THEME: LNG

PIONEERS IN FLOATING REGAS
LNG MARKET ANALYSIS
LEVERAGING LNG EXPERTISE
NEW LNG PLAYER

KONGSBERG

THE MAGAZINE FOR USERS OF KONGSBERG PRODUCTS AND SERVICES

THE FULL PICTURE MAGAZINE

DRIVING WORLD CLASS STANDARDS

How a global industry leader
meets market challenges
and stays ahead of the competition

Never stand still

BMW and the art of staying ahead of the competition

Page 34

In this issue of The Full Picture Magazine we have the pleasure of inviting you behind the wheel with a true global business leader and superbrand. BMW is at the very vanguard of its industry. The firm has secured its position thanks to a history of innovation, dependability and displaying an intimate understanding of its customer base.

However, you don't stay ahead of the competition by standing still, and the brand is intent on building a fresh history for itself with the launch of the BMW i8 – a quite remarkable supercar for a new generation of customers.

In the first of an occasional series of features on fellow world class firms and individuals, TFP headed to the 2012 Geneva Motor Show to meet BMW and discover how one sector leader is facing up to industry challenges that we can all associate with – finding fuels for the future, creating sustainable success and solving problems through relentless innovation.

Buckle up and turn to page 34, it should be quite a ride.

On the subject of 'fuels for the future', this issue also focuses on three letters that mean a great deal to the shipping and offshore segment – LNG. We discuss opportunities and market evolution with industry players such as Höegh, Golar, Dynagas, Thenamaris and Greek guru Stavros Hatzigrigoris, of Maran Gas.

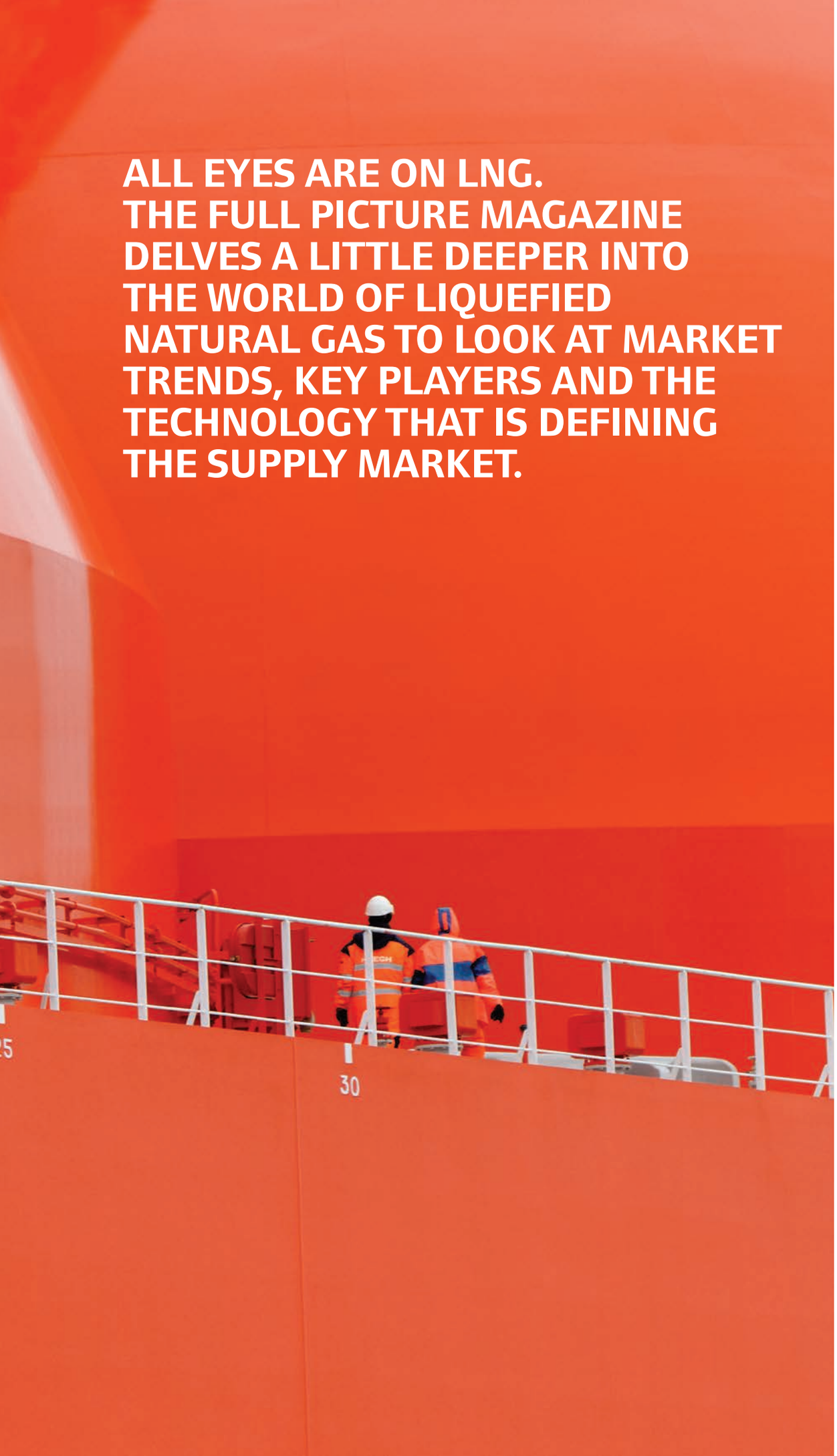
Working with the likes of Maran and Golar brings us conveniently on to the overarching theme for this issue, and one of Kongsberg's core values, collaboration.

How can firms, colleagues and even competitors join forces to realise business aims that, separately, they could only ever dream of achieving? TFP talks to DNV, Seajacks, Statoil and a host of other big names about sharing goals with partners, and the principle advantages of creating a united front.

We hope you enjoy collaborating with us for this latest look at The Full Picture Magazine.

Gunvor Hatling Midtbø
Kongsberg Maritime
Vice President – Comunication

CONTENT



ALL EYES ARE ON LNG. THE FULL PICTURE MAGAZINE DELVES A LITTLE DEEPER INTO THE WORLD OF LIQUEFIED NATURAL GAS TO LOOK AT MARKET TRENDS, KEY PLAYERS AND THE TECHNOLOGY THAT IS DEFINING THE SUPPLY MARKET.

BUSINESS OPPORTUNITIES

Pioneers in floating regas

Sveinung J.S. Støhle
CEO and President
Höegh LNG

Støhle is reaping the rewards of a strategy of evolution to meet market demand and calculated risk taking with newbuild contracts.

"When we find suppliers who share our vision and focus on delivering on expectations, like Kongsberg Maritime, we tend to use them again and again. Trust is a key part of building long-term relationships," Sveinung J. S. Støhle, Höegh LNG's President and CEO.

On 23 January, Höegh LNG was selected preferred bidder for a 10-year contract from majority state-owned energy company, Klaipedos Nafta for an FSRU project near Vilnius, Lithuania. Two days later, the company finalised an agreement with PT Perusahaan Gas Negara (PGN) to provide an FSRU and mooring system offshore Belawan, near the city of Medan in Indonesia. The 20-year charter includes two five-year options, which could extend the charter for a total period of 30 years – the longest contract yet awarded in the FSRU market.

Securing two long-term contracts in one week is a remarkable achievement, but according to Sveinung J. S. Støhle, Höegh LNG's President and CEO, the company's success hasn't happened overnight. "These contracts represent years of hard work, patience and collaboration with a broad network of suppliers and in particular builds on our success from constructing the two Neptune regas vessels on long-term charter to GDFSuez," he says. "From a financial perspective, the contract value is significant, but this achievement by HLNG sends a strong message to the market that we are a serious and viable player in the floating LNG solutions segment, and that we can deliver on our stated objectives."

A HISTORY OF INNOVATION

Established in 1973, Höegh LNG has long been recognised as a pioneer in the transportation of LNG. Indeed, the company's first vessel, Norman Lady, was the prototype for the Moss spherical cargo containment system (the vessel is still in operation today). At the time, Höegh LNG's parent company, Leif Höegh & Co was active in a number of different segments and so while the company successfully operated a modest fleet of LNG carriers for more than a quarter century, Höegh LNG was considered a niche player.

That all changed in the early 2000's, when Leif Höegh & Co began selling interests in other segments to focus exclusively on LNG and Ro/Ro. At the time, the LNG industry was in a period of rapid change. Rising demand for gas, particularly in the Atlantic basin, had led to investment by big players in new and larger membrane type LNG carriers, which increased competition and lowered freight rates. Rather than join the newbuilding bandwagon, Höegh LNG decided to take a new strategic direction. In 2006, HLNG Ltd. was spun off from Leif Höegh & Co as a separate and independent LNG company, under new top management and with a clear strategy to not only offer maritime transportation services, but also develop the systems and vessels to offer long-term floating production, regasification and terminal solutions.

"While we have very strong in-house technical competence, Höegh LNG has a tradition of working with leading suppliers to develop new concepts"

Sveinung J.S. Støhle
CEO and President, Höegh LNG

UNDERSTANDING THE ENERGY INDUSTRY

Støhle was recruited from the energy industry to execute the new business strategy. "When I joined the company, we had two aging vessels and a small staff," he says. "But we also had owners who were wholly committed to the new vision for the company and strong in-house LNG expertise."

While still committed to LNG transportation (in 2006, the company added two new carriers to its fleet, which are on long-term charter to Statoil and Total), Støhle brought in personnel with experience in the energy industry to develop other aspects of the business. "Part of our challenge in the beginning was that we were perceived as a shipping company," he says. "Our experience with LNG and operations at sea remains critical to our business, but to expand into the LNG value chain, we also needed to bring people into the organisation who really understood the energy industry."

THE CORE OF THE BUSINESS

Støhle explains that Höegh LNG's business model is structured around meeting the evolving needs of energy producers and energy providers. "Put simply, by offering LNG infrastructure offshore, our customers can gain faster access to growing markets and avoid many of the costs and permitting challenges associated with the construction of land-based facilities," he says. "By provid-

ing safe, reliable and proven floating LNG solutions, we allow energy companies to focus on their core business: trading gas and producing electricity from gas."

To offer these services, the company had to work closely with a network of suppliers to develop new, specialised types of tonnage. For example, working in partnership with GDF Suez, Höegh LNG developed a Shuttle and Regas Vessel (SRV) – a hybrid solution that can both transport and regasify LNG at a deepwater port off the coast of Massachusetts.

The SRVs were designed and constructed by Samsung Heavy Industries, but Höegh LNG also worked closely with Hamworthy, which supplied the topside regas system, Advanced Production and Loading (APL) which provided the submerged turret loading (STL) and associated mooring systems, and Kongsberg Maritime, which provided a broad range of custom-built electrical, automation, dynamic positioning and control systems. The result was two unique vessels, the Suez Neptune and Suez Cape Ann (delivered in 2009 and 2010 respectively). Both SRVs are on long-term charter to GDF Suez.

PURPOSE BUILT FSRU

At the same time, Höegh LNG continued its design work to develop the industry's first purpose built FSRU, based to a large extent on previous experience. While there are other floating LNG providers, who market FSRUs, their units are either converted LNG carriers or newbuilt SRV/FSRU – in other words hybrids. "The capacity of converted LNG carriers averages about 126,000 cubic meters of gas," he says. "Some of the newbuilt SRV's are 150,000 cubic meters, our purpose built FSRUs have a capacity of 170,000 cubic meters, which can make all the difference in some markets."

Støhle notes that for some projects, the conversion model is appropriate – in fact, the company recently purchased the 126,400 cubic meter capacity LNG carrier, LNG Libra that is ideal for conversion. But for companies seeking high capacity and technology, the purpose built FSRUs are the better solution. Once satisfied with the FSRU design, Höegh LNG sought equity financing on the Oslo Stock Exchange, raising about USD 132 million to construct two firm FSRUs, with 1+1+2 optional FSRU's at Hyundai Heavy Industries.

It should be noted that while market conditions supported the decision at the time, the company did not have a charter agreement. And with a delivered cost of about USD 320 million per unit, the company was taking a calculated risk. But according to Støhle, the company was confident that the FSRUs would secure a contract before the first unit was scheduled for delivery, by the end of 2013.

"If anything, we were surprised by how quickly we were able to secure charters for both FSRUs," he says. "But when you consider that there are more than 30 floating regas projects now in various phases of development, and that for the moment only three companies, including Höegh LNG, have the ability to deliver, we never doubted the viability of the business plan. In fact, we have recently exercised an option for a third unit and will consider building more, if market conditions continue to be positive."

> "Floating LNG solutions represents the industry's fastest, most cost effective path for energy providers to gain market access and import LNG"
>
> **Sveinung J.S. Støhle**
> CEO and President, Höegh LNG

THE ART OF COLLABORATION

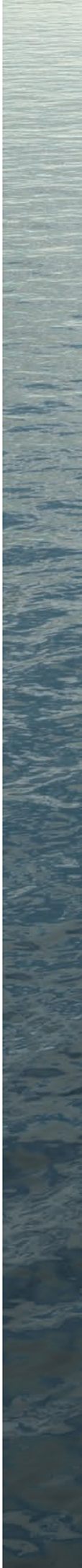
Støhle says that the company's ability to collaborate with technical suppliers have been a critical factor in achieving its ambitions. "While we have very strong in-house technical competence, Höegh LNG has a tradition of working with leading suppliers to develop new designs. And when we find suppliers, like Kongsberg Maritime, who share our vision and focus on delivering on expectations, we tend to use them again and again. Trust is a key part of building long-term relationships."

This collaboration model has been scaled up in the development of Höegh LNG's state-owned project, an LNG FPSO, developed in cooperation with DSME E&R and Papua New Guinea's majority state owned energy company, Petromin. So far, Höegh LNG has invested more than 300,000 engineering man-hours in the concept, producing over 1500 datasheets and a detailed FEED that has won Approval in Principle from Det Norske Veritas. Höegh LNG is working with a number of suppliers, including KBR (FPSO engineering) the Woodgroup PSN (operations and maintenance), and partners to negotiate contracts with local gas suppliers.

ON THE FOREFRONT OF TECHNOLOGY

"The technical and commercial complexity of the FPSO project requires that we partner with other organisations and collaborate with known suppliers to get the job done," he says. "While there are other LNG FPSO projects now in development, we are on the forefront of this technology and are confident we have a viable solution."

Looking ahead, Höegh LNG sees tremendous growth potential in the LNG segment. "While there has been a shift in demand from the Atlantic basin to the Pacific, LNG is becoming a preferred energy supply in many markets," says Støhle. "And right now, the greatest bottleneck is inadequate infrastructure. Floating LNG solutions represents the industry's fastest, most cost effective path for energy providers to gain industry access and import LNG, and as a pioneer in this segment, we feel we are in a good position to support the industry's growth."



Höegh has invested in purpose-built FSRUs to give clients high capacity and the very latest technology.

The liquefied natural gas (LNG) sector has had its ups and downs, but right now it's hot. The Full Picture Magazine asked four industry specialists for their views on recent market events and the outlook for global LNG.

MARKET OUTLOOK

Hot, hotter, hottest

"The Australian LNG projects are targeting Asia as an export market, and so are the Canadian and US projects, and increasingly the Qatari and African. The question is whether Asia will be able to absorb all that new supply"

Aje Singh Rihel
Senior Market Analyst,
Consulting, ODS Petrodata

THE INDUSTRY ANALYST

"Asia is the driving force now – but for how long?"
Aje Singh Rihel, Senior Market Analyst, Consulting, ODS Petrodata (now wholly-owned by IHS), says: "In terms of short-term demand, we believe that Japan is the driver, because following the Fukishima accident, Japanese nuclear utilisation is very low.

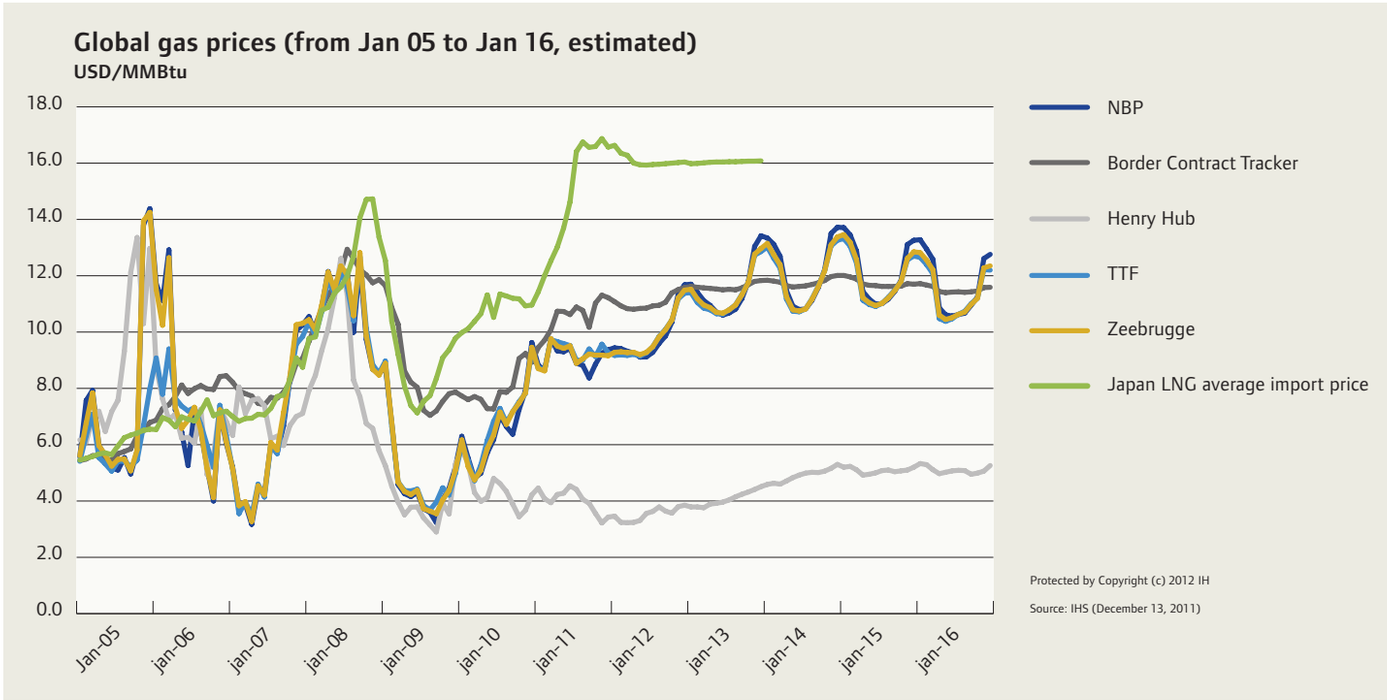
"We expect LNG demand to remain very high, with record annual import levels for 2012. Longer term it's a bit more uncertain and depends on nuclear policy."

But Japan is not the only Asian LNG buyer, Rihel notes. "Other Asian countries have high LNG demand. India's indigenous gas production is having trouble and more LNG impor t capacity is planned over the coming years. But China is probably the most important market over the next five to ten years and it has already locked in a lot of Australian LNG.

"The Australian LNG projects are targeting Asia as an export market, and so are the Canadian and US projects, and increasingly the Qatari and African. The question is whether Asia will be able to absorb all that new supply.

"According to IHS estimates, the supply of LNG to Asia would exceed the demand around 2017, given that the Australian projects and North American projects proceed in accordance with their individual development plans. Even with a lower capacity built, IHS expects a loosening of the global market by 2016."

However, turning to Europe, Rihel's prediction is more modest: "We expect moderate growth from now



onwards for Europe. It is not going to be the most important market for LNG in the future, partly because of low demand growth but also because suppliers want to shift LNG cargoes to Asia due to the higher gas prices in the Asian markets.

He highlights the importance of US shale gas: "Shale has changed the whole LNG market dynamics. Five to eight years ago the US was the main driving market for planned LNG export projects, then suddenly the huge expected North American demand never materialised and there has been a regional switch in market focus from the US to Asia," he says.

"What will be the extent of North American LNG exports? It will be a complete role reversal from prospective LNG importer to a role as LNG exporter," he adds.

"Who are the players to watch? China and India, especially China, have made huge investments in petroleum assets, in areas such as unconventional gas and oil sands. In North America alone, during 2009-2011 China has made several multi-billion dollar investments in petroleum assets.

"But it's one thing to gain access, taking stakes in development projects, it's another to carry out knowledge transfer. China has large reserves of unconventional gas that it wants to develop.

"It's too early to say, but if China is able to apply the know-how and develops these reserves it could affect Chinese demand a lot in the future. Potentially," concludes Rihel.

THE SHIPPING SITUATION

"The tight LNG shipping situation represents a major challenge"

JØRN BAKKELUND, partner, Economic Research, RS Platou Markets, explains how the availability of ships to carry the LNG affects the market. He says that the present tight market for short-term capacity is one of the major challenges for both LNG buyers and sellers.

"Only 10 of 51 Japanese reactors were in use prior to 2012 ... the lowest recorded utilisation rate since the Federation of Electric Power Companies started compiling monthly data in 1977"

JØRN BAKKELUND
Partner, Economic Research,
RS Platou Markets

Since Japan has closed down most of its nuclear power plants, the shortfall in generation capacity has been replaced by gas-fired capacity fuelled by LNG imports and by power-saving measures.

"In addition, the general economic situation in Asia – and by Asia I include Japan, Korea, China, India and Taiwan – has led to a situation where Asian countries are demanding LNG and are taking it from the Atlantic Basin, creating longer voyages.

"There are also some new buyers of LNG coming forward. For example, Thailand began buying LNG this year. So it is the Asian countries together that are driving LNG demand.

"The Asian consumers have been eager buyers of contracted volumes, but they have also been buying spot volumes. However they have been finding it difficult to secure vessels," says Bakkelund.

Because the number of available ships has dwindled, short-term shipping rates have climbed to around $105,000-$110,000 a day, or, more than double the rates seen last year. The average for 2010 was close to $40,000/day and Bakkelund predicts that the 2011 annual average will probably work out around $90,000/day.

"In general, it's a fairly tight LNG shipping market this year and we see this continuing for the short or medium-term, for the coming two to three years," he says. "We expect the demand for LNG carriers to leap by 30% in 2011 and the utilisation rate to increase by almost 20 percentage points to reach 91%.

"We've gone through a period where we saw substantial fleet growth – in 2008 growth was 17% and in 2009 it was 20%, with 13% in 2010 – but this year it is expected to fall to 10%. That's counting the active fleet," he added.

SHALE GAS

WHAT IS SHALE GAS?

Shale gas is one of a number of unconventional sources of natural gas, together with coalbed methane and tight sandstones.

Most unconventional gas occurs in thin layers of source rock and does not easily flow to the surface. It requires the rock to be fractured or stimulated to allow the gas to be produced.

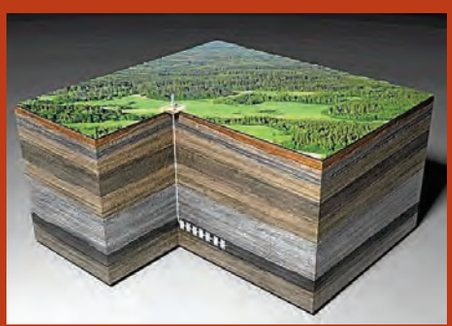
The potential of shale gas, tight gas and coalbed methane has long been known, with the first shale gas wells drilled in the 1820s.

However, a combination of recent technological improvements and much higher prices for natural gas has in recent years has made developing this gas economically viable. Towards the end of the 20th century, the combination of two existing technologies – horizontal drilling and hydraulic fracturing ("fracking") – changed the outlook for unconventional gas production.

THUMBS UP OR THUMBS DOWN?

– Many view shale gas as essentially green, enabling the replacement of polluting technologies such as oil or and coal-fired power generation and thus reducing carbon emissions. Some, like Dr Medlock, view it as a potential gas and LNG pricing paradigm-changer and as such beneficial.

– Others reckon that the production processes involved in developing shale gas reserves produce more carbon emissions than could be saved by substituting shale gas for oil or coal. Environmental activists point to the pollution of the water table that can be caused by the waterflooding necessary for shale gas production.



Statoil

"If the technology and lessons learned in the North American shale experience can be successfully deployed elsewhere, then shale will be truly transformative in many ways, including with regard to the LNG market"

Dr Kenneth B Medlock III
Fellow in Energy and Resource Economics, Rice University, Houston

"LNG shipping demand has gone in the opposite direction, from fairly low to high. It grew by 30% in 2010 and this year so far it is again up by 30%."

"We calculate that the productivity of the fleet has declined, mainly due to higher bunker costs," Bakkelund says. "This has led to shipowners running their ships at slow speeds, wherever operationally possible, at least on the ballast legs of their journeys, if not on the laden legs."

THE ACADEMIC VIEW

"Shale gas: the biggest market change in the last decade"

Dr Kenneth B Medlock III, Fellow in Energy and Resource Economics, Rice University, Houston, views the development of US shale gas as: "Perhaps the biggest change in the market in the last decade."

US shale has turned the US market from one in which most expected LNG imports to rise rapidly to one in which there are now active discussions about LNG exports.

"Just 10 years ago there were up to 47 proposals for LNG import capacity, and today we have three export filings in the [US] Gulf Coast and another in Western Canada. This entire development is the result of shale gas development.

"Going forward, there is intense interest in developing identified shale resources elsewhere in the world. If the technology and lessons learned in the North American shale experience can be successfully deployed elsewhere, then shale will be truly transformative in many ways, including with regard to the LNG market."

Dr Medlock says that as a result of this shift in demand dynamics, he now sees two big challenges in the future.

"One is a continued push by large consumers to move away from the traditional paradigm of oil-indexed pricing. Increasingly, consumers are looking to negotiate gas-on-gas indexed terms.

"As the Chinese market continues to develop, it is very possible that the concomitant increase in liquidity in the Pacific market could push significant change in the manner in which natural gas is traded," says Medlock

The second challenge, according to Medlock, is the increased competition that the new shale resources will bring.

"These new resources have increased the supply options to consumers in markets that are, or were, turn-

ing to LNG. This tends to pressure existing pricing and also portends a much slower growth in the LNG business than most expected just five to seven years ago," he explains.

"I do not think, however, that change will happen quickly, particularly with regard to pricing paradigms. Most likely, multiple forces will work together to push change over the next decade or so."

Medlock believes that in future most LNG market opportunity will increasingly lie in developing Asian economies. Strong economic growth, a lack of pipeline infrastructure and well-developed internal markets, and mounting environmental pressures will all serve to influence higher demand for natural gas.

"Of course, the largest player in the field remains Qatar, and that will not likely change in the near future," he says.

"There are some Arctic opportunities, but high costs and the risk of a limited market will likely mean the Arctic is not the next immediate frontier. Rather, technological innovations that lower costs and make new supplies available will be the most important thing to stay on top of."

Medlock sees the most innovation in the work on the NW shelf of Australia, due to the strict environmental requirements those projects face.

"In the near future, proposed development of LNG export capability in Eastern Australia will tap coal bed methane deposits for LNG exports. This, to my knowledge, is the only time this has happened," concludes Medlock.

THE INDUSTRY OBSERVER

"North America is the wild card in the LNG supply picture"

Michael Rieke, Managing Editor, Platts LNG Daily, sees LNG demand continuing to be buoyant.

"Demand for LNG continues to increase with many existing markets buying more supply and other countries entering the market year after year. Supply is also increasing but is not keeping pace with increases in demand."

Besides market driver Japan, Rieke singles out China and India as growing and potentially huge markets for LNG. However, both countries also need to build long, high-capacity pipelines as well as distribution systems, he says, so they can deliver regasified LNG to markets throughout their huge countries.

"Thailand, Vietnam, Pakistan and the Philippines are also entering the LNG market with newly-opened or planned import terminals. South America has been a growing LNG market for the last four years, with Argentina, Chile and Brazil beginning to import LNG."

> "By the middle of the decade, Australia plans to be second only to Qatar in LNG"
>
> **Michael Rieke**
> Managing Editor, Platts LNG Daily

On the supply side, Rieke points out there have been some turnarounds. Malaysia and Indonesia, which have been LNG exporters for decades, are now planning to build LNG import terminals as their existing natural gas reserves continue to shrink.

"Australia is going to be a major supplier. It has a number of new liquefaction plants being built as well as others still in the planning stages.

"But North America is the wild card in the supply picture. Gas prices in the US and Canada are the lowest in the industrialised world due to continually increasing supplies of shale gas. The US alone is said to have enough to last for 100 years," says Rieke.

He tips Brazil as another LNG importer that could become an exporter in the future as it develops huge deep water natural gas reservoirs.

"The country depends on hydropower for more than 80% of its power generation and, during years with low rainfall – like 2010 – it must import LNG to supply its gas-fired power generation plants.

"However, once Brazil develops its offshore gas supplies, it could export LNG when it has sufficient rainfall to meet its power needs," he adds.

What's next for the industry? Rieke tips floating liquefaction technology as probably having the greatest potential and notes that Shell has made a final investment decision to go ahead with its Prelude floating liquefaction project.

"If floating liquefaction proves to be economically feasible, it would open previously inaccessible natural gas reserves to development as LNG export projects."

So far, Shell has identified gas reserves off the coast of Australia and West Africa as suitable locations: "The technology could allow facilities to be used in one location until the gas reserves are exhausted, when they could be moved to undeveloped reserves, reducing the cost of new LNG export development projects," Rieke explains.

Dynagas builds success on experience gained from wide vessel trading, a high quality and flexible fleet and a fully integrated organisation. Dynagas Ltd is a fully integrated LNG Shipping company that built its LNG business on the short-term charter market. Now, with a proven track record and a solid customer base, it is expanding its LNG carrier fleet in a strong market.

IN PROFILE

The long and the short of it

Tony Lauritzen
Commecial Director, Dynagas

Manos Migadis
Newbuilding Director, Dynagas

An important part of Dynagas' strategy is to run all aspects of its operation internally, including newbuilding negotiations. The company is adding seven newbuildings to its fleet.

After closely watching the LNG segment for several years, Dynagas ordered its first three LNG carriers from Hyundai Heavy Industries (HHI) in 2004. The Kyoto protocol was about to come into force and regulatory trends as well as a shift in consumer preferences all pointed to a future based on cleaner burning fuels. Dynagas Commecial Director, Tony Lauritzen, says that based on an anticipated demand for LNG transportation, Dynagas wanted to become a high quality and reliable first-class LNG shipping company offering flexible shipping transportation solutions to first class clients.

"We built our carriers with the experienced HHI and selected the most robust and reliable equipment makers. Ensuring that we selected a design that was optimised for terminal compatibility was critical. At 150,000 cubic metres (cbm), the vessels were built to accommodate the average cargo size and guaranteed wide terminal acceptance. We also opted for full in-house operations and pursued short-term charter employment with as many first class charterers as possible. This meant the company would be exposed to different trades and market participants in order to gain industry experience," he points out.

A FLEXIBLE ALTERNATIVE

The LNG sector was built on the idea of long-term contracts. This allowed Dynagas to offer a clear alternative to charterers looking for more flexible shipping solutions which Lauritzen says, "enabled their cargoes to reach the highest paying markets and realise the true value of the commodity."

While a long-term time charter approach may have been an easier way to enter the industry, Lauritzen says there were other reasons for Dynagas to go down the short-term route.

"Many operators sign long-term charters with a fixed load and discharge terminal. We realised that we needed to take a different approach to quickly progress in the sector. Despite being offered long-term charters, we chose to do business with several charterers with a wide trading pattern, calling at different terminals. This helped us gain trading and terminal experience and build up an operation that exceeded the requirements of various industry participants. It hasn't been easy, but it has resulted in the company building up a robust knowledge base," he explains.

As they had suspected, Dynagas faced a steep learning curve in a notoriously tough industry for newcomers. But by constantly challenging itself to meet requirements for a variety of operations and terminals, the company quickly developed both its onshore and offshore capability. Lauritzen states that Dynagas is now one of the few carriers in the market with widespread industry experience.

Newbuilding Director, Manos Migadis, elaborates: "We don't have comparable statistics to back this up, but I'm confident that there aren't many LNG ship-

owners that can match our ratio of terminals visited divided by years and vessels," he asserts.

By employing this strategy, Dynagas was also able to develop relationships with a range of charterers and build a reputation as a trusted LNG carrier.

"The terminals our fleet has called to have given us excellent feedback which we take pride in. The vetting inspections by the majors of the vessels have also come out with high-ranking results. However, this is a dynamic industry with constant changes in requirements and we continuously monitor developments and adapt accordingly in order to stay ahead of the curve," Lauritzen states.

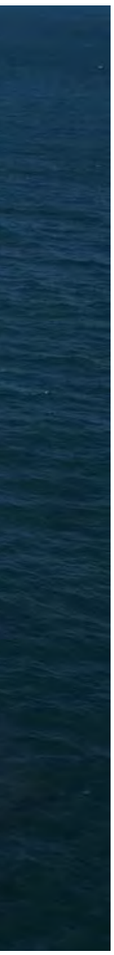
KEEPING IT ALL IN-HOUSE

An important part of Dynagas' strategy has been its commitment to run all aspects of its operation internally including newbuilding negotiations, plan approval, site supervision, HSSE, technical management, crew management, technology & IT and administration. Companies looking to fast-track entry into a market or reduce liability often opt to outsource. While outsourcing is usually cheaper, Lauritzen says, "Having the cheapest operations has never been our goal. Our goal is to ensure safety and performance and thereby avoid downtime."

He adds that, "Problem solving and ensuring good communication between departments is much more efficient when you manage things internally rather than outsourcing.

Dynagas will add seven newbuildings to its fleet. While Lauritzen admits that maintaining quality through rapid expansion is one of the biggest challenges any company can face, he believes the in-house strategy will ensure that the company will meet this challenge successfully.

"Our operation will become more complex as we add the newbuildings, but with no downtime in five years on any vessel I believe we have the right approach. Our preparations have included hiring experienced additional seafarers and office personnel, training staff for new technology on the existing ships and shore training," he explains.



Dynagas is expanding its LNG carrier fleet in a strong market.

DYNAGAS

WHAT EXACTLY HAS DYNAGAS LEARNED ABOUT LNG?

"Safety and diligence is number one priority. All owners, charters, terminals and industry participants are diligent and only enter business with credible partners. It takes time, effort and opportunity to build up a reputation. Charterers are mainly interested in owners who have a reliable track record and ensure safe transportation, supported by a fully integrated organisation that performs 'a' to 'z' internally,"

TONY LAURITZEN,
Commercial Director Dynagas.

VESSEL FLEXIBILITY IS KEY

Now with a recognised track record and brand and an expanding, diversified fleet, Dynagas is aiming to build a balanced charter portfolio with short, medium and long-term charters.

All of Dynagas' vessels have been built to serve multiple charterers, which makes flexibility key. The ships are built to handle a variety of conditions and optimised for terminal compatibility.

Of the seven newbuildings, three represent an evolution of the current fleet of 150,00-cbm. By using similar principal hull dimensions and replacing the steam engines with tri-fuel diesel electric propulsion systems, the newbuilds gained an additional five thousand cubic metres of carrying capacity taking them to 155,000-cbm while retaining the same terminal compatibility.

At 162,000-cbm, and with the latest low boil off technology, Migadis says the remaining four newbuildings are designed for long-haul transportation. "This size is large enough to make long voyages economical, while retaining good terminal flexibility. For vessels larger than 162,000-cbm, terminal compatibility is reduced and fewer charterers have access to fill up such cargo sizes," he explains.

All newbuildings will be powered by fully redundant tri-fuel diesel electric propulsion systems, and have reinforced membrane cargo containment systems. They will also be assigned with green passports and fitted with a ballast water treatment system.

The entire Dynagas fleet is fitted with KONGSBERG equipment. When building the first vessel in 2004, one of Dynagas' conditions to Hyundai was to use a KONGSBERG integrated automation system. Migadis says a reliable automation system is essential on LNG vessels.

"In LNG, you don't come into contact with the cargo at all so you need a very accurate system. The selected systems proved effective and reliable. The KONGSBERG after sales and support is good and we also have a very close relationship with the people. It is also encouraging that KONGSBERG has opened a new office in Greece, which will give us better access to their training facilities and should improve the level of follow up they provide. It also helps that we can meet them and that they are in the same time zone." he says.

Dynagas has now extended its scope with Kongsberg Maritime by installing the custody transfer system, K-Gauge CTS.

BIG AMBITIONS

Lauritzen says the company is excited about and well prepared for the addition of seven newbuilds, but confides that the company's long-term ambitions go beyond ships.

"Our long-term goal, is to be a comprehensive, reliable and fully integrated LNG company, owning other LNG infrastructure assets in addition to LNG ships," he remarks.

"There aren't many LNG ship owners that can match our ratio of terminals visited divided by years and vessels"

MANOS MIGADIS,
Newbuilding Director, Dynagas

Maran Gas Director, Stavros Hatzigrigoris, has 32 years experience in the construction and operation of bulk carriers, tankers and gas ships, has strong views on the industry and is well known and respected in the Greek shipping community. The Full Picture sat down with Mr Hatzigrigoris in the company's Athens office.

INTERVIEW

Enduring success

MARAN GAS

Maran Gas Maritime Inc. (MGM) is the Gas Shipping Management unit of the Angelicoussis Shipping Group Limited (ASGL). MGM was set up in 2003 to manage the LNG and LPG carriers of ASGL. MGM was the first Greek shipping company to sign contracts to build and own new LNG ships and enter the LNG market in a capital intensive way. The company's first order came in September 2003 and by July 2005 the first ship was in operation. Now with an improving market Maran has boosted its fleet to 17, with an order of 11 newbuildings.

Q: What makes Maran Gas different from other Greek shipping companies?

A: What makes us different is our commitment to developing long-term relationships with our clients and the companies that we cooperate with. Our whole business is built around this philosophy. Our owners are more interested in what will happen in the distant future than aiming to make a short-term profit by buying and selling ships. We are putting a lot of effort into what we do and the quality that we are trying to achieve is very important for our organisation.

Q: ASGL and Maran Gas are known as trendsetters in Greek shipping, is this reputation justified?

A: We have a long tradition, we have expanded a lot in recent years and we always managed to operate in a profitable way. It is only natural that other companies take notice of what we do.

Q: With over sixty years of shipping experience in the Group, did this help to make a smooth transition into LNG?

A: We needed to call on that experience because LNG is much more difficult to enter than other shipping sectors. If you compare it to bulk carriers, for example, the cost is much higher and there are many regulations and requirements that need to be complied with. We have been fortunate enough to employ people with LNG experience and that made a big difference to the organisation.

Q: Despite the difficulty in entering the LNG sector, what opportunity did you see in LNG that made it worth the investment?

A: We wanted to diversify and realised that the LNG sector had a big future. At the time the new building prices were lower than they were for tankers and bulk carriers. The market was reasonably strong when we signed the first contract. Soon after that there were a number of factors that caused the market to drop significantly, including the Enron debacle (a multi-billion dollar project that the government of Maharashtra cancelled) and the entrance into the market of some big players like the Qatari giants of RasGas and QatarGas who ordered a large number of vessels. The market suffered from oversupply for a number of years but started to recover about a year ago. Increased consumption in Japan also greatly helped the market.

Q: What was your strategy for managing the company in a weak market?

A: We ordered the vessels on speculation and fortunately in 2004 we signed long-term contracts for the four vessels that were under construction. While the return was far below what tankers and bulk carriers were getting at the time, it was still positive cash flow and an acceptable return on investment.

»

"The risk of oversupply is inherent in shipping because owners are optimistic by nature"

Stavros Hatzigrigoris
Maran Gas Director

Q: What changed in the last year?

A: Demand picked back up significantly. At the moment the spot market is very high and I cannot see it staying there because there are more vessels coming onto the market. An increase in ton-miles is originating from the low gas prices in the USA and much higher prices in the Far East (mainly in Japan). Shipyard prices are still reasonable and with a long-term contract it should take about twelve years or so to pay off the investment.

Q: Have you changed your strategy as the market improved?

A: Our basic strategy has not changed but our level of investment has. We have always based our strategy around long-term contracts. When we entered the LNG sector, we made a small investment to test it out and after a few years we realised that it was something that could work for us. Now the market is much stronger than the tanker and bulk carrier markets, so it makes sense for us to invest more heavily in LNG and that is why we have ordered 11 new vessels. This is a big expansion, so over the next few years we plan to consolidate this and continue with the same strategy that has served us so well. I think everyone in our organisation has realised how much work is needed to ensure success.

Q: Where do you see the market going from here?

A: I think LNG will continue to secure good transportation prices, but I don't believe they will go much higher than the extraordinary levels we see now.

Q: Is there a risk of oversupply of vessels?

A: The risk of oversupply is inherent in shipping because owners are optimistic by nature. This can sometimes lead to an excess of vessels because everyone wants to get involved in the new hottest market. But the strong entry barriers in LNG help to reduce this risk. As an established LNG carrier, I believe we have an advantage over newcomers, so we are confident about the long-term viability of our business.

Q: What is the advantage of holding long-term contracts as opposed to operating on the short-term market?

A: Many of the Greek shipowners entered the LNG sector with the aim of getting into the spot market but most of them have changed their mind. Now they mostly consider LNG ships as long-term positive cash-flow investments rather than an opportunity to make a quick profit. Sure the spot market rates are high today, but who knows where they will be tomorrow? The long-term market gives you more stability and more scope to expand.

Q: Is there a possibility of Greek shipowners forming LNG pools?

A: I don't think so. Although we have seen a number of pools created in the international market in the past, very few Greeks have been willing to participate in them. This is not something Greek owners are likely to do, but maybe there will come a time when we will have to reconsider.

Q: Is regasification an interesting proposition for Maran Gas?

A: It is, but at the moment we have our hands full and it is more expensive and probably more risky to do. Floating Storage and Regasification Units (FSRU) are something we could consider, but we would first need to find a charterer who was willing to work with us on such a project. At this moment we feel FLNG projects are too expensive and complicated for us.

Q: Is the state of the Greek economy affecting the shipping industry here?

A: The Greek shipping industry has been successful for a long time, so fluctuations in the economy don't have a major effect on it. The high unemployment rates in our country will help to bring high quality young people into shipping. Some of our cost elements will also go down. I just hope that we will get a stable government soon and they will understand the importance of shipping for our economy and will not try to change things that have been working in a satisfactory way for quite a long time. Shipping contributes so much to Greece that it would be a disaster for the economy if it were forced out of the country.

Q: Why did you select Kongsberg as a supplier for all of your vessels?

A: Because they have a lot of experience and the international support network we require. It is vital to choose the right partners in the shipping industry.

MARKET DEBUT

Diversifying into LNG

Fotios Belexis
VassilikiSoussani
Minas Giaouzis
Vasileios Lampropoulos
Simon Murray

With three LNG newbuilds in the pipeline, Thenamaris is expanding its dry bulk and tanker business with a first-class LNG presence.

THENAMARIS

Since 1970, Thenamaris has managed both dry bulker and tanker tonnage. It now provides management services to a fleet of over fifty with an overall tonnage of around four million tons deadweight.

Bulk and Tanker operator, Thenamaris, looks to leverage its long and successful history as it debuts in the LNG market with three newbuildings.

"We have a strong company culture and a great reputation and we are confident of success in the LNG sector"

Simon Murray
Chief Operating Officer, Thenamaris

Thenamaris, after eight years of monitoring the LNG sector, is now making an entry with three newbuildings, which are set for delivery in late 2013 and early 2014. The vessels are sister ships, sized at 160,000 cubic metres, which Deputy Manager New Buildings, Fotis Belexis, calls, "The most flexible design". They are optimised for efficiency with tri-fuel diesel electric propulsion systems, enhanced features and a reduced boil off rate of 0.1 percent.

Simon Murray, Chief Operating Officer of Thenamaris LNG, says Thenemaris is unfazed by its newcomer status and sees the company's move into the LNG sector as simply an extension on a long history of successful bulk and tanker shipping.

"The entry barriers are high, but the strengths and long history we have as a tanker company can be successfully transferred to the LNG sector. We are building on the same philosophy that has brought us success in the past. We have a strong company culture and a great reputation and we are confident of success," he says.

Having operated all around the world with a variety of industry participants, Thenamaris has built an extensive network. Its strategy will be to encourage some of these contacts to show faith in its LNG operation, Murray is upbeat: "Our customers are more than satisfied with our performance so we are confident they will continue to work with us when it comes to LNG," he says.

The company only entered the capital intensive LNG market when it felt that the right market conditions had emerged. Murray reiterates that the company is well placed to capitalise and says the main focus now is hiring employees with LNG experience.

"We are rigorously preparing so we can run a successful operation from the outset. We have the technical aspects in place and will use the services of a third-party manager to assist with the initial operation. We also realise that it is just as important to get the right people with LNG experience both onshore and offshore," he says.

Thenamaris knows that its standing in the LNG sector will depend on the success of its first vessel. Its initial manning strategy will therefore be to contract with an experienced crew manager to provide LNG seafarers. However, in the long-term it will also train crewmembers from its tankers. Murray says that due to the company's crew being highly experienced in tanker operations, this training will focus on the additional skills required for LNG operations.

"Our crew members' experience in tankers gives them an excellent foundation from which to undertake training. A seafarer who has experience on tankers will have most of the skills needed on LNG carriers, but there are also additional and specific competencies like cargo handling and managing a

more comprehensive control system and a high voltage electrical system, and these are the skills the training will address," he explains.

The crews will also receive training in the fully integrated Kongsberg control systems installed on the vessels.

As the tanker market continues to struggle, diversifying into the LNG sector was an obvious choice for Thenamaris and one that many tanker companies have recently made. However, having been around for over forty years the company has been through peaks and troughs in the market before and will not change its core business. Belexis says that while the tanker market is having tough time, Thenamaris is well placed to remain profitable and sit out the storm.

"We have been through this before in the mid-80s, it is cyclical and we are confident that, in time, it will pick back up. Until then, efficiency is the key to realising opportunities in the tanker market. Thenamaris has a lot of experience in keeping down costs while maintaining maintenance and the quality of services. Fuel efficiency is one of the main ways to reduce costs. We have reduced the average speed of the vessels in our fleet and have installed energy saving devices."

"Thenamaris has a lot of experience in keeping down costs while maintaining maintenance and the quality of services."

Fotis Belexis
Deputy Manager New Buildings, Thenamaris

CUSTOMER VALUE:

Leveraging LNG expertise

LNG is one of the fastest growing energy markets globally. The number and scale of LNG projects proposed or under construction will double global production capacity. The International Energy Agency estimates more than $250 billion of new investment, in all parts of the LNG chain, will be required to meet demand until 2030.

"From liquefaction plants, and coastal regasification import terminals to specialist tankers and mega floating production units, the LNG market and activities are humming," says KNUT IVAR DYBDAL, General Manager of KM's LNG section.

In the last five years, the volume of LNG available on the market has jumped 50 percent, three times faster than the overall growth of world gas production. LNG supply is expected to grow 4.4% p.a. to 2030, double as fast as total global gas production (2.1% p.a.).

Europe and non-OECD Asia, particularly China and India, will lead demand growth securing major percentages of the global LNG increment. In 2010, the Asia-Pacific region consumed 60 percent of the world's LNG, consuming 135.1 MMtpa of LNG.

Pushing the LNG carrier fleet to 360 ships, up from 195 ships end 2005, an average of 35 new LNG carriers have entered the market each year from 2006 to 2010. The combined capacity of the 2010 fleet totaled 53 million cubic metres.

"LNG continues to grow despite global challenges. We see an increasing demand for alternative uses of LNG ships, including floating regasification and/or LNG storage vessels. There are a growing number of private and national projects for floating liquefaction technology and vessels are getting more advanced and bigger, reflected by the growing Q-Flex (210,000-217,000 cm each) and 14 Q-Max (>260,000 cm) fleet," says Dybdal.

Escalating natural gas prices and widespread competency in the LNG value chain today makes transporting LNG over long distance economically feasible. And with Australia and Africa becoming major LNG providers in the future, natural gas is evolving from a regional to a global market.

KNUT IVAR DYBDAL
General Manager
Kongsberg Maritime LNG

Kongsberg Maritime is collaborating with world-class LNG players to design better systems and equipment for superior LNG operation. This cooperation gives us unique market competence and strong competitive advantage.

LNG – IT'S ALL ABOUT EXPERTISE

KM's LNG activities took flight in 2000 after installing a fully integrated automation system (IAS) onboard the 87,600 cm LNG, Høegh Galleon. In 2001, KM delivered similar IAS systems to seven LNG tankers built by the three largest shipyards in Korea (Hyundai, Samsung and Daewoo). Two years later, KM landed control system contracts for four LNG tankers built at Mitsubishi Heavy Industries. The vessels, two owned by Hoegh and two by K-Line have been carrying LNG from the Snøhvit field to the USA, Spain and France since 2006.

Working collaboratively with LNG players growing and seeing a rising demand for truly "mission critical" technology and vessel requirements, KM developed its own center of LNG excellence in 2005. Today, it has a highly experienced team of LNG specialists in Norway and Korea.

"Our LNG order book grew extensively. Splitting our focus areas into a dedicated LNG division, able to fully follow a specific market and refine breakthrough technology and concepts, has significantly enhanced KM's ability to meet and exceed its LNG growth and goals. Without a doubt, KM LNG drives valuable results for the company and the client," says Dybdal.

KM technology highly applicable to LNG includes Integrated Automation System, Custody Transfer System, Emergency Shutdown System, Engine Control Fire and Gas, and Integrated Bridge System. Additionally, KM has provided Dynamic Positioning for Hoegh's SRV vessels.

KM technology grants effective LNG operation, says Dybdal, pinpointing KM's custody transfer system.

"CTS, like all of KM's LNG applications, is state-of-the- art technology," optimized for LNG operation. CTS monitors LNG volumes at export and import terminals. How much did the ship fill, how much did she export, are extremely important commercial aspects for the

owner and charter," says Dybdal.

KM's state-of-the-art, fully integrated automation system technology – a world standard for many vessels – and a number of prestigious, innovative LNG projects from 2000 – 2006, gave KM a world-recognized LNG expertise edge.

But LNG innovation is often short lived, that is, often changing and advancing with each LNG newbuilding.

"The dynamic world of LNG technology demands continual high-tech innovation – things are changing all the time," says Dybdal.

The challenge facing LNG players will be to pinpoint long-term trends and select import markets. In addition, owners and operators must continually raise the bar in technical LNG expertise and operational efficiency for specialized vessels such as FSRU's, FLNG, LNG power plant vessels etc."

> **"From liquefaction plants, and coastal regasification import terminals to specialist tankers and mega floating production units, the LNG market and activities are humming"**
>
> **Knut Ivar Dybdal**
> General Manager, Kongsberg Maritime LNG

GLOBAL COLLABORATION

Less than a decade ago, KM's LNG section managed most activities from engineering and commissioning to gas trials from Norway. But this has changed. Today, development of new solutions and initial engineering are done in Norway. Assembly, installation and commissioning are done mainly by our colleagues in KM Korea, and further also in KM China. There is a very good cooperation within the project teams across country borders and long distances.

The technology teams are under constant pressure to continuously innovate with greater efficiency. LNG's fast paced business environment requires KM to explore the use of external sources for technology to augment in-house R&D.

"Typically we utilize another Kongsberg product, Dynamic Simulator, to simulate the live process for proofing control system solutions and pre-tune the functions before commissioning. We keep core technology within our company and rely heavily on global competence from our sister companies in Korea, Singapore and China. To achieve the full LNG integration picture, we collaborate with the best to create the best," said Dybdal.

In 1999-2000, KM developed its automatic boiler control system together with Kawasaki and Mitsubishi and compressor control with Cryostar. Later together with Cryostar, Samsung and DSME, KM developed its dual fuel gas management and vapor handling system. And reliquefaction plant to the Q-Flex fleet was developed together with Hamworthy Gas Systems.

To keep abreast the latest regasification unit development within FRSU, KM teamed up with world-leading LNG operator, Golar, and Hamworthy to create a total FSRU control system and process control philosophy.

Generally located near the LNG consumer site or power plants, FSRUs are dependent on a systematic level of control hierarchy, functional segregation and automatic integration. The control and safety system is usually composed of normal process control system, interlock and shutdown system, fire and gas system, and emergency shutdown (ESD) system.

"By drawing on each other's strengths we have developed the most competitive LNG systems in the world. No one can deliver the full LNG picture like us. We are responsible for the whole package and will continue to develop new technology within the company and with chosen partners," states Dybdal.

According to Dybdal experiences gained from LNG and FPSO are important foundations for delivering state of the art technical solu tions to vessels like FSRUs.

"When a an owner calls on us, they know that we have the history, the competence and the ability, to ensure that new LNG concepts and systems are quality configured, designed for reliable, robust and safe operation," said Dybdal.

NEW TECHNOLOGY IN THE PIPELINE

Projects, projects and projects. More projects enhance KM's competitive edge and link up with leading LNG owners and suppliers in the development of new systems.

"Today, KM is collaborating with world-class LNG players to design better systems and equipment for superior LNG operation. This cooperation gives us unique market competence and strong competitive advantage ," says Dybdal.

Presently, KM is further developing regasification plant technology with Hamworthy Oil and Gas Systems in Oslo, Norway, and is investigating new technology on how to convert two stroke ship engines into MEGI (Main Engine Gas Injection).

Additionally, the company is developing tailor-made control systems for small to medium FLNGs and power plants to be ready when this side of the business kicks off.

"KM takes full responsibility for system interface and our team of LNG engineer experts are continually pushing our innovation, concepts and solutions," says Dybdal.

THE OBSERVER

LNG faces manning squeeze

Bill Wayne
General Manager
Society of International Gas Tanker and Terminal Operators

Mr Wayne is concerned not only over the availability of experienced seafarers, but also the supply of competent shore managers.

As natural gas looks set to play an increasingly pivotal role in world energy supply, its safe ocean transport and terminal handling remains a top priority. Bill Wayne is general manager of SIGTTO (Society of International Gas Tanker and Terminal Operators), which represents almost all of the world's LNG owners, all LNG export terminals, most LNG import terminals and about half of the shipping and terminal operators in the LPG sector, and has had observer status at the IMO since 1982.

He believes that an adequate supply of competent personnel in this highly specialised sector is a growing challenge, and he points to the current order book, which now comprises more than 40 units, well over 10% of the existing fleet. Unlike most other shipping sectors, the wave of downbeat sentiment which has seen newbuilding orders reduce to a trickle in many markets appears to have bypassed the LNG business. A spate of new contracts have been signed in recent months, with some vessels contracted 'on spec', with no long-term forward employment cover in place, an unusual development in this highly capital-intensive market.

The SIGTTO general manager is particularly concerned about main propulsion units, pointing out that LNG carriers are really the only merchant vessels still in operation with steam turbine powered main engines. Older steam turbine units could well be with us for another 20-30 years, he suggests, and yet there is already a scarcity of engineers with steam experience.

But Mr Wayne is concerned not only over the availability of experienced seafarers, but also the supply of competent shore managers. Traditionally, he points out, shore-based superintendents were recruited from the ranks of experienced sea staff, but that source of supply is largely drying up. And he questions the value proposition facing a senior engineer at sea who is offered the chance of a superintendent's job ashore. For many, he suggests, the typical package lacks appeal. Terminals, he says, face similar issues, which are likely to become more pressing as the ocean trade in LNG expands both in volume and geographical spread.

This he sees as an inevitable development. Whilst Japan, South Korea and China are likely to remain amongst the largest importers, expanding gas trades will embrace a growing number of energy-hungry economies. And although the global downturn meant that various projects slipped back in time, the strong environmental appeal of LNG as compared with oil – no SOx, less NOx and less CO2 – continue to underpin the sector's development.

Mr Wayne therefore believes there is a strong case for extending the use of LNG as a marine fuel, certainly in some regional trades if not on long-haul ocean routes. He admits there are challenges, citing the volume required for storage on board, appropriate access to LNG bunkering stations and the fact that the world's refiners are used to selling off the bottom of the barrel as bunker fuel. But the fact that the environmental lobby has more clout than ever is likely to ensure the continuing development of LNG-capable propulsion systems for certain ship types.

What of the future for floating LNG? The concept was studied in detail when Mr Wayne worked for Shell earlier in his career, but the business case did not stack up at that time. It is no coincidence, however, that the oil major is pioneering the first such plant in its Prelude project off the Australian coast. Energy supplies tend to be developed on a 'next easiest' basis – floating technology eliminates the need for costly undersea pipelines and, as exploration and production moves further offshore, floating units will become an increasingly attractive option.

Looking to a bright future: But qualified manpower could be an industry concern.

Hugo Skår **and**
Lars Erik Egeberg.

With an existing fleet of nine LNG carriers and four FSRUs, Golar LNG is already recognised as an industry leader in LNG transportation and regas. But with an ambitious newbuilding programme now underway, Golar LNG has moved quickly to capitalise on rising global demand for natural gas.

INDUSTRY AMBITIONS

Fast forward

Golar has been operating in the LNG segment for 30 years under various ownership and brands. Since 2001, when investor John Fredriksen took control of the company, Golar LNG has grown from a modest fleet of six LNG carriers to nine, and has added four FSRUs – all on long-term contracts.

According to Golar Chief Technical Officer, Hugo Skår, Golar LNG's rapid development owes much to the entrepreneurial spirit of Fredriksen. "While stock listed in Oslo and New York, the company has a measure of autonomy that allows us to act quickly when we spot an opportunity," he says. "Rather than create restrictive long-term plans, we monitor the market carefully and act decisively when the timing is right."

A FORCE FOR PROGRESS

Golar LNG's stated goal is to be a progressive player in the LNG sector and in particular help to push the market towards greater flexibility. "We champion LNG as an alternative fuel and believe LNG should be on equal terms with oil with regards to improved flexibility of trades and shipping," says Skår. "These beliefs have been at the core of our successful effort to expand into the LNG value chain."

Over the past five years, the company has tried to encourage the industry to embrace proven technologies from other shipping sectors. According to Lars Erik Egeberg, Project Manager at Golar Wilhelmsen Management, one Golar LNG specialists were heavily involved in the development of the first IMO Gas Code, which was developed in the mid seventies. "The industry is relatively conservative, so many of these principles are still in place which is good," says Egeberg. "However, we are also trying to encourage a more flexible and progressive attitude, particularly in the floating regas segment."

PROVEN TECHNOLOGIES

Egeberg notes that there are examples of proven technologies in other shipping sectors that would have a positive impact on LNG shipping if the sector were only willing to adopt them. For example, the industry has long been cautious about the ship-to-ship transfer of LNG, even though similar transfers between oil tankers and LPG vessels have been taking place for decades. As part of a development project to be the first company to convert an LNG carrier into an FSRU, Golar LNG required the approval of industry guidelines for ship-to-ship transfers. "Ship-to-ship transfer is not based on any revolutionary technology," notes Skår. "In fact, much of the technology the industry is currently debating has actually been around for a long time."

Likewise, the technology behind Golar LNG's concept for floatingproduction (FLNG) is already available. "Our predecessor Gotaas-Larsen actually developed a prototype for FLNG as early as 1977, but there are still no FLNG units in operation. So it shows how long it takes to develop technology and surpass the commercial and contractual hurdles in order to actually bring it to market."

But all that might be changing. Last year, Shell announced last year that the company plans to construct the world's first FLNG facility, which will be placed about 200 kilometers off the Australian

»

**Forward planning:
Golar's fleet is set to expand rapidly,
with 13 vessels currently on order.**

Coast to serve the Prelude gas field. "What made the project commercially feasible was that Shell controls the whole supply chain," notes Skår. Once completed, the Prelude FLNG facility will not only be the world's first FLNG facility, but will hold the title of the world's largest floating object ever constructed. "It will also help change how energy companies see floating production," predicts Skår.

PROOF OF CONCEPT

Skår notes that Golar LNG goes to great lengths to provide proof of concept when getting the industry on board. When developing the FSRU projects in Brazil, Dubai and Indonesia, we worked together with reputable International Oil companies who proved and demonstrated our concept through their technical assurance program. We have zero tolerance for downtime and recognise that it is healthy to be a little conservative, but when we identify clear advantages to certain technology, we make a strong case."

STRONG UPSIDE IN LNG

In a recent official statement, Golar LNG's President and CEO, Jon Fredriksen said that the company had secured an unequalled, strategic position in the LNG industry:

"The Board has already seen strong interest for short and long term charters and expects that a solid charter portfolio can be developed prior to the individual deliveries of the new buildings. The increased activities in the LNG market including possible US export also supports a strong spot market in the years to come. The Board is of the opinion that current weakness in Global shipbuilding prices creates limited downside in building prices and an attractive chartering upside."

Skår says that the industry is beginning to see the light. "The FSRU concept has proven to be a safe, reliable, flexible and affordable alternative to land-based LNG terminals and as we have demonstrated over time, ship-to-ship transfers are routine," he says. "And with more FSRU projects now in the planning stage than ever before, energy companies are showing signs that they appreciate the value these new concepts can provide."

BREAKING NEW GROUND

There is perhaps no better example of Golar's willi
ngness to lead from the front than its conversion of LNG carriers to the industry's first FSRUs. Initially put forward by Golar LNG's main engineering partner Moss Maritime in 1997/8, the FSRU concept was not new. Indeed, for many years, environmental concerns, congested ports, security issues and cost considerations resulted in the delay or cancellation of building new land-based terminals or expanding existing facilities. By placing the terminal offshore, many regulatory and environmental issues could be avoided.

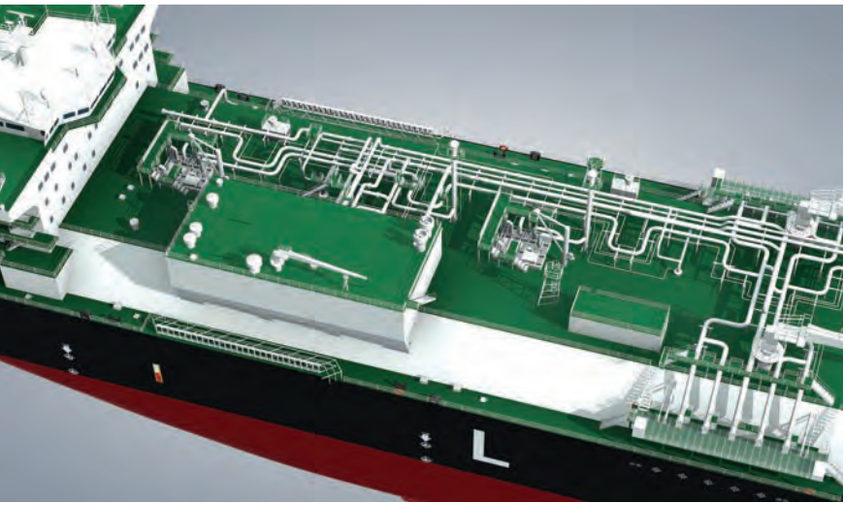
With the full support of Fredriksen, Skår initiated a project to convert LNG carriers to the industry's first operational FSRUs. The Golar Spirit was chartered by Brazil's energy giant Petrobras soon after the conversion had started. Today, Golar LNG is one of the major players in the regasification market, with four FSRUs currently in operation and two more on order. Skår says the speed of installation and operational flexibility makes the FSRU concept an attractive option for energy companies seeking access to new markets. "FSRUs are an efficient, low-cost entry to LNG for consumers and countries that do not have the necessary infrastructure for land-based LNG operations," he says.

FLOATING POWER PLANTS

Golar is also exploring several other opportunities in the LNG supply chain. One such idea is the development of floating power plants. Rather than exporting gas from a floater to a port, both units are

"We champion LNG as an alternative fuel and believe LNG should be on equal terms with oil with regards to improved flexibility of trades and shipping"

Hugo Skår
Chief Technical Officer, Golar



SPECIALISED FLEET MANAGEMENT

Golar LNG's newbuilding programme will bring the company's fleet to 26 vessels in the next few years. To manage the fleet, Golar LNG and Wilhelmsen formed a separate entity, Golar Wilhelmsen Management. Skår explains that the establishment of Golar Wilhelmsen had been a positive development for Golar LNG.

"It gives us the economies of scale but still means we have day-to-day involvement which is important particularly with FSRU vessels and other non standard LNG carriers. It further helped to optimise the company's crewing, HSE, purchasing and administration services," he says.

» combined on one floater so that electricity can be exported rather than just gas. Skår states that as is often the case in the LNG sector, this initiative is being prevented by the lack of an appropriate commercial arrangement. "We are ready to go on this from a technical point of view. If we find the right commercial set-up we can deliver this solution in 30 months," he says.

RAPID EXPANSION

Despite Golar LNG's significant focus on FSRUs, LNG carriers make up the majority of its fleet. With the LNG sector booming and vessels attracting healthy day-rates, Golar LNG is now rapidly expanding. Initially, the company ordered four, but as market conditions improved, kept adding to the order book. Today, the company has 13 vessels on order.

All of the vessels are equipped with a TFDE propulsion system and are built with the basic LNGC design. There are seven sister ship LNG carriers, two FSRUs with slightly different designs and two winterised and ice class vessels ordered at SHI. Apart from one of the FSRUs being 10-cbm larger than its 160-cbm counterpart, the vessels are very similar and equipped with many of the same systems. In addition, two conventional TFDE LNG Carriers have been ordered from Hyundai Heavy Industries (HHI). All newbuildings will have state-off-the-art increased insulation thickness in order to reduce the cargo boil-off to better match the higher efficiency of the Tri-Fuel engines.

FUEL EFFICIENCY

As with all newbuildings, these vessels are designed to optimise efficiency. According to Egeberg, managing fuel efficiency for an LNG carrier requires a different mindset.

''On LNG carriers, you have to look at how the propulsion system use the boil off gas. Two-stroke engines are more fuel efficient, but it is also important to ensure that the boil off gas is utilized efficiently in all operation modes."

Golar LNG insisted that KONGSBERG systems be installed on all of its vessels, including, automation and the custody transfer system, K-Gauge CTS. Egeberg says the company has always been satisfied with KONGSBERG as a partner. "KONGSBERG offer us a excellent support in the operation phase which is very important because of the long lifecycle of LNG vessels. The company's attention in critical situations is invaluable to us. We also know KONGSBERG is financially stable and therefore a long-term partner."

BRIGHT FUTURE

Skår says that while a number of competitors have emerged, he is confident that Golar LNG will be able to maintain a position of strength. "This is where the industry conservatism is in our favour because experience and a good reputation are very important in LNG," he says. "We have both the design and operational experience and have been very successful at leveraging this experience to secure FSRU opportunities. We see a bright future not only in transportation and regas, but in FLNG as well."

LNG TALK

Franck discussion

Kongsberg Maritime Sales Manager Cato Franck explains the firm's success in the LNG field and outlines what lies ahead for the business and the partners and clients it collaborates with.

Q: In 2011, KONGSBERG took a lion's share of all major control sys m and automation contracts for LNG related vessels. And 2012 looks extremely positive. What is driving this success?

A: It's all about meeting demand and supply, and having a proven track record. KONGSBERG has been delivering proven LNG technology for over 15 years. Hand-in-hand with an exploding and demanding LNG market, we have continually evolved and developed new concepts tailor-made for the LNG industry.

With each new LNG project, we tweak and improve our system technology and software to deliver the absolute best full picture solution each time. Continual improvement backed by a dynamic team of senior LNG engineers and application expertise has made us a preferred partner to a growing number of ship owners, yards and other main LNG suppliers. Today, we are the leading supplier of complex integrated Automation Systems (IAS) for advanced LNG vessels worldwide.

Furthermore, we support the global LNG operation of our clients through 24-hour support from KONGSBERG hubs worldwide, and remain focused on strengthening our team of technical engineers through cutting edge LNG expertise accumulated from worldwide operation of LNG carriers.

Training is a major component in the LNG equation. Building a robust future fleet of some 35 LNG vessels, Greece, alone, needs over 1,500 qualified LNG seafarers by 2015. We recently opened a training center in Athens to assist Greek owners in top class LNG training, a major prerequisite for safe LNG operation.

KONGSBERG supplies the LNG industry with niche simulator training. Simulators meet the highest requirements for real-time LNG systems, and are based on high-fidelity models accurately reflecting the behavior of real LNG operational processes.

Real life work scenarios, for example KONGSBERG's Engine Room Simulator (ERS) model based on a Dual Fuel Diesel Electric (DFDE) Engine Room configuration from a modern liquefied natural gas (LNG) carrier, assist LNG crew in making accurate decisions and problem solving. KONGSBERG training is world class and available in several training centers around the world.

Q: What has the development KM's processes and control systems brought to the LNG industry.

A: Simply, KONGSBERG created the stage for success. Pioneering integrated oil and gas management systems and dynamic simulators and then combining this with reliable project management – and customer support - services, gave our LNG clients the right solutions. LNG operations require a unique blend of complex work processes, advanced technologies, environmental compliance, and service. KONGSBERG has the capabilities to help LNG operators manage this integration to achieve maximum operational efficiency.

Our in-house dynamic simulation tool has given us in-depth experience through numerous references from a wide variety of LNG process systems and equipment. We use dynamic simulation as a tool to improve LNG process design and solve operational problems in new and existing LNG ships. The findings are summarised in reports with conclusions and recommendations to the client.

Of 37 contracts signed in 2011, 33 were for dual fuel diesel electric propulsion and four for slow speed with reliquefaction plants. Our world-class LNG experience and technological knowledge is leading the further development of next-gen reliquefaction and regasification plant systems. Today we have more than 20 reliquefaction references, and the regasification and FRSU segments are looking very interesting. Further technology improvements are making K-Chief 700, our distributed monitoring and control system, the market's most chosen high-end offshore marine automation system.

Q: How important is collaboration to KM's strategy and future LNG solutions?

A: Collaboration accelerates technology and broadens the scope of our total package. Collaboration is key to retrofit and newbuild projects and developing new technology and products. Future advancements in ME gas injection for slow speed engines, DFDE and regasification applications are dependent on streamlined collaboration within and without KM's global network.

The LNG future is highly specialized, driving a sharp development curve within the FSRU, FLNG, LNG power plant vessel and SRV segments. KM's suite of automation and control performance systems are comprised of quality components from a number of leading OEMs; Kawasaki, Cryostar, Mitsubishi, Hamworthy, Snecma and Sacke, to name a few.

Systems for LNGs contain hundreds of interconnected processes. Working closely with the best in the industry means that the KM solutions adapt and grow intact with breakthrough LNG technologies. We take full responsibility for interfacing all technology and components and provide shipowners with the total package. This is our pole position.

LNG milestones

Until well into the 20th century, natural gas was considered a bother and a by-product of crude oil extraction. But since Frank Phillips, founder of Phillips Petroleum, recognised the importance of natural gas in the 1920s, the LNG industry has exploded. The Full Picture Magazine takes a look at some of the most important milestones in the short history of LNG.

1914 **First LNG (USA) patent**
Awarded for LNG handling/shipping.

1917 **First LNG plant**
Built in West Virginia in 1912 and began operation in 1917.

1941 **First commercial liquefaction plant**
Cleveland, Ohio.

1964 **World's first LNG importer**
British Gas Council imports LNG from Algeria

First LNG ship
Methane Princess becomes first LNG carrier taken into service The ship was built at Vickers shipyard, Barrow-in-Furness, for British Gas.

1969 **Alaskan LNG to Japan**
Natural gas produced by ConocoPhillips and Marathon from fields in Cook and liquefied at the Kenai Peninsula LNG plant Inlet goes to Japan.

1970 **Moss system**
Kvaerner develops 88,000 cu m Moss spherical containment system.

1972 **First Asian LNG plant**
First Asian LNG plant opened at Lumut, Brunei and starts to export gas to Japan and South Korea.

1973 **Norman Lady**
Norwegian Leif Höegh & Co builds world's first LNG carrier with spherical tanks – Moss spherical cargo containment system prototype.

1975 **Ben Franklin**
At 120,000 cu m capacity, becomes the first LNGC to supersede the 100,000 cu m benchmark.

1977 **Indonesian gas debut**
Japan starts to import Indonesian gas.

Middle East gas debut
LNG exported from Das Island, Abu Dhabi, UAE.

1980 **Dispute**
Falling market and price dispute with Algerian LNG exporters leads to shut down of major USA terminals Cove Point and Elba.

1984 **Japan tops LNG import**
Japan purchases 72% of the world's LNG.

1990 **Taiwan's first LNG terminal**
Receives first shipment from Indonesia.

1991 **First Australian LNG to Asia**
LNG from Australia's North West Shelf arrives in Japan and South Korea.

1992 **Hyundai targets large LNG carrier segment**
Hyundai builds vessels up to 138,000cubic meters, making its shipyard the first in the world available for building both Moss-type and membrane-type LNG carriers.

1995 **The first membrane LNG carrier built in Korea**

1997 **Second Middle East LNG producer**
Qatar becomes the second Middle Eastern LNG producer with the delivery of its first cargo of LNG from Qatargas LNG.

1999 **World's largest New Membrane-type LNG carrier**
Samsung Heavy Industry successfully constructed the largest single hull-form vessel in the world at a price equivalent to 10 freighters ($220 million) at that time.

2000 **LNG regasification**
El Paso Corporation begans to explore the concept of shipboard LNG regasification.

Hoegh Galleon retrofit
KM delivers a fully integrated automation system (IAS) onboard the 87,600 cm LNG, Høegh Galleon.

KM develops computer based Automatic Boiler Control together with Mitsubishi and Kawasaki.

2002 **World's largest LNG producer**
Indonesia becomes world's largest LNG producer, exporting about one fifth of the world's total volume in 2002.

2003 **Energy Frontier**
Producing approximately 87 million m3 of natural gas when re-gasified, Energy Frontier delivers 67,000 tons of LNG to Tokyo Gas' Sodegaura LNG Terminal from Malaysia.

2005 **Dual-fuel engines and electric propulsion.**
Gaz de France at Chantiers de l'Atlantiqu starts production of a 153,000 m3 LNG carrier with dual-fuel engines and combined output of 39.9 MW.

The worlds first LNG-RV vessels

2006 **180**
Number of LNG carriers in operation with a total capacity of over 21 million m3.

Arctic Princess
Becomes the largest LNG carrier ever built at 288 meters long and a fully-laden capacity of 147 000 cubic meters of LNG. The LNG is carried at a temperature of minus 163 degrees centigrade in four spherical tanks, each with a diameter of 42 meters. A full cargo load of LNG is sufficient to cover the yearly energy consumption of all households in a city with a population of 45,000 people.

The worlds first CS1 containment system

LNG Carriers to the Snohvit field in Norway
KM delivers fully integrated automation system to Arctic Princess and Arctic Lady to MOL/Hoegh LNG, Arctic Voyager and Arctic Discoverer to K-Line.

KM develops reliquefaction plant for the Q-Flex fleet, together with Hamworthy Oil And Gas Systems.

KM develops Dual Fuel Diesel Engine Vapour handling together with Samsung Heavy Industries, DSME and Cryostar.

KM develops Gas Combustion Unit Control System with Hamworthy Combustion.

2007 **Snohvit LNG Export Terminal goes on stream**
Processes gas from the Snohvit, Albatross and Askeladden gas fields via a 160 km pipeline.

Qatar Gas
Delivers in total integrated control system to the Ras Gas and Qatar Gas' Q-flex fleet, totally 18 vessels (2006 – 2009).

2009 **First Russian LNG plant Sakhalin-2 on stream**
First load of LNG from Sakhalin Island sailed for Japan opening new market for Russian hydrocarbons.

20 years of LNG exports
In 2009 the North West Shelf Venture marked 20 years of safe and reliable LNG exports to the Asia Pacific region.

Long- term contracts with Japanese utility customers underpinned the construction in 1985 of LNG production and export facilities at the North West Shelf Venture's Karratha Gas Plant in Western Australia.

The North West Shelf Venture delivered its first LNG cargoes to Japan in 1989, and since then, has delivered more than 2800 LNG cargoes to customers around the world including Japan, China and South Korea.

In 2009 the North West Shelf Australia LNG sellers successfully completed a new era of agreements with their original 1985 Japan customers for the additional supply of LNG.

First FRSU
Golar Spirit becomes the world's first FSRU conversion project, which was awarded to Golar LNG by Petrobras.

FEATURE

WORLD CLASS WONDERS. KONGSBERG SITS DOWN WITH BMW, ONE WORLD CLASS INDUSTRY LEADER TO ANOTHER, TO DISCOVER HOW THE MANUFACTURER IS STEERING IN A NEW DIRECTION FOR FUTURE BUSINESS SUCCESS.

The Full Picture Magazine falls in love with the bewitchingly beautiful BMW i8. BMW i Head of Design Benoit Jacob takes us under the bonnet of the concept car to discuss collaboration, innovation and the motivation to drive an industry forward in sustainable style.

INNOVATION

i do

Walking into the Geneva Motor Show is a bewildering assault on the senses.

The main exhibition hall opens up like a giant treasure chest, delegates and the press spilling greedily over every glittering automotive jewel, buzzing, chattering with an excitement that irresistibly drags you into the mayhem.

In amongst this hubbub, hunched seductively on a platform surrounded by familiar blue and white propeller logos, sits a sight that somehow drowns everything out – silently demanding your focus, requiring your attention.

This is the jewel that is shining brightest at Geneva 2012. This is the star of the show. The BMWi8.
Standing alongside the sleek carbon fibre shoulders of the i8 like a proud father, TFP finds the stylishly dishevelled frame of Benoit Jacob – the French-accented, passionately animated, Head of BMW i Design.

"She's beautiful, isn't she?" He smiles.
It is, understandably, a rhetorical question.

REVOLUTION NOT EVOLUTION

Jacob has every right to look pleased. The i8 is a stunning creation, on a myriad of different levels.

The big brother of the all-electric i3 – a city runabout due to hit the market in 2013 – the i8 is an plug-in hybrid that is capable of 93 miles to the gallon, reaching 0 to 100 km/h in around 4.5 seconds and leaving green-car sceptics choking on their own exhaust fumes.

But the stats and the curvaceous body only tell half the story here. Jacob is itching to tell the rest. This, he imparts, is something of a revolution, rather than an evolution, of the existing sports car sector: "Something completely new".

He allows that thought to idle for a second, and then races off:

"Typically electric or hybri d cars are built around conventional chassis and drivetrains, or they're modified versions of existing vehicles. The i3 and i8 are purpose built around the new LifeDrive modular architecture, with two separate main modules – the Drive module and the Life module.

"The Drive module has been built horizontally, with a flat structure – a bit like a laptop, if you like.

"In the i8's case, this mainly aluminum module houses an electric engine in the front, battery cells in a central tunnel and a 1.5 litre turbo-charged combustion engine in the rear. This linear style creates balance and optimises space and weight distribution." »

Benoit Jacob
Head of BMW i Design

Jacob joined BMW as an exterior designer in 2004, after spending time with Renault, Audi and Volkswagen. He sees the i8 as an opportunity to provide "performance with a conscious" – a sustainable supercar for a new generation of consumer.

Leading light: LED headlights are just one of the innovations on the i8.

He continues: "Sitting on top of that, as a bridge between the two drive units, is the Life module, constructed entirely from carbon fibre reinforced plastic – which is a first for the industry.

"This is like a racing car cockpit in some ways, extremely stable, rigid and safe, while being incredibly lightweight."

In fact, i8 Product Manager Henrik Wenders later tells TFP, carbon fibre is 50% lighter than steel and 30% lighter than aluminum, meaning that if an equivalent 'module' had been constructed from those materials it would add 250kgs in weight to this svelte supercar.

A matter of life and concept death, according to Wenders:

"This weight saving allows the car to house the two engines and retain its speed, all-round agility and its supreme efficiency in terms of energy consumption.

"Less weight and less consumption, equals more fun," is his simple, explanatory equation.

REDEFININ G SUSTAINABILITY

The innovations don't screech to a halt there though, far from it.

The i8 also boasts laser lights (more than twice as efficient, and ten times smaller, than LED headlights), a smartphone app that allows remote-controlled checking and charging of its battery, and 'stream flow' sculpted bodywork, 'air curtains' and a completely enclosed, smooth underbelly, all of which work to reduce drag and increase that all important efficiency.

'All important' because this is the beating heart at the core of the i sub-brand – efficiency, and more precisely sustainability.

Sustainability is a buzzword uttered across many industries, but at Geneva 2012 it swarms ferociously, incessantly throughout the entire exhibition arena. Swat it away passing the Volvo stand and, before you know it, it's zeroing in on you again thanks to Nissan, Ford, Citroen, Fiat, Kia, Peugeot and a fleet of other manufacturers.

In an industry for so long tarnished as a major world polluter and, quite literally, one of the driving forces behind global fossil fuel consumption, it can be difficult to see the word as anything other than the latest marketing ploy.

Which, of course, it is… but in the case of the BMW i brand, there's a little more to it than that. Jacob describes the i brand as a chance to: "Build cars for the future, completely from scratch, with a clean sheet and sustainability throughout the entire supply chain." It is, he stresses, a new approach, a kind of pilot project: not just for BMW, but for the industry.

The carbon fibre nature of the cockpit structure, the Life module, presents obvious challenges – production cars have never been built in this way before – but it has also created a major 'green' opportunity.

In 2009 BMW formed a collaborative venture with industrial carbon manufacturer SGL Group – creating the new entity SGL Automotive Carbon Fibers – to manufacture carbon fibres on a commercial scale for the car industry. Together the firms, each leaders in their separate fields, have built a 60-acre carbon fibre production plant at Moses Lake in Washington, USA, investing around $100m.

This plant – which produces the fibres themselves, that are then made into i components in Germany – is run by a purpose-built onsite hydropower facility to ensure its green credentials. At BMW's Leipzig assembly base, where up to 800 extra jobs have been created by the advent of the i models, four giant wind turbines will generate the juice needed to get the production line flowing.

The scale of this commitment contributes to the fact that, by 2013, development costs for the i3 model will have surpassed the €400m mark.

Neither Jacob nor Wenders would answer TFP when quizzed on how much the i8 has cost so far.

"How much do you think?" Wenders laughs.

ELECTRIC DREAMS

So, the production line is green, but what about the i8 itself?

According to BMW's press information, the sports car will go around 20 miles on its electric charge alone, which isn't very far down your nearest Autobahn. It relies on the supercharged petrol combustion unit to wade in and add some much-needed stamina, making it a truly usable supercar, rather than just a beautifully sculpted ornament marooned by the side of the road.

So, why include an electric unit at all? Is this just 'greenwashing' to give this Geneva jewel a little

HENRIK WENDERS, **i8 Product Manager, gets up close and personal about his project at Geneva 2012.**

"The weight that has been saved allows the car to house the two engines and retain its speed, agility and supreme efficiency. Less weight and less consumption, equals more fun"

HENRIK WENDERS
Product Manager, BMW i8

more lustre?

Jacob looks mortified by the suggestion.

"I sometimes describe the i8 as a very clever sports car," he states, "and the electric nature of the car is central to that.

"The i8 can be driven on the electric charge alone, and that makes it perfect for city commuting and meeting the restrictions and laws that are making it harder and harder for sports cars to navigate city centers.

"But the drive units should be thought of in unison, not separately. Working together they deliver the performance that makes the i8 such a fantastic driving experience."

He explains that the electric motor "delivers immediate torque right out of the starting blocks" – meaning acceleration is instant, rather than having to achieve a combustion engine's certain amount of revs before power delivery – and carries on all the way through to the governed top speed of 250km/h.

"It is really quick and really fun," he adds, rather needlessly given the acceleration figures, opining that this is "electric commuting with a kick."

The small petrol unit, assisted by its electric

"The reason for creating the new i subbrand, is that this is a new market with new customers. Although the i brand technology may impact on the business, we don't want to change BMW as a brand"

Benoit Jacob
Head of BMW i Design

Ready for the road ahead: the i8 is set for a 2014 launch.

friend and empowered by the lightweight build, means that 100km of road can be eaten up as less than three litres of fuel are washed down – truly groundbreaking consumption figures for a supercar.

EXPENSIVE TASTES

The i8 may not cost you much at the fuel pump, but it will leave your wallet significantly lighter when you drive it out of the showroom. Again, both Jacob and Wenders were elusive on the economic questions around their baby, but did remind TFP that this was a "premium mobility product" and would come with a concomitant price tag.

Industry speculation suggests that this could be somewhere around the €150,000 price point, which is an expensive BMW but perhaps not so expensive for a brave hybrid creation. So, what hardy BMWophiles will be tempted to fork out for it? Not your traditional 3-series stalwarts, perhaps?

"The reason for creating the new i sub-brand, is that this is a new market with new customers," is Jacob's response.

"Although the i brand technology may impact on the business, we don't want to change BMW as a brand. It will continue to offer its market the cars that are such a success there.

"We, on the other hand, have this fresh opportunity to target a new audience."

This, he explains, is people that have become "uncomfortable" with society's levels of consump tion and, as far as the i8 is concerned, are looking for "performance with a conscious."

He continues: "I speak to business and society leaders, people at a certain level, at conferences and exhibitions like these, and the feedback on the i8 is incredible.

"They tell me, 'okay, if you can deliver what you say you can deliver, then tell me where to sign up'.

"We know this is a new kind of car, so we won't be starting with crazy production volumes (exact figures here are also under wraps), but we do believe that this model will find its place within the market."

Casting an eye over the three-deep throng that is encircling this 'responsible supercar' it appears as though it's already found it.

Whether these admirers all have the bank balance to drive off into the sun with this glittering Geneva jewel is another question. But TFP feels that Jacob and co are going to have fun finding out.

The i8's journey has only just begun…

COLLABORATION

SHARING MARKET EXPERTISE, TECHNOLOGY, PROCESSES AND OBJECTIVES IS, FOR MANY OF THE WORLD'S KEY INDUSTRY PLAYERS, THE KEY TO SHARING IN BUSINESS SUCCESS. BUT WHAT MAKES FOR GOOD COLLABORATION? HOW EASY IS IT FOR TWO, OR MORE, SEPARATE COMMERCIAL ENTITIES TO WORK TOWARDS ACHIEVING ONE GOAL? HERE WE FOCUS ON A RANGE OF KEY CLIENTS AND PROJECTS THAT KONGSBERG COLLABORATES WITH TO DEMONSTRATE THE BENEFITS OF COMING TOGETHER.

The shipping industry has long been criticised for failing to work together to address common challenges. But with the rising cost of bunkering and new international regulations coming into force, all that might be changing.

EVOLUTION

Let's do this together

The rising cost of energy and increased concerns about the environment have resulted in significant changes in the industry. In July 2011, the IMO introduced a new chapter 4 to Annex VI on Regulations on energy efficiency for ships (EEDI). The regulations apply to all ships of 400 gt and above and will enter into force in January 2013.

At the same time, regulatory bodies in different states are working to introduce Emission Control Areas (ECAs). At present, sulphur emissions control areas (SECAs) are in effect in the Nordic region and the Baltic Sea and ECAs will be established in the English Channel, North America and some islands in the Caribbean. And earlier this year, the EU published a consultation document which considered a number of options for curbing emissions, which may take the form of a market-based mechanism that would apply to ships' emissions in Eurozone waters or a "compensation fund" that would require owners to make payments to offset damages caused by carbon emissions.

MARKET FORCES

But according to Henrik O. Madsen, CEO of DNV Group (Det Norske Veritas) market forces have also played a role. "Bunkering prices have tripled over the last three years and while oil prices remain volatile, most analysts agree that prices will continue to rise for some time," he says. "For owners, these prices represent a serious business risk. Between new and existing regulations on emissions and bunker costs, the industry is looking for solutions."

Madsen notes that as a class society, DNV works with owners, suppliers and regulators on a broad range of issues related to climate change and fuel efficiency. "At present, DNV is participating in more than 30 Joint Industry Projects with various maritime industry stakeholders, is active in a number of other smaller scale projects in cooperation with universities and technical institutes and regularly consults with regulators and other class societies," he says. "We are also working with other industries, such as aviation and auto manufacturing, on a number of safety and logistics initiatives."

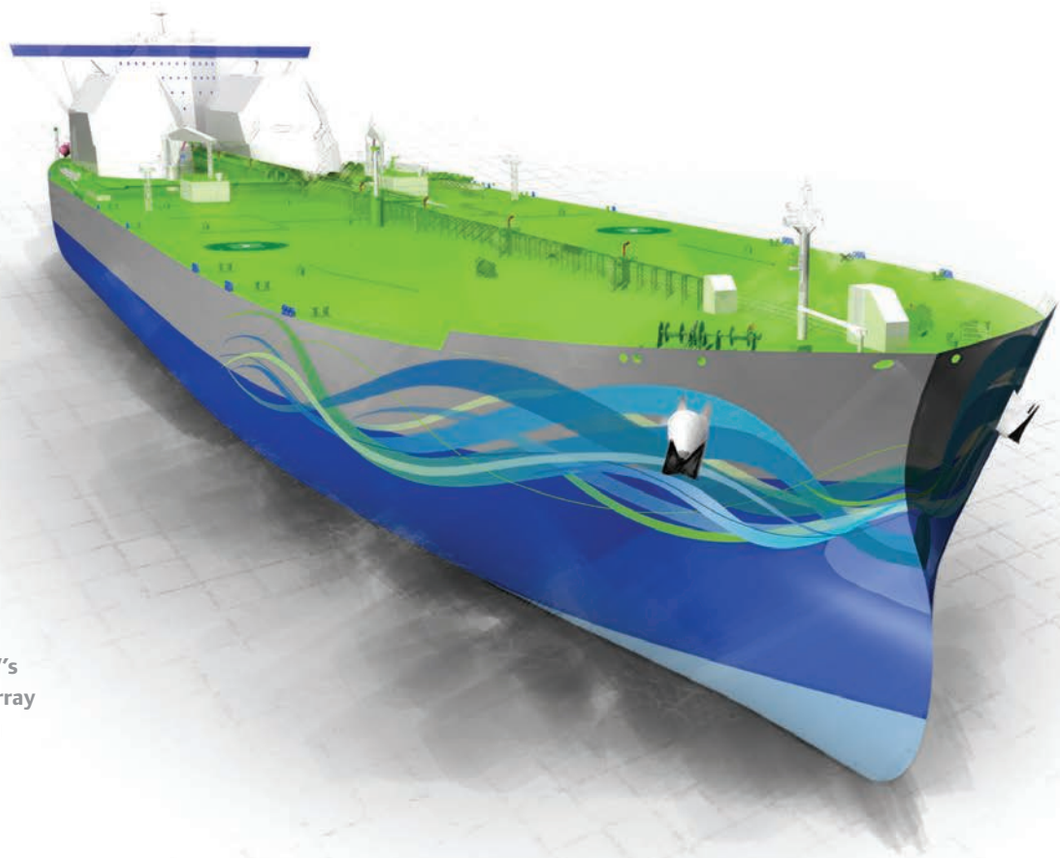
MANAGING BUSINESS RISK

While DNV's primary goal is safety risk management, Madsen is quick to note that DNV also offers services related to managing business risk. "The scope of our technical expertise and close cooperation with industry players has allowed us to see these issues from a broader perspective," he says. "And after working in cooperation with a number of suppliers, owners and regulators, we have demonstrated that the industry can achieve common goals by working together."

Owners developing new vessel concepts are faced with a broad range of options to improving energy performance, ranging from innovative hull forms to new types of propellers, rudders, thrusters, propulsion and automation systems, to name a few. Madsen acknowledges that all these components can impact emissions and fuel costs, but says it is how they work together (or don't) that makes a big difference. "The point is, there is no quick fix or single technology that can improve fuel efficiency," says Madsen. "Only by utilising different technologies and integrating them

Henrik Madsen
President and CEO, Det Norske Veritas

The scope of technical expertise and close cooperation with industryplayers has allowed DNV to see issues from a broader perspective.



Ship shape concept: DNV's Triality VLCC offers an array of innovations, including eliminating the need for ballast water.

"Only by utilising different technologies and integrating them properly can owners improve fuel efficiency and reduce emissions. And that requires cooperation"

Henrik Madsen
President and CEO, Det Norske Veritas

properly owners can improve fuel efficiency and reduce emissions. And that requires cooperation."

Madsen says that DNV's in-house expertise in propulsion, noise and vibration, hydrodynamics and machinery among other specialised services, allows the organisation to bring some fresh ideas to the table during the design phase.

Indeed, DNV's collaboration with different stakeholders helped inspire a unique development initiative. Two years ago, DNV began an innovation programme to develop concept vessels for different segments. The purpose of the programme was to show how the industry could make use of existing technologies to reduce fuel costs and lower emissions. While some these concept vessels include well-publicised innovations, such as LNG-fuelled engines, it was the combination of many different components that made the difference. "We saw that by adopting a number of innovative solutions and integrating them properly, owners could both comply with emerging regulations and achieve significant long-term savings."

INTEGRATING TECHNOLOGIES

To ensure a practical result, the DNV concept vessels were developed for typical trades and involved significant input from suppliers, shipyards and owners. For example, Quantum, DNV's container ship concept is powered by four dual-fuel engines providing a redundant machinery system with flexible power generation over a variable speed range. The broad beam of the vessel (42.5m at waterline) improves stability and practically eliminates the need for ballast. With the WideDeck solution (49m at deck level) container capacity is improved without increasing the fuel consumption. A twelve-metre draft allows the vessel to trade in shallow waters, including river ports, and the unique shape of the Quantum's bow helps reduce wind resistance, resulting in further fuel savings. In addition, the hull design specifications, including the use of new, lightweight composite structures utilising plastic laminates, reduce the vessel's weight by an estimated 1,000 tonnes.

A NEW APPROACH TO VLCCS AND VLOCS

Triality, DNV's concept VLCC, has two high-pressure dual-fuel slow speed main engines fuelled by LNG, with marine gas oil as pilot fuel. Its V-shaped hull form and cargo tank arrangements completely eliminate the need for ballast water in the VLCC version. The new hull shape results in a reduced wetted surface on a round trip and has a lower block coefficient and thus a more energy efficient hull. The Triality VLCC can collect and liquefy more than 500 tons of cargo vapours during one single round trip. These liquefied petroleum gases will then be stored in deck tanks and up to half will be used as fuel for the boilers during cargo discharge, while the rest can be returned to the cargo tanks or delivered to shore during oil cargo discharge.

Ecore, DNV's VLOC concept vessel, represents a

Quantum force: DNV offers the container sector a groundbreaking way forward.

TRIALITY

QUICK FACTS

– Emits 34% less CO2
– Emits 82% less NOX
– Emits 94% less SOX
– Emits 94% less particular matters
– Eliminates VOC releases (Volatile Organic Com pounds)
– Eliminates ballast water, and
– Uses 25% less energy than a conventional VLCC

Given that a supertanker with Triality design operates for one year, the following reductions would be achieved:
– CO2 25900 tonnes
– NOx 1785 tonnes
– SOx 1500 tonnes
– particulars 180 tonnes

Today 504 supertankers are in operation worldwide. Given that all of these vessels had the Triality design and operated for a year, the following reductions would be achieved:
– CO2 13 million tonnes
– NOx 900 000 tonnes
– SOx 750 000 tonnes
– particulars 90 000

step change in bulk carriers. Powered by two-stroke dual fuel ME-GI engines, this concept features a more ballast-friendly hull shape, a large centre cargo hold that was developed to minimise the need for ballast, enables more efficient cargo handling and space for LNG tanks to be stored below the main deck.

Madsen says that the DNV concept teams also consulted with a broad range of suppliers and equipment manufacturers to include smaller innovations, from new propeller designs to rudder profiles, waste heat recovery systems to coatings solutions. "Alone, these elements may not cut fuel costs significantly, but by integrating a number of technologies and designs, these small changes add up to real savings."

FROM CONCEPT TO REALITY

While DNV does not expect these concept vessels will be built as designed, Madsen notes that some elements are already being adopted by the industry. "DNV has worked closely with Oshima Shipbuilding Co., Ltd. on a joint programme to develop the ECO-Ship 2020, a concept design for an open hatch bulk carrier," he says. "And we have worked closely with Man Diesel & Turbo to further develop the ME GI engine for the Quantum 9000 concept vessel."

DNV has cooperated with Kongsberg Maritime (and other industry players) on a number of projects over the years, such as a research project on Arctic operations and technology and an initiative to develop improved methods for qualification of technology for power and energy management control and DP systems. The two organisations also participated (with others) in a JIP in 2007 organized by the Maritime Research Institute Netherlands to develop Service Performance Analysis, (SPA) aimed at optimizing ships' fuel efficiency. And earlier this year, DNV, Kongsberg Maritime and IBM announced plans to develop a real time environmental monitoring system for Statoil's Research and Development Center in Trondheim.

SHARING KNOWLEDGE

"As a leading supplier to the maritime industry, Kongsberg Maritime understands the benefits of co-operation and has made some real contributions to safety and fuel efficiency over the years," says Madsen. "By working on a project structured to share knowledge they not only add genuine value, they gain critical data they can use to strengthen their business."

While Madsen acknowledges the industry still has a long way to go, he argues that the challenges faced by the industry at present represent a genuine opportunity for change. "In the end, fuel savings and emissions control is as much about attitude than it is about technology," he says. "And for the first time, fuel efficiency and harmful emissions are closely linked to business risk – a strong incentive for industry stakeholders to recognise the benefits of collaboration. We welcome this development and stand ready to do what we can to bring the industry together."

BREAKTHROUGHS

Cool customers

Testing times: Kongsberg, Statoil, Hamburg Ship Model Basin and the Norwegian University of Science and Technology have been breaking the ice with one another.

The Arctic region is as rich in resources as it is harsh and remote. The safe and ecological extraction of these resources is becoming a prominent commercial and geo-political issue. But many components need to be put in place before that becomes a reality, including the use of Dynamic Positioning (DP), which is vital in Arctic conditions due to the impracticality and cost of mooring. Through the Dynamic Positioning in Ice (DYPIC) project, KONGSBERG, Statoil, Hamburg Ship Model Basin (HSVA) and the Norwegian University of Science and Technology (NTNU) are taking important steps on the way to bringing the first ice-optimised DP system to market.

Arne Gürtner
DYPIC project lead, Statoil

Kongsberg is involved in many joint industry projects and sees collaboration as essential to making technological advancements that benefit entire industries.

"If you are serious about creating an innovative solution to a complex problem, a collaborative effort is vital"

Arne Gürtner
Project Lead, Statoil

With an estimated 22 percent of the world's undiscovered, technically recoverable resources lying within the Arctic Circle, the industry is looking north. DYPIC project lead at Statoil, Arne Gürtner, says developing the technology necessary for complex offshore exploration is part of Statoil's overall strategy.

"The Arctic is a very high-potential region, particularly for hydrocarbon resources. As a technology-focused upstream company, our aim is to encourage the development of technology required to conduct exploration in the region," says Gürtner.

While DP is widely used for exploration operations in open waters, it needs to be heavily modified for Arctic conditions. This is done by identifying and mitigating additional risk factors and although this is an arduous process, Gürtner says DP is a critical element.

"The development of an ice-optimised DP system is essential. Operating safely and efficiently in Arctic conditions requires vessels to have accurate station-keeping abilities. If we can successfully deliver a stable DP technology for ice it will allow us to access the resource-rich areas for longer periods during a year," he says.

PROJECT STAGES

Statoil's long-term objective is the commercial availability of a DP system, but the complex nature of the technology requires it to be developed in stages. The DYPIC project mainly focuses on getting a fully-automatic DP system working in a test environment.

Initially, physical model tests are being used to determine the necessary input parameters for a full-scale DP system. Data from test results is used to improve the DP system and provides millions of parameters for the development of numerical modelling, done by NTNU. The modelling supplements physical testing, and in turn helps to further enhance the technology. According to Kongsberg project lead, Torbjørn Hals, the project has been highly successful so far.

"We are about halfway through the project, with extensive testing having already been conducted in the HSVA model basin. Analysis from the results has helped us to improve the DP system in the test vessel. Data has also been funnelled back into preliminary numerical modelling," he says.

COLLABORATION

COLLABORATING FOR BETTER OUTCOMES:

This project is a particularly good example of how a collaborative approach can create highly innovative solutions to difficult problems. Though each party had their own goals for the project, those goals largely overlapped, leading to mutually beneficial outcomes. Here's an overview of the partner roles and what the project lead said about the benefits of a collaborative approach:

Collaborating for better outcomes

PROJECT LEAD/ PARTNER	ROLE	OVERALL OBJECTIVES	COLLABORATION IN THE DYPIC PROJECT
Tobrjørn Hals, Kongsberg	Expertise in DP technology	To reinforce position of Kongsberg as market leader for DP. To ensure value to customers.	– Led to better results in a shorter time – Created discussion between experts in different areas – Created awareness of challenges in different parts of project – Mutually beneficial outcomes due to strong overlap between objectives
Peter Jochmann, HSVA	Provide test basin and knowledge of ice behaviour	To have the world's only hydrodynamic test facility for station keeping abilities in ice	– Project would not have been possible without expertise of other partners
Arne Gürtner, Statoil	Define scope and technology readiness. Advising on practical scenarios and application	To gain confidence in an ice-optimised DP system for use in arctic exploration.	– Essential due to the complexity of the technology
Sveinung Løset, NTNU	Develop numerical modelling system for testing possible scenarios faced by DP vessels in ice.	To conduct innovative research with offshore industry partners	– Very important for gaining understanding of practical application – Made it easier to identify problems on both practical and theoretical side

some of the many factors that affect the station keeping ability of vessels. The DYPIC project focuses mainly on broken and managed ice. This is due to thick ice posing too difficult a problem and the fact that DP operations will be supported by physical ice management (i.e. ice breakers).

Add a list of other variables including the unique characteristics of each vessel and the need to ensure safe redundancy levels, and you start to see why, according to Gürtner, the project requires the expertise of several partners to achieve a successful outcome.

"The DYPIC project is very complex and would not have been a realistic undertaking without incorporating the expertise of the partners involved. Statoil has a tradition of technology development in cooperation with other industry leaders. If you are serious about creating an innovative solution to a complex problem, a collaborative effort is vital," explains Gürtner.

CHALLENGES

Though the harsh environment is the main challenge, there are others. For project lead at HSVA, Peter Jochmann, the difficulty is in trying to create a real-life simulation while also understanding how the limitations of the test environment affect results.

"We have never done DP in such a harsh environment," he says. "Though we try to make the test environment as realistic as possible, there are many factors that we can't simulate like the extreme temperatures and darkness. The challenge then is to factor those considerations into the data so that the DP technology can handle those conditions."

Hals explains that for Kongsberg, the main challenge is to ensure that the data and numerical modelling are used to refine the technology to the greatest extent possible.

Gürtner agrees: "The real challenge is making sure all the learning and algorithms from the tests are utilised to ensure a highly practical outcome."

DYPIC – Dynamic Positioning in Ice

PROJECT FACTS:

– Timeline – August 2010 to December 2012
– Part of the EU's ERA-NET Maritime Technologies project
– Consortium includes HSVA, Kongsberg, Statoil, NTNU, DNV and Sirehna
– Funded by government bodies in Germany, Norway and France as well as Statoil
– Aims: to advance model testing facilities for DP in ice and to use the results of that testing to produce numerical modelling and further develop an ice-optimised DP system
– Status: Halfway through with strong progress. Some testing and data analysis completed, leading to further development of ice-optimised DP technology.

Cracking prospects: the IceMAX design will help open new horizons up for exploration.

From the icy waters of the Arctic to the deep waters off the coast of Brazil, Stena's new drillship now under construction at Samsung Heavy Industries can drill in almost any sea conditions and at depths down to 3000 meters.

ARCTIC DRILLING

Drilling to the MAX

Tom Welo
Managing Director, Stena Drilling

Welo believes that the 'new market reality' of tapping into harder to reach resources opens up opportunities for innovative ships such as the Stena IceMAX.

"With this unit, we can offer the flexibility to go anywhere and drill at almost any depth"

Tom Welo
Managing Director, Stena Drilling

Scheduled for delivery in April 2012, the most recent addition to Stena Drilling's fleet will be the industry's first ice class +1A1 dual-mast ultra deepwater drillship built for arctic conditions. According to Tom Welo, Managing Director of Stena Drilling, the project was conceived to meet the evolving demands of the industry.

"Increased global demand for oil has encouraged energy companies to focus more on exploration," he says. "And since many of the most promising fields are increasingly found in deepwater and harsh environments, including the Arctic, we saw an opportunity to build a drillship optimised for the new market reality."

Welo acknowledges that IceMAX represents a significant investment for the company: "Any newbuilding project built on spec is a risk, but in our view, the greater risk would be to sit still," he says. "We anticipate continued growth in this segment, and want to strengthen our position as a leading provider of deepwater drilling units equipped to operate in harsh environments."

PROVEN DESIGN

The DrillMAX ICE is based in part on Stena's DrillMAX design, first developed in the early 2000s. The DrillMAX series of Stena drillships, which include Stena Carron, Stena IceMAX, and Stena Forth, have modified hulls to accommodate Stena Drilling's unique NOV hydraulic cylinder drill package. Also, the series is equipped with a number of fully automated applications including ballast discharge, mud systems and dynamic positioning (DP3) to maximise ease of operation. The two-mast system provides greater flexibility allowing the ship to work on both the blowout preventer (BOP) and top-hole drilling at the same time.

But according to Harry Rostad, Lead Instrument & Electrical Engineer for the Stena Ice Project, the IceMAX required some special modifications: "The basic design is the same as previous DrillMAX vessels, but making the drillship suitable for arctic operations resulted in a number of important changes," he says. "For example, the vessel design provides deck workers improved protection against the environment and the hull is re-enforced with a band of steel between 6.5 and 14 meters above the baseline to ensure hull integrity in icy seas."

MODIFIED FOR ARCTIC DRILLING

Other modifications include special power management, propulsion and anti-icing systems. Powered by six ice-classed 5.5MW azimuth thrusters, IceMAX has two designated moon pools port and starboard to allow for installation of two separate ROV systems. Anti-icing equipment protects the unit's helicopter deck, deck piping, lifeboat escape exits, ventilation intakes, scuppers and drains while enhanced de-icing machines keep decks, gangways, and handrails clear.

IceMAX also has expanded crew areas, to accommodate meteorological scientists and ice management teams: "Structurally, we added conning stations both port and starboard to allow the DrillMAX ICE to be piloted from three different locations," says Rostad. "At the same time, the anti-icing systems required that we work with suppliers and the yard to ensure these systems were seamlessly integrated with the power supply."

STENA DRILLING

SPECIALISING IN DEEPWATER IN HARSH ENVIRONMENTS

At present, Stena Drilling operates four semisubmersible drilling platforms and three drillships. While these units have been active all over the world, including the North Sea, US Gulf of Mexico, South East Asia, Mediterranean, Caribbean, South America, North America & Greenland: Atlantic Front, Australia, North Africa and West Africa, the company has earned a strong position as a leading provider of drilling services in harsh environments. While similar to the company's existing fleet of drillships, the design of IceMAX has been optimised for ultra deepwater arctic operations.

ARCTIC INNOVATIONS

Rostad notes that in order to comply with ice class +1A1 classification, all electrical cables have been tested and approved to function at -40°C. For example, the company worked together with Samsung and lighting provider Glamox to develop LED lights for outside use: "We discovered that traditional florescent lights do not work properly at temperatures below -30°C, and the anti-icing system design is a result of detailed laboratory testing in various low temperatures and wind conditions in order to be sure that the anti-icing is fit for purpose," he says. "All this extensive testing resulted in new types of handrails, heated walkways and light fixtures among other features."

BUILDING LONG TERM-RELATIONSHIPS

Stena worked with a broad range of suppliers to get results. In addition to Samsung, a leader in drillships, key suppliers on the project include NOV, supplier of drilling equipment, Knuckleboom (deck cranes rated for -30°C conditions), DNV (class services), Cameron (six-RAM BOPs) and Kongsberg Maritime, which provided bridge control, drill control, DP3 station-keeping systems and related automation.

Ivar Vebostad, Project Manager (Drilling) for Kongsberg, says that the project has gone well: "Our close relationship with Samsung and years of experience with Stena – including our work on the three previous IceMAX vessels – has helped the project move forward on schedule," he says. "We have been working with each other on these vessels over the past seven years, so we all know each other well, and have learned to anticipate each other's needs."

SHARING INFORMATION

Hans-Christian Hagevik, site manager for Kongsberg who has been working on the IceMAX vessels at Samsung for the past five years, says that the project has helped the company understand some of the practical issues related to operations in Arctic conditions: "Operating safely in icy seas and low temperatures, which can drop to -20°C degrees in summer, is challenging," he says. "So in addition to modifying the power management system to support anti-icing equipment, we have also had to develop wind sensors that can withstand -35°C temperatures and install an additional INMARSAT system to ensure accurate readings on the DP systems. Redundant references systems are critical to the integrity of DP3 systems, especially in the Arctic, where the quality of satellite coverage varies."

While Hagevik is quick to note that Kongsberg has supplied systems to many vessels trading in harsh conditions, the company's practical work on the Stena IceMAX vessels has helped build its expertise in cold climate systems.

"We are very grateful to both Samsung and Stena for the opportunity to work on the IceMAX vessels, especially IceMAX, which takes an innovative design one step further," he says. "In my view, the IceMAX will be recognised as one of the most versatile, technically-advanced drillships on the market."

CALCULATED RISK

For Stena, the DrillMAX ICE represents a calculated risk. In total, costs related to adapting the IceMAX unit for Arctic conditions add up to somewhere between USD 220 to 240 million. And while the company is already in dialogue with a number of energy companies that have expressed interest in the concept, the drillship does not yet have a charter agreement.

But Stena's Managing Director Tom Welo remains confident the unit will attract a charter soon: "The IceMAX will be delivered at a time when energy companies are expanding their deep and ultra deepwater exploration programmes, and offshore drilling in the Arctic is attracting more interest," he says. "With this unit, we can offer the flexibility to go anywhere and drill at almost any depth."

Transporting people from A to B. SEACOR's customers have a simple requirement that can be met using proven vessel designs and technology. This hasn't stopped SEACOR Marine in ploughing millions into improving its vessels' comfort, safety and efficiency though.

PIONEERS

CrewZer collaboration

"I feel that they know me and if I can express my needs to them they can help us make a package of all the various components and put that together to make a successful vessel"

Joe McCall
Project Manager, SEACOR

Aiming to exceed customer requirements has paid off for the Houma, Louisiana based crew boat specialist, as it is one of the largest crew boat operators in the world and is considered by many as the most innovative and forward looking.

"SEACOR is always looking at ways to push the envelope – to go bigger and faster with more advanced technology. We are always looking to add innovations to the vessel platform, which enhances the benefits to our customers. It's very fun to be part of that," explains Joe McCall, SEACOR's project manager for aluminium crew boats and all-round crew boat design and operation guru.

Joe's reputation as an expert in the field has come through decades of working with offshore vessels and through following in the footsteps of his dad, Norman McCall. Norman, who celebrated his 88th birthday in March this year, started McCall Boat Rentals Inc. (later known as McCall/Cameron Crew boats) in 1967 and in 1969 he built his first crew boat, the Phyllis McCall.

Norman is responsible for several industry firsts including the first four engine crew boat in 1970, the first five engine crew boat in 1984 and the first 6 engine crew boat in 1989. In 1996 McCall/Cameron Crew boats merged with SEACOR Marine and the innovation kept coming; by 2002 Norman and SEACOR had built the largest ever crew boat for its time, the 190ft Granville C McCall.

PIONEERING SPIRIT

The pioneering spirit of his father has certainly rubbed off on Joe, whose work over the past 16 years at SEACOR and before that with McCall/Cameron Crew boats, has resulted in a number of his very own firsts. Notably he was behind the first ever DP1 crew boat, the first ever DP2 crew boat and now, with the forthcoming 190ft CrewZer Class vessels SEACOR Lynx and SEACOR Leopard, the world's first DP3 crew boats.

"SEACOR is always looking for innovation to apply to crew boats to make them a safer platform for cargo and personnel transfer offshore," explains Joe. "DP improves our station keeping ability. We implemented our first DP system on the Phillip Alan McCall in 1999. There were challenges with integrating the equipment and with training our personnel to operate it. That was the first step, however, and that led us to where we are today."

Ted Murphy, Senior Sales Manager at Kongsberg Maritime Inc., has been working with SEACOR for over thirty years and has played an important role in developing DP technology for crew boats alongside Joe.

"The guys involved at SEACOR were Tony Jones, Joe's dad Norman and Joe, and from Kongsberg Maritime it was me, Lars Moen and Sam Weather- »

all," explains Ted. "No one had ever even dreamed about the possibility of putting DP on a crew boat but Tony called one day so Sam and I went down and met with Joe and his dad."

Joe explains that because crew boat dynamics are so different from other offshore vessels, there were a lot of challenges with the DP software at first: "The Philip Alan McCall was never designed as a DP vessel, so many modifications to the thrusters, engine and gear controls, and other systems were necessary. We were working on controllable speed propellers at the time too, which would prove very beneficial later, but there were a lot of challenges to overcome."

Ted takes up the story: "So what we had to do was let it work for three months and take in all the data and write the software based on this. Once we had established how the software and crew boat worked together then it became easier from that point forward. A key breakthrough was when SEACOR recognised the need to hold the bow in position correctly. You might ask, 'what's the point,' on a crew boat the bow is usually out of the water. Joe and Norman came up with the idea of putting in a drop down thruster. That was the one key factor that made all of this go forward."

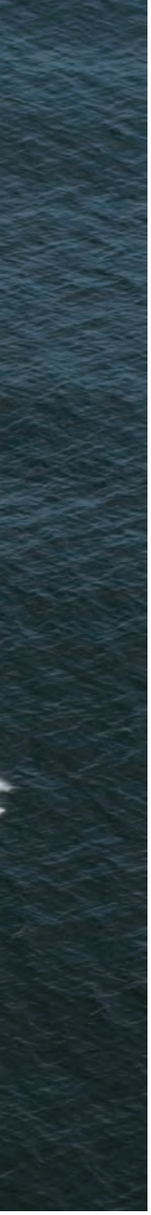
"They really are cutting edge, state of the art vessels designed to optimise passenger comfort"

Joe McCall
Project Manager, SEACOR

THE MAGIC NUMBER

Since those pioneering days of developing the concept of DP for crew boats, SEACOR has been one step ahead of the competition. The latest generation CrewZer class vessels have been designed around the redundancy and segregation that a full DP3 system requires.

SEACOR Lynx and SEACOR Leopard are under construction at Gulfcraft Shipyard in Franklin, Louisiana and due for delivery in the first half of 2013. The vessels will be the first crew boats to operate using an ABS Class DP3 system, affording them the highest degree of manoeuvring safety available today. The CrewZer Class features a twin-hull design that enables speeds of 46-knots, which is more than



Dynamic moves: SEACOR is using a collaborative approach to set new sector standards.

NORMAN MCCALL **and** JOE MCCALL.

twice that of conventional crew boats.

"They really are cutting edge, state of the art vessels," enthuses Joe. "They are designed to optimise passenger comfort. This includes first-class seating, passenger amenities and the equipment on board to minimise pitch and roll while underway. We want passengers to be as comfortable as possible. They should be well rested when they arrive at their final destination."

The key difference between DP2 and DP3 is increased redundancy, especially for fire and flooding. For DP3 multiple engine rooms and segregation of cable are key aspects. The DP computer is on the bridge and thrusters are at the other end. If there is a fire in the middle of the vessel it could affect thrusters at either end. DP3 allows for this so that the vessel can continue to manoeuvre safely during and after the loss of a thrusters or system because of the multiple layers of redundant systems.

"The main reason for going DP3 is that it's a standard, a regulatory benchmark. It affords a level of safety above DP2 that can be measured and recognised by customers. It's not a job requirement but an additional layer of safety," says Joe.

VITAL INGREDIENT

It's safe to say that DP crew boats are SEACOR's domain, and Joe's speciality. He readily admits though that he is not a DP specialist so he depends on his vendors to support his vision for his latest project. According to Ted Murphy, moving from DP2 to DP3 is very much a team effort, with the onus on SEACOR and CrewZer vessel designers Incat Crowther to create a vessel that allows for the redundancies and segregation the class demands. Working closely together has proven to be a vital ingredient for success.

"Collaboration is very important, because nobody knows the equipment as good as the supplier," adds Joe. "I'm not an expert on DP, I'm not an expert on engines, I'm not an expert on transmissions but each of my vendors are so I rely on them to work with me so that I understand the capabilities, benefits and value the equipment brings to me.

"I've been working with Ted and Kongsberg Maritime for many years. I feel that they know me and if I can express my needs to them they can help us make a package of all the various components and put that together to make a successful vessel."

Kongsberg Maritime has been SEACOR's sole supplier for DP for crew boats. According to Joe they recognised a long time ago that Kongsberg Maritime has a quality product so collaboration with them makes perfect sense in that it has supported SEACOR in enhancing its capabilities towards customers. At the end of the day, keeping customers happy with a reliable and safe method of transportation is why SEACOR is at the top of its game.

"Our crew boats operate in some of the most remote places in the world and Kongsberg Maritime has always been there with technical support to keep our equipment running. We want a relationship with our partners to span decades, for the life of the vessel and partners that are ready and keen to work on future projects. I think Kongsberg Maritime fits that bill."

THE PERFECT COLLABORATION

One of the biggest challenges of integrating DP on a crew boat is that because they are built for speed, they have a very different hull design than other offshore vessels, but a close collaboration between Kongsberg Maritime and SEACOR on the Phillip Alan McCall overcame this challenge.

"Bow thrusters are a challenge," starts Joe. "Successful dynamic positioning demands large bow thrusters but that is difficult to install on crew boats that have limitations on space and weight considerations. So Kongsberg Maritime began working with the software to overcome that limitation by better using the main engines.

"We went offshore with Kongsberg Maritime engineers and put the boat on DP in a location where the wind and current were so strong that the DP system couldn't hold it. We then turned DP off and held the boat manually, whilst recording the telemetry. This allowed them to re-configure their software to manoeuvre the boat the same way we were doing it manually."

"It was the perfect collaboration," continues Ted. "Joe drove us to this. He got his people to work with our software people to understand how the vessel worked. It took us a couple of shots and we really had to talk to his guys and understand exactly what was going on because DP on a crew boat was a totally new thing. We cracked it though and the end result is that SEACOR gets the best use of its bow thrusters and main engines. That's a big difference for SEACOR – they actually do DP."

NEW MARKET FORCES

Winds of change for Fred. Olsen

After more than 35 years of building and operating oil and gas vessels, drilling units, FPSOs, and tankers, Fred. Olsen Windcarrier saw an opening in the wind turbine installation market. It promptly ordered two large new-builds, designed specifically for this purpose. The Full Picture visited the Lamprell shipyard at Jebel Ali, UAE, to see the first vessel, Brave Tern, nearing completion.

Darren MacDonald
Senior Project Manager, Lamprell

The Seajacks builds have presented huge challenges, and excitement, for MacDonald and his team at Lamprell – including the task of transporting a 12,000 tonne vessel 800 metres over land.

With an increasing focus on wind as a viable long-term energy option, several wind turbine installation vessels (WTIVs) are currently being built around the world. The offshore wind-farm industry is in its early days and there is still much discussion over the optimal WTIV design – size being one of the most contentious issues.

After weighing up its options, Fred. Olsen Windcarrier decided to construct vessels at the larger end of the scale. According to Site Manager, Sturla Fjoran, it was all about striking a balance between operational and market considerations.

"There are many factors to consider during the design phase, but our vessels are designed to handle both installation of the bottom mounted foundations as well as the topsides including tower, nacelle and blades. Basically, we are constructing vessels that we believe will be suited to deliver more than 90 percent of the contracts in the market.

"Some deep-water foundations will be in excess of our capabilities, but we haven't yet seen any turbine designs that our new vessels cannot handle. In our judgement, it would have been excessive to build bigger vessels, as the market is not ready to pay the corresponding price; on the other hand, the smaller vessels cannot transport enough turbines at a time, are limited to shallower waters and are too slow," he points out.

Regardless of size, installing offshore wind farms requires the WTIVs to maximise both deck space and variable load, enabling them to transport and install several turbines at once without needing to reload. »

KONGSBERG'S ROLE

Kongsberg is providing both Fred. Olsen vessels with a delivery based on the Full Picture ethos. The vessels are equipped with a fully redundant DP2 propulsion system, which is critical in making them fit-for-purpose when installing wind installation vessels.

Fleet building: expect to see a demand-driven explosion in the number of WTIVs.

This is one of the major design features of the Fred. Olsen Windcarriers. To free up as much deck space as possible, the vessels are outfitted with an 800-tonne capacity crane, which wraps around one of the legs. This makes room for an exaggerated 3,200 square metres of deck space – which can support up to 5300 tonnes.

SERIOUS JACKING CAPABILITY

These dimensions – along with the need for a frequent and rapid jacking capability to minimise installation times – put an extreme demand on the jacking system. To address this, the vessel is equipped with a heavy-duty, continuous hydraulic jacking system.

Whereas a regular jack-up vessel will often only jack up once a month, the WTIVs are made to jack up and down 300 times a year. The trade-off is that the cylinder legs are not capable of going to a water depth greater than 50 metres, but most wind farms are being installed in waters shallower than that limit.

This made the cylindrical leg, allowing for a fast and extremely robust jacking system, an obvious solution compared to a truss leg with a fatigue sensitive rack and pinion jacking system.

In order to reach the required tolerance levels, its cylinder legs had to be accurate within millimetres over their eighty-metre length. Lamprell's Senior Project Manager Darren MacDonald says completing the design and building the prototype jacking system was a significant feat.

"The tolerance in this system is like nothing I've

ever seen. Constructing the legs required extreme fabrication and dimensional control. Installing the hydraulic components was also a complicated process because the whole system had to be installed sequentially," he says.

VERSATILE VESSELS

As insurance against a possible downturn in the offshore wind market, the Fred. Olsen Windcarrier vessels can be converted to oil and gas vessels. Fjoran explains how this was a consideration during the design phase.

"We wanted to have a fall-back option. This led to certain design features such as the ship-shaped hull and the size, which makes it better suited for oil and gas purposes. We also worked closely with Det Norske Veritas (DNV) to ensure that the vessel complied with relevant rules so that it could easily be prepared without major conversions for various operations like accommodation, construction and well-maintenance," he says.

Fjoran hopes, however, that this flexibility will not be required.

"We believe that the offshore wind market has a strong future. At the moment, European offshore wind is not meeting the ambitious growth projections with some scheduled projects slipping considerably. Consent, financing, and the grid and infrastructure required for offshore wind farms have been causing delays. However, we believe that in the long term, wind will form an important part of many nations' total energy requirements," he says.

AGGRESSIVE SCHEDULE

"We are con structing vessels that we believe will be suited to delivering more than 90 percent of the contracts in the market"

Sturla Fjoran
Site Manager, Fred. Olsen

It is an impressive operation. At any one time, there are more than 2500 employees working on the WTIVs – Brave Tern and Bold Tern (and so far there has been no time lost due to accidents or injury).

Because of the aggressive nature of the schedule, McDonald says his project team had to think of creative ways to streamline the construction.

"We cut the first steel just sixteen months ago. It was a concurrent design and build approach, meaning that much of the design was still being done after construction had started, so we could meet the deadline. At this stage, we are on target to launch in mid-February as planned," says MacDonald.

He concludes that he and his team have learned much throughout the challenging project.

"Admittedly, the nature of these vessels, their sheer size and the fact that they are under a new class notation has resulted in a very challenging design and construction process. But I have a fantastic team working through these issues on a daily basis and it has been a great opportunity for us to meet that challenge with new thinking and find solutions that we will use again in the future," he says.

DARREN MCDONALD OF LAMPRELL:
TO MOVE 12,000 TONNES OF VESSEL OVER LAND

How would you move a 12,000 tonne vessel, 800 metres over land to the water? Lamprell Senior Project Manager, Darren MacDonald, explains how his team managed the biggest ever wheeled land move in the Middle East (and the 2nd largest ever worldwide), on February 10.

"First we needed to clear the way. This meant tearing down several fences, walls and road signs that impeded our path and levelling and compacting the road – it was made for heavy vehicles, but not this heavy. 418 axles and over 1600 wheels – in the form of self-propelled modular transporters (SPMTs) – were placed under the vessel, which was lifted off the building stands and onto the axles. Just assembling, interlinking and aligning the SPMTs took several days. We then drove the vessel down the road, which took about four hours. Believe it or not, that was the easy part.

"After that, we had to transfer the 12,000 tonnes over the quayside onto a submersible barge, which was constantly ballasting in order to keep level while it took the weight. The vessel was longer than the barge, so the thrusters were overhanging onto the quayside, just 80cm above the concrete. That tiny margin narrowed with the ebb, giving us just a few hours in which to complete the transfer and move away. There was no margin for error, if we hadn't transferred it quickly enough, the aft thrusters would have crashed right into the quayside.

"It was a delicate operation, but having done it before with smaller vessels, we were confident we could do it with a larger one, and we did."

TECHNOLOGY

Building for the Future

CEO and Chairman of Harvey Gulf International Marine, Shane Guidry, is passionate about bringing new technology to the market. That's why Harvey Gulf is the first company to build US flagged DP2 class dual-fuel powered Platform Supply Vessels (PSVs).


HARVEY ENERGY
LNG POWERED
HARVEY GULF INTERNATIONAL MARINE
stx Marine SV 310 DF

The Full Picture Magazine met Guidry in Harvey Gulf's newly built office in Houston, where he talked about the company's latest investment; the construction of two PSVs that run on natural gas. This is a first in the US.

"Some might say it's crazy to spend an additional ten million dollars on each of these two dual-fuel vessels today, but we are not building our vessel only for today; we are also building them for future operation," comments Guidry.

A LONG RELATIONSHIP

From its headquarters in New Orleans, Harvey Gulf provides offshore rig moving, anchor handling and offshore drilling supply services for jack-up, platform and semi-submersible drilling rigs and drill ships. The company specialises in towing drilling rigs and provides Offshore Supply and Multi-Purpose Support Vessels for the deepwater and ultra-deepwater offshore oil industry, operating in water depths up to 12,000ft. While also operating internationally, the company's main market is in the Gulf of Mexico (GOM) region, which is where the two new dual-fuel powered PSVs will operate.

With an LNG storage capacity of 290 cubic meters (m3), the vessels will be able to operate for more than a week at a time. They will carry 5,520 tons of deadweight at load line and have a transit speed of 13 knots.

Their main function is to transport goods and personnel to and from offshore oil platforms and other offshore structures. To perform such tasks, it is essential that the vessels are kept in a stable position and that is why they are outfitted with a Kongsberg Dynamic Positioning (DP2) system. As a result of a decade-long business relationship, numerous vessels in Harvey Gulf's existing fleet are already fitted with Kongsberg equipment. While a system's performance is the main concern when choosing a vendor, Guidry emphasises good business relationships as another major factor.

"We all know that Kongsberg's DP systems are great. There is no question about that. I've had them onboard my vessels for 10 years without any major issues. The most important thing, however, is to build a good business relationship with the supplier, and I know I can rely on Kongsberg. Their local presence in this region is vital to ensuring the systems stay supported," comments Guidry.

IN EXPERIENCED HANDS

Kongsberg's delivery to Harvey Gulf's new dual-fuel vessels will include the unique GreenDP® control system, which reduces fuel consumption and CO2 emissions by as much as 20 percent. GreenDP® control secures the vessel, allowing it to stay within a specified area of operation. This new approach is based on forecasting the vessel's motion, rather than acting on present conditions, using a method called 'non-linear model predictive control', which optimises the predicted vessel offset against the use of thrusters. By doing so, small and short-term disturbances that do not force the vessel out of its operational boundary are 'filtered out'. This allows for smooth control, which dramatically lowers peak loads – leading to less wear and tear on thrusters.

"The GreenDP® is part of Kongsberg's Green Ship Strategy, and fits nicely with Harvey Gulf's mission of building greener vessels," comments Executive Vice President of Sales for Kongsberg Maritime in Houston, Jon Holvik.

Holvik emphasises that although LNG powered vessels are a first in the US, this is not the first time Kongsberg has made a delivery to vessels with this technology.

"We are very familiar with this technology," he says. "We delivered a full range of integrated systems consisting of automation and control, including power management system to the world's first ever LNG powered OSV, Viking Energy, owned by the Norwegian company, Eidsvik. So it's safe to say that Harvey Gulf is in experienced hands," explains Holvik.

AHEAD OF THE CURVE

The first of the two vessels, which will both be built at Trinity Offshore Shipyard, is scheduled for completion in October 2013, and the second build will follow 90 days later. Compliant with the highest emission standards, the vessels are part of Harvey Gulf's mission of 'going green'.

"You won't find any vessels that have as low emissions as these. They comply with both current environmental regulations and laws that are planned but not yet enforced. We are trying to be as green as we can, and as environmentally friendly as we can. That's where the future is, that's where we're headed, so we want to make that commitment now. The emission requirements are going to get stricter

Shane Guidry
CEO and Chairman,
Harvey Gulf International Mariner

Kongsberg's delivery to Harvey Gulf's new dual-fuel vessels will include the unique GreenDP. control system, which reduces fuel consumption and CO2 emissions by as much as 20 percent.

and stricter, with expected tier 4 standards in 2016, so you might as well be ahead of the curve," says Guidry.

GREEN PASSPORT

The dual-fuel engine technology has several environmental benefits. It enables the engine to operate on either gas or diesel fuel. This means that when the vessel is running in gas mode, there will be minimal environmental impact since nitrogen oxides (NOx) are reduced by some 85 per cent compared to diesel operation. Sulphur Oxide (SOx) emissions are completely eliminated since gas contains no sulphur, and emissions of CO2 are also decreased. As natural gas has no residuals, the production of particulates is virtually non-existent.

In addition to being powered by cleaner burning natural gas, the new vessels will achieve the so-called 'ENVIRO+, Green Passport' certification by the American Bureau of Shipping (ABS). This involves implementing ballast water sewage and garbage management plans, keeping logs and records as well as training on environmental practises. The vessels will also be constructed with certified environmentally friendly materials to ensure that no hazardous materials are released at the end of the vessel's lifecycle. In addition, there will always be a certified Environmental Officer onboard, dedicated to monitoring all these issues.

"Today's regulations demand that there must be someone onboard to monitor issues related to the environment, but this can be an ordinary crew member. Since Harvey Gulf has a so-called Target Zero strategy when it comes to accidents, we put great emphasis on the training of our staff to ensure safe operations. On these particular vessels, we are taking the safety level one step further, by ensuring that there is a certified Environmental Officer onboard each vessel," says Guidry.

A GREEN SERIES

Bringing LNG powered vessels to the US market is not the only first for the company. As part of the green strategy, Harvey Gulf recently launched the first in another series of Offshore Support Vessels, which will be built at the Eastern Shipbuilding Group in Panama City, Florida. Although these OSVs will not run on natural gas, they will be the first in the U.S. to be constructed to the regulatory standards required for 'ENVIRO+, Green Passport'. In addition, two Multi-Purpose Light Construction Vessels are ordered that have larger cranes than most similar vessels in the industry.

"The construction vessel Harvey Deep-Sea is scheduled for delivery in April 2013, and will also be ENVIRO+, Green Passport Certified. It will be equipped with a 165-ton crane capable of lifting 100 tons at depths up to 10,000 ft. There are not that many vessels out there that can do that," states Guidry.

> "Some might say it's crazy to spend an additional ten million dollars on each of these two dual-fuel vessels today, but we are not building our vessel only for today; we are also building them for future operation"
>
> **Shane Guidry**
> CEO and Chairman,
> Harvey Gulf International Marine

GOOD PROSPECTS

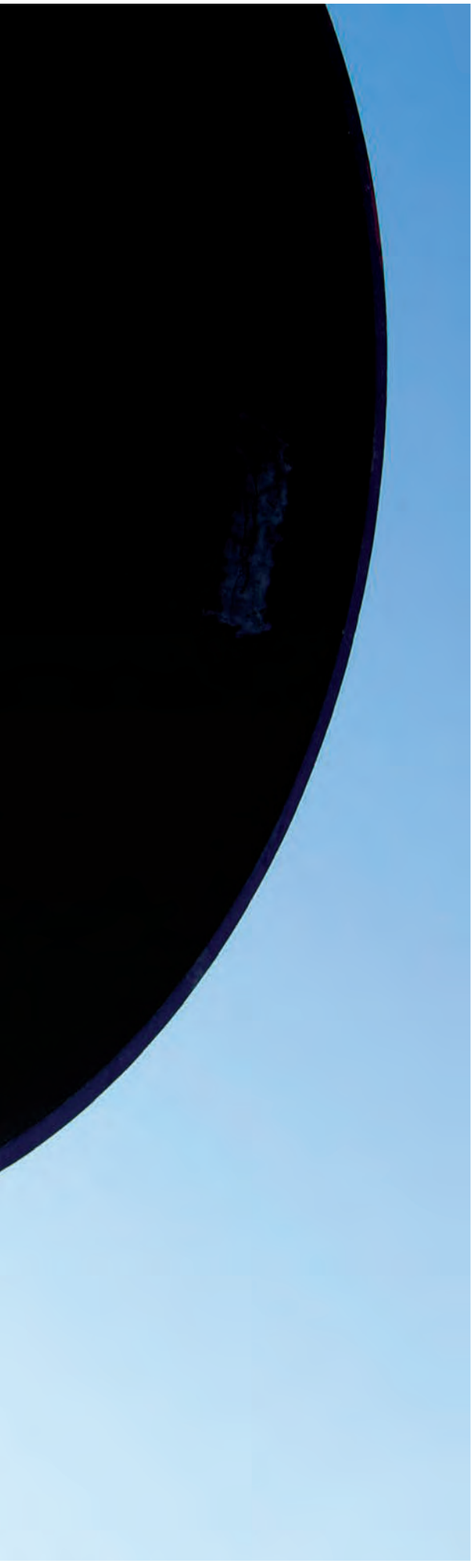
While Guidry believes that a change towards greener vessels in the market will take time, he considers it inevitable that with future changes of regulations, other companies will follow in Harvey Gulf's example. As the first company in the US with dual-fuel vessels, however, he expects added value and more business for Harvey Gulf.

"I think the future looks bright for Harvey Gulf. By building these new vessels now and adhering to our green strategy, we of course aim to reduce the harm for our environment, but we also hope to get more global recognition, a higher rate of return for our investors and to be better equipped for the future," says Guidry.

NEWBUILDING

Seajacks harnesses wind for growth

Lamprell Project Manager Thomas Hart.



Wind turbine installation vessels (WTIVs) may not be a familiar sight on the high seas as yet, but, with government subsidies fuelling growth in this renewable energy source, you can expect a few more to blow onto the industry horizon in the near future.

Kevin Alcock
Vice President
New Build Projects at Seajacks

Seajacks Zaratan is being constructed at Lamprell's Hamriyah facility and is due to be delivered in 2012. Seajacks has selected Lamprell to deliver its three Wind Turbine Installation Vessels.

Demand for WTIVs is growing in line with the sector they serve and several newbuilds are currently underway to fill a perceived gap in the market.

This flurry of activity has some market observers suggesting that over, rather than under, supply may soon be the real issue – possibly by as soon as the end of 2013.

However, this is not a school of thought that Kevin Alcock, Vice President New Build Projects at Seajacks, subscribes to. He believes the demand is there to justify the creation of several new WTIVs of varying sizes, including Seajacks' latest addition Zaratan, the construction of which Alcock is currently overseeing at the Lamprell shipyard in Hamriyah, UAE.

"Each field has a different operating environment, sometimes the smaller vessels are better suited and sometimes the bigger ones are. But there is plenty of demand and I predict this will continue for the foreseeable future," says Alcock.

And with contracts signed for the two existing vessels in the Seajacks wind installation fleet, Leviathan and Kraken, Alcock should know. But just in case his forecast falls short, Seajacks has a back-up plan as the vessels were also designed and built for use in oil and gas operations.

At 81 metres long and 41 metres wide, the Seajacks Zaratan is larger than the first two Seajacks vessels. Her first project is located in the German North Sea at Meerwind, where it will be accompanied by another Seajacks

"Innovation is important, but it needs to be based on solid foundations"

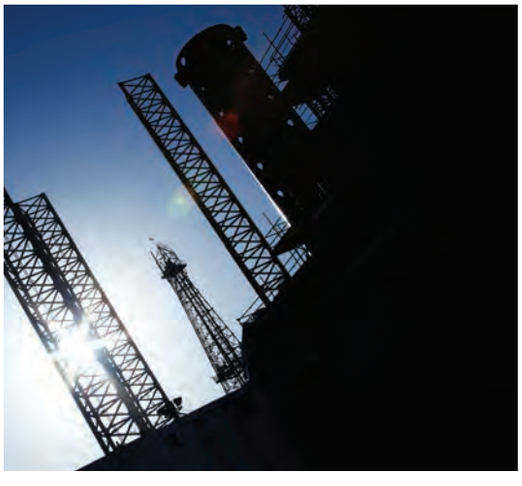
Kevin Alcock
Vice President ,
New Build Projects, Seajacks

vessel, Leviathan. Zaratan will lay the monopiles with Leviathan following behind installing the transition pieces. Both vessels will then install the wind turbine generators. This two-rig installation strategy maximises the flexibility within the Seajacks fleet.

REFINING THE CONCEPT

Seajacks encouraged operational employees to provide feedback based on their experience on the two first WTIVs in the Seajacks fleet. These suggestions were then reviewed and, where appropriate, included in the final specifications for Zaratan.

This process of steady refinement corresponds with Seajacks' rig building philosophy – namely that quality and reliability trump, what Alcock calls, "Innovation for innovation's sake."



"There's always a place for innovation, but it needs to be based on a solid framework. When it comes to rigs, the most important thing is a sound and workable design. Once you have that, then you can start to think about refinements.

"We learned a lot when constructing and operating our previous two rigs, which are similar, but smaller than Zaratan. The modifications that came out of that process were incorporated into the design and we are looking forward to seeing a better end-result," he says.

As wind installation vessels are generally contracted on a day rate, huge losses are incurred if a vessel is out of commission due to technical failure. This is why Seajacks has a strict list of pre-approved suppliers, focusing on quality and reliability.

> "Being closely involved on the engineering side throughout the project has allowed us to guide decisions, leading to a better final product"
>
> **Tor Martin Flåten**
> Senior Project Manager,
> Kongsberg Maritime

FEWER SUPPLIERS

Many builders pride themselves on employing an army of mini-suppliers, billed with developing individual parts. Seajacks, however, finds this approach difficult to manage and fraught with danger. Instead, explains Alcock, they prefer to work with fewer, trusted suppliers.

"It's one thing to have good parts, but integrating those parts can be problematic. You reduce this risk when you work with a small number of sub-contractors responsible for handling large parts of the project. For example, GustoMSC designed the basic vessel structure, the jacking system and the crane – if we had purchased each of those parts from different suppliers, integration would have been more difficult," he says.

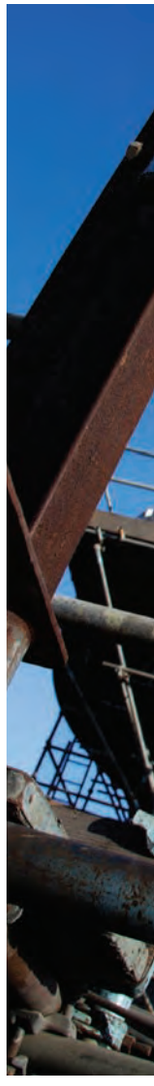
In line with this approach, Kongsberg – in conjunction with Norwegian Electrical Systems – is supplying, sub-contracting and integrating all the electrical and automation apparatus on the vessel as well as delivering engineering services throughout the project. According to Senior Project Manager, Tor Martin Flåten, the combination of delivering a complete package and transparent cooperation with the other partners enables Kongsberg to deliver an excellent service.

"We are delivering our entire range of products and services on this project. That, combined with the close partnership we have shared with the other stakeholders from the start of the project, provides us with a great opportunity to deliver an excellent service. Being closely involved on the engineering side throughout the project has allowed us to guide decisions, leading to a better final product," he says.

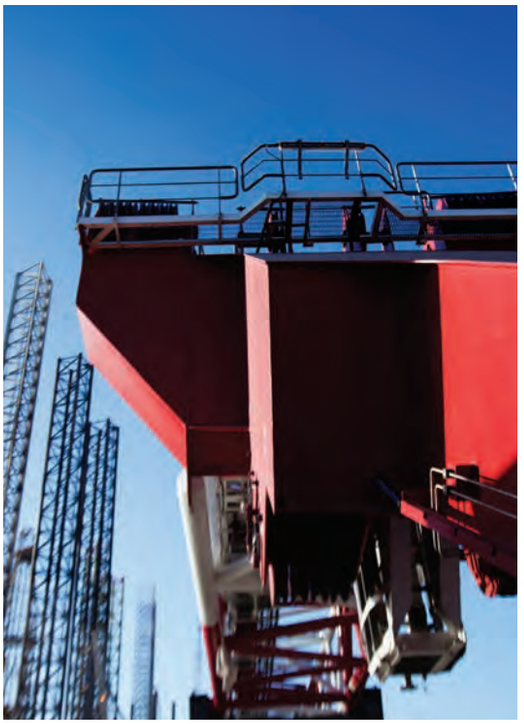
ACCURATE POSITIONING CAPABILITY

Installing offshore wind turbines requires extreme positioning accuracy. That is not easily achieved in the North Sea, especially in winter – leading some to question wind-farm installation as a viable year-round activity.

In addition to the operational requirements, Alcock says Zaratan's fully redundant Dynamic Positioning 2



Blue sky thinking: Seajacks is learning from each new design and build project it undertakes.



(DP) propulsion system makes economic sense, as it shores up any possible contractual obligations due to safety requirements.

"The nature of wind-farm installation makes a robust DP system essential for safe and effective operations. Indeed, you can't win contracts unless customers know your rigs have a strong DP capability. With regards to the seasons, we've found that the weather is not as problematic as has been predicted; Zaratan is purpose built for such conditions. We also monitor weather patterns carefully and have the possibility of jacking up and riding out bad weather, if necessary," he says.

AFTER CONSTRUCTION

Seajacks Zaratan will be delivered in May 2012. The rig will then be taken – by heavy lift transport – to Rotterdam, where it will mobilise for a contract with WindMW GmbH to install a new wind farm in the German sector of the North Sea. Seajacks Leviathan is also contracted for the same project.

KONGSBERG WORLDWIDE

YOUR TICKET TO THE LATEST DEVELOPMENTS IN DUBAI, CHINA, HOUSTON, GREECE AND MEXICO. COME WITH US ON A JOURNEY AROUND THE WORLD OF KONGSBERG.

In June 2010, Kongsberg Maritime established Kongsberg Maritime Middle East DMCCO in Dubai. In less than two years, the company has taken on extra responsibility and become essential to Kongsberg Maritime's regional strategy.

"We are now able to solve issues as they arise, diminishing the risk of escalation"

Halvard Sagdahl
General Manager, Kongsberg Maritime Middle East

INSIGHT

Destination Dubai

Halvard Sagdahl
General Manager
Kongsberg Maritime Middle East (KMME)

In 2010, Kongsberg established a new service, support and after sales company for the GCC region.

Kongsberg Maritime Middle East (KMME) was established to improve the quality of service, support and after sales to vessels and yards in the Gulf Cooperation (GCC) region.

Though Kongsberg has had an agent in the GCC for over 20 years, General Manager, Halvard Sagdahl, says establishing a permanent office has given Kongsberg more control over its operations in the growing region.

"The market responded very well to us opening an office in the Middle East and we are experiencing considerable growth. Having a strong presence here has enabled us to capitalise on the high potential in the region," he says.

Establishing a base in the Middle East has had many benefits for Kongsberg, allowing it to boost sales and improve customer support, while reducing the time and costs associated with travelling from Norway. Sagdahl notes that customers in the region have welcomed the increased level of support that Kongsberg offers.

"Opening an office here has meant that we are able to solve issues as they arise, diminishing the risk of escalation. It has also demonstrated our commitment to our customers and the region as a whole," he says.

Dubai was a natural place for Kongsberg to be based in the Middle East. It is a hub for many international companies doing business in the region and its 'free zones' provide a legal structure, which facilitates a smoother set up process. While some of the projects in the Middle East are still coordinated from Norway, Sagdahl explains that being locally based has helped provide Kongsberg with a more intimate understanding of the business culture in the Middle East.

"Being immersed in the culture has given us insight into how business is done here and how people think. For example, good personal relationships with people are critical. Whereas in other regions, it is business first, talk second, in the Middle East you first speak about family and other personal issues before getting down to business," he says.

KMME was set up to support the full range of Kongsberg products for projects throughout the region. This includes advanced automation systems, alarm and monitoring systems, machinery control systems, dynamic positioning systems, navigation systems and hydro acoustic control systems including underwater navigation and seabed mapping systems.

The staff has now grown from 28 to 40 and Sagdahl says they have taken on further responsibility in the areas of external training and other project services.

"We are looking at ways to provide added value by delivering more projects from our local office. We are also building up our training capability and deliver external courses in the various Kongsberg products. We would like to see this trend continue and do much more training from our local office," he says.

There is more demand than ever for Kongsberg Maritime training courses. In Houston, the number of course participants has doubled in just three years. Recently, the department had to expand with two new classrooms, and soon the centre will outgrow its premises.

TRAINING

The learning curve

The Full Picture Magazine visited Kongsberg Maritime's training facilities in Houston. In one of the classrooms, WILLIAM WESTMORELAND is teaching six participants from Transocean. It is the first day of a four day, tailor-made, 'PowerSim' course.

INCREASED FOCUS ON SAFETY

The PowerSim course was developed in collaboration with Transocean in 2005 and has since been held regularly for the company's employees as part of an internal training program. Typically, the participants have completed both a basic and an advanced course in dynamic positioning (DP). However, Transocean wanted their employees to know more than the basics of operating a DP system. An important part of this course is therefore to practice on potentially dangerous scenarios that may occur onboard their vessels, such as blackout or extreme weather conditions that require specific expertise. The goal is that trainees will be able to take what they learn in the courses and discuss how to best respond in these situations, when onboard.

"Fortunately, the participants will never experience most of the scenarios we practice during these courses," says Westmoreland.

But why spend four days practicing for scenarios that will probably never happen?

"Safety is extremely important, and there is increased focus on it. On board the vessel, the operators must make decisions under pressure, and this course is based on real-life examples. Although the most extreme scenarios rarely occur, the crew must be prepared for every imaginable and unimaginable situation. Transocean saw that most errors committed during the operation of DP systems were human errors, not errors in the system itself. This may be due to lack of knowledge about how to handle different situations. This course is developed as a result of that. It gives participants the opportunity to learn by doing, making them better equipped to handle any crisis," he explains.

SIMULATION TRAINING

Simulation is a crucial tool used in several of the courses held at the training centre. It provides realistic practice on potentially dangerous situations in a safe environment, something that would not have been possible on board a vessel, both for safety and economic reasons. The first simulation exercise is to steer a drill ship towards an existing well, to position the BOP (Blow Out Preventer) directly over the wellhead and to connect and lock the two together. For each exercise, the participants are given various power plant conditions and DP system status, and must reference their Well Specific Operational Criteria. This forms the basis for their decision-making during operations. Examples of such criteria are how many thrusters are up and running, and whether the Power Management system, designed to ensure that there is enough power to meet the needs of the DP system, is working. As participants become more accustomed to the situation, they will get more difficult criteria to deal with.

In order to make the experience as authentic as possible, participants are assigned different roles. Three of them are in action at a time, while the other three are observers. One is the captain, the other is responsible for the vessel monitoring system and the third is the DP operator. While the course instructors are actually sitting in the room next to the simulator, they are virtually in another part of the vessel, and communicate with the participants on the 'bridge' through an internal intercom system. A

camera placed in the rehearsal room gives instructors full control of what goes on in the simulator. After the exercise is completed, the instructors can play it back to see what the trainees could have done differently.

A STRESSFUL SITUATION

During the exercise, participants need to make quick decisions or the drill ship will not reach the wellhead safely. DP Operator Kevin Murphy says putting trainees in these realistic situations is a very effective form of training.

"The simulator provides excellent and cost-effective training. If there is an accident in real life, it costs millions of dollars and can have serious consequences for crew safety and the environment. As DP operators, this gives us an idea of what can go wrong in real life. This course is definitely helpful for me in my job," says Murphy.

Offshore Installation Manager, Chris Wokowsky, agrees.

"When you are in front of the simulator, you learn what it's like to be in a stressful situation. It gives you the feeling that this is real. This is much more useful than just looking at PowerPoint throughout the course. I think that what the instructors really want to get across in this course is that if you do not diagnose the problem correctly from the start, it will cause a domino effect and that can have serious consequences," he comments.

FIRST AND LARGEST

This course for Transocean is just one of numerous courses offered at Kongsberg Maritime's training center in Houston, and one of the few that are tailored to a specific customer. Most courses are open for booking by various customers. The center offers training in both basic and advanced use of dynamic positioning systems, in addition to HiPAP underwater positioning system and K-Chief marine automation system. As Kongsberg Maritime's first and largest training centre outside Norway, Houston has experienced a significant increase in demand during its twelve years of operation. In 2000, the centre had 36 courses and 236 participants. In 2011, this number had increased to 145 courses for 870 participants. According to training manager in Houston, Alaric Durkan, there are several reasons for this growth.

"First of all, the increase is related to our location, since a lot of our clients are based in, or operate in, the region. In addition, several new drillships and other DP vessels will be built and delivered for operation in the Gulf of Mexico during 2013. This

leads to more demand for well-trained and qualified operators and technicians. We are also expecting stricter safety and competence-assurance laws, and complying with these laws requires thorough training and knowledge of onboard systems. Rather than wait for these new rules, many clients want to be proactive and provide adequate training for their employees," explains Durcan.

BRIDGING THE GAP

Durcan believes education is essential to running safe and efficient operations.

"Quality training, when conducted in accordance with strict guidelines for delivery and content, is a critical aspect of safe operations in our industry. Our students are highly intelligent and experienced shipboard operators and technicians, but they still require in-depth operational and technical knowledge to safely operate and maintain the systems we deliver. We try to bridge the gap between the basic technical understanding and the specific use of these complex systems," says Durcan.

INCREASED DEMAND WORLDWIDE

In addition to Houston, Kongsberg Maritime has training facilities in Norway, Scotland, Brazil, China and Singapore. According to Global Training Manager, Anne Toril Kasin, all these facilities are experiencing increased demand.

"We have found that higher safety standards and quality demands in the industry result in more interest in our training services. This means that we must ensure the quality of our instructors so that we are prepared to respond to our customers' increased demand," says Kasin.

"Our students are highly intelligent and experienced shipboard operators and technicians, but they still require in-depth operational and technical knowledge to safely operate and maintain the systems we deliver"

Alaric Durkan
Training Manager, Kongsberg Maritime, Houston

NEW OFFICES

The world of KONGSBERG

Moving development for Kongsberg Maritime China

KONGSBERG has demonstrated its commitment to the Asian shipbuilding industry by making a major new investment in a state-of-the-art facility for its burgeoning Kongsberg Maritime China division.

Launched in 2003, the business has grown in tandem with its host nation's shipbuilding prowess – China continues to be the world's largest shipbuilder, accounting for 41% of global orders in 2011 – and now employs a workforce of some 650 staff.

In order to accommodate the firm's headcount and further growth ambitions, a decision was taken to invest in a new six-storey, 5060m² building two kilometres away from KONGSBERG's traditional Shanghai base. In addition to the extra office space, it also boasts a training facility accredited to Nautical Institute standards as a DP operator training centre. The building officially opened for business on 15 March.

Speaking of the development, Kjetil Lund of Kongsberg Maritime China Ltd said that increasing customer demand for the firm's products and services was driving the business' growth in the region. Locating to bigger and better facilities had, he opined, become "essential."

In a display of KONGSBERG's strength within Asian, the company has decided to retain its former Shanghai base to test and assemble new products for the market.

Mexican wave of expansion for KONGSBERG

Kongsberg Maritime has opened up its first facility in Mexico to service the growing number of DP vessels and merchant ships that are using the firm's navigation, automation and control systems in the region.

Operating under the banner of Kongsberg Maritime Mexico S.A DE C.V., the new base swung its doors open for business in summer last year, after developmental support from Kongsberg Maritime New Orleans. With a service team that boasts a number of field engineers, the fresh hub, located in the city of Veracruz, acts as an important extension to the firm's worldwide service network.

Lars Kristian Moen, EVP Global Customer Support, justified the expansion as "a strategic decision" that was wholly motivated by "the service requirements of our customers operating in the region."

He noted: "By establishing a Mexican service facility with a full stock of spares, we are better positioned to serve all of these vessels with fast acting, high quality service from a local hub."

Mexican waters are increasingly important for both the shipping and offshore sectors – Mexico is the world's seventh largest oil producer, with new investments in the pipeline to tap into huge unexploited reserves – and Kongsberg Maritime is the supplier of choice for a growing number of vessels, semi-submersibles (such as Groupo R's Centenario and Seadrill's West Pegasus) and accommodation units, like PEMEX's Chemul, that operate in the region.

Victor Proy, General Manager of Kongsberg Maritime Mexico, said that he believes the new service hub would be "a key differentiator for Kongsberg Maritime and a huge benefit to our customers in Mexico."

On March 20, Kongsberg Maritime Hellas (KMH) held its official opening at its office in Piraeus. Located in the traditional hub of the Greek shipping community, the office has an adjoining training and storage warehouse which was the perfect scene for the nearly 200 movers and shakers from the shipping community to meet, mingle, enjoy good food and entertainment and witness General Manager, TERJE DYHRE, cut the red ribbon.

INVESTMENT

Greece focus, global strength

At the opening of KONGSBERG's new Greek office, there were activities to keep everybody entertained. The crowd included many prominent shipowners' representatives as well as journalists and key Kongsberg management.

After a Greek Orthodox priest blessed the site, Dyhre and members of the executive management, MORTEN HASÅS and LARS KRISTIAN MOEN gave speeches reiterating KONGSBERG's commitment to one of the shipping industry's most important regions.

"Greek owners account for over 15 percent of the world's total tonnage. Like Norway, the country has a strong shipping tradition and it also has a bright future, one that we at KONGSBERG are proud to be part of," stated KONGSBERG's Executive Vice President Merchant Marine Division, MORTEN HASÅS.

KMH was set up primarily to offer a range of support services for KONGSBERG's customers in the region and although this was the official opening, the office has been in operation since mid-2011.

Technical Director at Dynagas, MANOS MIGADIS, has noticed an improvement in KONGSBERG's support since then.

"With a KONGSBERG office in Athens, we can meet them anytime and get better follow up. It also means we can more easily train our crew in the KONGSBERG products we use on our vessels," he said.

Dyhre claimed that the closer customer relationships developed in that short period vindicated KONGSBERG's decision to open the office.

"We established KMH to develop a more proactive approach to our customers here and so far the market has responded well," he said.

He added that effective support was highly valued in the Greek market.

"Short turnaround times are important anywhere, but no more so that in Greece. Having a presence in Greece allows us to quickly resolve our customers' issues and build relationships with them so we can further understand and support their organisational goals," he said.

As an example of the superior support a local office is able to offer, Dyhre explained how his team now performs a smoother quotation process for system upgrades.

"Not only do customers have easier access to Kongsberg Maritime solutions and information, but we also have dedicated staff to support them through the process and revert quickly should they require assistance," he said.

In his speech, Executive Vice President Global Customer Support, LARS KRISTIAN MOEN, reaffirmed that establishing local support offices in KONGSBERG's main markets was a strategic priority for the company.

The advantages are clear, not only does it allow KONGSBERG to offer efficient support and build relationships with customers, it also demonstrates the company's commitment in a particular region.

As well as critical support services, KMH is also beginning to ramp up its sales and marketing activities, with a new Sales Manager, MS. INARA TISCENKO, joining the team in Febuary this year. The proximity to customers will help KONGSBERG build its understanding for developing trends in the market and adjust its offerings accordingly.

KMH will also offer training services on already well-known systems for merchant fleet, Autochief and Datachief/K-Chief, as well as introductory courses for newer systems such as K-Chief 600. The office is also equipped with an offshore console, including K-Chief 700/DP/CTS and Polaris simulator which will be used in familiarisation courses and at a later date also for training purposes.

KMH currently employees 15 staff and Dyhre said he is impressed with their knowledge and dedication.

"I am very impressed by the knowledge our service engineers possess, both of the KONGSBERG products and the Greek shipping industry in general. There is an excellent working environment where the employees have a positive attitude and take responsibility in fulfilling their roles. I am very optimistic about KONGSBERG's future in Greece," he said.

After several customer requests in 2003, Kongsberg Maritime Inc. (KMI) moved its customer support operations from Houston, Texas to New Orleans, Louisiana (NOLA). Since then, the number of employees in the office has risen sharply (from nine to 81) and KMI expects an additional 30% increase by the end of 2012.

SUPPORT

Up close and personnel

Regional Customer Support Manager at Kongsberg Maritime, Eivind Alling, says proximity to major ports has resulted in an upsurge in business.

"The customer support division was moved from Houston to New Orleans as a direct response to customer requests in August 2003. Now the office is near major hubs, such as Venice, Port Fourchon and other key Gulf of Mexico ports. Moving closer to the action has led to more business and the more people we hire, the greater the demand is," says Alling.

He adds that there is no replacement for having people on site to solve issues as soon as they arise.

"Avoiding downtime is crucial to all of our customers, and we can help them do this by providing quick and professional customer support. Having local support resources is one of KONGSBERG'S main goals and was the primary reason for establishing this thriving office," says Alling.

DRAMATIC INCREASE

Since it opened in 2003, the workload has increased dramatically. KMI performed 284 service jobs in 2005, by 2010 this number had almost tripled and last year the office completed around 1300 services. Alling says this increase is simply due to more customers running KONGSBERG systems in the region.

"We have seen a significant increase in demand for our service, particularly during the past two years. Today, we perform approximately 140 services per month, which is almost the same amount as the services performed by our headquarters in Norway. More vessels with KONGSBERG systems onboard, means more services, and this is an upward spiral for us. In addition, a lot of older systems are ready to be upgraded, which will keep us busy in the future," says Alling.

HIGHLY SKILLED WORKFORCE

The office has qualified employees offering support in Dynamic Positioning, Automation, Navigation, Merchant Marine Systems and After Market Support. KONGSBERG has mainly recruited engineers with military backgrounds and graduates from local universities such as Louisiana State University and the University of New Orleans. Alling says that in addition to their education, the engineers go through an extensive local and international training program before they can operate independently.

"All KMI service engineers have to pass regional safety classes, which are required by law and by our clients. In addition, we run an internal training program to ensure the safety and quality of our employees. They are our main asset and should be given credit for our success in the region. Today, we have a good mix between experienced employees that have been here since we opened the office in 2003, and talented new employees ready to help our clients at any time," he says.

GLOBAL SUPPORT

WORLD-WIDE MAIN CONTACT

Call +47 815 35 355
km.support@kongsberg.com

REGIONAL SUPPORT CENTRES 24H

Europe, Africa & Middle East (Norway)
Kongsberg Maritime as
24h Hotline: +47 815 35 355
km.support@kongsberg.com

North America (Louisiana)
Kongsberg Maritime inc.
24h Hotline: +1 504 234 3934
km.support.neworleans@kongsberg.com

South America (Brazil)
Kongsberg Maritime do brazil
24h Hotline: +55 21 9965 5170
km.support.rio@kongsberg.com

Far East & Oceania (Singapore)
Kongsberg Maritime Pte. Ltd.
24h Hotline: +65 9862 2881
km.support.singapore@kongsberg.com

EDITORIAL STAFF

EDITOR-IN-CHIEF

Gunvor Hatling Midtbø
Vice President Communication
Kongsberg Maritime
gunvor.hatling.midtbo@kongsberg.com

EDITORIAL PRODUCTION

Blue-C
www.blue-c.no

Mark Fuhrmann
mark@blue-c.no

Alan Johnstone
alan@blue-c.no

Damien Devlin
damien@blue-c.no

Alexander Wardwell
alex@blue-c.no

Christina Fjellstad
Christina.fjellstad@kongsberg.com

Saul Trewern
saul.trewern@saltwatercoms.com

DESIGN

Moving Minds
Ole Christian Bergan
Arve J. Andersen
ocbergan@moving-minds.no

COVER PHOTO

BMW

PRINTING

RK Grafisk A/S

COPYRIGHT

Kongsberg Maritime AS

ADDRESS

Kongsberg Maritime AS
Kirkegårdsveien 45
P.O. Box 48
NO-3601 Kongsberg
Norway
Telephone + 47 32 28 50 00
Telefax + 47 32 28 50 10
Km.fullpicture.editorial@kongsberg.com

The Full Picture Magazine is a magazine for the users of KONGSBERG products and services. For a complimentary copy of the magazine, please contact Kongsberg Martime AS: km-fullpicture.editorial@kongsberg.com

The Full Picture Magazine is also available in pdf-format at: www.km.kongsberg.com

2012

POSIDONIA 04 JUN. - 08 JUN. PIRAEUS, GREECE
UTC - UNDERWATER TECHNOLOGY CONFERENCE 13 JUN. - 14 JUN. BERGEN, NORWAY
NEFTEGAZ 25 JUN. - 29 JUN. MOSCOW, RUSSIA
ONS 28 AUG. - 31 AUG. STAVANGER , NORWAY
SMM 04 SEP. - 07 SEP. HAMBURG, GERMANY
MAST 11 SEP. - 13 SEP. MALMÖ, SWEDEN
RIO OIL AND GAS 17 SEP. - 20 SEP. RIO DE JANEIRO, BRAZIL
MONACO YACHT SHOW 22 SEP. - 25 SEP. MONACO, MONACO
GASTECH 08 OCT. - 11 OCT. LONDON, UNITED KINGDOM
OCEANS 2012 14 OCT. - 19 OCT. VIRGINIA BEACH, UNITED STATES OF AMERICA
PACIFIC MARINE EXPO 17 NOV. - 19 NOV. SEATTLE, WASHINGTON, UNITED STATES OF AMERICA
EXPONAVAL 04 DEC. - 07 DEC. VALPARAISO, CHILE

EXPO

www.km.kongsberg.com

Kongsberg Maritime AS
Kirkegårdsveien 45
P.O. Box 483
NO-3601 Kongsberg
NORWAY