedersen, Vice President Drilling, OIV & IMS at Kongsberg Maritime.

"A vessel of this scale and capacity has never been built before, so we had to use all our project management experience, technological expertise and operational understanding to devise a state-of-

» the-art system that was perfectly suited to its exacting requirements.

"It's been an exciting challenge and one we've tackled using the very epitome of a Full Picture solution."

The team's integrated Dynamic Positioning and manoeuvring concept for Allseas' flagship relies on a distributed and open system design, employing a fully backed-up system-wide standardised communication network. This integrates with the K-Pos Dynamic Positioning, K-Thrust thruster control, K-Bridge Navigation and K-Chief machinery automation systems, creating a complete solution with remarkable positioning and manoeuvring capabilities – custom made for the vessel's uniquely demanding duties.

Pioneering Spirit's versatility and operational security is enhanced by two fully equipped and redundant KONGSBERG Navigation bridges - both forward and aft in the vessel, occupying separate fire zones – complete with Multi Function Displays. In addition, the K-Bridge system utilises new Radar Transceiver interface technology enabling long cable runs (500m) and is delivered with innovative features such as the ability to combine radar images from multiple radar transceivers and display them as a single composite picture. This eliminates blind spots and provides a 360-degree view around the vessel.
Talk about the Full Picture!

NEVER STAND STILL

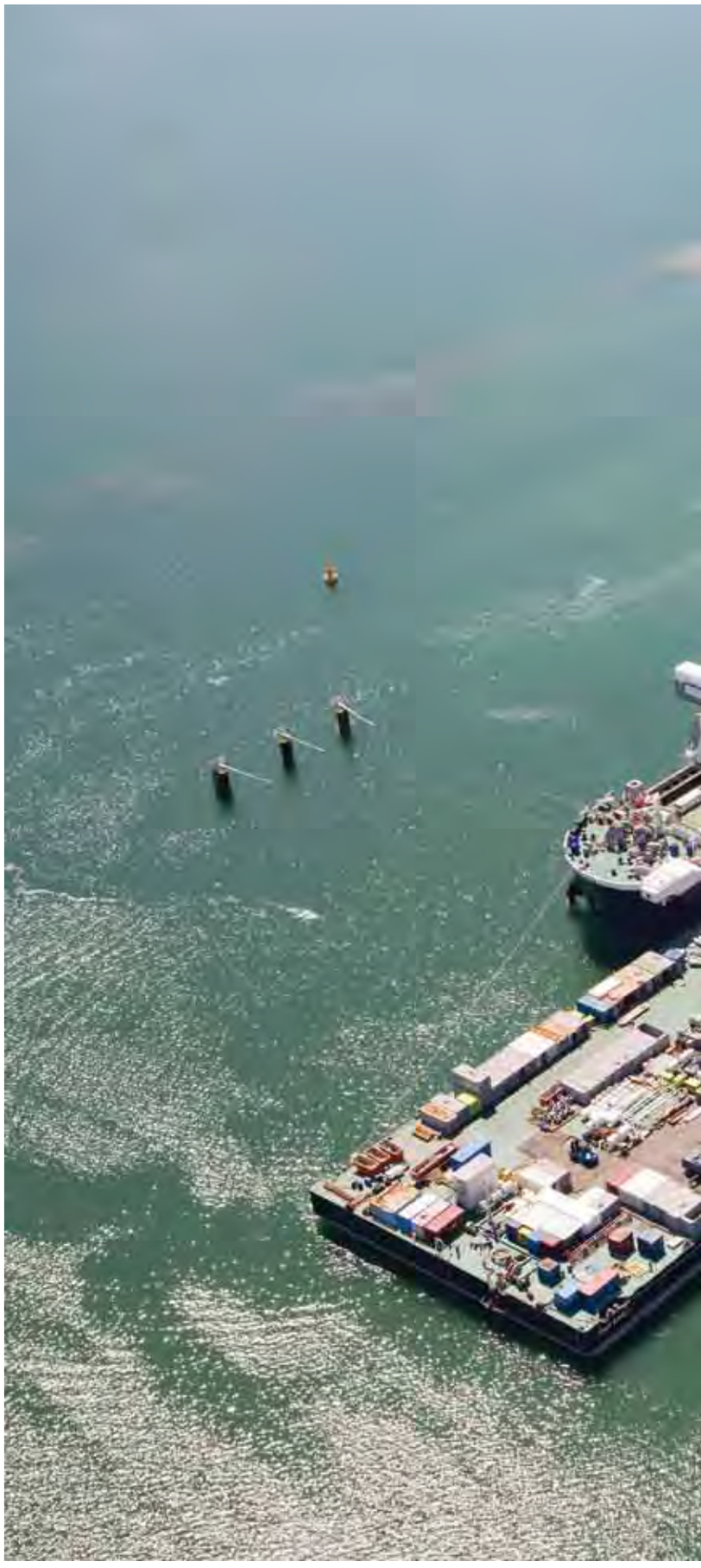
"For such a ground-breaking vessel, we needed a ground-breaking solution," explains Gerard Stenfert, Allseas E&I lead engineer. "The operational capabilities of Pioneering Spirit are enormous and thus require quality control systems that are second to none.

"The vessel will undertake complex operations, in some of the most demanding marine environments there are, so the level of trust we require in its systems is absolute.

"Allseas has a good working relationship with Kongsberg Maritime, and excellent experience of KONGSBERG technology, so the partnership was an obvious choice to help us bring this innovative new offshore concept to market."

Although, at the time of writing, Pioneering Spirit was yet to commence operations, Allseas has already shown its conviction to break fresh boundaries by announcing a new, even larger single-lift platform installation and decommissioning vessel, due for delivery in 2020. This new goliath, with a width of 160m, will boast a topside lift capacity of 72,000 tonnes, some 50% greater than that of Pioneering Spirit. This will enable it to install giant topsides worldwide, while also removing the platform topsides in the North Sea that are beyond the capability of its existing sister vessel.

If you think this all sounds like a dream, you'd be forgiven. But remember, Allseas has a habit of making dreams come true.



Giant opportunity: Awesome in scale, strength and scope – there's nothing else quite like Pioneering Spirit.

It's been a while since the latest upgrade was completed on Petrojarl Varg, but the project is still fresh in the minds of the team. Understandably, since they were all part of an effort they feared might be 'mission impossible'. Owner Teekay's challenge was for them to perform an upgrade of the tank surveillance system while the ship was in operation. Demanding to say the least, and yet everything went according to plan. Careful planning, a positive attitude, and an innovative project plan all went into achieving success.

PETROJARL VARG

From mission impossible to mission accomplished

KONGSBERG has been delivering Tank Gauging Systems for more than 25 years. From 1984 to 1997 the GL-90, the system on board Petrojarl Varg, was the standard product. But standards and technologies change, also in this field. The GL-300 was the model on Teekay's wish list. This was also at the recommendation of KONGSBERG, since vital components in the GL-90 are aging and becoming outdated. Planned upgrades are recommended in order to avoid an emergency situation where replacement parts are not available. KONGSBERG is well acquainted with upgrades, also in cooperation with other suppliers, since Tank Gauging systems often communicate with other systems. So what made this project special?

UPGRADE DURING OPERATIONS

An initial meeting between KONGSBERG and central Teekay staff was held, where the message was delivered about the big challenge. Vegar Stavrum, E&I Superintendent, Teekay, was crystal clear in his wishes: "Taking the vessel out of service is out of the question. This upgrade must take place during operations."

"I was a bit sceptical as to whether we could even do this," smiles Reidar K. Sether, project engineer at Kongsberg Maritime. "But we really had no choice. This was what the customer wanted, so we had to get busy finding solutions," he recalls. "First there were the technical challenges, then came the surrounding factors. The vessel operates under demanding conditions in the North Sea, with EX-zones (explosive gasses), and on top of that we were being given a week to perform the actual installation. There was no room for bad decisions."

"From our side we had to carry out extensive safety assessments," Stavrum explains. "Our multi-discipline team developed a detailed risk analysis that made the assessment easier for us. We would have never challenged KONGSBERG on this if we didn't think they could manage the task," he assures.

"We also had to address the necessary safety issues," he continues. "We realised early on that extensive testing would be required if the upgrade was to be carried out without complications. Communication with the FPSO's automation system was a critical point, and this was tested thoroughly on land before the installation on board. The entire system was moved to Teekay's partner MOG Automasjon in Molde for a full-scale test. The need for manual measuring in order to control the level in the tanks and the ship's stability was also identified."

Bjørn Ludvik Moen, project engineer at Kongsberg Maritime, took part in both the testing and the implementation phase. He confirms that testing was essential. Complications were uncovered and resolved, and the necessary confidence instilled to make sure that a hectic upgrade onboard would go off without a hitch.

"There was some degree of tension," Moen admits, himself looking the very picture of confidence. He took part in both project planning and implementation, and was on board while all the changes were made. Cabinets were rebuilt with the power on, operator stations were installed, and electronics were replaced on deck - all without incident. "During this phase I was probably a little more alert when the phone rang on land, but I slept well at night," Stavrum laughs.

A DIFFERENT PROJECT MODEL

In conversations between Stavrum and representatives from Kongsberg Maritime, the project model that served as the foundation for the successful upgrade project comes up often. "Involvement and empowerment are the keys," Stavrum assures. "We wanted it to be possible for the operative team to be able to contact decision makers directly," he says, adding: "In stead of a bureaucratic system with accompanying decision-making processes, we wanted to reduce the distance between the issue and the decision. This in turn demanded decisiveness from all those involved." Project manager Ina Elisabeth Sandneseng of Kongsberg Maritime nods in agreement. "We really valued the commitment and involvement. We got to learn a lot about the vessel and we were involved throughout the entire process, and issues and uncertainty were identified and resolved quickly. I feel certain that the project time was reduced and the quality of work improved as a result," she concludes.

"We wanted two-way communication the whole way," Stavrum explains. "We have faith in the effect of this in Teekay. Not all companies are suited to this model, but KONGSBERG was a good partner. The assertiveness and competence in both parties was a good match, even though we did have our discussions. But when all is said and done, I believe we all agree that we would not hesitate to take on another live upgrade," he concludes. "It really did go very well."

Collaborating for success: Vegar Stavrum and Reidar K. Sether.

FACTS ABOUT PETROJARL VARG

Petrojarl Varg is a turret moored, floating production, storage and offloading vessel (FPSO). The ship is equipped with processing facilities for oil production, gas injection and water injection. Petrojarl Varg is part of the production solution on the Varg field in the central North Sea. Talisman Energy Norge AS is the operator on the field.

- **ACCOMMODATION:** 77 people
- **LENGTH:** 214 meters
- **STORAGE CAPACITY:** 470,000 bbls
- **OIL PRODUCTION:** 57,000 bopd
- **IMO:** 8763309
- **GROSS TONNAGE:** 52296
- **BUILD:** 1998
- **FLAG:** Bahamas

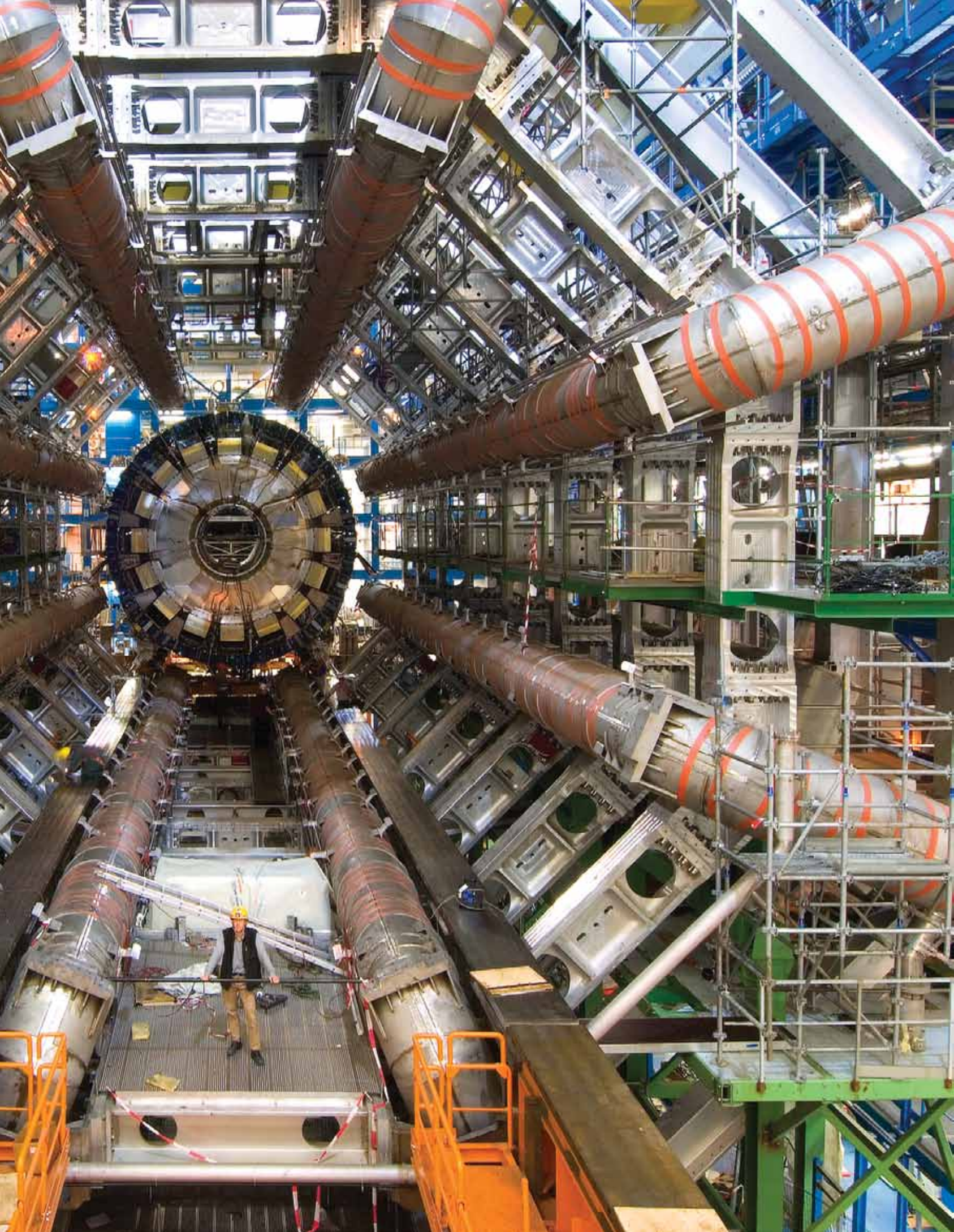
KONGSBERG AND THE UPGRADE OF PETROJARL VARG

The existing analog level and temperature transmitters from the old GL-90 system were replaced by new digital GL-300 components. The mechanical installation of the radar level gauges and temperature sensors were kept, so only electronics needed to be replaced, and there was no need to open any tanks.

The existing system cabinet was rebuilt. All I/O units, processing and communication modules were upgraded to modern GL-300 and K-Chief 700 units. A new touch screen operator station was installed in the cabinet door.

A new operator station with K-load loading computer was also installed.

FEATURE STORY



From providing the Full Picture of maritime technology to discovering the full picture about the existence of everything, Kongsberg Maritime visits CERN to see how the LHC plans to fling open the doors of understanding and shed light on the universe's darkest secrets.

THE LARGE HADRON COLLIDER

Smashing science

Dr Sudarshan Paramesvaran
CERN

Dr Christoph Schäfer
CERN

CERN: European Organization for Nuclear Research
Founded: 1954
Member states: 21
Annual budget (2014): CHF 1billion (c. EUR 970million)
Staff: 2,531 full time, 800 contractors, 587 fellows and apprentices and 11,726 'users'
Did you know? The World Wide Web was invented by Tim Berners-Lee, a British scientist at CERN, in 1989 with the purpose of sharing information between universities and institutes around the world.

Did the earth move for you?

When the Big Bang is taking place directly beneath your feet, over and over again, you may expect to feel something. But at the headquarters of CERN, the European Organization for Nuclear Research, there isn't even a ripple in the scientists' coffee cups.

It's calm, controlled… and entirely deceptive.

The 14,000 people who work here are well aware that reverberations *will* follow.

And, when they do, they'll have the power to deconstruct the universe.

THINK BIG

CERN's somewhat nondescript facilities, near Geneva on the French-Swiss border, hide a colossal secret.

Buried around 100m underneath them lies the world's largest machine - the Large Hadron Collider (LHC) particle accelerator.

With a circumference of some 27km, a construction cost of EUR 6.5billion and an operating temperature of -271.3°C, colder than interstellar space, everything about the LHC inspires awe.

Built over ten years, with the backing of CERN's 21 member states, the collider is currently beginning its second run after a two-year programme of upgrades. This will see it operate at full power for the first time, whipping beams of protons up to the speed of light using superconducting magnets, before smashing them head-on into one another with a force of 13 trillion electron volts (TeV). Or, to put that into perspective, enough energy to melt a tonne of copper on impact.

The result is simply put, subterranean 'Big Bangs', which recreate the conditions experienced a trillionth of a second after the birth of the universe; unleashing miniscule fireballs, massive temperatures and a treasure trove of subatomic particles. Data on these is captured by four enormous particle detectors, using 150 million sensors, for a multinational team of scientists to sift through.

Their goal? Finding the keys to unlock the universe. It's an astonishing endeavour, on a unique scale. It simply doesn't get any bigger than this.

BUT … WHY?

Standing among CERN's scattered buildings and army of engineers and physicists it's easy to understand the scale of these experiments. The science »

Accelerating science: A tiny part of the LHC's 27km long ring of superconducting magnets, where particles are whipped up to the speed of light. Photo: Maximilien Brice

» itself is a little harder.

That's why The Full Picture is talking to Dr Christoph Schäfer, a veteran of some 20 years at the organisation.

Schäfer, as with so many at CERN, arrived from his homeland (in his case Germany) on a temporary basis and ended up falling in love with a community and environment alive with a passion for discovery, where everyone, regardless of nationality, is fluent in "the language of science."

Thankfully for us, he opts for English to try and explain the LHC's importance.

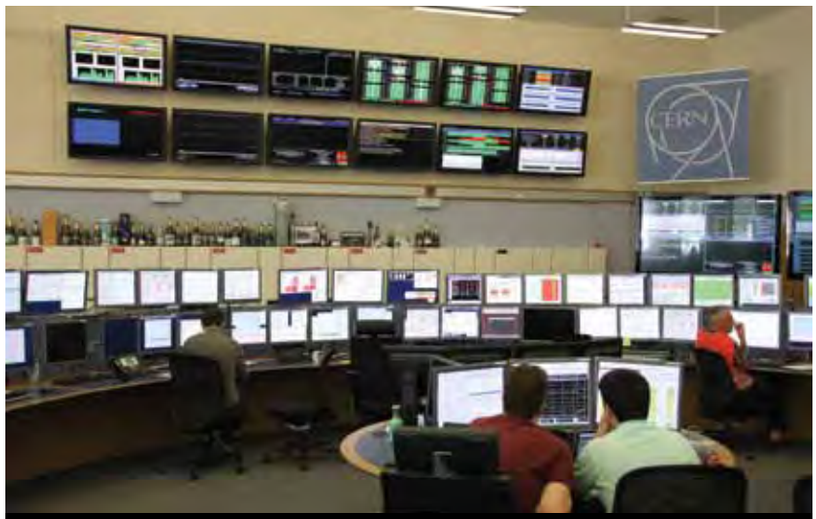
"Every day we wake up here with the possibility of discovering something completely new or unexpected," he states, adding, "That's the beauty of fundamental research."

Fundamental research is different, Schäfer clarifies, from applied research, which is what usually occurs in industry.

"With applied research you know the result, or at least what you want to achieve," he notes, "such as a more environmentally friendly car, a faster plane, a flatter TV set etc. That's good for industry as it's efficient, but you're constrained by your imagination.

"With fundamental research, the very essence of CERN, we do not know the result, we just have to observe. But while observing we can discover something that is *beyond* our imagination, something completely new.

"That is the only way for mankind to take a big leap forward, to make discoveries and begin to really understand the full picture."



LHC FACT FILE

- What: The world's largest and most powerful particle accelerator – a 27km ring of superconducting magnets.
- Why: To unravel the universe and discover what it's made of.
- Where: Buried at a mean depth of 100m below the ground on the Swiss-French border.
- Construction cost: c. EUR 6.5billion.
- Energy use: 120 MW, roughly the same as that of the combined households within the state (Canton) of Geneva.
- Start date: 10 September 2008.
- The second run: The first beams in the second run circulated the LHC on 5 April, the first low intensity collisions took place at the end of that month.
- Closure date: 2035.
- Experiments/particle detectors: ATLAS, CMS, ALICE, LHCb, LHCf, TOTEM and MoEDAL.
- What is a 'hadron': A subatomic, composite particle, such as protons or ions.

FROM DARKNESS TO LIGHT?

At the moment that picture is far from full. In fact, mankind only understands what constitutes a fraction of the universe.

Our knowledge is based on something particle physicists call the Standard Model, which provides a picture of the particles that we know make up the universe and the forces that act upon them. In 2012, scientists working at the LHC discovered a missing part of the equation that was needed for the Standard Model to work, when data from collisions revealed a new, long-theorized particle called the Higgs boson (necessary to give matter mass). This discovery was significant enough to win the two physicists that postulated it, back in 1964, a long-awaited Nobel Prize for physics.

So far, so good. But there's a problem. A big one.

The Standard Model only explains about 5% of the universe. So what about the rest?

Enter the new run of the LHC, commencing now.

"There's no easy target with this second run of the LHC (the machine shut down for refurbishments in 2013 after three years in operation). In the first run we were searching for the Higgs, as theoretically we knew it existed, even if it hadn't been discovered. Now we don't know what we're going to discover, but we do have theories," Schäfer explains.

Those theories tend to congregate on the alluring prospect of shedding light on dark matter, which is thought to make up around 27% of everything within the universe that has yet to be observed (dark energy, a cosmic phenomena, is believed to account for the remaining 68%). A principle called super-symmetry, whereby the particles we can see have heavier partners that we can't, seems to be the favoured way of explaining dark matter and it's this,

the buzz around CERN suggests, that the new LHC experiments may be able to reveal for the very first time.

But again, this brings us back to the question, why? If the LHC's massive underground detectors pinpoint dark matter, what does it mean? How will mankind actually benefit?

Dr Sudarshan Paramesvaran, a British particle physicist working in the control centre of CMS, one of the LHC's four detectors, attempts to provide an answer.

"When you're pushing boundaries to make new discoveries you can't possibly know what the benefits will be," he argues. "First you have to find things, then you understand them, then you find applications.

"Look at the discovery of the electron for example (in 1897), the benefits at the time might have been impossible to understand, but now the whole world is run on electronics. That's a direct result.

"What will we find here? New ways of making clean energy, or managing our planet? Who knows, but we do know that it has the potential to move the world forwards, and if we still want to explore and discover then we can't stand still.

"This," he says, with characteristic CERN passion, "is a path to enlightenment."

ENGINEERING BEYOND IMAGINATION

To access those hidden realms of the universe the LHC needs to operate at full power; as the more power in the beams, the larger the collisions, the smaller the subatomic debris produced and, potentially, the greater the discoveries.

In its first run, the accelerator managed to achieve a maximum energy of 8 trillion electron volts (TeV) before shutting down for refurbishment. Now, two years later, the target is 13 TeV (6.5 TeV in each beam), moving up to its designed threshold of 14 TeV in 2016.

This staggering leap in energy could only be achieved with a comparably enormous engineering effort, headed by CERN's 1,033 full time engineers and scientists and 885 technicians. Together they put in well over one million man-hours on a renewal that's been likened to 'taking a ship into port and changing every single plank.'

All of the LHC's 1,232 15m long and 35 tonne superconducting magnets were surveyed – 18 were replaced - protection systems were added, and the roughly 10,000 electrical interconnections between them consolidated. The cryogenic, vacuum and elec-

»

Over one million man hours were used upgrading the LHC for its new run.
Photo: Anna Pantelia

"Fundamental research is the only way for mankind to take a big leap forward, to make discoveries and begin to really understand the full picture."

Dr Christoph Schäfer
CERN

tronics systems were also improved and strengthened.

Lasse Normann, a trained electronics engineer from Narvik in Norway, and CERN stalwart of three decades, explains that the beams have also been configured to produce more collisions – increasing the probability of making new discoveries.

"This will," he says, with the air of someone struggling to believe his own words, "produce 900 million collisions per second when the beams are running at full intensity. That's a lot of physics, producing a lot of data."

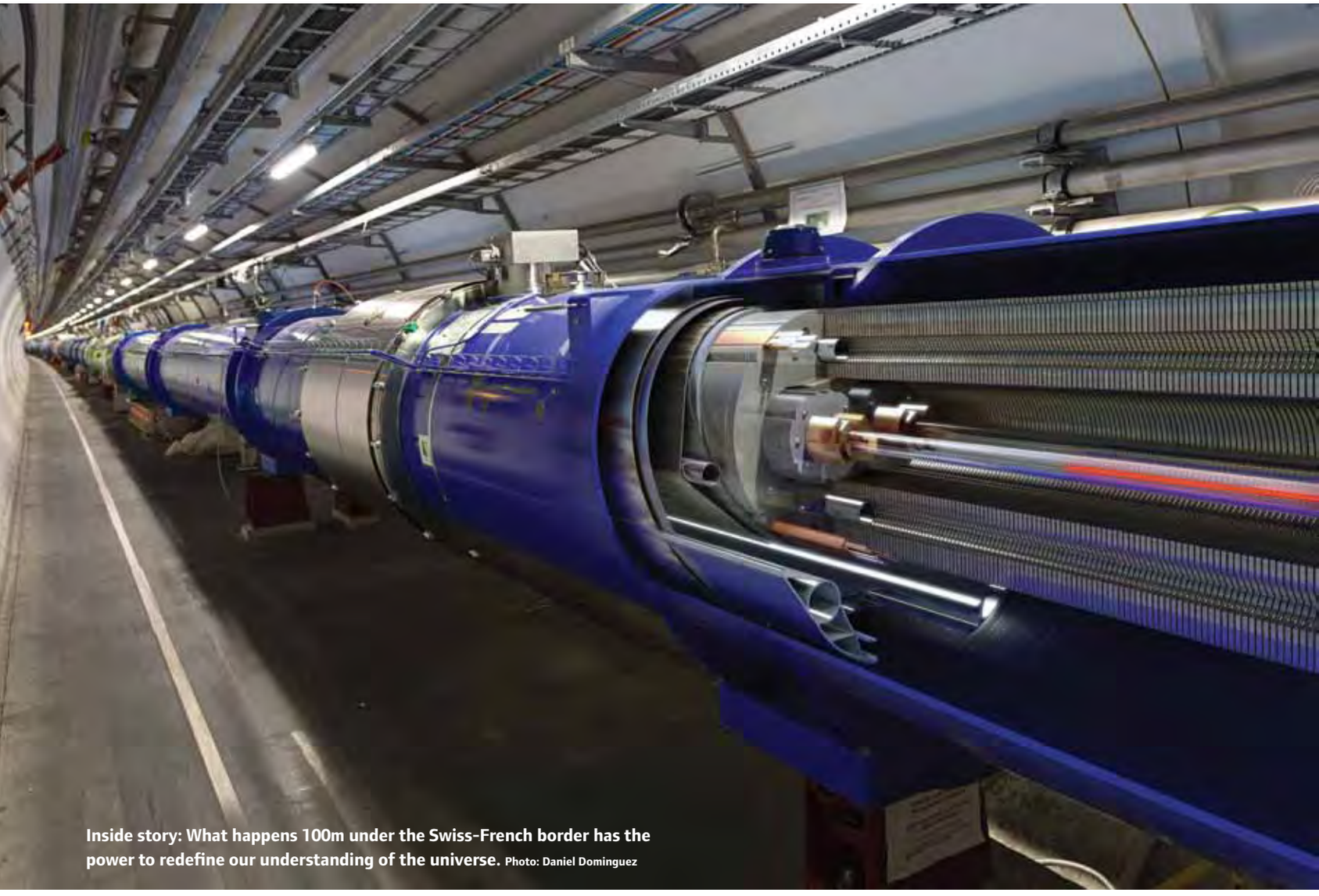
Normann, as with his colleagues, admits to being nervous about the restart – not because of a lack of faith in the robust nature and quality of the work, but rather due to a natural sense of caution related to such a complex operation.

"This is an enormous, complicated machine, and one that the eyes of the world are trained upon," he says. "It takes months to actually start it up, and we've been waiting two years to do so, so it's naturally tense, but also incredibly exciting."

The budget behind the LHC refit – an eye watering EUR 100million – probably won't do anything to alleviate that tension.

"There's no easy target with this second run of the LHC … We don't know what we're going to discover, but we do have theories"

Dr Christoph Schäfer
CERN



Inside story: What happens 100m under the Swiss-French border has the power to redefine our understanding of the universe. Photo: Daniel Dominguez

UNITED IN DISCOVERY

But are the money, the man-hours and the resources really important?

CERN's 2,500 staff, 800 contractors and over 11,000 'users' (basically visiting scientists) from more than 100 countries worldwide would argue 'no'.

It's the passion and the potential that binds them together and drives them on, not the numbers. In the end the biggest thing about the LHC isn't its colossal scale, or the investment, but the power of this raw human ambition.

These people are, more than anyone else, determined to provide mankind with the full picture. When they do that they really will make a big bang impact … one that'll move every one of us.

"This is an enormous, complicated machine, and one that the eyes of the world are trained upon…so it's naturally tense, but also incredibly exciting."

Dr Sudarshan Paramesvaran
CERN

MAGNETS AND BEAMS

- Accelerators need magnets, lots of them, as the particles travelling through them are charged.
- The LHC has around 9,600, which are used to optimise the trajectory of the beam.
- 1,232 of these are dipole magnets, each of which is 15m long and 35 tonnes in weight. These bend the beams.
- 392 quadrupole magnets, 5-7m in length, focus the beams.
- Together they whip the beams up to 99.9999991% the speed of light.
- A proton can complete 11,245 27km laps of the LHC in a second.
- Beams can circulate the LHC for 10 hours, travelling more than 10 billion kilometres – enough to get to Neptune and back.

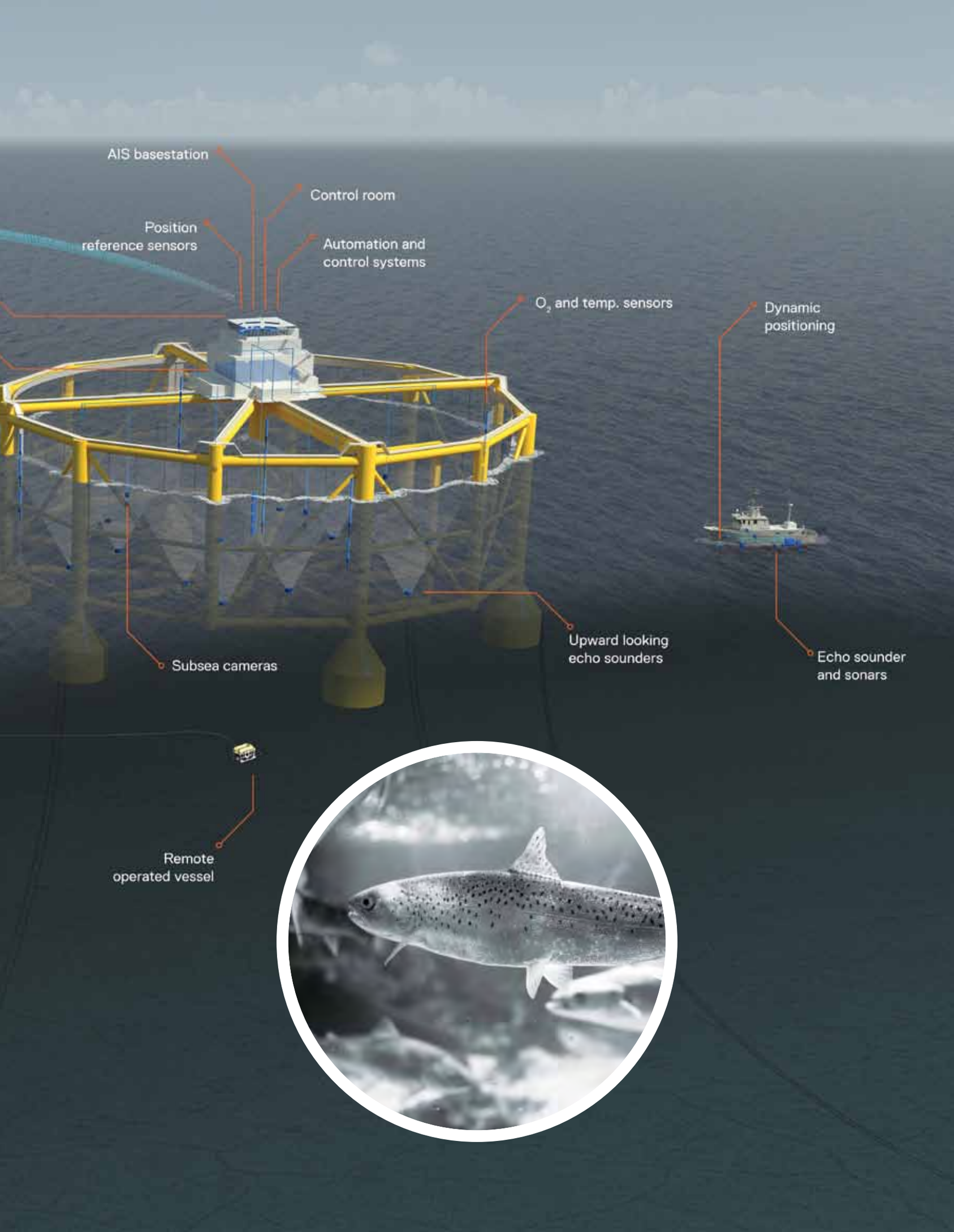
ON THE BRINK OF A NEW TOMORROW

Over two thirds of the planet is covered by oceans. Within that water lies a wealth of resources that can help sustain a growing global population. There is huge opportunity, but also considerable risk.

Fragile ecosystems, challenging environments and the need to establish safe, efficient operations that protect not just workers, but also wider society, are all issues that must be addressed.

By adopting high-tech, reliable and secure solutions our Ocean Industries can start to realise this vast potential in a responsible, sustainable manner.

Driven by determination, enabled by innovation – a new world is waiting for them …


AIS basestation
Control room
Position reference sensors
Automation and control systems
O_2 and temp. sensors
Dynamic positioning
Subsea cameras
Upward looking echo sounders
Echo sounder and sonars
Remote operated vessel

OCEAN FARMING

Offshore fish farming: Food for thought


C1

Gunnar Myrebøe
COB, Ocean Farming

The full picture according to Ocean Farming
For the future of mankind, we need to look out to sea. Ocean Farming believes we can't see the full picture if we focus food production efforts on land. Only 2% of the world's caloric intake currently comes from the oceans. By embracing new offshore solutions we can satisfy the hunger of billions more mouths.

With a growing population and dwindling availability of arable land mass the world needs to solve the food production challenge. Ocean Farming believes the answer might just lie offshore …

The world is hungry for innovation in food production. By the year 2050 it is estimated that there will be 2.3 billion more mouths to feed, requiring a leap in production levels of some 70% compared to the present day. Satisfying that demand requires a fundamental step change, but which way can society turn?

Gunnar Myrebøe thinks it's time to look to the ocean.

Myrebøe, a veteran of the energy industry with Norwegian firm Statoil, is COB at Ocean Farming, a subsidiary of SalMar ASA. Ocean Farming was set up three years ago by Gustav Witzøe, the founder and principal owner of SalMar, in response to the increasing need for fish protein and nutrition. The firm has hit upon a big solution for this big issue, combining technology from the fishery, fish farming and offshore industries for a project that has the potential to revolutionise the aquaculture industry.

PILOTING THE FUTURE

"Fish are some of the last living creatures we still hunt in large quantities in the wild," states Myrebøe, adding: "We have to change the way we think about fishing and make use of new ocean territories in order to meet future demand for nutrients and feed a growing world population. According to the Food and Agricultural Organization of the United Nations, the production of seafood has to increase, primarily through aquaculture."

There's nothing new about aquaculture, but there is about Ocean Farming's vision. The firm is awaiting construction of a full-scale pilot project that is unlike anything the industry has ever seen. Large enough to fit an entire offshore platform inside, with the capacity to raise 1.5 million fish annually, and moored far from land in an exposed environment, its submerged ocean fish farm would be science fiction, if it wasn't very soon to be science fact.

"We hope to start operating in 2017, provided we get the necessary concessions," Myrebøe reveals. He describes the project as "an enormous research facility," where the initial focus will be on ensuring "the proper functioning and stability of the facility, and to maintain the welfare of the fish." The data it collects will be crucial in underpinning the further development of ocean fish farms.

THE BEST OF BOTH WORLDS

Myrebøe depicts the company's ocean fish farm as a submerged/floating facility designed much like an offshore rig, secured by anchors and tethered at depths of between 100 and 300 metres. Global Maritime AS has performed the technical design and engineering, with MARINTEK involved in a basin model test to ensure suitable behaviour in harsh weather conditions. DNV GL was brought in to verify design work through an independent review process.

KONGSBERG was selected for the project due to the strength of its unique combination of experience as a supplier to the maritime, offshore and fishery industries. Systems from KONGSBERG will include sensors and echo sounders for real-time visualisation of fish »

"We have to change the way we think about fishing and make use of new ocean territories in order to meet future demand for nutrients and feed a growing world population."

Gunnar Myrebøe
COB, Ocean Farming

distribution in order to monitor such factors as fish biomass, position and escape.

Communication systems for data transfer to shore, automation and navigation systems, project management and EIT will also be provided as part of the firm's integrated 'Full Picture' solution.

"All of the key suppliers involved in the fish farm are driven by tremendous enthusiasm and a sense of prestige, which are the best control parameters in my opinion. We searched for suppliers who were the best equipped to drive the project, and who would be able to provide the technology needed to run this facility in the future. KONGSBERG has a proven record as a supplier to the offshore oil industry and is recognised for high image quality in its subsea products. Among other things, we use sensors from KONGSBERG to measure the size of the fish to determine which are ready to be harvested," explains Myrebøe.

A FARM ON THE FISH'S TERMS

Critics have voiced concerns about environmental and health issues related to fish farming, and the industry is working hard to resolve these issues. For instance, placing the facility offshore gives biological conditions more suitable for aquaculture on the 'fish's terms'. Running a successful offshore fish farm is dependent on finding locations with a natural supply of fresh water, such as Frohavet, where the Gulf Stream passes through. The pilot will be located here, and despite waves of up to 8-10 metres, the huge facility is designed to remain completely stable.

"One of the challenges when a fish farm is placed in a fjord is that the tide washes the same water in and out around the facility," Myrebøe relays. "This causes problems with lice, since the same population of lice is simply flushed back and forth. In an offshore facility placed in the ideal location, the water passes through the cage and washes away lice and other pollutants, giving the fauna a habitat as close to natural as possible."

Although lice are a natural part of ocean fauna, they can be damaging to fish in large quantities. With this in mind, other methods are also being tested to avoid infestation.

"By releasing larger smolt into the facility, the risk of contracting disease is reduced along with the life cycle. Another technique we use is to feed the fish 10 metres below sea level, forcing them to submerge. This reduces the risk of catching lice, since lice live close to the surface. It is also important to place the farms so that water from one facility does not wash into other nearby facilities," Myrebøe states.

FULLY AUTOMATED

All farming operations can be managed either on board or remotely, minimising the use of service vessels and outside equipment, and thus making the entire facility more environmentally friendly. This means the fish can stay inside the net from initial stocking through to the point where they are harvested. The facility can also be divided into three separate compartments if needed, enabling various parallel operations.

The net is fixed to the structure and is specially designed to pre-

FISH FARMING FACTS

- **DIAMETER:** 110 M
- **HEIGHT:** 67 M
- **VOLUME:** 245,000 M3
- **SALMON:** >6,000 TONNES

vent fish from escaping. In addition there is an extra net in the surface zone to protect against drifting matter. Regular cleaning of the nets is accomplished through the use of automated spray nozzles. Since the facility is fully automated, heavier manual operations are avoided, and a crew of only two to four can run the entire facility.

"There has been a lot of interest in working on the farm," Myrebøe divulges. "We are aiming to have three people on board at all times, combining competence in biology, electro and instrumentation. The staff will be trained much like offshore staff, including emergency preparedness courses."

LOW OPERATIONAL COSTS

While a comparable fish farming facility today has a price tag of approximately NOK 50 million, an ocean farming facility will have a significantly higher investment cost, raising questions of profitability. However, since operational costs are expected to be lower than traditional fish farming facilities, offshore farms may prove to be more profitable in the long run.

Myrebøe explains more: "If the fish are doing well, they will grow faster, meaning larger fish at harvest. Using more advanced surveying systems to monitor the fish and the environment on the fish farm will also help control costs. In addition, operational costs are lower since most processes are automated and only three people are required to operate the facility. Maintenance costs are also lower, as maintenance work can be completed faster. The rig will be deballasted out of the water to facilitate inspection by experts. The entire operation can be completed in just one week."

SUSTAINABLE RESOURCES

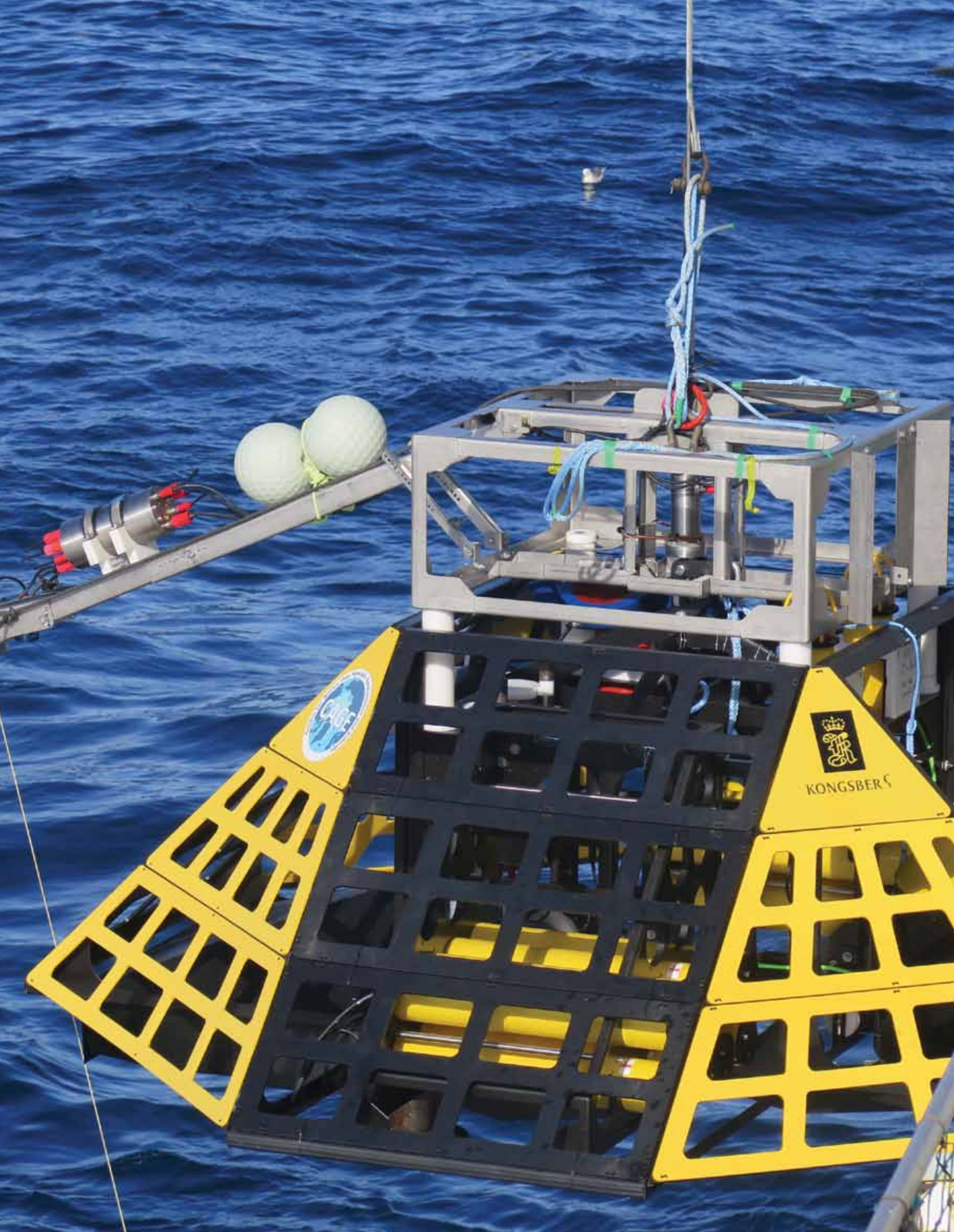
There is little doubt that this enormous construction, if put into operation, has the capacity to streamline the future of the fishery industry. The world needs more fish protein, and with the enormous resources that Norway's long coastline offers, it is expected to take a leading role.

"It is important for the future of the world population that this project succeed, and I don't see why it shouldn't," Myrebøe concludes.

"The world's oceans represent more than half the earth's biological diversity, and fishery is incredibly sustainable, but only 2% of our caloric intake comes from the oceans. This makes the sea an obvious resource for feeding more people. The Norwegian government has set a goal to increase fish production from one million to five million tonnes by 2050. If we are to meet this goal, it's time to start thinking differently and put those intentions into action."

"It is important for the future of the world population that this project succeed, and I don't see why it shouldn't."

Gunnar Myrebøe
COB, Ocean Farming


KONGSBERG

There are three things that are fundamental for the future of research: creativity, ideas and technology. The CAGE Centre for Arctic Gas Hydrate, Environment and Climate leads the way in all three, as it sets out to uncover the secrets of 'the ice that burns'.

CAGE

Chasing the ice that burns

At the northernmost university in the world, surrounded by nothing but ice-capped mountains and vast stretches of ocean, sits a research centre that leads the way within its field. The CAGE Centre for Arctic Gas Hydrate, Environment and Climate is located in the city of Tromsø, the Arctic capital. Its presence here is anything but coincidence. Tromsø's UiT is a renowned institution, with an excellent Geology department, while the Arctic is a natural home for studying gas hydrates, which are common in the region's icy waters.

Jürgen Mienert, director of the CAGE centre, explains: "Gas exists naturally in the ocean floor, and is stored in the form of hydrates in continental margins worldwide, where there is high pressure and low temperature. Their prevalence is therefore particularly high in the Arctic region, and Tromsø offers the perfect starting point for this type of research."

DUAL MEANING, SINGULAR PURPOSE

The CAGE acronym has two meanings. In addition to being an abbreviated name for the centre itself, it also refers to how methane molecules form a network of water molecules in the shape of a cage. These ice-like crystalline solids of water molecules encaging gas molecules, are often referred to as 'the ice that burns'. This is because when heated, the water drips while the gas hydrates burn.

This cage of molecules is what Jürgen Mienert and his team study in order to understand how methane gas is released from the sea floor, how it is transferred into the atmosphere, and how this impacts upon our environment.

"Our goal is to discover the connection between the large quantity of gas hydrates in the Arctic region and climate change. Methane is many times more aggressive than CO2, and is therefore considered an environmental hazard. We want to understand the dynamics of the gas hydrate system, both when it comes to quantity and its reactions to pressure and temperature. Our research therefore covers both subsea reservoirs on the sea floor and in the ocean within Arctic regions," Mienert says.

RESOURCE AND HAZARD

While it has been established that methane released from hydrates will accelerate climate change, because it is a major greenhouse gas, gas hydrates have another, perhaps less well-known function – as a potential unconventional energy resource for the future. This is another field of research that should not be confused with studies of its environmental impact.

"While other fields of study concentrate on the possibility of using methane gas as an energy source, CAGE is unique in that it focuses solely on the environmental and climate aspect of gas hydrates. This is the first time that research has been conducted on the entire methane emission system, from the seabed and into the atmosphere. We have discovered that bacteria eats the methane gas, which is something that can stop its release into the atmosphere," explains Mienert.

THE FULL PICTURE ACCORDING TO CAGE
Researchers and industry need to embrace the full picture together. By discussing the technologies they require researchers can be a catalyst for new industrial innovations. In turn, industry can benefit from research results. Collaboration, rather than working in isolation, facilitates new understanding, technology and opportunity.

Photo: Torger Grytå

Jürgen Mienert
Director, CAGE

"The industry can develop systems that are useful for research, and our research may in turn be interesting for industry, so this is a win-win situation."

Jürgen Mienert
Director, CAGE

NORWEGIAN CENTRE OF EXCELLENCE

CAGE is staffed by a team of 50 scientists, conducting cross-disciplinary research in a variety of projects. The importance of this field of research is so significant that the centre has been granted status as a Norwegian Centre of Excellence. Few research teams in Norway can boast this prestigious title. Out of the 139 research groups that submitted applications in 2012, only 29 made it through to a short-listed decision round, with just 13 passing a final test based on both the scientific merit of ongoing and planned research activities and the quality of their personnel. Other factors that were assessed included the added value of creating a centre, national and international cooperation, and environmental impact. The CAGE centre has it all.

"Our researchers are the best in the country within their respective fields," Mienert states. "We also collaborate closely with other research institutions in Europe, Russia and North America, something which contributes to making our centre and research visible both nationally and internationally."

THE IMPORTANCE OF TECHNOLOGY

As a Norwegian Centre of Excellence, CAGE receives 140 MNOK of support from the Research Council of Norway over a period of 10 years. A part of this award covers the acquisition of the technology that is necessary to complete the project.

"Research without technology will not function in the future. In my opinion, the three most important criteria for conducting research are: ideas, creativity and technology. There should be more conversations with relevant industries to establish which types of technology we need. In this way, research communities can be a driver for technological development. The industry can develop systems that are useful for research, and our research may in turn be interesting for industry, so this is a win-win situation," Mienert notes, while also underlining that the CAGE centre is engaged in basic research, which is not industry specific.

"Our goal is not to serve certain industries, but to conduct basic research within our field. This is not to say that our findings can't be useful in some ways.

KONGSBERG SIGNING: Anna Silyakova, Benedicte Ferre, Jürgen Mienert and Arild Brevik.
Photo: Maja Sojtaric

For example, it is useful for certain parts of industry to know the location of gas hydrates," he says.

Ocean observatories

In October 2014, CAGE signed a contract with Kongsberg Maritime for the delivery of two ocean observatories. The observatories are unique, constructed especially for this project, and contain a range of sensors to serve the purpose of the research team. They will be paramount to conducting this innovative type of research.

"The observatories from KONGSBERG will be used by the team researching water columns and how gas hydrate emissions change the chemistry of the sea," Mienert explains, before adding: "More specifically, we want to find out how much methane is released and how this impacts upon the atmosphere. In order to understand this dynamic, we need to stay in the same place for a period of several months, maybe even years. The ocean observatories will stay on the sea floor for a period of 12 months collecting data. This data can be sent to the surface while they undertake their on-going tasks."

Using the university's own research vessel, Helmer Hansen, the CAGE researchers go on month long expeditions exploring areas from the Kara Sea to the Barents Sea, which form part of the Arctic waters to the north of Norway and Siberia. These seas provide optimal conditions.

"In addition to providing the right temperature for containing methane gas, the Arctic areas are interesting with regards to ocean currents and depths. These areas contain large stretches of gas emissions that are interesting for our research," says Mienert.

Unique constructions

The observatories were successfully tested in March 2015, before being deployed off the coast of Svalbard in June 2015. They are self-contained, advanced autonomous sensor systems boasting a range of integrated sensors. During their year-long stay on the sea floor, the observatories will be powered by battery packages, capable of wirelessly keeping contact with the surface through Kongsberg Maritime developed acoustic communication technology.

"The ocean observatories from KONGSBERG consist of a range of different sensors, measuring such factors as water mass, oxygen, CO2, pH, current bubbles in the water columns, climate on the sea floor and even sound. These observatories are unique and have never been produced before. We needed a partner that was at the vanguard of technological developments, and KONGSBERG provided the right set of expertise with its extensive knowledge of the maritime industry," Mienert comments.

FUTURE OPTIMISM

The CAGE research project is still in its early stages, and it may take years of research within several different disciplines to achieve results. While environmental research often paints a dark picture of our future and potential hazards, Mienert is optimistic.

"We need to place our research in a historical perspective, and the world has already lived through several environmental catastrophes," he says, concluding: "The oceans contain vast, unused possibilities, and with the increase in the world population, we might need to look to them for resources. Our research will hopefully be a resource for the future, and we might get a little closer to understanding the full picture of how environmental factors function together."

For the first time ever, Kongsberg Maritime was present at the world's largest aquaculture exhibition, Aqua Nor, held in Trondheim in August.

Kongsberg Maritime presents The Full Picture for aquaculture at Aqua Nor 2015

Represented by staff from various business units and departments, Kongsberg Maritime showcased its vast variety of products designed for the future of fishery and aquaculture. The show marked the first time that Kongsberg Maritime has displayed its complete product line for aquaculture, and the concept generated significant interest.

"Aquaculture is one of the main focus areas for Kongsberg Maritime going forward, so this was the right time for us to attend Aqua Nor," explained Thor Hukkelås, in charge of coordinating aquaculture offerings in Kongsberg Maritime.

"Only 2% of the world's food production comes from the ocean, and only 2% of this is from Norwegian aquaculture, so there is a huge potential for increased production of seafood along the Norwegian coast. Using our long coastline and offshore ocean areas to produce healthy food for the world's growing population is surely one of the most meaningful activities that we can be involved in," said Hukkelås.

BASED ON PROVEN TECHNOLOGY

As a partner in the newly established SFI Exposed Aquaculture Operations, managed by the research organisation SINTEF, Kongsberg Maritime can provide a range of various systems for aquaculture, such as different types of sensors and echo sounders for real time visualization of fish distribution, allowing for monitoring of such factors as fish behaviour, size distribution, activity levels and position. Kongsberg Maritime also offers several other systems for fish farms, such as automation, navigation and communication systems for data transfer to shore.

"None of these products are new in our portfolio. They are all based on technology proven over decades. The challenge is to integrate these systems, gather vast amounts of data from a large number of different subsea sensors, and present the data to the human operator in a meaningful and intuitive way," Hukkelås comments.

INCREASING DEMAND FOR FOOD

Minister of Fisheries Elisabeth Aspaker gave the opening address at the exhibition, focusing on the growing world population and the increasing need for sustainable food production such as fishery and seafood.

"We live in a world in dramatic change. While our climate is shifting, world population is increasing by the day. By 2050 there will be 9 billion people on earth. The demand for clean and affordable energy will surge, and according to the Food and Agriculture Organization, food demand will increase by a staggering 100%. Feeding a growing world population is one of the major challenges facing the global community today, and fish and seafood are a crucial part of the solution," said Aspaker.

"The potential for sustainable growth and wealth creation within fisheries and aquaculture is great. Yet, at the same time the industry is faced with challenges related to sustainability and green growth. The good news is that we have more and more examples showing that marine sectors such as fisheries and aquaculture can be managed in a way that meets the three dimensions of sustainability: environmental, social and economic," Aspaker concluded.

AQUA NOR FACTS

- Aqua Nor was established in 1979.
- The show is held biennially in Trondheim, Norway.
- It is the world's largest exhibition for aquaculture.
- Presenting technology, processes and services related to the farming of salmon and other marine species, shellfish, and more.
- This year's show attracted a record number of 20848 visitors from 76 countries.
- There were 550 exhibitors from 27 countries at Aqua Nor 2015.

During a visit to Kongsberg Maritime in Horten, Norwegian Minister of Fisheries Elisabeth Aspaker expressed great enthusiasm for the prospects of offshore fish farming facilities.

Norwegian Minister of Fisheries welcomes offshore fish farming

From left: Hege Skryseth, Group EVP and Chief Administrative Officer in KONGSBERG, Finn-Øyvind Langfjell, Mayor of Horten, Elisabeth Aspaker, Norwegian Minister of Fisheries.

The Minister was presented with the offshore fish farming project of Ocean Farming, including Kongsberg Maritime's contribution to this innovation.

"First and foremost, I am very proud that we have companies such as KONGSBERG in Norway. They are great suppliers to the fisheries industry, one of the most important industries in Norway. I think that if we are to develop fisheries further, we need suppliers that break down barriers and develop new technology enabling us to harvest from the ocean into the future," Aspaker commented.

The Minister considers offshore fish farms a vital development in order to reach future goals for fisheries and make better use of the recourses of the ocean.

"This development is crucial. If we are to achieve our ambition of increasing salmon production in Norway fivefold in the next 35 years, we need to take new and greater leaps forward. Developing new offshore production platforms for salmon farming and making use of areas further away from the coast is definitely part of the answer to reaching this goal. We are dependent on the success of this type of technological development, and I am very optimistic when I hear that in two to three years, we might be able to see the first offshore fish farm on the Norwegian coast. This is good news indeed," Aspaker concludes.

TRAINING AND INNOVATION

THE POWER OF POTENTIAL

The development of people and technology has to go hand in hand to maximise performance.

New innovations bring new benefits, but also demand fresh skillsets.

Through greater understanding and hands-on experience people can exploit the true potential of technology – paving the way for enhanced standards and new industry achievements.

It's a process of continual improvement, for man and machine. Together we get better every day.

Launched in September 2015, Teekay's newest LNG carrier Creole Spirit has the potential to save the company $20,000 on the cost of fuel every day. Alongside companion ship Oak Spirit, soon to be delivered from Daewoo Shipbuilding & Marine Engineering (DSME) of South Korea, and seven more identical vessels on order, the annual fuel saving could reach $65 million. Of course, it's unlikely that all nine vessels would sail 365 days a year. But Teekay Gas is pretty busy.

TEEKAY GAS

Knowing you, Knowing ME-GI

There's no black magic at work here. It's all to do with Teekay's commitment to continuous improvement, which led to its decision in 2012 to become the first mover on a new technology developed by engine manufacturer MAN. The result is the first two vessels in the world to use M-type, Electronically Controlled, Gas Injection (ME-GI) twin engines, which are significantly more fuel-efficient and have lower emission levels than other engines currently being used in LNG shipping.

You may have heard it all before. But it seems ME-GI is the real deal.

Teekay's ME-GI powered vessels have a consumption of 100 tonnes, up to 30 tonnes lower when compared to the most efficient Dual Fuel Diesel Electric (DFDE) propulsion systems, which have daily consumption in the region of 125 to 130 tonnes including sea margin. The vessels will also feature best-in-class carrying capacity, and once built will be among the largest LNG carriers able to transit the newly expanded Panama Canal. Continuous improvement indeed.

THE HUMAN FACTOR

Note the use of the word 'potential' when talking about ME-GI's ability to reduce fuel costs. After all, efficiency is the result of many different aspects. Not least people. While Teekay, MAN, Daewoo and Kongsberg Maritime with K-Chief 700 have embraced the challenge of perfectly integrating these new engines in two of the world's most advanced LNG vessels, educating the professional engineers and deck officers in charge of Creole Spirit and Oak Spirit to make the most of ME-GI is just as important.

Which is why we have come to Glasgow. With $12 billion in assets and some of the world's largest fleets in its core offshore, gas and tanker markets, Teekay is a trans-national energy powerhouse. So it's all the more intriguing as our taxi pulls up outside a distinguished, though somewhat modest terraced office building to meet Teekay Gas' Training Centre Manager Captain John Williams.

The unassuming exterior (scaffolding included) is soon forgotten once inside though. Opened in May 2014, Teekay Gas' Glasgow training facility is a contemporary space, open plan on entry with doors leading off to specific training and debrief rooms for cargo handling, engine room and ship's bridge training. The whole set-up feels friendly, a feeling that is cemented when meeting John, a seafarer of 30 years and one time supertanker captain, for the first time. Welcoming as he is, it doesn't take John long to get down to business, eager to tell us the story behind the training centre he had such an important part in establishing from scratch. The building itself comes up in conversation, a topic that John seems to enjoy.

"One of the great things is that when we viewed the building for the first time there was just a small glass partitioned room in one corner and the rest of it was open. So we started with a blank canvas. We got exactly what we wanted. We were able to design the facility with expansion in mind," he says. It's this last part that leads us on to the reason we are here. "I knew we'd ordered ships with a new propulsion system," he starts. "Then it was simply… 'John you should make some space'."

NO PRESSURE

The space John needed was for a sophisticated new ME-GI trainer system based on an IO Emulator for the K-Chief 700 system on board Teekay's new vessels. This PC-based system will help to teach the engineers best practice on ME-GI. They aren't starting from scratch though; they are all experienced LNG vessel crew, so the training will be aimed at adapting their skills for the new engine technology and

Integrated training: Teekay Gas' KONGSBERG ship-handling simulator is next door to the new ME-GI training facility. The bridge features a K-Chief 700 ME-GI console that will be connected to the ME-GI trainer so what happens there, will affect what happens on the bridge.

Captain John Williams
Training Centre Manager,
Teekay Gas

The full picture according to Teekay Gas
By focusing on individuals you build a better team. Teekay regularly talks to crewmembers to assess their skills and skill gaps, tailoring its training to fill any holes and build overall competence. It's a process that never stops. Continual improvement is its key to unlocking the full picture.

Captain John Williams at the opening of Teekay's Glasgow training centre.

making the most out of it.

Next door to the ME-GI training room is John's baby, his full-mission K-Sim Polaris ship handling simulator, which will also play a key role in the forthcoming ME-GI training. Recently delivered is a new K-Chief console, identical to the one found on the deck of Creole Spirit, Oak Spirit and Teekay's other ME-GI vessels on order. The console is configured for control and monitoring of the ME-GI system by deck officers and at the training centre as in real-life, it will be fully integrated with the engine room equipment.

"On gas ships there's a lot co-operation between the deck and the engine departments because of the relationship between the two systems. It's totally integrated," explains John. "It's not just engineers on this course. Masters will have to understand how the whole system works. So too will Chief Officers because they are for all intents and purposes in charge of the cargo and of course the engineers, who are in charge of the propulsion system."

"One of the great things about the trainer is that it's an exact mirror. We can get the guys from the ship in here for a week, so when they go on the ship they're not faffing around, they know where everything is and what it does, despite it being a brand new system." There's a lot of work before John can get the lucky crew assigned to the historic first Creole Spirit run out gathered in Glasgow for training. To start, John and nine other Teekay Gas people are attending a training course at Kongsberg Maritime in Aberdeen, to gain a strong understanding of the ME-GI system and the training systems. Once completed, Morten Steffensen, Product Advisor and ME-GI expert from Kongsberg Maritime's Global Customer Support Training team will be training the trainers at Teekay in Glasgow.

After this, Teekay and Kongsberg Maritime will as John puts it, "Thrash out the actual course, with the aim of having the ship's crew for full training at the beginning of December." We met John at the end of September. No pressure then.

CHOOSING TRAINING PARTNERS

Luckily, John is confident in his chosen training partner. Of course, Kongsberg Maritime was the obvious choice for this course. K-Chief 700 is on all of Teekay's ME-GI vessels. But a productive training relationship between the two goes back as far as 2007. We're talking much longer as an equipment supplier for Teekay's ships.

"There are several equipment manufacturers and training providers out there. We've probably looked at most of them and talked to people that run other manufacturers equipment. But Kongsberg Maritime has got the better functionality and it improves year on year." There's that focus on improvement again.

It's also telling that a pre-requisite for Teekay's international 3rd party training partners is that they have some kind of relationship with KONGSBERG. Being a global organisation, John is pragmatic when it comes to the logistics of training everyone in Glasgow.

"It's not economical to get everyone here. It's nice to do that but we have to be realistic, so we use preferred partners, he says. "A few weeks ago I was in India, doing an audit on a training centre we use there for a bridge team course. I get to see quite a few training centres in different countries. I go out and audit them. Sit in for a

"Everything we do is aimed at continuous improvements."

Captain John Williams
Training Centre Manager, Teekay Gas

WHAT IS ME-GI?

Teekay is the first ship owner to order a ME-GI-propelled LNG carrier, which are designed to be significantly more fuel-efficient and have lower emission levels than other engines currently being used in LNG shipping.

The heart of the ME-GI engine consists of the Burckhardt Compressor and the Partial Reliquefaction System. The compressor will take the boil off gas from the cargo tanks and compress it to 300 bar for direct injection into the ME-GI engine. The Partial Reliquefaction will take any of the excess gas not used by the engine and return it to a liquid state to put back into the cargo tank by dropping the excess gas pressure from 300 bar to 3 bar in a pair of Joule Thomson Valves.

It is not just the fuel consumption that makes the two stroke ME-GI system story so compelling. The reduction in the number of cylinders requiring overhaul, the reduction in the size of the complex electrical systems and the introduction of a passive partial reliquefaction system add to these LNG vessels' efficiency and further help to reduce the unit freight cost.

CREOLE SPIRIT

The world's first ME-GI powered LNG carrier newbuild, Creole Spirit is on charter contract with Cheniere and is expected to enter service early 2016, making it the most efficient LNG ship on the water with the lowest unit freight cost in the world fleet.

DIMENSIONS
- Length – 294.9 m
- Breadth – 46.4 m
- Depth – 26.5 m

CAPACITY
- NO. 1 Cargo – 24,620 m3
- NO. 2 Cargo – 50,180 m3
- NO. 3 Cargo – 50,180 m3
- NO. 4 Cargo – 48,420 m3
- Total – 173,400 m3

ENGINES
- Type and number – MAN B&W 5G70ME-C9.2-GI x 2 set (Derated)
- MCR – 12,520 kW x 69.1 rpm, each
- NCR – 10,775 kW x 65.7 rpm, each

week. Look at the establishment, the instructors, the qualifications of instructors, methods of delivery of the course and then have a two way discussion. Regardless, we always chose places with Kongsberg Maritime equipment."

GOOD SHIPS, GOOD PEOPLE

Course development at Teekay is undertaken by experienced professionals, both maritime and academic - working closely with the end users and partners. A key tool Teekay uses for pinpointing the training needs of its people is the competence management system, SCOPE (seafarer's competence for operational excellence). By talking to every individual on board its ships on a regular basis Teekay can identify gaps in training and utilising IMO model courses and tailored training, the input necessary for designing the course is garnered.

SCOPE is another example of continuous improvement at Teekay. There are many others. John tells us for instance how he uses the simulators to review at-sea incidents and implement change based on this research.

"We're a learning organisation. We learn from things going wrong. You look at a near miss for example. Even minor near misses you can learn from. If we have an incident there is an investigation. When the report is completed we'll distribute it to the vessels for the Master to communicate the advice to everyone – at all levels. We include root courses, contributory causes and of course what we can do to stop it happening again."

Of course, this kind of feedback is, rightly so, somewhat standard in quality shipping firms, but Teekay's approach takes it one step further.

"We developed a dynamic learning tool. We take an investigation report, make a story board and working with a third party we animate it. You can see the story developing on screen and in a small window you can see the navigation instruments and important environmental data. It details the whole scenario step by step in an easy to understand, and digest manner. We also provide a coaching guide so the Master can communicate the learning points optimally."

"Everything we do is aimed at continuous improvements," adds John as if on cue.

The maritime industry is dynamic, change being the only constant; so it is with the courses offered at the Teekay training centre. New knowledge, changing regulations, and feedback from course participants keep its courses up to date and current. The development of the ME-GI course is a prime example of how Teekay embraces the industry's dynamism, to support its business and customers. Talking to John we leave with the impression that the company has fostered a culture of quality and improvement across the board, especially when it comes to people and processes.

"We want to be a cut above the rest," says John. "We are all fighting for the same business so if we can be just a little bit better than the opposition then hopefully the customers will come to us first. We deliver the overall package. We have good ships, so we need good people to make them run at an optimum level."

"One of the great things about the trainer is that it's an exact mirror."

Captain John Williams
Training Centre Manager, Teekay Gas

At Maersk Training in Svendborg, Denmark, there are signs at the top and bottom of the long staircase from the lobby to the first floor: 'Use the handrail'. Centre director Michael Bang does. Every time.

MAERSK TRAINING

Home safe

Michael Bang is a former military bomb squad leader (and yes, he is aware of the irony of a bomb disposal expert named Bang). His past training fits exceptionally well into his current passion – making sure people get home safe from their jobs at sea.

Maersk Training is an independent business unit in the Maersk Group, which means they can serve the complete offshore and shipping industry, though more than 50 per cent of revenue comes from training Maersk crews in Svendborg. "We were originally an internal training facility," Michael says, "but now all players have the opportunity to use Maersk Training." That means of course maintaining the highest levels of integrity and trust. "Just like Kongsberg Maritime, one of our key suppliers of simulators, if we talked to our clients about each other, we'd be out of business," Michael assures.

Maersk Training's students come from all over the world to the smallish town of Svendborg, where the A.P. Møller-Mærsk Group was founded in 1904. Former chairman Mærsk McKinney Møller wanted a lasting Maersk presence in Svendborg, and the training centre has since become an integral part of the local society.

DIGITAL REALITY

Maersk has several different types of training centres around the world. While others teach survival and emergency skills, the Svendborg centre is based on the use of digital simulation to prepare for specialised operations, often customised to customer needs.

"Anyone can install a simulator," says Michael. Or as he succinctly puts it, "A simulator is basically a PlayStation on steroids." Until it is put in the hands of the Maersk instructors. "Our top-level instructors are the key to fully utilising advanced simulator capabilities. And that's where these machines become more than a game." The instructors draw on the full range of capabilities that cutting edge simulator technology has to offer, giving them both force and flexibility. "One week we might have a very experienced crew, the next week one less experienced. The instructors can add or remove challenges to match any level of ability."

But the last thing they want to do is push people beyond their limits. "If somebody goes away thinking, 'If this happens in real life we are all going to die,' then we haven't helped. With advanced simulators and expert instructors, we are playing chess with eight queens," he points out. "We can control the game. Our job is to make people feel that 'If this happens, I can deal with it, because I've done it before.'"

Again Michael's former career serves him well in his present job: "There is a saying in the military: 'Train as you fight'. That's what we do here. We need to train as close to reality as possible, especially when people can be pushed to their limits by real-life emergencies. There should be no difference between a situation in reality and one on a simulator."

For that to happen it's important that suppliers of simulators like Kongsberg Maritime understand the critical need to mirror reality. "The simulator has to be intuitive and matched to the student's real environment, or the training can lose its effect," Michael emphasises.

Michael Bang
Managing Director
Maersk Training Svendborg

The full picture according to Maersk Training
Everything begins and ends with safety. You go to work safe, you should come home safe too. By mirroring reality in training scenarios, Maersk prepares trainees to cope with the toughest challenges the industry may throw at them. Building skills, building confidence, building a safer industry – that's the full picture.

Maersk Training: investing in a safer tomorrow.

MIND AND BODY

In a challenging situation, reactions of a team or an individual start in the mind, and end with the body. Michael and his team need to prepare them for the entire chain of reaction. "We are often accompanied by psychologists who look at the team and at individual reactions in reflection sessions after training. The one or two per cent gap in human response is what we are looking for, because that's what causes accidents. Equipment will always be improved, but once the technical aspect is resolved, human response has to be refined as well."

In stressful situations, people tend to revert to their most base instincts. Or as Michael says, "We go back to where we came from. People must be able to choose other options and not just go with their reflexes. If they are used to choosing option A, we have to give them B or C as well. Our purpose is to train automated responses."

Reflecting again on his military training, Michael offers this scenario in an emergency: "Your first response gives you a head start in resolving a problem. Then your brain starts catching up. If your first response is panic, you have lost the initiative. The situation now controls what is going to happen next, and you are going to be behind trying to catch up all the time. Putting your instinctive stress response off will help you make better decisions."

Another psychological factor is ensuring a constructive learning environment. "There is no blame culture here. We don't want an alpha male pointing fingers and making people feel insecure. Blame is not a good learning mind-set. What we want is to try all avenues of approach to the same problem. If something goes wrong here, there's no extra cost. It's all part of the learning experience that they are paying for."

UNIQUE CAPABILITIES

The Maersk Training centre at Svendborg boasts two distinct training modules: one dedicated to maritime, and the other to offshore. Unique to the centre is that all the simulators in each module can be used individually or together, in order to simulate complex marine operations, or a complete drilling rig, with bridge, engine room cranes and drilling operator station.

"We are the only training centre in the world with the capability to offer this combination," says Michael. "When a new rig is commissioned, we can get 60 crew coming in to train together. They may have worked together before, but each new vessel requires new training, because they have never operated this particular vessel before."

CHANGING MARKET, SAME VALUE

With the offshore market in decline, does Maersk Training see a downturn in business? "There is still a need for training, and we will continue to grow, organically and through acquisition. Our next full rig simulator will open soon in Houston," Michael reports. Also Aberdeen, growth in Stavanger and India, and a new centre in Dubai are on the way. "The drilling market is down now, but we will come out of the dip with new market demands. There are always different training needs on the other side of a crisis. Probably that is because every downturn is a wake up call for everyone, and they know that nothing is going to be the same when it's over."

But the present downturn might be best seen in the change in make-up of the training portfolio. "Introductory level training is down for the time being, but the high-end training gives good return for companies, and they know it is money

"With advanced simulators and expert instructors, we are playing chess with eight queens."

Michael Bang
Managing Director, Maersk Training Svendborg

well spent. Their teams come out as better drilling crews."

LITTLE THINGS MEAN A LOT

Similar to the airline industry, offshore and shipping exercise a zero tolerance policy toward accidents. "We know that companies are willing to invest a fortune to reduce a little risk. Nine out of ten dollars are spent to avoid that little bit of risk that can cause a very big problem. We can help them find out why things go wrong and avoid those mistakes."

More often than not, it has to do with people making the wrong decisions at the wrong time. "Human error is the cause of most accidents," Michael confirms. "Even an experienced crew can get too confident and ignore the facts. It's like in football, being ahead 2-0 can be dangerous. You relax and let your guard down. Here we push them to be even better, to not become complacent."

"When we get a complete veteran crew in a drilling simulator, we can observe how they interact and train positive behaviours. Even though you are really good, what does it take for you to be even better? We can keep pushing them at a high-stakes level and not let them get bored. They might think it was tough, but will go away saying, 'Hey, this is really good.' The good people go out feeling that they have gotten better."

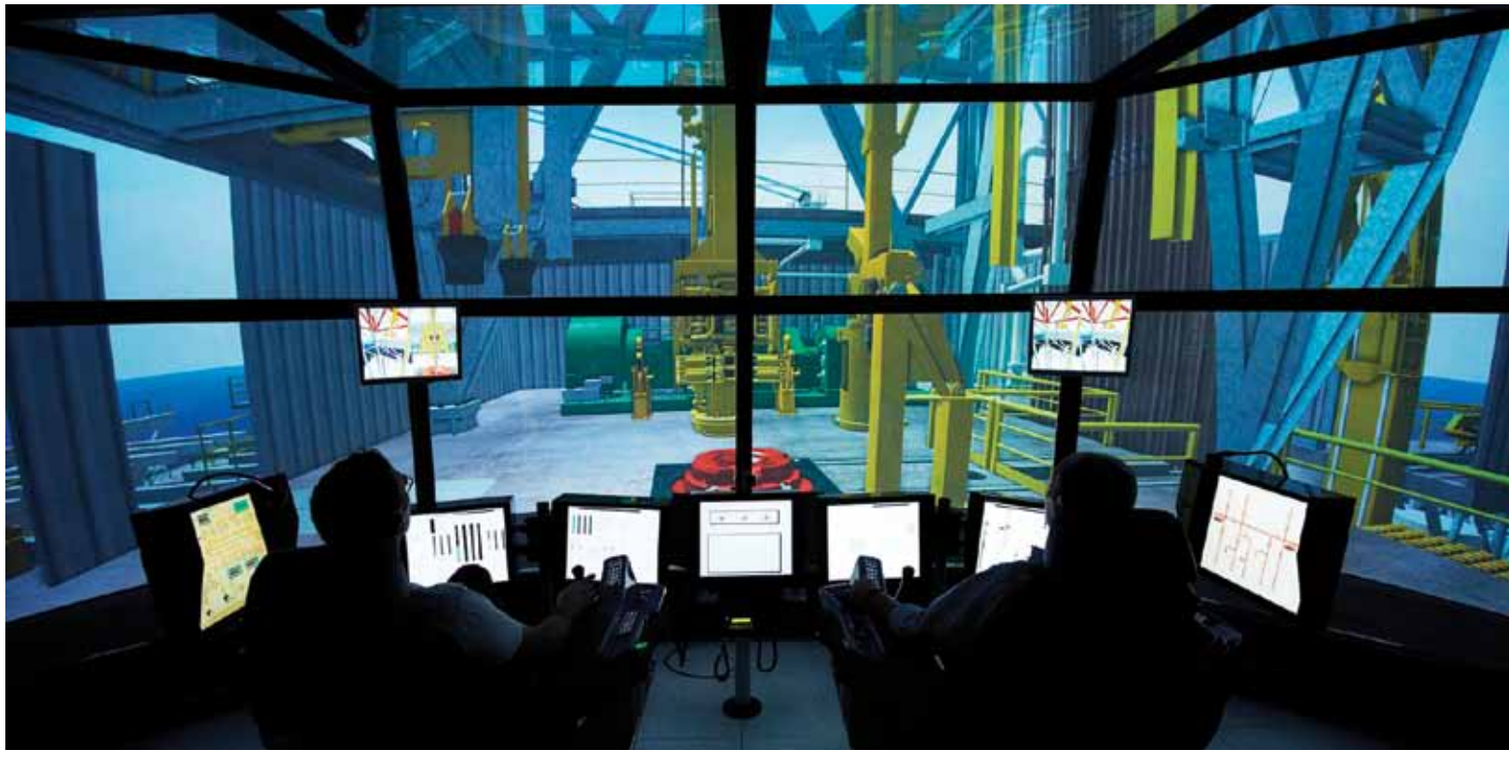
THE FUTURE HOLDS …

Of course no one knows what the future will bring. "But if you are smart enough to know what the market wants after the crisis, you can use the crisis to leap-frog the competition," Michael observes. "Customers know what they want, we don't tell them that, and technology evolves all the time. What we tend to see is more of a shift in mind-set. Can we do things smarter? Do we want to invest or save a buck, or be more efficient? It's all about how to get the most out of your money."

"If there's one thing I would say about the future," Michael ventures, "it's that high end training is here to stay. That's where companies get the most for their money." And retaining advanced training requires repetition, so the best customers keep coming back. As Michael says, "If you don't use it, you lose it."

Maersk Training's mission statement reads: 'To enable our customers to improve safety and operational performance'. Michael Bang has completed many missions in his career, and he has his own personal reflection on this one. "People go to work safe and sound, and they should go home safe and sound. If they are more effective while working safe, that's an upside. At the end of the day, being safe is what matters."

Kongsberg Maritime is proud to contribute to the successful completion of Michael's latest mission.



'More than a game': The marriage of advanced technology and instructors who excel.

With the NORAIS-2 instrument on the International Space Station (ISS), and its AIS payload on the AISSat surveillance satellites, KONGSBERG gives the world a way to track virtually every ship sailing the globe. The result is improved safety, fewer violations at sea, and overall greater understanding of maritime activity in the world – in other words, the full picture.

KONGSBERG

Eyes on every ship

AIS, or Automatic Identification System, is required on all ships over 300 gross tons, but is in practice used on many more types of vessels. AIS transmitters send out signals containing information on a ship's identity, position, heading, speed, and planned destination. The signals are picked up by other ships, land-based stations, and by radio tracking systems provided by KONGSBERG on the ISS and the AISSat satellites.

SEEING FROM SPACE

"Data from the space station is controlled by the ISS for now, but it is a hugely important experiment in the value of information from space for many areas of society," says says Gard Ueland, President and CEO of Kongsberg Seatex, a Kongsberg Maritime company. He names research, environmental protection, fisheries and search and rescue at sea as just some of the beneficiaries.

When the European Space Agency (ESA) contacted the Norwegian Space Centre with a need for a robust and effective transponder that could meet the stringent requirements of a human space flight mission, the job went to KONGSBERG. No small task, and one that had to be completed in record time.

"We basically had to respond on an experimental level. We took the best of our technology that had been developed for AISSat and adapted it for this mission. Our expectations were understandably modest, but the equipment has performed far beyond what we anticipated," Ueland relates.

SAVING LIVES ON EARTH

While the users of space AIS data are primarily government agencies, ships' crews and owners are the direct beneficiaries. "They feel safer at sea, knowing they can be seen wherever they are," says Ueland.

While AIS technology enables following ships from space, there is still much sea traffic that is best kept track of from earth. To that end, land bases were installed in 2004 along Norway's coast. The bases represented a vast leap forward at the time, but the last ten years have seen new advances, and upgrades were deemed necessary. Now the same technology used on the ISS and in AISSat satellites is being employed on land. KONGSBERG has been contracted by the Norwegian Coastal Authority (NCA) to upgrade AIS equipment in 57 base stations in Norway.

"This is space technology brought down to earth," Ueland emphasizes. "KONGSBERG is using our cutting-edge radio technology in land-based surveillance stations and on ships and boats."

Just days after upgrading one station near Bergen, on the southwest coast, a Polish sailboat with low-wattage AIS-B onboard capsized in the area. The new station picked up the distress signal and dispatched a SeaKing helicopter, rescuing the entire crew just before the boat went under.

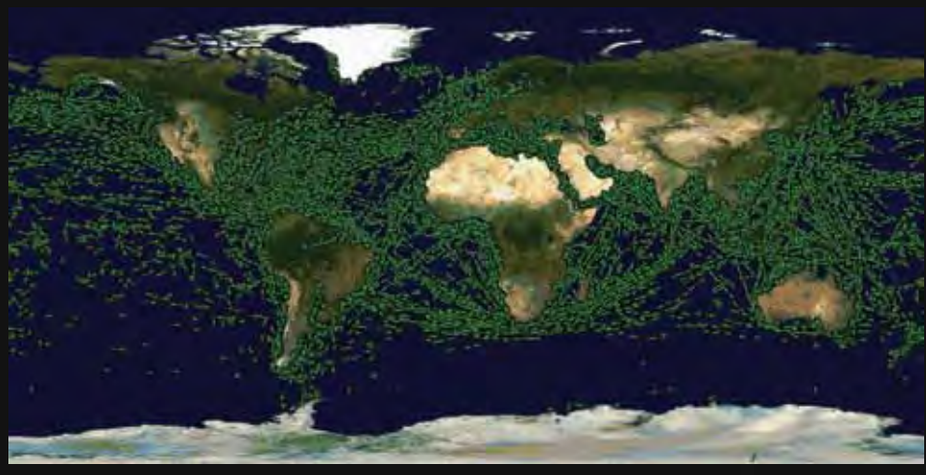
With winds at 60 knots and waves up to 15 feet, the situation was critical. "They were nearly 60 nautical miles from land," says Harald Åsheim, senior engineer in the NCA. "The old stations had a range of around 40 miles and were not as sensitive as the new models, so without the upgrade we wouldn't

»

NORAIS/AISSAT

Watching ships from space and on earth, KONGSBERG are giving the world eyes on every ship, with benefits for:

- Fisheries
- Arctic operations
- Environmental protection
- Anti-piracy
- Coastal and offshore safety
- Search and Rescue



NORAIS: Keeping track of every ship, everywhere.

» have picked up the signals and couldn't have initiated the rescue."

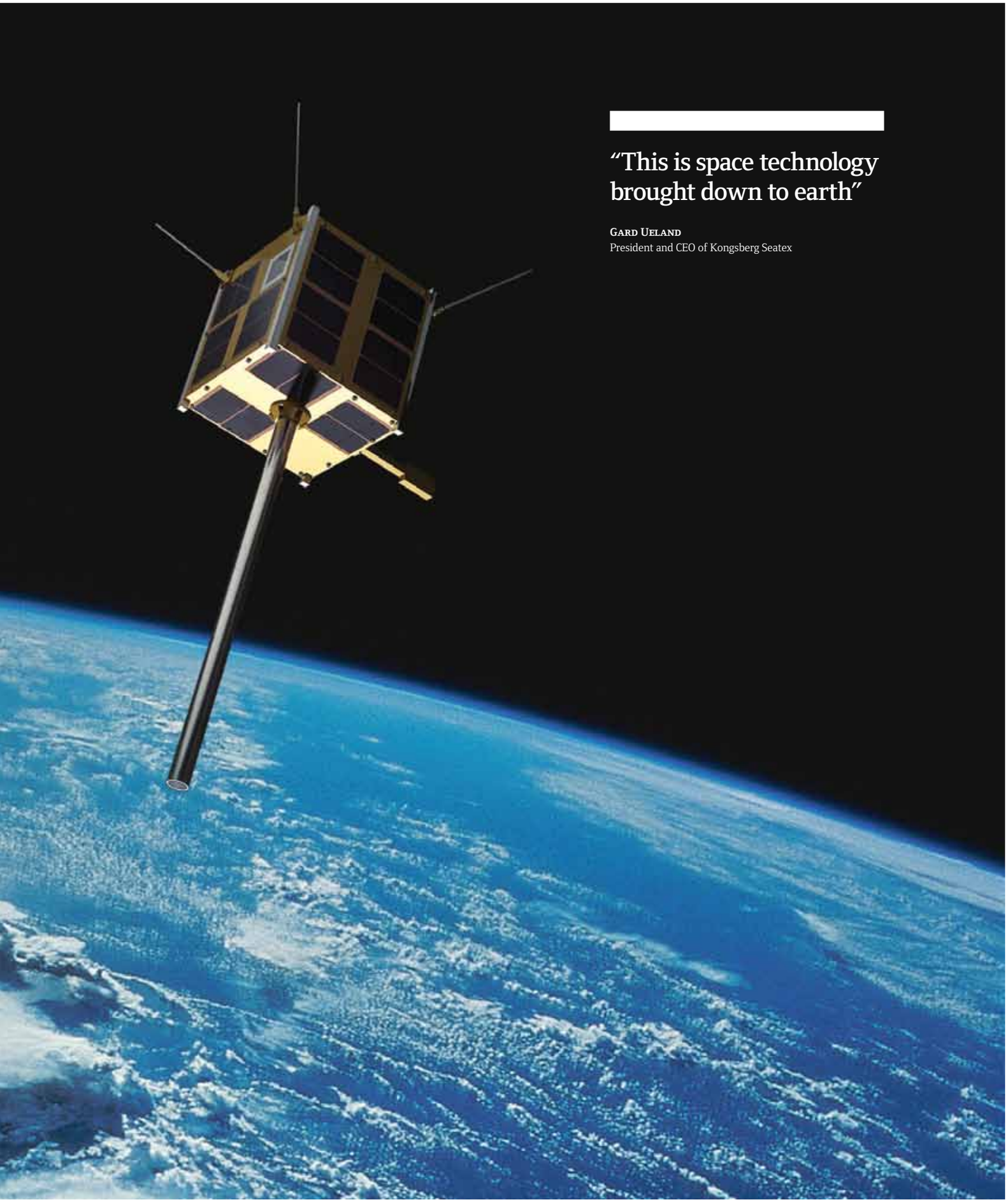
MEETING PRACTICAL NEEDS

AISSat-1 was launched in 2010, designed for a life of three years. Five years later, it is still relaying information to earth. AISSat-2 went into orbit in 2014, further strengthening surveillance capacity. Now KONGSBERG and the Norwegian Space Centre are developing a more powerful AIS transponder to be launched on AISSat-3 in January 2016.

Originally intended as a collision avoidance system, AIS information is finding steadily more uses. The AISSat satellites were enlisted by the Norwegian Coastal Authority to survey Norway's vast and remote arctic territories, but during the 2011 tsunami in Japan, Norwegian authorities supplied their Japanese counterparts with valuable information on the status of vessel traffic, as parts of their own infrastructure were knocked out by the giant wave.

As an indication of the varied uses for AIS data, Gard Ueland tells this story: "I was sailing last summer when I happened to meet an adventurer just minutes after he got his feet back on Norwegian soil, after four years sailing around the world. He had been 62 days at sea on one crossing, and he had AIS-B on board. He said he always knew where he was, and he could plot the courses and speeds of all ships in his vicinity, then go below deck and have a nap for a couple of hours, knowing that they could see him as well." Safe, with the watchful eyes of AIS and KONGSBERG on every ship.

AISSat-2(C)
Norsk Romsenter
FFI NASA.



"This is space technology brought down to earth"

Gard Ueland
President and CEO of Kongsberg Seatex

HEEREMA MARINE CONTRACTORS

Working as one

In a quest for the highest possible training standards, Heerema Marine Contractors (HMC) chose to integrate a range of advanced simulators to mirror its complex operational assignments. In a project with collaboration at its heart, the firm looked to KONGSBERG to empower this new virtual reality.

HMC is a heavyweight within the international offshore oil and gas industry. With a staff of 1,750, more than 50 years of operational success, and a fleet of unique vessels, the business, headquartered in Leiden, Holland has impeccable industry credentials. But it's HMC's ability to get the most challenging jobs done that marks it out as a real big hitter.

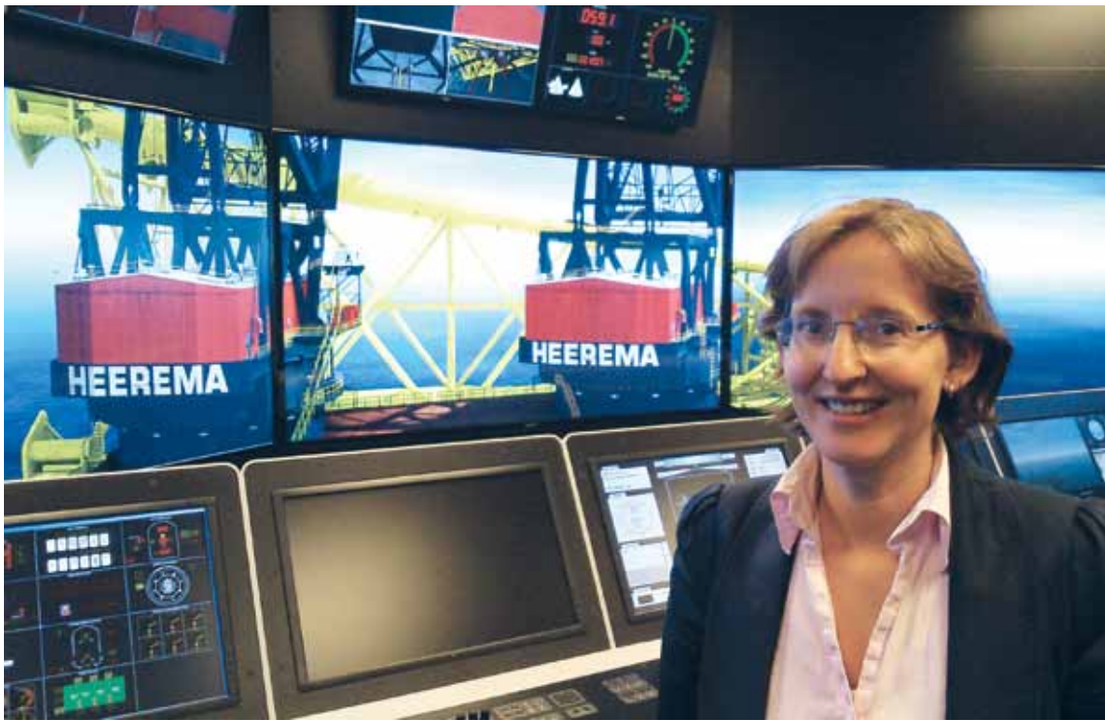
ONLY THE BEST WILL DO

The firm specialises in transporting, installing and removing fixed and floating offshore facilities. Whatever the environment, whatever the depth demands, HMC has the expertise and equipment to perform. Its five-strong vessel fleet includes three of the world's largest crane ships – SSCV Thialf, DCV Balder, and SSCV Hermod – while its latest addition, the DCV Aegir, is tailor-made for the most challenging deep water infrastructure and pipeline projects.

In HMC's world the conditions are harsh, the lifting strenuous and the demands on personnel competence uniquely exacting.

"With such taxing project parameters, it goes without saying that our training practices and facilities have to be at the very cutting edge of the industry," explains Catina Geselschap, Project Manager at the HMC Academy. "We are proud of our excellent safety, quality and operational standards, and are committed to a programme of both continual improvement and investment to ensure we maintain leadership in our field."

It's this commitment that has paved the way for a landmark collaboration between HMC and Kongsberg Maritime.



Catina Geselschap
Project Manager, HMC Academy

The full picture according to Heerema Marina Contractors
In an increasingly complex industry, training facilities have to evolve to keep pace and mirror reality. For Heerema, collaboration is essential for success. By working together with its training simulator supplier, the firm can maximise the full potential of technology to provide the best facilities, experience and results.

THE REAL DEAL

In September this year, KONGSBERG delivered what has been heralded as the world's most advanced offshore heavy lift crane simulator to HMC's training Academy at its Dutch HQ. Based on the K-Sim Offshore simulation platform, the package is tailored for the company's purposes and ambitiously broad-based in its scope.

It features two offshore crane operator domes and a DNV Class A bridge with K-Sim DP simulator, mirroring the K-Pos DP systems used by the firm's vessels. In an effort to provide 'at sea realism' for the academy environment, the advanced K-Sim Offshore simulator installed boasts detailed models of the semi-submersibles Thialf and Balder, and the mono-hulled Aegir, in addition to several barges and an offshore supply vessel.

"The scope of the project may be huge, but the integration is seamless," Geselschap states, "and that's the whole point of this delivery."

She explains: "Every task our crews undertake is complex. They have to deal with operations that involve vessel manoeuvring, crane lifts, winch operations, dynamic positioning, ballast handling, and all the communication activities that are required to ensure that they are united in their focus and coordinated in their actions. To train for this kind of integrated operation we wanted an integrated simulator package – one that helps us produce the most competent operators, with the best understanding of planning, execution and total through-the-line delivery.

"Fidelity is also key," she continues. "Accuracy is crucial in heavy lift crane operations, so we needed a supplier with a track record of delivering in this respect. There's zero room for error in the field… so there's no place for it in our Academy either."

COLLABORATING FOR SUCCESS

In their quest to provide the upmost realism, not to mention the most diverse and rewarding challenges for trainees, HMC and KONGSBERG worked hand-in-hand to ensure the simulator package is staggeringly comprehensive in scale. The finished suite includes a wide variety of library objects alongside detailed models of offshore installations, and all the equipment used for simulating specific heavy lift projects. Those projects include lifting Jackets, topsides and subsea templates from barge to vessel, and from vessel and overboard.

"We want to use the facility for project planning, testing and verification," Geselschap comments, "so, it had to offer the full spectrum of tasks, equipment and operational challenges that our personnel will face in the field.

"To do this we needed not just a partner with the sophisticated technical skills and simulator technology to create realistic situational experiences, but also the ability to work with us, engage in dialogue and find solutions that matched our individual requirements.

"And of course," she adds, "the project doesn't stop with delivery. This is an on-going development, so it's essential to keep that dialogue going, arrange workshops when necessary and ensure the organisation exploits the full value of this state-of-the-art solution."

DEVELOPING POTENTIAL, SECURING SAFETY

HMC is rightly proud of its established safety culture and standards, promoting a workplace where Quality Assurance, Safety, Health and Environment (QASHE) is as core to operations as technical excellence. The company's overarching aim is for an 'incident and injury free' environment, founded on principles of sharing, caring and respect. The simulator package is central to that mind-set.

"Both our QA and HR departments were involved in this procurement and delivery process," Geselschap reveals. "Our QASHE philosophy is central to everything we do and, as simulation training is proven to increase competence and reduce unwanted incidents and accidents, this equipment complements and supports our objectives perfectly.

"The extensive instructor and debrief system that is included in the order will ensure all our training personnel can utilise the full potential of the platform, while working together towards a clear set of goals.

"So far the feedback from them, and the trainees, has been very positive."

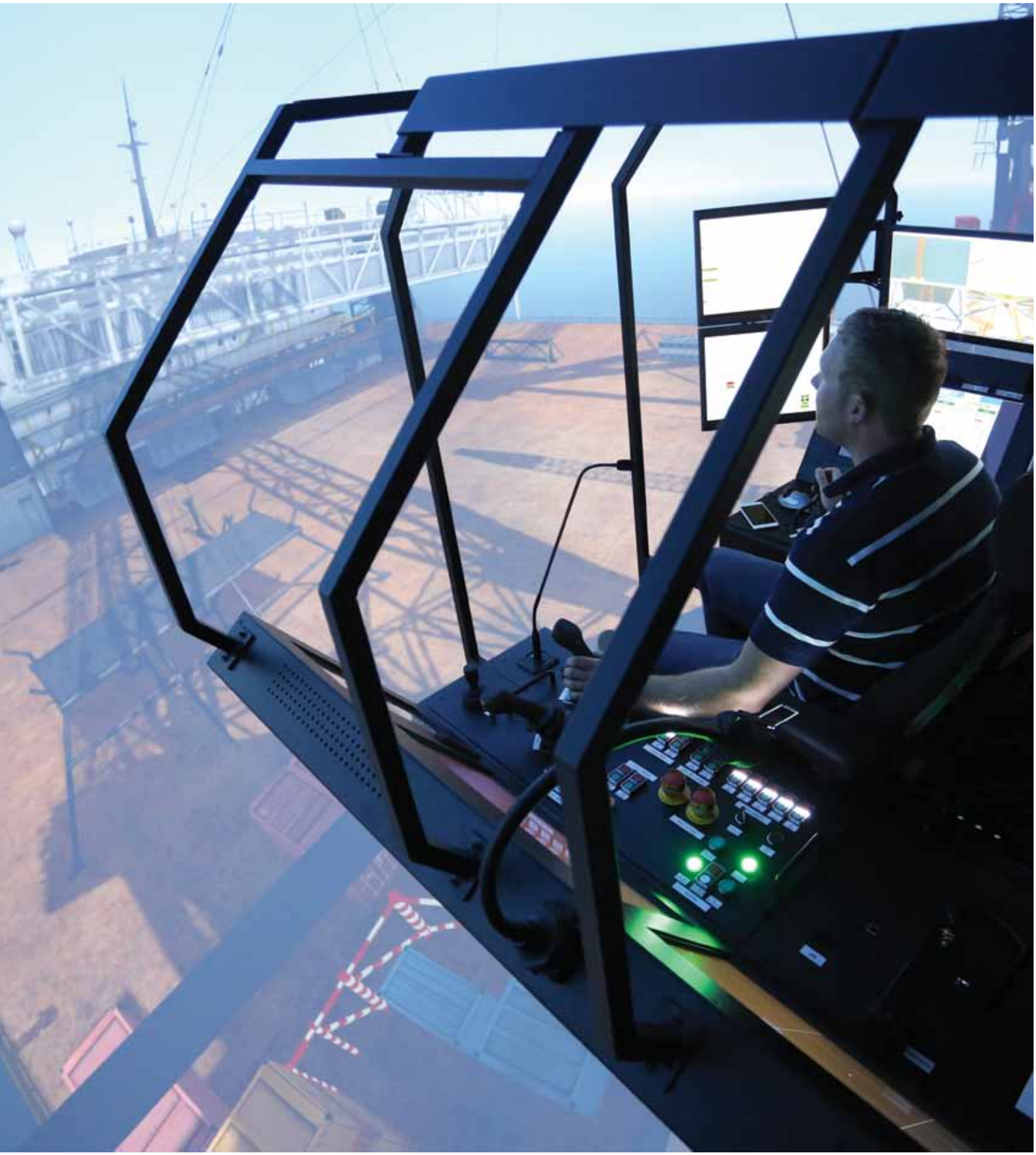
SHARED VISION

KONGSBERG's simulation technology is developed on a platform of 40 years of marine simulator leadership, and a dedication to providing individual customers with the solution that fits their unique needs.

"This delivery provides the full picture of our expertise," says Harald Kluken of Kongsberg Maritime Simulation. "It combines our understanding of providing realistic operational scenarios – built on the company's long history of delivering actual navigation, automation and DP systems to the industry – with our ability to listen, collaborate and customise solutions that help customers achieve their goals.

"HMC is pioneering new standards within the field of heavy lift operations, and we're delighted to provide them with a simulation suite that does the same."

On top of the world: Heerema's advanced simulator in action.



Imagine undertaking complex multi-asset offshore operations, across large areas, with multiple teams working simultaneously, and enjoying complete situational awareness, facilitated by seamless data, voice and HD video transfer. The stuff of dreams? It was, until now …

Vegard Haugen
Area Sales Manager,
Kongsberg Seatex

The full picture according to KONGSBERG
Effective communication is the cornerstone of delivering full picture success for any complex, modern maritime operation. By connecting people, assets and systems, teams can work as one, with one goal, and one outcome – mission accomplished.

KONGSBERG

A communication revolution

Vegard Haugen has 15 years of experience from the Norwegian Coast Guard, where he worked his way up to Commander. His experience in leading large operations where comprehensive communication systems were lacking convinced him of the great potential that lay in optimising operations through better communication.

Although at first glance, with his relaxed persona and business-like attire, he doesn't look like a typical firebrand revolutionary, Vegard's passion for his cause clearly surges through him.

"There are many different types of challenging task that demand optimal operational capabilities, such as complex offshore operations, remote subsea mapping, surveillance, and autonomous surface vehicle operations," states the Kongsberg Seatex Area Sales Manager. "That applies to people, operational assets, equipment and, crucially, communication platforms.

"In situations where multiple vessels and assets, often spread across large physical distances, must work as one, any issues with data transfer, or misunderstandings of verbal messages, can lead to delays and incidents where personnel and equipment are exposed to risk. It is therefore imperative that these crews are truly 'connected', or united across the waves with a common situational understanding."

"Provide them with that", Vegard adds, "and you provide them with the platform for optimal co-ordination, performance, efficiency, safety and success".

OLD CHALLENGES, NEW SOLUTION

It's here that Vegard and his colleagues at KONGSBERG can usher in a new age, enabling a level of communication and collaboration that is nothing short of revolutionary. Their latest product, Maritime Broadband Radio (MBR), holds the key.

Traditional radio has, to this point, been the standard for communications during complex maritime and offshore operations. But its limitations have been obvious, especially relating to misunderstandings and misinterpretations of messages.

Creating WI-FI networks is a more recent development for data exchange, but here technical barriers loom large. The surface of the sea creates special challenges in signal transferring, while large structures like vessels and offshore installations effectively halt signals. This makes the requirement for free 'line-of-sight' extremely hard to satisfy.

"And then there's the cost issue, " adds Vegard. Traditional communication and data transfer solutions are often dependent on added infrastructure to enable optimal functionality, and that creates a significant financial burden."

So, taken together with the dynamic nature of vessel movement and interaction, these challenges make it difficult to exchange data seamlessly and consistently.

But not for MBR.

BUILDING THE INFORMATION HIGHWAY

MBR is simple, reliable, cost effective, and a genuine game-changer.

Vegard Haugen explains: "By installing units on every vessel/asset undertaking operations, a broadband link is established and a maritime 'information highway' is created – one that enables the high-speed and capacity transfer of data, with low latency, no need for added infrastructure and no prospect of it 'disappearing' en-route.

"The unit is simple to install, connecting with the ship's network (Ethernet), and to operate, communicating seamlessly with other specified MBRs within an operational reach that, thanks to unique beaming technology, extends to over 50km. Its smart antenna makes it equally as effective over short distances as it is over long, while it also has the ability to steer signals so they bypass issues with steel, thus ensuring a consistent and reliable real-time data exchange."

MBR: A NEW COMMUNICATIONS REALITY

- In excess of 50km operational range.
- Meshed network solution.
- IP connectivity for seamless data exchange and sharing with low latency.
- The ability to stream live HD video and voice without conventional infrastructure.
- Innovative antenna design, able to transfer data in highly obstructed areas.
- Low maintenance, with no moving parts.
- Easy to install – all that is needed is the unit, a power source and Ethernet connection.
- Cost effective, high performance solution.

SECURING THE FLOW

The MBR proposition really gets up and running when its extensive broadband capacity is considered. This allows for the transfer of live broadcast HD video between participating vessels, leading to faster situational awareness and better-informed decision-making. What's more, the necessary bandwidth is secured by the MBR's 'smart management' feature.

The unit can be set to prioritise traffic within the given bandwidth, while ensuring that the maximum bandwidth threshold is never crossed. In this way it maintains and optimises bandwidth, securing video and voice (which must have minimal delay), while allocating enough space for the simultaneous transfer of sensor data exchange.

"The flow is kept consistent, reliable and real-time, connecting crews like never before," Haugen enthuses. "What's more, any third party system capable of exchanging data via Ethernet can do so via the MBR, allowing complete integration and sharing of all mission critical information."

SUCCESS IN THE FIELD

As a product evangelist, Vegard's enthusiasm is obvious, but you don't need to take his word for this revolutionary technology – take it from The Norwegian Coastal Administration (NCA), the Norwegian Coast Guard and the Norwegian Clean Seas Association for Operating Companies (NOFO).

The three organisations took part in a comprehensive, full-scale exercise in the North Sea in June 2015. MBR was used as the communication platform for them to exchange data, co-ordinate actions and conduct simultaneous operations.

Units were mounted on multiple operational assets, including a plane that streamed their forward looking camera, SLAR (Sideway Looking Aircraft Radar) and AIS tracks directly down to vessels, thus giving them a new perspective and a completely different situational understanding.

Ketil Aasebø, Senior Advisor for the NCA's Emergency Response division, was just one of the participants impressed by MBR's capacity. He commented:

"The NCA, in cooperation with the Coast Guard and NOFO, conducted a test of KONGSBERG Maritime Broadband Radio on board our surveillance aircraft LN-KYV and a number of emergency response vessels. The tests demonstrated that the capacity and reach of MBR is very promising."

He continues: "While conducting an oil on water verification test on the Frigg field in week 24 2015, we received live images from our surveillance aircraft at a distance of some 100 nautical miles. The ability to transmit live images and video from a surveillance aircraft to seagoing units for oil spill response is incredibly important. MBR proved itself to be a stable communication medium for this purpose."

The system unites data, assets and off- and on-shore teams in a way that was previously just a pipedream, enabling complex operations and more effective surveillance and inspection activity involving multiple assets. With a reach, capacity, consistency and simplicity that will appeal industry wide, expect there to be a lot of traffic on this new information highway very soon.

A large oil field in operation is a complex choreography of many diverse players, all dependent on each other to keep the operation running smoothly.

DNV GL

Demonstrating, not just documenting DP skills

A supply vessel assists a drilling rig, a diving vessel is in operation, there is a floatel with a gangway to a drilling unit, an offshore loader retrieves oil, a helicopter lands on deck – all depending on the same technology to operate and interact with each other safely and effectively. That technology is Dynamic Positioning (DP). Simply put, with its ability to keep a vessel in a fixed position at sea, regardless of waves or weather, DP is the key enabler of simultaneous operations.

As complex operations have become steadily more dependent on DP, the main focus in recent years has been improving safety and redundancy in the system. But accidents do happen, and analyses show that they are very often due to human error, with lack of knowledge and experience ranking high on the list of causes. In reply to this, DNV GL's latest Seaskill program is focused on DP operations and the competence and skills of DP operators.

SHOW, DON'T TELL

According to Lars Markusson, Principal Surveyor and Auditor at DNV GL, demonstrating skill is more important than just presenting a certificate:

"In many ways, this started with requests from the industry. There was a desire for a certification method based on DPOs demonstrating their competence, not just documenting it. Show, don't tell, were the key words, and we quickly saw that this was a match with our Seaskill thinking, which focuses on proof of knowledge. The assignment quickly grew into a total program, with recommendations that could provide a DPO standard with a basis in the industry that more players could relate to."

"Today there are excellent training simulators, and we are generally quite clear that courses without assessment are of little value. Being able to tick off for competence both theoretically and through advanced simulator exercises has become a very important factor in our methodology," says Markusson. He explains that KONGSBERG was a first mover in acknowledging the importance of pedagogy and the effects of learning, and integrating assessment into its courses.

"Without the foundation that KONGSBERG built in the mid-2000s, we would not have succeeded with today's solutions," he says, adding, "I was actually very impressed when I saw how they work with the assessor courses for their instructor team."

SEEING IT FROM THE SYSTEMS SIDE

Øyvind Pedersen, former DPO and Key Support Manager for training in Kongsberg Maritime confers:

"As a system supplier, we can see that a lot of different things happen during operations as a consequence of misuse of DP systems. Learning means changed behaviour, but it is not a given that we as DPOs understand this completely. A systematic approach to pedagogic thinking and development of skills is essential. Ensuring that third-party objective professionals make the final assessment of skills, rather than colleagues, is another crucial factor."

Øyvind Pedersen and Irene Bøen, DPO and Product Advisor for DP training in Kongsberg Maritime, have both been central in the development of KONGSBERG's training solution and the collaboration with DNV GL on standards. Kongsberg Maritime bases their new KONGSBERG Training Scheme for DP Operators on a combination of new and established DNV GL training standards, employing a specially designed learning process.

"We have designed a holistic system, where learning on board plays a vital role, together with classroom, theory and simulator training." Pedersen says. "The captain is central to guiding crew on the bridge, so he needs to be involved. To that end we have developed a work book with distinct tasks requiring that competence be verified and demonstrated, with participation of the captain."

Irene Bøen, Product Advisor, Kongsberg Maritime, and Øyvind Pedersen, Key Support Manager, Kongsberg Maritime.

CLEAR LEARNING GOALS

Markusson says that the key idea from DNV GL is the requirement of clear learning goals and a 'level of cognition' describing the knowledge needed for various operational tasks and operations. This has resulted in various fields of competence and certificates, which in turn means passing specific exams in order to get DP certification. "Handling a rig is different from steering a shuttle tanker, and DPO training must reflect this," says Markusson.

Øyvind Pedersen says that KONGSBERG has been given the freedom to create solutions that provide the best learning outcome, as long as they correlate to DNV GL standards. There are other standards to comply with as well, including overall standards for DPOs, management systems, instructor demands and simulator demands.

"It`s challenging to take the role as an assessor" says Bøen. "Assessment, both with regards to evaluation and feedback, is new to the maritime industry. Giving good, constructive feedback to course participants, and not least delivering the correct guidance, is central to our training program. With proper guidance from skilled instructors, the participants will be better equipped to meet challenges as they arise."

KONGSBERGs top priority is after all operational support and safety. "Safe operations and better use of our systems result in more satisfied customers," says Bøen, and Markusson concludes: "At the end of the day we all contribute to safer operations at sea."

DYNAMIC POSITIONING OPERATOR

In June 2015 Kongsberg Maritime became the first global maritime training provider to offer the new DNV GL approved Dynamic Positioning Operator (DPO) training scheme at its training centres worldwide.

Lars Markusson, Principal Surveyor and Auditor, DNV GL, and Line Øverland, Senior Surveyor, DNV-GL.

For Sturla Henriksen, the Norwegian Shipowners' Association's (NSA) CEO, the challenges facing the shipping industry demand long-term adjustments, instead of quick fixes. It's time, he believes, to accept the reality of the 'new normal'.

NORWEGIAN SHIPOWNERS' ASSOCIATION

Embracing the 'new normal'

"We are now facing a more fragmented, challenging, and dynamic world picture than we would have anticipated just a year or two ago. In plain terms, this means that the world has become less secure… and less predictable."

Sturla Henriksen's expression and tone are in stark contrast to the light dancing on the sparkling Oslo Fjord right outside the NSA's imposing offices. His own view, for now, is consumed by the serious challenges confronting his 150 plus members.

A DEMAND FOR DETERMINATION

Shipping, Henriksen explains, is a key pillar of the Norwegian economy, with the maritime industry as a whole creating NOK 175 billion of annual value (2013). It is also the most global industrial sector and, as a result, the first to face the impact of international waves of change.

Those waves, he says, are currently coming in thick and fast.

"We are witnessing a world undergoing dramatic upheaval, which has obvious ramifications for shipping. There are escalating geopolitical tensions, low and uncertain economic growth, radical Islamist groups on the offensive, record numbers of refugees, growing social inequalities, falling oil prices, and global climate challenges. Taken in isolation, every one of these factors demands attention, taken together …"

Henriksen pauses for a second, "well, they demand a new sense of determination – of unity, to face and overcome these challenges together."

CAUTIOUS OPTIMISM

Despite the size and serious nature of these 'waves', Henriksen remains confident that his members, and the industry as a whole, can rise to the challenge.

The most recent NSA Outlook Report – an annual publication that takes the pulse of the Norwegian industry – found that shipowners were "markedly less optimistic" in 2015 than 2014, but all segments, with the exception of offshore service owners, expected some growth.

This ranged from anticipated growth of 5.1% for deepsea shipowners, down to 2.5% for their shortsea counterparts. But growth is growth, and that alone is a reason for optimism. "Even with today's modest global rates, the world economy is set to double over the next couple of decades," Henriksen states. "That means more demand for traditional shipping, more demand for offshore services and more demand for maritime goods and services."

He continues: "We face very real challenges that will impact the lives of individuals, our workplaces, and Norwegian value creation in the future. Yet the Norwegian maritime industry continues to make its mark on the world.

"We are one of the world's largest and most advanced maritime nations, and our position today is arguably stronger than ever. There are now more than 1,800 Norwegian-controlled ships and rigs in action around the globe and, in many cases, these are industry-leading, modern vessels with the very highest operational standards.

"What's more the Norwegian maritime sector is renowned for its innovation and proven ability

to find new solutions for industry challenges. This provides a genuine competitive edge. We believe that through the development and adoption of new technology we can further reduce harmful emissions and provide more efficient transportation solutions, while new forms of energy will contribute to more sustainable trade and growth."

STANDING TOGETHER

From an international perspective, Henriksen says, it's important to see the full picture, rather than addressing industry issues from a position of isolation. He comments: "Despite the growing sense of fragmentation, we believe that continued efforts to strengthen multilateral regulations can and will promote cooperation between nations. A global response is really the only way to address global challenges. We must face them together.

"Norway may only be a small nation, but we are a global leader for shipping. We will take our share of the responsibility to meet these future challenges, and we will take that very seriously."

Henriksen concludes that the short-term challenges facing the industry are significant, but it's how we understand and act on the prevailing global trends that will determine the success of the industry and its contribution to wider society.

"We can't change the new normal," he states, "so we have to embrace it and adapt accordingly. Fighting to restore the past is no way to face the future."

Sturla Henriksen
CEO
Norwegian Shipowners' Association

The full picture according to Norwegian Shipowners' Association
Challenges are often opportunities. The industry can adapt to the new normal by embracing rather than rejecting it. Innovation is key. Solving today's problems can facilitate tomorrow's successes.

"We are witnessing a world undergoing dramatic upheaval, which has obvious ramifications for shipping."

Sturla Henriksen
CEO, Norwegian Shipowners' Association

Esben Poulsson, President of the Singapore Shipping Association (SSA), has a problem that many maritime players can only envy in today's tough markets.

SINGAPORE SHIPPING ASSOCIATION

A different take

"We are working hard to fill empty seats. Singapore has virtually full employment, so anyone graduating with a marine-related degree more or less walks out of the university and into a full-time job. I often tell young Singaporeans that they don't really know how lucky they are," he confesses.

In fact domestic recruiting to maritime companies is one of the Singapore Maritime Authority (MPA's) highest priorities. In a step up on recruiting efforts, Singapore's Deputy Prime Minister launched the Skills Future program at the SSA's 30-year anniversary celebration in September of this year. The program offers funding for trainee programs and further education, and the state will sponsor a year abroad for young executives to gain international experience, provided they return to Singapore.

Recruiting is at the top of the SSA's list as well, and they have their own contribution to the effort. The Young Executives Group (YEG) is a popular networking and social initiative and includes guest speakers, seminars and courses, with the ultimate aim of increasing participation of young executives in Association affairs.

STRONGER THROUGH COLLABORATION

Another priority for the SSA is building up the marine insurance and finance segment in Singapore. "Being such an important maritime hub, it would seem obvious that we would stand among the world leaders in these fields as well, but Oslo and New York are well ahead of Singapore here," Poulsson states.

Typically for Singapore, they are methodically, if not exactly patiently, building up their War Risk Pool, launched in February this year. "I was able to announce the 301st vessel joining the Singapore War Risks Mutual at our anniversary dinner," Poulsson states with some satisfaction. "It has been a long process, but we are building one brick at a time." Much as Singapore itself has been built: steadily, guided by a firm hand, and always with clear, strategic, and common goals.

Perhaps a different way of working than their independent-minded counterparts in Europe, but there are still many similarities to be found. "We have great relationships with the ship owners' associations in Denmark and Norway, and many others as well." As proof of their role as an 'active team player' on international issues, Poulsson has no faith in predictions of one or another maritime capital dominating the industry.

"I see four or five leading capitals being closely interconnected," he states, "learning from each other, filling different roles, and driving the industry forward in healthy cooperation."

LEVELLING THE PLAYING FIELD

Key goals that Poulsson and the SSA share with their global counterparts are the continued growth in free trade, and the need for uniform maritime regulations to support that growth. "From a Singaporean perspective it is essential that free trade be allowed to flourish. Open markets have been instrumental to Singapore's success, and for that to continue, we are dependent on a level playing field," he points out.

As a truly international cross-trader, Singapore is among the most vulnerable to unilateral regulatory initiatives from major players like the US or Europe. "These initiatives are symptomatic of a lack of confidence in international bodies to regulate the industry," he states. "We are working with global partners like the International Chamber of Shipping to achieve more effective development and implementation of international regulations, in order to reinstate the faith in multilateral governance."

Of other issues affecting global shipping, the refugee situation in the Middle East is equally shocking in Singapore, but not as immediate as in Europe. "We are deeply moved by the things we are seeing from the Mediterranean," he relates, "but we are on the other side of the globe, so our business is not directly affected."

Political unrest is another relatively remote issue, though Singapore is observing developments in the South China Sea with some apprehension. Environmental issues will also bring on change in

Esben Poulsson
President, Singapore Shipping Association

The full picture according to Singapore Shipping Association
We're in this together. The full picture of shipping encompasses the full industry, with all nations, owners and stakeholders abiding by uniform regulations and conducting business on 'a level playing field.' Everyone included, everyone playing their part.

the industry, Poulsson believes, and though Singapore might not take a leading role, he assures: "We are ready to play our part."

THE VIEW FROM ASIA

As a Norwegian-Dane who has lived and worked in Canada, Hong Kong, the U.K. and Denmark, Poulsson recognises, and embraces, the unique character of Singapore, starting with its strong international makeup. "In the major European shipping centres, there tends to be a dominant domestic presence," he observes. "In Singapore, it's the other way around. Although there are a number of substantial domestic owners here, we are truly an international maritime hub."

With Poulsson's own organisation taking a leading role. When the SSA celebrated their 30th anniversary, the Minister of Transport joined the Deputy Prime Minister and a staggering 2200 dinner guests, including the Danish and Norwegian ambassadors to Singapore.

"We do enjoy good standing in the community," Poulsson understates. Not that it has come easy. With a membership made up of the who's-who in the maritime world, Poulsson and his Council are kept busy working with a full time active Secretariat to come up with solid initiatives to serve the membership, and the national interests of maritime Singapore.

Esben Poulsson has another mission in his service of shipping, in Singapore and around the world: that of increasing Asian influence among international maritime decision makers. The task not without its inherent challenges. "There is a saying that 'In order to be heard, you must speak.' Asian culture does not embrace loud or self-serving behaviour, so there can occasionally be a feeling of being 'left on the side lines' of critical discussions and decisions. But as Asia now controls roughly half the tonnage in the world, their voice must be heard. If there is anything we can do to promote the Asian perspective in shipping, we will do it."

"I see four or five leading capitals being closely interconnected, learning from each other, filling different roles and driving the industry forward in healthy cooperation."

Esben Poulsson
President, Singapore Shipping Association

"By structuring our business to support global development, we can contribute to lifting more people out of poverty, and that is a great thing to work for."

Anne H. Stephensen
CEO, Danish Shipowners' Association

DANISH SHIPOWNERS' ASSOCIATION

Weathering the storm

Anne H. Stephensen
CEO
Danish Shipowners' Association

The full picture according to Danish Shipowners' Association
The full picture is one with more silver linings than cloud. There are reasons to be confident, reasons to be proud and reasons to look forward to the future with optimism. Global development is on-going, and shipping remains a key driver of positive change.

Putting to sea is not for the faint of heart, even in the fairest of weather. As the shipping industry once again finds itself sailing into turbulent waters, the belief that safe haven waits at the other end of the voyage is being tested in new ways.

"Danish ships picked up 1100 refugees in the Mediterranean only last week," reports Anne H. Steffensen, CEO of the Danish Shipowners' Association, illustrating both the plight of a desperate population, and the effect of a world in turmoil on her member companies. "Instability in the world is having a huge impact on Danish shipping."

"We don't know how the traditional axis of development will evolve," she states. "The economic situation in Europe is still uncertain, the US is looking stronger but growth is not creating more good jobs, and China's economy is slowing down and becoming more internalised. The changes in China are of particular concern for us, simply because of the large volume of business that our members do there."

Add to this picture unrest in the Middle East and Northern Africa and unsettling behavior from Russia, and you are looking at a future difficult to predict with any certainty.

Climate and the environment are also on the list of concerns. "The shipping industry has an obligation to make a difference. We need to have the smallest negative footprint possible, and that means finding ways to become more energy efficient."

REASON TO BELIEVE

Yet in this challenging scenario, Anne H. Steffensen finds reason for optimism, starting with the climate contribution that shipping is making. "The Danish fleet has reduced its CO2 emissions by 40% since 2008," she reports. "Now A.P. Møller Maersk has set a goal of 60% reduction by 2020 compared to 2007. These are ambitious goals, but we have the technology and the knowledge to reach them."

Nor does today's gloomy economic picture dampen her faith in a better future. While the optimism surrounding the BRIC countries is fading, Steffensen spies one bright spot. "Brazil, Russia and China are all facing slowdowns, but India seems to be on the right track. Foreign investors' confidence is being rewarded and foreign trade is opening up. India has a very young population and they have a strong educational system. Their economy is also diversified, more so than China, and they are making key investments in their infrastructure."

Developments in Africa also give reason for hope. "Africa has good growth potential. Many countries are becoming more integrated into world economy. Nigeria, Kenya, Ghana and Tanzania all have resources and infrastructure to support growth. Even if you start small, 5, 6 or 7 per cent growth is significant, and it multiplies over time."

"The medium and long-term opportunities are out there," she emphasises. "We just have to keep a positive outlook and be looking for the next opportunities for growth and development. Even if we only meet conservative estimates for growth, there will still be opportunities."

STRONGER TOGETHER

Among the concerns that shadow Steffensen's optimism is the fragmentation of international regulations governing the shipping industry. The weakened state of the UN is evident in the current situation in the Mediterranean. Inertia in the World Trade Organisation and other large regulators is also cause for serious concern in the shipping industry. "Thankfully we still have a strong International Maritime Organization in the UN, working to keep a level playing field in the shipping industry." Where global corroboration is lacking, Steffensen reckons regional agreements like the Trans-Atlantic Trade and Investment Partnership (TTIP) are the next best thing. "It's important for Europe and the US to agree on a single set of standards. Fragmented standards are devastating for our industry. We have our work cut out for us to achieve comprehensive global regulations and organisations to enforce them."

LIGHT IN THE DARKNESS

"I am a born optimist. But I honestly believe there are good reasons for optimism today. First of all, there are clear signs in the economy that there are countries and industries on their way up. Secondly, our own industry has always been able to weather crises. Our competence has gotten us through tough times before, and it is the key to being optimistic for the future," Anne H. Steffensen maintains.

"But the real winners over the past 20 years are the poorest people in the poorest countries who have made their way out of poverty and gained a place in the global economy," she concludes. "We have seen it happen in Asia, and we see it coming in Africa. Again shipping has played a significant part in this development and has to remain ready to tap into the opportunities that changing trade routes will bring. By structuring our business to support global development, we can contribute to lifting more people out of poverty, and that is a great thing to work for."

KONGSBERG WORLDWIDE

The KONGSBERG logo may have a crown, but the customer is king in Kongsberg Maritime Global Customer Support (GCS). Their new Executive Vice President, Vegar Arndal, will be working out of Kongsberg in Norway, but he has a global responsibility and the mind-set to match. That should come in handy, managing an organisation with employees and customers around the world.

GLOBAL CUSTOMER SUPPORT

Around the clock

Vegar Arndal has worked for KONGSBERG since 2002, giving him substantial knowledge of the organisation. But the key feature of his new position lies outside the company, in the close, direct contact with customers.

"I have been involved in a wide variety of tasks during my years. The transition to GCS has given me the opportunity to increase my focus on operative business management and customer orientation, which I find extremely motivating," he says. "Global Customer Support is a highly efficient matrix organisation, with committed employees and broad experience in customer relations. That being said, I feel certain that there is room for improvement and heightened focus in our work."

While Vegar might be careful about taking his work home with him, his enthusiasm for his new tasks can sometimes spill over into his free time: "I read a book on the LEAN philosophy of management during summer vacation, and I came across a statement I liked a lot: 'When everyone works towords improving efficiency and quality, and making the company a little bit more 'beautiful' every day, we become important pillars in the culture we want to establish.'"

CHALLENGING TIMES

"We are facing a challenging time in the oil industry these days, and a lot of our clients are in tough market situations," Arndal says. "Our customers' cost is our main concern. How do we set up our services and our organisation to meet the customers' needs in the best way? How do we meet our customers' needs for both predictable and reduced operational costs? Are there new ways we can provide our services? These are questions we ask ourselves every day, and today's market situation is having an impact on the answers," Arndal relates.

"We are recognised by customers for our global support organisation's ability to support them 24/7 locally at sites around the world, but we would like to strengthen the proactive local support even further," he adds. GCS believes that close relationships are essential for building trust, and trust is essential for sharing ideas and working together in the long term. These, Arndal believes, are the cornerstones of the service business. He goes on to describe how being prepared with world-class remote services, and having a global network that collaborates well across boarders and cultures, must be key priorities in GCS.

CREATING VALUE FOR THE CUSTOMER

"KONGSBERG's values are strong. If you look at our mission, which is 'Maximizing Performance by providing the Full Picture', and our values, *determined, innovative, reliable and collaborative*, they all influence how we behave and work, both inside and outside the company," Arndal states. "They also support one of my mantras: *We always strive to deliver on expectations, and our behaviour is essential for the customer's experience.*" Arndal is known for telling

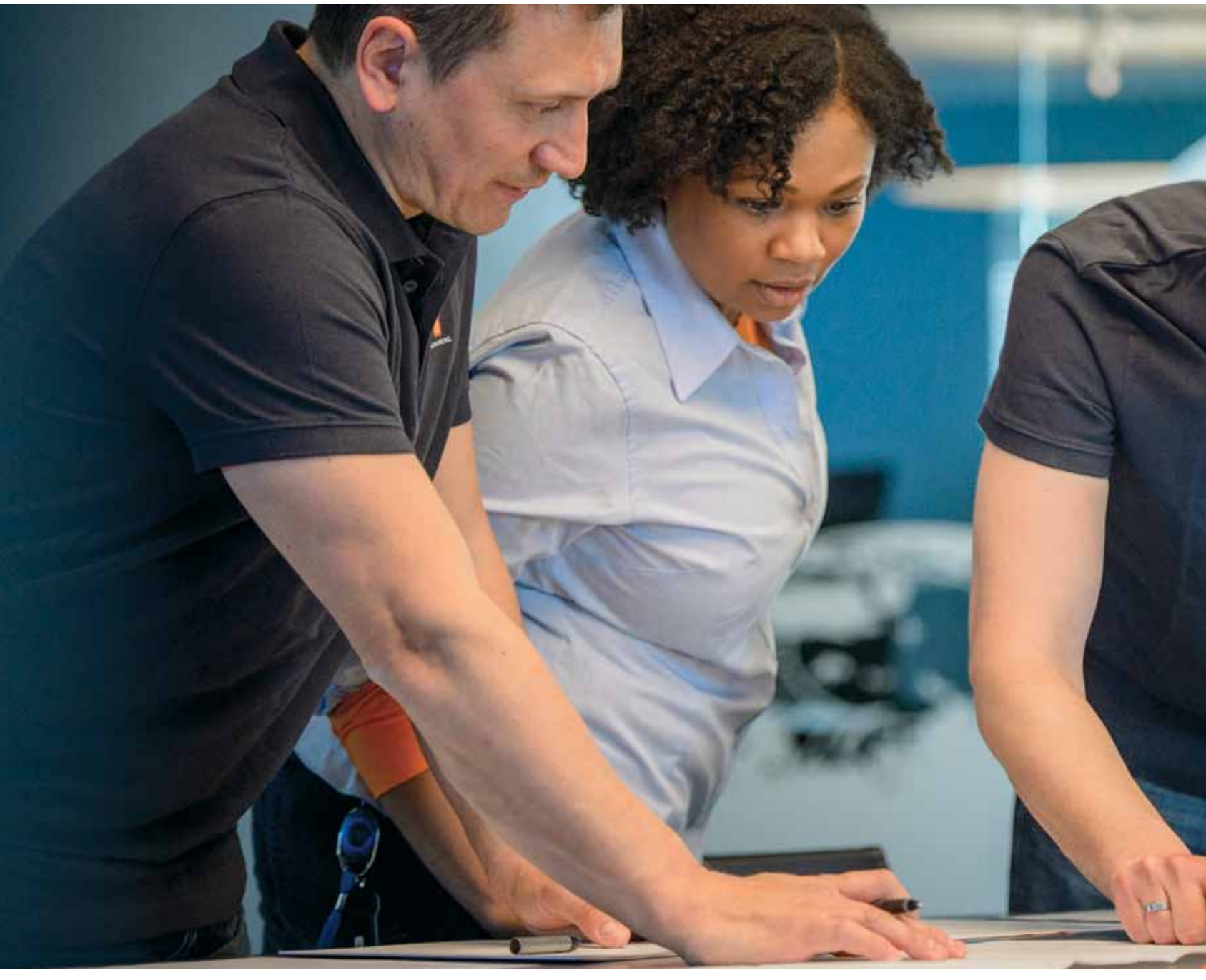
Vegar Arndal
Executive Vice President
Global Customer Support

colleagues to never give customers reason to complain about behaviour. Technical challenges and difficulties on board will arise, but GCS is committed to always acting according to company values.

Vegar Arndal is eager to talk about his work, and his energy and enthusiasm shine through, especially when talking about Kongsberg Maritime's customer promise. His obligation to the customer is firmly embedded in his thinking. And though Key Performance Indicators (KPIs) may not supply the spirit that drives GCS, they are clearly essential in a customer support organisation.

"Our KPIs are the keys to keeping our customer promise in the support organisation," Arndal explains. "To provide qualified answers 24/7 to the requests from some of the 18,000 vessels with KONGSBERG systems on-board requires that we work the same way, with the same tools and the same work processes and behaviour," he emphasises. "Our shared objectives and values are essential for building a strong corporate culture and a good reputation. To that end, every month we monitor our global organisation's ability to deliver on our promise," he confirms.

"Our business is very customer oriented, and we must always ask ourselves: 'What is best for the customer - and how do we help them meet their challenges?' We have to help them create value. If we conduct our work with this focus, we all succeed," Arndal concludes.



By your side, worldwide: Global Customer Support works 24/7 to provide prompt responses, technical expertise and global assistance.

GLOBAL CUSTOMER SUPPORT

KEY PERFORMANCE INDICATORS – OUR PROMISE:

- **ALWAYS – 24/7:** Immediate worldwide technical and spares telephone support shall be given for all products through Kongsberg Maritime support centres.
- **RESPONSE TIME:** We promise an eight hour working day response time for emails addressed to Kongsberg Maritime support centres.
- **FIRST TIME FIX:** We always endeavour to fix the problem first time, every time.
- **NO DECLINED SERVICE REQUESTS:** We aim to respond to and solve all your challenges.

FACTS ABOUT GCS

- More than 1200 employees
- Support offices in 20 countries
- Supporting 18,000 vessels with KONGSBERG equipment on board
- Use the same service desk
- Solve cases in the same virtual collaboration centre

FOLLOW THE SUN

Global service network of support centres provides expert technical and operational support, 24/7.

A world of virtual collaboration ensures that customers have the expertise they need, where and when it is needed.

- Call Centre – Front End
- Case Solving
- Service Coordination
- Virtual Collaboration Centre
- Incident Handling
- Worldwide Coverage

Every year Kongsberg Maritime develops the skills of around 7000 people through its network of global training centres. They provide dynamic environments, with world class instructors, technology and results. Here's a round-up of their latest news from across the globe.

Competence counts

NIGERIA

Training staff Nigeria.

MAINTENANCE COURSES AVAILABLE LOCALLY

In order to strengthen course delivery on a local basis, KONGSBERG now provides K-Pos Maintenance courses in Nigeria. Initially the courses will be arranged in Onne Port and delivered by Norwegian instructors, with a tailored mobile travel kit of computers, technical racks and desk top panels.
These courses will be provided both as standard, open courses and closed courses, with the possibility of tailoring the content towards each vessel in action.

ABERDEEN

Test tank facility at the Aberdeen Training Centre.

NEW HIPAP SURVEY COURSE FOR OFFSHORE SURVEY PERSONNEL

A new HiPAP Survey course has recently been developed to cater for Offshore Survey personnel. The course involves both classroom and practical training using our state-of-the-art test tank facility. This gives participants hands on experience of KONGSBERG products to improve their learning experience. The Aberdeen training centre, located in Westhill, is recognised as the Global Subsea Centre of Excellence. It is ideally positioned to run these courses as many subsea customers are neighbours within the same business park. Designed in line with IMCA's Competence & Assurance Guidelines for Offshore Survey, course delegates learn how to configure, operate and apply HiPAP to achieve highly accurate results for offshore survey operations.

BRAZIL

Classroom in Brazil.

NAUTICAL INSTITUTE ACCREDITATION OF DYNAMIC POSITIONING (DP) TRAINING SCHEME FOR SHUTTLE TANKER COURSE B

The training centre in Rio de Janeiro, Brazil recently received accreditation for the DP training scheme for shuttle tanker, course B. The main course objective is securing optimal understanding and skills for the individual Masters and Dynamic Positioning Operators (DPOs) when handling the DP mode and DP manual mode, as well as in traditional manual modes where appropriate. This will further optimise the safety of the tanker's manoeuvring and loading operations. The target group for the course is offshore personnel who want to work as DPOs on board offshore loading vessels.

MEXICO

Training in Mexico.

NEW TRAINING CENTRE IN VERACRUZ, MEXICO

A new KONGSBERG training centre is set to open in Veracruz, Mexico. Victor Proy, General Manager at Kongsberg Maritime Mexico S.A. de C.V, explains that this is due to KONGSBERG's commitment to provide its customers with extended local services. As the DP fleet in Mexico has been increasing year by year, so has the request for local crew training. The training centre will provide DP training according to Nautical Institute standards, alongside product training on various KONGSBERG equipment and systems.

CHINA

Bridge simulator.

ADVANCING LOCAL DP TRAINING

The training centre in Shanghai, China has extended its bridge simulator set-up with a DP class B in order to meet the Nautical Institute's simulator requirements for DP training. This will also enable the centre to provide more advanced training courses and real time offshore scenarios for local customers.

CANADA

Improved training facilities in Halifax.

UPGRADED TRAINING FACILITY FOR FULL FLEXIBILITY

The training centre in Halifax, Canada has been upgraded, with one new classroom and technical lab fully fitted for all courses offered. Currently the offering consists of technical courses for DP and HiPAP, and operator courses for HiPAP, Hydrography and GNSS products. The centre is also equipped to host courses that are normally offered locally.

HOUSTON

K-sim simulator.

NEW DP COURSE REDUCES SEA TIME TRAINING REQUIREMENT

Kongsberg Maritime's training centre in Houston, Texas has become the first maritime training facility in North America to offer the Nautical Institute accredited Sea Time Reduction Course for Dynamic Positioning Operators (DPOs). Kongsberg Maritime already offers the same course at its training facility in Rio de Janeiro, Brazil. The course reduces the time spent at sea required to achieve the Nautical Institute's DPO certification by up to six weeks. This is achieved through greater focus on realistic simulation exercises on a Kongsberg Maritime full-mission K-Sim DP simulator.
Picture: K-sim simulator

GREECE

From first K-Chief 700 LNG Dual Fuel Gas management course.

MEETING CUSTOMER DEMAND FOR LNG DUAL FUEL TRAINING

KM Hellas training centre completed a pilot of the K-Chief 700 LNG Dual Fuel Gas Management course in May 2015. The course was created in response to customer demand and to have a scenario based training set-up for LNG Dual Fuel vessels. The course enables the users of Dual Fuel Gas Management systems onboard LNG vessels to train in a secure and controlled environment on possible scenarios they might encounter onboard during operation. The scenarios are based on real life operations, reflecting onboard situations as realistically as possible. The main content of the course is focused on learning how to react, what to do, who to alert, and so on, in a given situation.

The training centre at Carpus, Kongsberg has held the first four customer workshops designed to assist them in building up procedures and checklists to help crews operate the K-Pos DP system more safely.

Procedure workshop for DP vessels and recurrent training

Good procedures and checklists will make it easier for the DP operator to avoid incidents or escalations. Some customers also want to test these procedures in a simulator, introducing the procedures to the operator in KONGSBERG'S full mission bridge simulator system. This type of recurrent training is highly efficient, and can give the operator the competence to recognise scenarios and initiate action before a situation escalates.

TRAIN THE TRAINER

Being a good instructor does not only require sound knowledge about the course subject, but also the right teaching and assessment skills. An increasing focus on assessment of offshore workers has resulted in new course developments from Kongsberg Maritime. The Art of Instruction (Including IMO 6.09 and more) and the Art of Assessment (including IMO 6.10 and more) are approved by Norwegian Maritime Directory and DNV-GL. These courses can be conducted at all Kongsberg Maritime training centres worldwide.

SEISMIC TRACK COURSE FOR BRIDGE NAVIGATORS AND SEISMIC NAVIGATORS

Kongsberg Maritime has developed a new course for seismic tracking operation for the C-Joy and K-Pos systems. To stay on track at the right speed, it is very important to utilise a seismic vessel to the maximum. Even the smallest errors may cause several hours of extra work. It is therefore crucial that the operator is sure of how to tune the system for maximum performance. An optimised system is only partly responsible for getting the best performance. The team onboard also needs to understand each other's needs and challenges, which is why we recommend that both bridge and seismic navigators join this course at the same time.

Enhancing DP understanding, skills and safety.

Long-term relationships provide long-term benefits, with enhanced understanding, planning capabilities and performance. Kongsberg Maritime partners with its clients to deliver lifecycle solutions that are tailored to their individual asset needs. Together we get results.

Espen Liset
Director Refit & Conversions,
Kongsberg Maritime

Stein Erik Øvstetun
Manager Lifecycle Support,
Kongsberg Maritime

LIFECYCLE SOLUTIONS

Stronger together

Kongsberg Maritime takes care of a huge operational fleet. Worldwide, there are about 17,000 vessels equipped with our products, ranging from dynamic positioning systems to automation systems, tank radars and reference systems. Each vessel is an individual, demanding individual care over long lifetimes that can often encompass various types of operations. This can lead to interesting challenges, for both the vessel owners themselves and KONGSBERG.

Espen Liset, Director Refit & Conversions at Kongsberg Maritime, and Stein Erik Øvstetun, Manager Lifecycle Support, are on the front line of customer support, ensuring that our global customer base gets the best possible solutions, and performance, across the lifecycles of their vessels. Their diverse range of responsibilities spans from spare parts to complete upgrades of on-board systems.

"It is our philosophy that we build and maintain a partnership with our customers from project initiation and throughout the entire lifetime of operation," explains Liset.

"Our customers' KPI's are our concern. We always aim for optimised performance on their behalf, and feel that their success is partly our mission as well. Since some of their vessels have a lifetime of up to 40 years, we know that changes will be required during that timescale. By understanding their needs and, naturally, our own technology, we can be at the forefront of predicting what might happen with everything from our spare parts to third party spares, as well as the functionality required for new regulations or operational tasks."

Stein Erik Øvstetun agrees. He notes: "From our point of view, we scale the support to meet the operational and maintenance requirements defined by the customers. We are able to indicate operational risks and concerns and, thanks to close relationships with our clients, discuss and suggest methods for mitigation. What's more, good planning is cost effective."

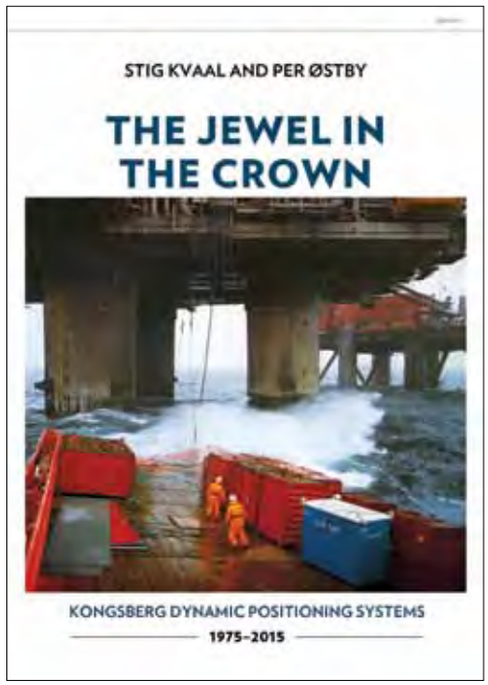
Øvstetun continues: "The Lifecycle management solution from KONGSBERG aims to assist customers throughout all phases. Providing fleet lists with a status overview is part of the service we provide. The effective execution of Lifecycle analysis is important and together with the customer we can plan ahead for all upgrades and schedule necessary maintenance."

Liset nods in agreement, concluding: "We tailor programmes individually for each vessel or fleet. By doing that, we think we have a good tool for minimising operational disturbance and risks.
"At the end of the day, that is our main mission; maximising performance for our customers."

"Our customers' KPI's are our concern. We always aim for optimised performance on their behalf, and feel that their success is partly our mission as well."

Espen Liset
Director Refit & Conversions , Kongsberg Maritime

With the title 'The Jewel in the Crown' who better to receive the very first copy of Kongsberg Maritime's new book than King Harald V of Norway?



DYNAMIC POSITIONING

A crowning achievement

The hardback book, which charts Kongsberg Maritime's central role in the development of Dynamic Positioning (DP), was presented to the Norwegian Head of State at this year's Nor-Shipping exhibition in Lillestrøm. The combination of the King's involvement and the title, which also alludes to the crown in KONGSBERG's logo, provides an indication of DP's importance to both the company and wider Norwegian society as a whole.

DP is a groundbreaking technology that allows a vessel to maintain a fixed position at sea using its own propellers and thrusters, rather than anchors. First developed by KONGSBERG in the mid 70s, it would go on to play a key role in enabling Norway's success in the oil industry. Its significance is such that Morten Breivik, Head of the Department of Engineering Cybernetics at Norwegian University of Science and Technology (NTNU), suggested documenting its history while some of the key individuals involved in its development are still here to tell their story.

"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 so long," Breivik explains. "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. We should honour their work in helping to make maritime operations safer and more efficient."

He continues: "The story of the KONGSBERG DP is also an excellent example of how modern cybernetics theory was successfully applied by engineers educated at the department founded by professor Jens Glad Balchen in 1954 at The Norwegian Institute of Technology (NTH now NTNU). It's my hope that this book will help inspire new generations of engineers to contribute to similar achievements in the future."

The Jewel in the Crown took three years to complete with the help of countless contributors, both in Kongsberg Maritime and elsewhere. It is written by NTNU professors Stig Kvaal and Per Østby.

"We started with a clean slate, although this was in fact a return to the subject of our Masters thesis several years ago," comments Kvaal. "This has enabled us to get to know an exciting technology and culture which is now world leading, and it's interesting to see how a Norwegian company can succeed in this way and create such a professional environment."

The Jewel in the Crown provides a detailed account of the people, technology and events behind DP. The adventure started in 1975, when Kongsberg Våpenfabrikk signed its first DP contract before delivering its very first system one and a half years later to Seaway Eagle, a Norwegian diving vessel in the North Sea.

Since then, KONGSBERG's DP systems have become a worldwide success story. The technology was first developed and industrialised as a collaborative effort between Kongsberg Våpenfabrikk, professor Balchen, SINTEF, Simrad and shipowner Stolt-Nielsen. The system was, and still is, an essential enabler for advanced marine operations.

"Today, DP is found on board all types of vessels worldwide, from offshore supply vessels to the new generation of mega-cruise ships," notes Nils Albert Jenssen from Kongsberg Maritime. Jenssen is an Honorary Member of the Norwegian Society of Automatic Control and a Maritime Technology Society Distinguished Achievements Award winner, for his role in the development of DP systems.

He concludes: "After 40 years of developing DP technology, Kongsberg Maritime still maintains its world leading position as a DP supplier. It's very satisfying that the technology we have worked so hard to perfect was also recently chosen as the most important Norwegian engineering accomplishment since the Second World War by the readers of Scandinavia's leading engineering and technology magazine, Teknisk Ukeblad."

King Harald receives 'The Jewel in the Crown' from Kongsberg Maritime CEO Geir Håøy.

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