A ‘Magic Mushroom’ for Enhanced Oil Recovery?

The schizophyllum commune or split gill mushroom, pictured above, produces a gelatinous biopolymer that, among other things, serves to enhance the strength of its cell walls as it grows. Soon, if German oil and gas company Wintershall is correct, the unique substance may also serve as a tool for enhanced oil recovery (EOR).

The term EOR covers a variety of ‘tertiary’ recovery techniques employed when water and gas injection (‘secondary’ techniques of boosting well output) no longer produce enough oil. These include steam injection and use of chemical or microbial additives, which in various ways attempt to dislodge the remaining oil from the microscopic pores of the reservoir rock.

Knowing polymers have long been used as thickening agents in such products as toothpaste, Wintershall scientists believed the split gill’s biopolymer could be made to thicken water for use in EOR – and in December 2012, after six years of intensive research, they began a field experiment to prove it.

The product being tested, named Schizophyllan, was developed by Wintershall and parent company BASF. The experiment is underway in a mature north German oilfield currently producing 90 percent water, and involves one injection well, three production wells and an oil reservoir 1,300 meters below the surface. The solution being injected contains reservoir water and just 0.035 percent of the biopolymer – which is enough to increase the viscosity of the water 25 times. Injected around the clock at a rate of about 7.5 m³/hour, the solution is expected to take one to two years to reach the production wells – and, it is hoped, bring with it additional oil.

Wintershall believes the Schizophyllan-enhanced water could be strong enough to remove an additional 10 percent or more of an oilfield’s riches, depending on the reservoir. In addition, the company says the biopolymer is ‘extremely eco-friendly’ because it is fully biodegradable, and can satisfy technical concerns because it is naturally resistant to the high temperatures and salt content found deep underground. If the test proves successful, this mushroom may indeed one day earn the right to be called ‘magical.’
COVER:

Above-ground test of a subsea tool. Engineers from FMC Technologies examine the upper lubricator section of an equipment stack used in riserless light well intervention, a critical maintenance operation for offshore oil and gas wells. An article on this interesting subsea technology begins on page 8.

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INVENTIVE SOLUTIONS
for an Evolving Industry

A venerable design house brings innovative solutions to the evolving world of offshore energy.

Based in Oslo, Norway, just up the fjord from the town where it began more than half a century ago as the design department of the small Norwegian shipyard Moss Rosenberg Verft, Moss Maritime is probably best known as the inventor of the spherical containment system for liquefied natural gas (LNG). Once a radical concept whose engineering design pushed the limits of technology, Moss LNG carriers with spherical tanks first went to sea 40 years ago and quickly became the dominant LNG carrier design in the global LNG fleet, until overtaken by membrane systems during the previous decade. While the Moss LNG carrier won a place in maritime technical history, it is but one high point in the company’s long record of inventive design for clients ranging from shipowners and offshore operators to the US Navy.

In recent years, Moss has focused on offshore engineering projects ranging from development of production vessels that survive yearlong Arctic ice to pushing the limits of semisubmersible rig design. Today, as energy companies around the world pursue a growing number of oil and gas projects in ice-filled seas and harsh environments, and view with increasing interest the use of floating facilities for the processing, liquefaction and storage of natural gas, the designers at Moss Maritime see a promising future both for their specialist offshore equipment and for the iconic cargo tank trademarked with the company name.

Among the main sparks for increased interest in the Moss LNG carrier are Japan’s determination to dramatically increase its use of natural gas for power generation; the rise of the United States as a natural gas exporter; and the growing number of energy projects with a floating LNG (FLNG) component.

In Japan, the world’s top LNG importer, the past three years have seen natural gas become an increasingly important support for the nation’s economy. With all 54 of the country’s nuclear reactors still shut down in the wake of the 2011 Fukushima disaster, the government has been negotiating gas import deals with suppliers ranging from Mozambique to British Columbia and the US Gulf, and shipowners have accordingly begun planning fleet expansions. Natural gas now supplies 49 percent of total power generation, up from 32 percent in 2010, and that growth is expected to continue for some years to come. Japan was an early builder and user of Moss LNG carriers for its LNG imports, and all recent orders have reflected that familiarity with the technology.
Meanwhile, market analysts now predict that the US will become a net exporter of natural gas by June 2016, two years ahead of estimates by the US Energy Information Agency. While Japan will clearly be one of the main customers for those exports, there is also an expectation that so much gas coming into the market, plus the opening of the new Panama Canal, will spark changes in the way natural gas is traded. Since the first days of the LNG market, the product has been subject to regional, not global pricing and has largely been sold by the shipload on long-term pendulum contracts. With the wider Panama Canal accommodating most of the current global LNG fleet, the doors to worldwide trade will be thrown open for US terminals and most available LNG carriers virtually overnight.

This has industry observers theorizing that, as gas exporting nations increase production, worldwide demand for gas rises and more ships become available to serve a wider customer base, a spot market for LNG parcels might develop. Should that happen, carriers having the ability to sail with partially loaded tanks would have extra opportunities for employment. While that remains speculation, partial loading is proving to be important to FLNG projects.

“The market for Moss LNG carriers was low for some years, but now we are seeing renewed interest in the technology, where also offshore liquefaction projects (FLNGs) play a role,” says Ida Husem, CEO of Moss Maritime. “Since the Moss LNG tank can accept any filling and associated sloshing pressures, it is ideal for FLNG applications. The Moss LNG tank has a perfect track record – there has never been leakage from a spherical tank and it is immune to cargo sloshing problems, and hence it is recognized as the most robust LNG containment system available,” she adds.

Of the 114 Moss-type LNG carriers built to date, 110 are still in service; four of them have been converted to floating regasification terminals (for which Moss executed the engineering). At present, there are 15 Moss LNG carriers under construction at the Mitsubishi and Kawasaki yards in Japan, and at Hyundai Heavy Industries in Korea, with capacities ranging from 150,000 to 182,000 m³.
We have also found a niche in the need for small-scale LNG plants and lesser-cost floating units for stranded gas and associated gas fields that would otherwise be uneconomical to develop," she adds. “Putting a liquefaction system aboard an existing vessel, installing limited pre-treatment systems and, of course, the necessary power, gives a relatively low-cost way to take advantage of limited resources and marginal fields.”

Offshore Innovation
Moss also has developed a thriving business providing hull and marine designs for the offshore energy sector, a sphere of activity (two additional business lines) that the company has named ‘Offshore Services and Floating Production’ These products include FPSOs; semisubmersible rigs for drilling, production and specialty services (such as the US Navy’s ABS-classed SBX-1 radar platform); and a range of sophisticated offshore service vessels with and without icebreaking capabilities.

“Floating regasification projects have kept us very busy in the recent years, and we think this will continue,” says Husem. “In certain areas of the world, there is high demand for natural gas but a lack of gas and/or infrastructure. Our multi-discipline competence contributes to realizing these projects.”

The company’s most successful rig design to date has been the six-column ‘catamaran semi’ (CS) family, which has been produced in
displacements from 25,000 to 60,000 tonnes. Husem credits the success in part to excellent motion characteristics, very important in critical operations where the platform needs to lie as still as possible, and a structural design principal whereby forces imposed on the rig are absorbed through bracing arrangements in the lower hull. Many rig designs rely on the deck structure as the main element of strength.

“In the CS series we have catamaran pontoons with brace structures in-between; the braces absorb the forces on the rig, giving it excellent load distribution and very high flexibility in deck usage,” she says. “Relying more on the deck structure imposes more requirements as to location of structural members and, as a result, does not necessarily allow optimal arrangements of drilling equipment on deck – for example, you have many bulkheads that you cannot go through. Ultimately, this is a tool for drilling, and the best unit is the one that gives the most flexible tool for drilling purposes. That’s what the end user looks for: a good-functioning tool for daily operation that allows efficient arrangements of the drilling package – riser storage and handling and so on.”

A CS-50 unit has recently been ordered to ABS class at NYZ Offshore in China by Singapore-based drilling contractor Primepoint.

“In terms of load distribution, designs without braces, in which the pontoons are rigidly connected to the deck, have many fatigue ‘hot spots’, which designers typically solve by specifying cast details,” Husem explains. “Cast details that are purpose-made and put in place are very difficult to repair; typically, you cannot make local repairs and the details have to be replaced completely. Welded details can be repaired on board. We have all-welded construction; it is less expensive and a little less complicated from the construction point of view. So, while our design may look more complicated, we think it is, ultimately, simpler.”

Between refurbished older semisubmersibles and new drillships, Moss sees the mild environment market approaching saturation and the better future in designing units for harsh environments and for Arctic service. Also, the company notes a growing renewal need in the mid-water segment, both due to existing over-aged units and higher functional demands that cannot be met by the older rig fleet. The Arctic challenge is particularly interesting because it involves a broad spectrum of ice service conditions, ranging from seas of slushy lumps to waters traversed by indestructible ice mountains. Several international joint efforts and a number of private studies are being directed towards understanding the environment and defining its technical requirements, as energy companies work to develop an idea of what the basic Arctic offshore drilling kit should look like.

New Ideas for New Jobs

With many unknowns still in play regarding Arctic service, Husem says the key for the equipment designer today is to understand the client’s wishes: for example, is the goal to have a rig capable of worldwide Arctic service, or just specific areas; and, is the philosophy to prepare for a seasonal or full-year drilling program, or something in-between. Those answers then set the stage for choosing a solution.

“There is a variety of choices, ranging from the semisubmersible with a little bit of ice reinforcement up to the ultimate icebreaking ship that can stay on location all year,” Husem says.

An example of the latter is the ship Moss developed for Russia’s Shtockman project, which is designed to be able to stay on location in almost all ice conditions. It uses a...
Octabuoy is a column-stabilized semisubmersible production platform designed to perform drilling, well completion, production, maintenance and workover (a maintenance operation requiring direct access to the reservoir). Its standout design feature is a set of uniquely shaped columns created to conquer the Mathieu effect – parametric roll and pitch motions known to plague deep-draft floaters, which result from a resonance between normal heave and pitch motions. Moss reports that the Octabuoy’s special columns give the platform excellent motion characteristics even in very harsh environments, allowing use of rigid risers and a ‘dry tree’ (meaning the manifold of piping and valves that control oil flow from the reservoir is installed on deck).

“For these second-order parametric motions, the main excitation comes from a variation in stability; the key to this variation is the unit’s metacentric height, which varies with the centers of buoyancy and gravity,” Husem explains. “The center of gravity of the unit is constant, but the center of buoyancy varies as the structure moves up and down relative to the water surface. If you eliminate the variation, you eliminate the source of the problem.”

After many years of research and a long collaboration with the Krylov Shipbuilding Research Institute of St. Petersburg, Russia to put the finishing touches on the design, Moss created a column with a varying waterplane area that would keep the platform’s metacentric constant as it moves. Since its introduction a decade ago, the Octabuoy concept has been developed also for wet tree and subsea well applications. Octabuoy is part of a family of octagonally shaped floaters that includes the Octopus (a ‘bucket’-type drilling rig) and the Octabob offloading buoy.

The first Octabuoy hull was constructed to ABS class three years ago, but still awaits outfitting in the shipyard, its project one of many casualties in the widespread wake of 2010’s Macondo incident.

“We designed the Octabuoy specifically to take very demanding conditions, and we’re eager to see it get into the sea and prove its capabilities,” Husem says. “We have good products and promising markets for all of them, in drilling, LNG and floating production. Those same competencies also span the challenge of how to approach Arctic development, across the whole range of Arctic conditions,” she adds. “We have a long history and, I believe, a bright future.”

 disconnectable turret mooring so that it can escape from the toughest situations – icebergs and multi-year ice floes – but in all other ice conditions can stay on location.

“The problem with ice is that it comes from all directions, and can reverse direction,” Husem explains. “You want to be in good position to break the incoming ice. We model tested our design to develop a ship that can vane into all these drift reversal conditions. It is a highly capable hull that would allow year-round drilling in very heavy ice.”

With Shtokman suspended pending better times – in 2012, Gazprom announced project costs were “too high for it to be realized in its present form” – the ice-fighting drillship has yet to be realized. It is the second Moss innovation attached to a project on standby. The other, much closer to realization, is the Octabuoy.
Long-lived company has many quiet anniversaries. Last year, for example, marked 50 years since the launch of the first Moss-designed gas carrier.

The beginnings of the company that is today Moss Maritime can be traced to a chance remark made shortly after the small Moss Verft a Dokk shipyard was purchased in 1961 by a manufacturer of pressure vessels named Kvaerner Brug. Kvaerner’s intent was to convert the yard into a mechanical workshop, until shipbroker Hjalmar Bjoerge suggested to Kvaerner President Kjell Langhalle that he instead combine this newly acquired pool of expertise with Kvaerner’s own technologies and start building gas carriers. The entrepreneur agreed, and Moss was set on its road to destiny.

Moss Verft launched its first gas carrier in 1963 and soon built a solid reputation in construction of refrigerated and pressurized gas carriers. To support this growing business, in 1969 Moss acquired a larger shipyard, the Rosenberg Mekaniske Verksted of Stavanger. That same year, the yard received an enquiry from shipowner Leif Hoegh, asking if Moss’ engineers would review a proposed LNG carrier design. For the newly forged Moss-Rosenberg engineering team, it was a life-changing challenge.

Drawing on their experience with pressure-vessel gas carrier systems, the talented engineers searched for a new, simpler LNG containment system, ultimately settling on a spherical tank. Commercial LNG sea transport wasn’t even a decade old at the time, and the concept presented a radical departure from the norm and a daunting engineering challenge. While there was nothing new in storing liquid in a sphere, and even though the idea of a single metallic shell covered with insulation was far simpler than current containment systems, executing the concept of a spherical LNG cargo tank pushed engineering and analytical technologies to their limit.

Since nothing quite like it had been done before, satisfying US Coast Guard, classification and customer requirements meant breaking new ground in materials, analytical, welding and testing technologies. More than two years of cutting edge work went into finalizing the tank design and its supporting structure, requiring intense research into structures and materials and painstaking use of such young computer-aided analytical technologies as finite element analysis (FEA).

Moss drew together an international team of experts to make the spherical aluminum tank a reality, sourcing brainpower from organizations as far afield as the Technical University of Norway, Dow Chemical, Boeing, US giant Kaiser Aluminum – for essential assistance in aluminum welding – and even the NASA space agency, which provided the know-how for analyzing buckling failure of the tank and supporting structure. Kvaerner Engineering was formed during this period, largely to help Moss with its cryogenics projects.

Eventually, four prototype vessels were ordered for delivery in 1973 and 1974: two at Rosenberg Verft with tanks in 9 percent nickel steel and two at Moss Verft with aluminum tanks. They quickly proved the concept and a license agreement was signed with the Quincy Shipbuilding Division of General Dynamics for a ten-ship series to be built in the US to ABS class. ABS developed the dynamic loading approach to FEA in part to help in this effort.

Except for the first two vessels built by Moss Verft, all vessels with aluminum tanks remain in service in some form today. Rarely, if ever before, has an unprecedented technology built a four-decade record of faultless service from Day One.
Advanced intervention technologies and new service models are making existing subsea wells more productive and, in the process, are also making subsea solutions more attractive to future projects worldwide.

Ever since the installation of the first ‘wet trees’ (the well control manifold mounted on the wellhead at the seabed) nearly 40 years ago, the ‘subsea’ segment of the energy sector’s engineering army has been driven by the vision of a far-off day when offshore oil and gas fields worldwide are developed without surface platforms, where processing and pumping equipment on the seafloor gives economical access to the deepest and most isolated reservoirs.

As happens, the pragmatic side of the energy world was slower than the inventive side in embracing the concept, and subsea technology advanced somewhat slowly for about 20 years, not really taking off until the late 1990s. The global number of subsea wells hit roughly 1,000 in 1997, reached the 3,300 mark in 2010 and today stands at about 5,500, with the widespread expectation that the population will pass 8,000 by 2018. Now, according to Norway’s State-owned oil company Statoil, which presently operates 700 subsea wells in the North Sea (accounting for half the company’s total production), the subsea dream is no longer so ethereal — Statoil has announced that it hopes to have a full subsea processing solution underway by 2020.

On the long road to realizing this vision, development of sophisticated equipment and complex systems – for example, subsea separation of well fluids with reinjection of water, gas and sand – have grabbed the big headlines, but it is an advance far more humble that has helped bring the subsea dream this close to reality: better and more economical maintenance of aging subsea wells.

The reason is that cleaning and maintenance, along with other intervention services (like ‘re-perforating’, where a new hole is put in the well pipe to access a richer part of the reservoir), can dramatically improve a well’s ‘recovery factor’.

Given that it is unrealistic to extract 100 percent of the oil in a reservoir, one of the all-important items in determining the economic viability of a potential or an aging offshore oil development is its recovery factor — how much of the resource you can actually recover. The typical recovery factor for subsea wells worldwide is about 30 to 35 percent (depending on who you ask, because methods of calculation differ), while for topside wells (where the tree is on a surface platform) the average recovery factor is closer to 45 percent. That difference translates into many billions of dollars worth of product, and historically has given a decided advantage to topside solutions.

Innovation in well services helps make subsea solutions more accessible.
One of the principal reasons for that gap is that accessing subsea wells for maintenance has long been a challenging and expensive endeavor; performing maintenance on a topside well has always been very efficient and much cheaper to do. Maintenance on subsea wells is typically done from a semisubmersible drilling rig or a drillship, not because drilling is required (it is, in fact, needed rarely), but because, until recently, only those units were available for such jobs, having the capability both to handle the maintenance equipment and to keep station over the well while deploying it. In addition, until not too long ago, maintenance could only be performed with the well shut down. The costs, challenges and production loss make many operators delay maintenance of subsea wells, which, with the passage of time, contributes to their decline in output.

**RECOVERY REVOLUTION**

Over the past ten years, a quiet revolution in the Norwegian sector of the North Sea has torn down many of the roadblocks to wider acceptance of subsea solutions by providing better means of performing maintenance and, thereby, increasing production. The advent of offshore service vessels specialized in light well intervention (services not requiring heavy lift or drilling), improved subsea intervention equipment and new techniques like sidetrack drilling (a way to drill outward from an existing well into nearby untapped parts of a reservoir group), have produced notable successes in reversing the declining output of aging subsea oilfields and have made subsea development an increasingly attractive solution for new projects.

This revolution was sponsored largely by Norway’s oil and gas authority, the Norwegian Petroleum Directorate (NPD), and Statoil, which, since their creation in 1972 have pressed operators in Norwegian waters to make fuller use of the country’s offshore energy patrimony. Their sometimes forceful encouragement has caused a community of world-leading subsea engineering companies to develop in the country; their combined efforts have produced many of the recent significant advances both in subsea production equipment and in the growing family of technologies included in the evolving field of increased oil recovery (IOR).

As a result of this development, the recovery factor of subsea wells in the North Sea is now near 50 percent – proof positive that subsea solutions can be competitive against topside developments. In 2013, Statoil announced it was aiming at a recovery factor of 60 percent on its fields and began pushing suppliers to strive towards that figure, without putting a deadline on achieving it. The incentive for
the announcement was clear: between 2011 and 2012, the company achieved a 1-percent increase in recovery, which, it reports, represented a gain of some 327 million barrels of oil equivalent (boe).

Recognizing that oil production from Norwegian waters has declined steadily since 2001, Statoil declared the objective of maintaining today’s current output level of 1.3 million boe per day until at least 2020. Meeting this goal depends not only on finding good new discoveries, but also on successfully applying advanced recovery-improving technologies to its maturing fields.

Speaking at the Deep Oil Technology conference in Houston this past October, Statoil’s Vice President of Technology for Mature Fields, Øystein Bøe, could have been summarizing growing industry awareness of IOR when he said that, from Statoil’s point of view, “IOR equals revenue – a 1-percent increase in recovery can potentially result in an extra $60 billion. Looking at Statoil’s total worldwide production, IOR represents the largest single ‘oil field’ we operate.”

**WELL SERVICES EVOLVE**

While traditional IOR methods like water and gas injection have been around for many years (although installation of that equipment subsea is quite new), other strategies have emerged much more recently. During the past decade, suppliers have developed efficient and cost-effective subsea maintenance tools, while offshore service vessel (OSV) operators have introduced new equipment ranging from advanced jackup barges for shallow-water IOR and well work to sophisticated dynamically positioned OSVs dedicated to deepwater light well intervention. Now these two development streams have come together to provide new hope for the growing number of maturing subsea wells with plateaued or declining production.

“Maintenance of subsea wells has moved beyond activities like pulling a control module, replacing a tree or renewing components; it’s now a much broader picture in which operators are looking to perform maintenance in order to increase oil recovery,” says Bjarne Neumann, Director of Well Intervention Services for Kongsberg, Norway-based FMC Technologies, the world’s largest supplier of subsea trees. A 25-year veteran of the subsea sector, Neumann has witnessed virtually all the important steps in the evolution of subsea maintenance, and has brought several of the innovations to market himself.

“The technology that operates inside the well is largely the same whether the well is subsea, topsides or on land. The tricky part with subsea operations has always been getting access to the well,” Neumann says. “Back in the late 1990s, performing maintenance and intervention on subsea wells was complex and expensive – I think the main showstopper for subsea solutions back then was that intervention simply cost too much. The most expensive part was having to use drilling rigs as the working platform to access the well,” he recalls. “We saw in this a track for product development and began investigating ways of doing the job more cost effectively, to give the customer a better service. This led us to look at how to move activities from a costly rig towards a different type of vessel.”

Lately, the offshore services sector has seen growing cooperation between subsea equipment providers and vessel operators to develop single-source well intervention and maintenance offerings. One of the first such
Intervention Milestones

FMC Technologies began developing its own light well intervention equipment 14 years ago as part of Norway’s Demo 2000 Program, a state-sponsored effort to enhance the profitability of the country’s offshore operations. In autumn 2003, the company qualified its first RLWI systems on three North Sea wells operated by Statoil. Their innovative, cost-cutting technology allowed downhole tools to be deployed under full well pressure without the need for a drilling rig and riser.

The technology is based on standard ‘wireline’ operations, in which analytical instrumentation, maintenance devices and downhole tools are lowered by winch from

alliances appeared about ten years ago, when FMC Technologies joined with local OSV operator Island Offshore to provide riserless light well intervention (RLWI) services in the North Sea.

Based on the success of that venture, FMC Technologies took the initiative worldwide in 2012 by forming a joint venture with Edison Chouest Offshore, a global leader in the OSV sector. Their new company, FMC Technologies Offshore, will provide integrated vessel-based services including RLWI, logging (analysis of well performance), maintenance and plug and abandonment, with the technology, tooling and expertise provided by FMC Technologies and the vessels, port logistics and ROV operations provided by Edison Chouest. Three 154-meter well intervention vessels for this service will begin building to ABS class later this year.

These vessel/supplier alliances give the service providers such advantages as improved logistics, lowered base costs and simplified sales efforts; the field operator, meanwhile, has the advantage of transferring operational risks to the contractors.

“We see a developing trend in which the operators look for a single main contractor to take the entire operation,” Neumann says. “This has led to the development of ‘one for all, all for one’ partnerships in which, for example, if the vessel is late, the supplier doesn’t get his day rate; and if the supplier’s equipment is on downtime, the vessel doesn’t get paid. It’s a kind of high-risk but trusting relationship between the partners, which requires that the partners design a complete and integrated service and make sure it is up and running all the time. It represents quite a change in philosophy for the industry,” he adds.
a surface vessel using a cable bundle (the ‘wire’) that also supplies electrical power to the equipment. The wireline equipment uses a patented subsea lubricator system as the gateway into the well; this allows the downhole tool packages to enter the wellbore under the well’s natural pressure, without taking any fluids to the surface vessel.

In the decade since proving the system, FMC Technologies has built three subsea RLWI stacks and performed intervention on over 250 live wells – an operation that was once considered impossible. Along the way, its well intervention team has grown to almost 250 marine and shore staff, supported by a careful program of technical self-improvement.

“Ever since we began RLWI, we have proceeded under the philosophy that every vessel crew shall include one subsea engineer,” Neumann says. “Because the subsea engineer can understand the operational and technical sides of the work, he can bring back new competence and new ideas on how to take the technology to the next level. That has been a very important part of our journey,” he adds. “Back in 2008 we had an operational uptime of about 80 percent; today we are close to 98 percent.”

FMC Technologies has invested in additional RLWI stacks as part of a plan to take its RLWI intervention services global. Stack Number 4 is currently being built, and Stack Numbers 5 and 6 have just begun construction and will be available in 2015.

“We see a coming need for maintenance in the deepwater wells being developed offshore Brazil and West Africa, which are now reaching 3,000-meter depths. Over time, they will need well intervention services. Traditionally, deep water in these regions has been handled by rigs rather than vessels. We hope to be able to change that,” Neumann says.

Whether the effort succeeds remains to be seen, but the economic case is compelling. A drilling rig presently costs upwards of $600,000 per day, on top of which must be added the costs of renting intervention equipment and hiring specialist crew. An RLWI vessel, on the other hand, is currently available for somewhere around $300,000 per day, fully equipped and crewed. Altogether, then, if heavy lifting or drilling aren’t needed the smaller vessel can provide the same service for about a third of the final cost of a rig, Neumann says. Statoil, meanwhile, has remarked on more than one occasion that for every dollar the company spends using an RLWI vessel, it saves ten. Such economics could potentially spark a change in production philosophy in several parts of the world.

“It has been a complicated journey, in a way,” Neumann says, reflecting on FMC Technologies’ pioneering subsea adventure. “To accomplish very new things offshore requires extremely competent people because there are no standard procedures to follow. You need people who understand well control very well; you need people who have a ‘black belt’ in subsea equipment and control systems; and even your client starting up these services needs to be technically strong and have a good understanding of the overall risk picture.”

Thus, even with all the right preparation and the right team in place, the first service tests of FMC Technologies RLWI system was a somewhat tense adventure, he adds, but one with a very happy ending.

“When we set out to prove our equipment back in 2003, everyone was intent on having a positive experience – we all want to break new ground and no one wants to be part of a failure. So, we were very excited when, after we were through with those three wells, the wireline operator that we hired for the job – who had performed thousands of traditional wireline services – said that, from his point of view, it is fully possible to do subsea wireline just as it is done topside,” Neumann says. “This was independent confirmation that, as we believed, there is no limitation between the two; whatever we do topside, we can do subsea.”

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A view of the patented subsea lubricator system that gives the wireline equipment a gateway into the well.
40 Years Beneath the Sea

FMC Technologies has a subsea history that goes back about as far as one can in the North Sea. Its legacy organization is subsea pioneer Kongsberg Vaapenfabrikk, which as Kongsberg Offshore was acquired by FMC Technologies in 1993. Visionary engineers at Kongsberg began tinkering with the idea of a subsea wellhead in 1974; their work started a development program that produced a prototype for field testing in 1978 and led to the company winning the 1980 contract to supply subsea trees to Elf Aquitaine for the Northeast Frigg gas field – the first subsea well in Norwegian waters and the first satellite well in the entire North Sea to be brought on stream through subsea technology.

Discovered in 1974, Northeast Frigg was a satellite of the larger Frigg field, which at its peak supplied 30% of all UK gas consumption. Northeast Frigg was developed using six subsea wellheads within a template that incorporated a manifold system, valves and the flowlines that sent the gas for processing in the mother field. Kongsberg built the wellheads and, with Elf Norge, designed the template. The field began producing in 1983, yielding 11.6 billion m³ of gas by the time of its shutdown in 1993.

On the water’s surface the field was marked by an unmanned control tower that received radio signals from the main control room of Frigg – the first instance of remote control of subsea wells on the Norwegian Continental Shelf. More importantly, Northeast Frigg helped prove that drilling subsea wells through a seabed template was a viable solution.

This was the first in a long series of subsea milestones for FMC Technologies. One of the high points in that history came nearly three decades after the field tests of the company’s prototype subsea tree, when in 2007 FMC Technologies installed the world’s first full-scale commercial subsea separation, boosting (pumping) and injection system on the Tordis field in the North Sea. This system separates the well fluids, sending gas and oil to the nearby Gullfaks C platform and injecting water and cleaned sand back into the reservoir. Three years later, FMC Technologies supplied the first full-field subsea separation and pumping system in the Gulf of Mexico to the Perdido development, which also includes the current record holder for world’s deepest subsea completion at 9,627 feet (2,934 meters).

In 2012, several years of collaboration with Brazilian national oil company Petrobras yielded an innovative submerged pump capable of handling some of the heaviest offshore oil on the planet, which was installed in the aging Marlim field in the Campos Basin as part of the world’s first system for deepwater subsea separation and pumping of heavy oil and water.

Today, Statoil is working towards a vision of placing a complete field development on the seabed by 2020. If history is any indication, should that come to pass FMC Technologies may celebrate its 40th anniversary as a subsea pioneer by supplying a piece of the sector’s future. ◆
Drydocks World, Dubai shipyard

New World, New Goals, New Life

Drydocks World rebounds from a fiscal precipice to find new paths forward.

Rarely does an organization get to celebrate both a milestone anniversary and a rebirth at the same time, but 2013 gave just such an opportunity to Dubai-based Drydocks World (DDW). On the brink of financial collapse just five years ago, the shipyard was able to announce last year that it had rebounded from its fiscal perils, completed several high-profile energy projects and, while remaining committed to its traditional ship maintenance and repair business, was betting its future on branching out into the demanding world of offshore oil and gas construction.

DDW was founded as a ship repair facility in 1983 and began building vessels in 1994. Charged up by the shipbuilding boom that began a decade later, in 2007 DDW embarked on a bold expansion into Asia. For $2.2 billion the company acquired the Pan United and Labroy Marine shipyards of Singapore, forming Drydocks World Singapore, and three facilities in Nanindah, Pertama and Graha on the Indonesian island of Batam, about 20 km off Singapore’s southern coast, forming Drydocks World Southeast Asia. Not long after, DDW followed the takeovers with speculation about expanding into China and an announcement of a joint venture with an Indonesian organization to build the Batam Maritime Centre, a multibillion dollar marine industry hub on Batam.

Sadly, the daring moves were badly timed. When the Global Financial Crisis of 2008 struck, DDW tumbled towards financial ruin as it struggled to shoulder $2 billion of debt while its main source of income, the shipping sector, plunged into a worldwide depression. After two years of increasing difficulties, the company brought in a new chairman to help untangle its problems and find the way forward. Led by His Excellency Khamis Juma Buamim, DDW implemented an organizational overhaul and a management philosophy refurbishment that, along with his successful outreach to creditors and a lot of hard work from the shop floor, brought the company out of the dark and into a brighter future.

In 2011 DDW secured a $200 million credit facility, to cover ongoing business costs and provide working capital in relation to new and existing contracts, and in 2012 was granted a $2.2 billion debt restructuring plan that helped sort out many of its financial woes. Shortly after the restructuring deal cleared Drydocks...
Buamim’s first challenge was breaking up what he saw as the company’s greatest cluster of problems, which stemmed from an acquisition drive and overall philosophy that were not aligned with global thinking.

“Successful international companies build their strategies based on deep analyses of growth and retraction,” he says. “They master that art; they weigh the growth that is required against expected market retraction to be sure that whatever retraction occurs does not pull them back totally. But these strategies were not in place here. The company was stuck in a process of denial that the boom was over; management believed it was a temporary slowdown that would end in a few months. As a result, the company ended up totally over-leveraged after its expansion and under huge financial pressures,” he explains.

He describes the holistic approach as a foundation for new, sustainable business practices that can stabilize a company and get it in position for potential future growth.

“I am a believer in the holistic approach, and a practitioner of it. I believe that you must not move to resolve one problem and, in the process, cause other problems; you must instead resolve your problems all together, as a whole,” he says. “Refocusing is one of the main drivers of the holistic approach. You have to refocus your thinking, concentrate...
and build within – build your strengths, build your capabilities and create value. You need to eliminate what is of no value to you, but that doesn’t necessarily mean manpower reduction. It is very easy to counter a downturn by getting rid of people, but that is the wrong process,” he says.

For Buamim, one key element in the transformation of Drydocks World was communications, reaching out not just to the lenders and suppliers to whom it collectively owed billions, but also to the individual workers, to whom it owed a different kind of debt.

“When I visited Batam, I was struck by the potential there. I knew we were in dire straits financially, but what made me commit to not letting people go, and instead reenergize the business, was the people. When you look into their eyes, you realize the problems are not their fault; it’s not their fault that you came along and did not become successful, and it’s not fair that they lose their bread and butter because of your bad decisions. I made the commitment there, in front of them, that I will not let our people go, that we will put the holistic approach in place and we will go on,” he says. “I later realized that retaining your people in a downturn situation is the best thing you can do; you win their hearts and they, in turn, will give you what you cannot imagine.”

Communication’s Key to Good Governance

“To corporations, problem solving usually means zooming in on certain elements: cut costs, reduce manpower, sell assets and so on,” Buamim says. “That is a mistake; it’s not forward thinking. I wanted to retain our assets and our people. Of course, if you see a mega-drain on your business you don’t leave it intact, and it is likely that some people will fall and some assets will get sold or reconfigured – that happens, but it’s not a strategy; it’s a tool,” he explains.

“I set up workshops and townhall meetings through the whole of our business globally. I made sure to stand up in front of all the employees and explain the bad and the good about the company, where it was going and that I needed their commitment; basically, I asked them to trust me and to work with me,” he recalls. “I had to do the same with our lenders and suppliers, who wanted a lot of money from us. I asked them to bear with us, to work with us, and I promised that we would pay them their money – and we did. We managed to pay all our suppliers within five months, and we did not borrow to do it,” he says proudly. “We did it from earnings. The people – our team – worked very hard and delivered 21 projects within a year, between the three facilities. That’s where the money came from.”

The key to DDW’s turnaround was its transformation into a builder for the offshore energy sector. Before 2010, the company had performed offshore fabrication, but never ventured into newbuilding. Today, 50 percent of the company’s revenue comes from construction projects for the oil and gas and alternative energy sectors, putting it in place to weather changes in both the shipping and energy industries.

“We continue to enhance our ship repair business and drive it to success – that is an important part of the corporate image we have built,” Buamim says. “We are growing both businesses, so that, when there is risk with one unit, the other can sustain it. The idea is to have diversification within your profession,” he explains.

DDW implemented this approach in early 2011, going through changes in management and the management of change, developing core values and the processes and guidelines needed to make the holistic approach concepts into reality. In February 2013 the company instituted an employee award scheme to recognize individuals for contributing to its transformation.
In presenting the award to its first recipients, Buamim said that “We have entered a phase of transformation. The success of this transformation is fully dependant on each and every one of our employees embracing and committing fully to the vision and strategy that will bring about the changes required for the future. We wish to recognize and reward employees who take up the gauntlet that has been thrown them: Embrace the 4 Rs of Excellence and achieve business transformation through continuous innovation.”

Buamim says the key to making positive change is, basically, getting the organization to be willing to change. “Over time, organizations become set in their ways of thinking and doing things,” he notes. “Breaking that mindset is the toughest part of instituting change; it’s all about human change, changing people’s minds. The company as a whole must be willing to think that tomorrow is a different world, and that to meet the challenges of that different world we must always be thinking about and analyzing what we do and how we can improve our output. A company has to have true managed processes in order to achieve this, and I was shocked to find that many of our key processes had never been written down,” he says, adding that one move critical to turning DDW around was development of corporate governance structures that served both the company and its workers.

“A global business needs to be governed by internal resources, external resources, auditing, processes and controls, but good governance does not mean that management has to be looking over everyone’s shoulder – disempowerment of the staff serves no one,” he advises. “The worst thing a leader can do is create a culture of fear,” Buamim says. “Fear is not humanly right; it is degrading. The leader must not allow that even the smallest people in the company fear him as the boss. I know there are cultures where they dread to see the boss coming to the office. That makes an organization weak. If all the people feel positive about their company, it can achieve great things. It’s called ownership, and it results in the employees feeling committed and, most of all, proud of what they do. That’s how a corporate culture needs to be built.”

Looking to restart its long-stalled Batam Maritime Centre project, in February 2013 Drydocks World (DDW) committed itself to a $2.5 billion joint venture with Indonesian engineering firm Bina Bangun Bahari. The 174-hectare Batam Maritime Centre project had been launched in 2008, but fell victim to DDW’s financial problems.

Under their Memorandum of Understanding, DDW’s land in Batam has been proposed as the site for development of an infrastructure, industry and energy project referred to as “the pendulum of the archipelago”, which is aimed largely at facilitating trade between Indonesian ports. The project would involve a number of sizeable infrastructure initiatives, including development of a high-capacity port on Batam. As a manufacturing hub, the Batam Marine Centre is also seen as being in position to support infrastructure development and construction related to a wave of recent investment from the Arabian Gulf in the energy future of Southeast Asia.

That investment began two years ago and has already reached some impressive figures. For example: in 2012 Qatar Petroleum took a 25-percent stake in a $4-billion Vietnamese petrochemical complex; shortly after, Kuwait Petroleum began participation in an engineering, procurement and construction project for a $9-billion refinery project in Hanoi involving Kuwait, Vietnam and Japan; Saudi Aramco announced plans to set up an $8-billion joint venture with Indonesian State-owned oil and gas company Pertamina in East Java that will process 300,000 barrels of crude oil per day; Abu Dhabi-based plastics giant Borealis – a joint venture between the Abu Dhabi National Oil Company (ADNOC) and Austrian plastics manufacturer Borouge – opened sales offices throughout the region amid predictions of overall growth for the Asian plastics market at 5 to 6 percent annually; the Qatar Investment Authority announced a $5-billion investment in Malaysian oil and petrochemical projects; and Mubadala Petroleum of Abu Dhabi started developing oil fields in Thailand, Indonesia, Vietnam and Malaysia.
In April 2012, the National Shipping Company of Saudi Arabia (NSCSA) announced a plan to restructure and expand its activities in ways that would produce one of the largest shipping conglomerates in the world, which would henceforth sail under the name of Bahri.

While a new brand in most of the world, ‘Bahri’ is, in fact, the name by which NSCSA has been known since the day of its creation in Saudi Arabia by Royal Decree back in 1979. The idea of the change was that, while retaining its full official title, the company would discard its somewhat unwieldy acronym in favor of the simple local word that succinctly describes the nature of its business. In Arabic, ‘bahri’ means ‘of the sea’ and can apply to anything that has a marine connection.

Although Bahri is Saudi Arabia’s main shipping company, it is an independent publicly listed corporation. The Saudi Government’s Public Investment Fund owns 28 percent of it, with the balance held by some 20,000 investors. As in any other corporation, Bahri management reports to the CEO and Board of Directors and must demonstrate to investors their proper stewardship of its assets and responsibilities.

Those responsibilities have grown significantly over the past 35 years. Bahri was originally founded to support the industrialization of Saudi Arabia that occurred during the oil boom of the 1970s. The company began with two roll-on/roll-off (ro/ro) vessels, but soon expanded the fleet with four new vessels to bring in the equipment and supplies required not only by oil development projects, but also by the building of two new industrial cities, the Arabian Gulf port of Jubail on the country’s east coast and the Red Sea port of Yanbu on its west coast. Over the next three decades, the Bahri fleet grew to include chemical carriers, crude oil tankers and dry bulk vessels.

In November 2012, Bahri and the Saudi Arabian Oil Company (Saudi Aramco) signed a final agreement under which Bahri would absorb the fleet and operations of Saudi Aramco’s shipping subsidiary, Vela International Marine Limited (Vela).

Founded in 1984, Vela made a name for itself as a high-standards tanker owner. At the time...
the merger was announced, the company operated a fleet of 14 double-hull VLCCs, one floating storage unit, one aframax tanker and four product carriers. When the companies are fully integrated, the Vela ships will bring the Bahri fleet to a total of 72 vessels – 32 VLCCs, 24 chemical tankers, five product carriers, six ro-ros and five dry bulkers – and make it the world’s second-largest VLCC owner. At the same time, Bahri is also taking on all of Vela’s maritime staff and shoreside personnel.

The details of the Bahri-Vela union are still in the end phase of a formal approval process involving scrutiny of the deal by a number of Saudi regulatory authorities, including the Capital Market Authority and the Supreme Council for Petroleum and Mineral Affairs. As no roadblocks were anticipated, the two companies started the long process of merging staff and operations at the beginning of 2013.

The deal also includes a long-term shipping contract, according to which Bahri will become the exclusive transporter of crude oil sold by Saudi Aramco on a delivered basis. Saudi Aramco will continue to manage all crude oil marketing and sales operations, while Bahri will provide reliable shipping services. Furthermore, the two companies plan to explore ways to expand their cooperation in the maritime sector.

Under the terms of the agreement, Bahri will pay to Vela a total consideration of approximately $1.3 billion, in the form of a cash payment of $832.75 million plus 78,750,000 new Bahri shares to be issued to Vela at an agreed price of SAR 22.25 per share; this will give Saudi Aramco ownership of 20 percent of Bahri’s post-issue market capitalization, along with two representatives on Bahri’s Board of Directors.

Speaking at the signing of the agreement, Saudi Aramco President and CEO Khalid A. Al-Falih called the merger of Bahri and Vela a milestone in the history of the shipping industry of the Kingdom of Saudi Arabia. “I am not exaggerating when I say that this merger represents a living and practical example in which two of the Kingdom’s pioneering companies in commercial success and reputation for excellence in their areas of business join hands to earn the Kingdom a major economic benefit,” Al-Falih said. “In turn, this will serve as a national champion that will promote the development of a thriving national maritime industry that creates jobs and other long-term opportunities” he added.

**Always Seeking Opportunity**

In line with the company strategy to diversify its activities, Bahri has recently undergone some organizational changes. The former Oil & Gas division has been split into Bahri Oil, to carry crude and refined products, and Bahri Gas & Offshore Services, which besides gas shipping will look to develop new business lines in the offshore energy service sector.

The first of those new business opportunities was announced last August, when Bahri signed a Memorandum of Understanding (MOU) with Saudi Aramco and Singapore-based ship repairer and rig builder SembCorp. Under the agreement, the three partners are
If it happens that we identify an opportunity for an acquisition, or for forming a joint venture with a company that has international experience and worldwide presence, we might consider it, but for now our focus is on opportunities in the Saudi market,” Al-Shamekh says, adding that having Saudi as the hub for the company’s business thinking brings its own expansion opportunities.

“I would say the mindset of our company has always been to grow,” he adds. “As with any company, we have tried to grow to meet the demands of our markets, and there is increasing demand in Saudi, to transport oil and petrochemicals in our tankers, to import grain with our dry bulk division and to carry project cargoes in our ro/ro vessels,” he says.

Meanwhile, the company’s ro/ro service took on the new name Bahri General Cargo, and in 2010 a joint-venture company, Bahri Dry Bulk (BDB), was established with Arabian Agricultural Services Company (ARASCO), the largest bulk importer into the region. Still retaining their original names at present are National Chemical Carriers (NCC) – a joint venture between Bahri and the Saudi Basic Industries Corporation (SABIC) – and Mideast Ship Management, a wholly-owned subsidiary that provides all of Bahri’s fleet management services.

“The story of Bahri is a story of growth,” says Saleh A. Al-Shamekh, President of Bahri Oil & Gas. A 25-year veteran of the organization who has headed its ro/ro and oil transportation divisions, he notes that, for the immediate future, much of that growth will be in offshore services, responding to the expanding requirements of Saudi Aramco and the growing Saudi marine sector.

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“In the process of serving Saudi interests, we serve others as well,” Al-Shamekh adds. “For example, the ro/ro’s have operated a dedicated service between the Middle East and the United States for years; now India, with all its export to the States, has also become a major market for these vessels.”

Meeting the Management Challenge

These days, a shipowning company’s success depends heavily on its vessel management practices, particularly when the fleet contains tankships. In 1996, Bahri established Mideast Ship Management, an in-house technical management service, in partnership with Scotland-based managers Acomarit. The company became a wholly-owned Bahri subsidiary nine years ago, and for the past seven years has been headed by management veteran Robert Houston.

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“The oil majors see us exactly as they see any other independent owner. We are audited regularly, and they won’t employ a ship if it’s not up to scratch,” Houston says. “We have to match up their expectations – in fact, because of the link with Saudi Aramco, we have to be better.”

“We have dealt with the oil majors through our Oil & Gas division, and our vessels were on all their preferred lists,” adds Al-Shamekh. “The reason why is that we invest in our ships and people. For example, if Robert reports that we need something to enhance the safety and security of a ship and its people, we go for it. It’s that simple.”

“The key to our success is maintaining balance between being commercially viable – because we are a commercial entity – and taking good care of the people on the ships and in the office,” Houston says. “Particularly, if the people on board don’t do their jobs properly, or if we don’t give them what they need to do their jobs properly, then all the hard work of everyone involved falls down like a house of cards.”

Mideast’s approach to fleet growth has been to build up on a small-fleet-group basis, in which two technical superintendents, two purchasers, a marine superintendent and a secretary look after eight ships. But, Houston cautions, good ship management is as much about looking after people and cultivating morale as it is about having proper procedures and processes and reporting in place.

“Many managers talk about how the internet lets you watch the ship 24 hours a day, but you don’t have to do that to have good-running ships,” he says. “The positive side to the instant communication we have with ships today is that, if the ship has any concerns, the people on board can reach us at any time. The negative side to instant communications is the temptation for the people on shore to demand knowing everything about the ship, immediately – to turn management into micromanagement,” he warns.

“To me, what’s most important is to look out for the people on board and maintain the ships, and the rest will follow. For example, the masters should not be worrying about whether they are allowed to make a decision, or that they will be second-guessed on decisions they make. That’s why we emphasize to every master and every chief engineer that, while we will supply whatever they need to do their jobs, they run the ship, they make the decisions and we support them all the way – they have our support,” Houston says. “If you make sure the people on board are capable of doing the job, get what they need to do the job, and know they are empowered to do the job, the ships will run well.”

Robert Houston, Mideast Ship Management
A Builder Rebuilds
A pioneering Arabian Gulf fabricator recovers from rough times to build a new future.

In its almost four decades of operation, the offshore fabricators at Lamprell established a solid reputation among a long list of demanding oil and gas sector clients, building modules for 18 FPSOs, constructing 20 jackup rigs and repairing or refurbishing more than 300 existing ones, fabricating numerous components for land and offshore energy projects and delivering a variety of offshore support equipment ranging from lift boats to wind farm installation vessels.

Today, with head offices in Dubai, seven bases of operation in the United Arab Emirates, Kuwait and Saudi Arabia and almost 10,000 employees worldwide, Lamprell is a far different organization from the family-owned operation that opened for business in 1976. For its first two decades the company focused on smallish offshore energy sector projects ranging from repair and modification of drilling rigs, accommodation modules and land camps to the overhaul of top drives, draw-works and rig machinery.

Then, in collaboration with leading FPSO owner/operator SBM and the builders at Dubai Drydocks (now Drydocks World) between 1998 and 2003, Lamprell produced a number of complex modules for several high-profile FPSO projects and opened the eyes of the energy sector to the industrial capabilities resident in the Emirates. This opened the door for other Gulf area yards to get a piece of the offshore construction market.

The company started formalizing along corporate lines in 1992, when the family brought in a CEO, Peter Whitbread, who over the next 17 years led the business from about $8 million in annual revenue to roughly $300 million, focusing mostly on rig repair and fabrication of FPSO topsides units. Lamprell became a public corporation in 2006 and, over the next five years, underwent a leadership change and rapid evolution that saw annual revenues rise to roughly $1.2 billion.

But with great expansion came great challenge, and in 2012 the company experienced the most unsuccessful year in its history, posting $110 million in losses amid job delays and other setbacks. As a result, the management team was removed and Whitbread was called back from retirement to steady the ship until February 2013 and the arrival of new CEO Jim Moffat. Formerly General Manager of Australia’s Gorgon Project (Kellogg joint venture) and, before that, Vice President...
of Worldwide Offshore Construction for mega-engineering company Kellogg, Brown and Root, Moffat was brought in to help reposition Lamprell and move it forward.

The company reported a net profit for first-half 2013 of $7.3 million, a major step up from its net loss of $47.1 million during the same period in 2012, and in January this year announced that results for all 2013 would exceed expectations, due largely to improvements in project execution (analysts had previously forecasted full-year pretax profit for the company of $16.4 million on revenue of $1.1 billion).

“2013 has proven to be an important year for Lamprell with the business returning to profitability,” Moffat said announcing 2013’s first-quarter results. “We now anticipate that the outturn for the full year will be ahead of previous expectations as a result of the continuing improvement in project execution in the last few months. We are focused on our core strengths of first class safety performance, high build quality, client satisfaction and our commitment to reliability. Against a competitive market backdrop we are playing to these strengths and are in dialogue with a number of prospective clients for new orders. The business made great strides in 2013 and we need to build on this in 2014, developing our strategy to ensure that Lamprell is competitively positioned for sustainable growth over the long term. Our focus will continue to be strong execution, maximizing efficiency and productivity and investing resources in those areas where we see growth opportunities for Lamprell.”

Now with an orderbook of $0.9 billion and some $4.7 billion in its bid pipeline, the company looks forward to continued recovery. Recently, Jim Moffat sat down with Surveyor to discuss his first year at Lamprell and his vision for the company’s future.

**Surveyor:** After attaining leadership positions in a huge global organization and an immense offshore engineering project, what drew you to the relatively smaller operation at Lamprell?

**Jim Moffat:** Although I had never built a project here I knew several people who had, and when I was offered the job at Lamprell I did my due diligence and asked around about them, and found four key attributes that I liked very much.

First, I found that it was a reasonably safe workplace and also an environmentally sensitive operation, both of which are very important qualities to oil major clients, and to me. I’m focused on workers’ health and well-being. I believe that people are not consumables; people have a right to be treated fairly at work and to go home in the same condition as they were in when they arrived. In all 2013 we only had three lost-time incidents, out of a total of 12,000 people – that’s an absolutely world-class statistic.

![Image of Jim Moffat, CEO, Lamprell](image-url)
The next attribute was schedule performance. Lamprell has a history of performing well; we can hold our head high on the scheduling aspect. In terms of organization culture, I would say that was driven by the rig repair business; rigs only make money when the drill bit's turning, so client pressure to deliver on time more or less permeated the organization over the course of the almost 40 years that we've been in business.

The third attribute was quality of workmanship. I have worked all over the world, and the quality out of this facility is as good as I've seen anywhere. The yard builds equipment for the North Sea; the fact that we can provide North Sea quality, and regularly do, speaks volumes about the company.

The final attribute was that Lamprell has the reputation of working with its clients, proof of which is the high number of return customers. In the end, I determined that the company had simply stumbled in 2011 and '12 and that, with those four attributes and with the work it had the pipeline, we could get back to business pretty quickly. In fact, we recovered even more quickly than I thought possible.

People who have never measured their performance themselves before get frightened by the idea – they think it will be used to criticize and cut them down. I believe we've been able to show our people that it's really a healthy thing to do. After all, you cannot get better at anything if you don't measure how well you're doing it.

S: Meaning?

JM: A lack of self-measurement. For example, our costs with the jackups were growing slowly but steadily. To be fair, some of that was due to inflation and some due to rising materials costs. Still, I think in terms of man-hours per ton and dollars per ton, and I believe that a business must try to make those figures go the other way. So for the past year we've been looking hard at self-measurement as a means to continuous self-improvement.

S: What surprised you most about the place, coming from such big operations?

JM: In every fabrication yard I've ever known, the business has been about being a dollar cheaper than the guy down the street. To make your offering more attractive, while maintaining quality and safety, you need to work hard, practice continuous improvement and keep trying to do your work better, more efficiently and at lower costs. When I first came here I was struck that we did not have that culture.

S: So it's about identifying weaknesses and strengths?

JM: Correct. We introduced targets, some tough and some not so tough, and we did well against those targets in 2013. We have encouraged a culture in which we all measure ourselves, so as to have continuous improvement going forward. In other words, what you did yesterday for 100 man-hours per ton, you do tomorrow for 99, then you try for 98 and keep improving. In that way, we can remain competitive against the Far East and whatever other low-cost builders appear. While we can't take the large volumes that some of these yards can, in the smaller projects we certainly can be competitive.

S: Is the winner always the cheapest guy on the street?

JM: No; I like to talk more in terms of efficiency than price. The more efficient you are, the more options you have. Still, you have to be cognizant of the fact that, after you jump the various hurdles and everyone's assessed as being technically proficient, the lowest cost often wins. So, you've got to be there or thereabouts.

S: As a rig builder, do you see opportunity or threat in the large number of aging jackups out there that remain in service, or in the rigbuilding boom?
JM: It’s true that more than 50 percent of the existing jackup fleet is 25 to 30 years old, but those older rigs are very good for our rig repair and refurbishment businesses. Regarding newbuilding, most of the majors are into replacement programs now, which is encouraging. At the same time, there are many rigs now under construction, a number of which are being built in the Far East for speculators. I’m not sure anyone can tell you what will happen when they start hitting the market.

There were around 80 newbuild jackups ordered last year; that level of development can’t last long, but I wouldn’t say the newbuild business will shut down. That said, you do need to watch the market all the time.

Our biggest offering is the LeTourneau 116E, which is still the rig of choice in 350 feet of water. That business is relatively robust and I’m reasonably upbeat about it. We now have seven rigs plus a lift boat under construction and are building at record levels for us. And, at least at this point in time, we are still seeing a lot of enquiries. How many come to fruition remains to be seen.

S: What do you see as interesting future markets?

JM: Over the coming years I’d like to broaden our offering back into FPSOs. The company has built modules for 18 FPSOs and we have a lot to offer that market. We also have a very credible offering for the North Sea arena; we’ve built subsea products before and, because we are recognized as representing exceptional quality, have a potential niche market there.

We could also get into modularized LNG plants; from my background I know there’s a lot of potential there. Look at the Gorgon project: it has 300,000 tons of modules. There are projects out there that are so big that the crumbs that fall from the table would sate a company the size of ours – and there’s no reason the Lamprell’s of this world can’t make a very decent offering in that arena.

S: To conclude, could you share a few thoughts on the human factor in Lamprell’s recovery?

JM: It’s all about people – about people knowing they are valued and having the willingness to work as a team.

People aren’t treated like numbers here and their contributions are recognized. We work hard, but we also celebrate success. I think the biggest leaps forward in team building have come from celebrating our successes – because everybody feels valued, as they should. When your people really feel part of a team, a valued part of what you’re doing, you can do the amazing. The longer we can keep that culture going, the better.

When you talk about a company’s accomplishments, one of the key points to remember is that one individual doesn’t fix anything; teams do. I was general manager on the Gorgon project in Australia, which employs thousands of people and, I believe, is generally recognized to be one of the biggest engineering projects on the planet. What I said when I worked on Gorgon, I also say here at Lamprell: great teams can do phenomenal things.”

Lamprell welders at work.
Breeding Workhorses

The evolving well services sector opens a world of opportunity for one owner’s innovative jackup barges.

An offshore services veteran has found a new life in a new niche among old wells and wind farms.

Headquartered at Abu Dhabi’s Mussafah Base, Gulf Marine Services (GMS) began in 1977 as a general offshore services company doing everything from crew transport and catering to providing accommodation and support platforms for well maintenance. The company was acquired by a group of investors led by private equity firm Gulf Capital in 2007, who saw great global potential in its SP-SESVs that today focuses on supporting enhanced oil recovery and brownfield well services (for mature offshore fields) and the installation and maintenance of offshore wind farm equipment. Today, well services and enhanced oil recovery support constitute about 70 percent of the company’s business – and, if its growing half-billion-dollar backlog is any indication, will do so for some time to come.

“Our philosophy is to create workhorses for the oil and gas and renewables markets,” says GMS CEO Duncan Anderson. “We avoid both the smaller, lighter type of self-propelled jackup barge and the large wind farm installation vessel, being very much occupied with the middle ground,” he says, citing that the flexibility of these units allows GMS to service much of the world’s shallow-water oil and gas developments.

“Over 52 percent of all wellhead platforms worldwide are more than 20 years old, and the vast majority are in less than 100 meters of water,” Anderson says. “With oil companies focused on production, they tend to get behind on maintenance of these platforms, so there’s plenty of opportunity in that area, as well as in plug and abandonment of fields that are no longer viable.”

The strategy has proven successful. Over the past seven years, GMS has become fiscally eleven times larger than when it was acquired, Anderson reports. The company currently operates a fleet of nine SP-SESVs – seven ‘K-Class’ units (for up to 45-meter depths) and two ‘E-Class’ (for up to 65-meter depths) – and two anchor handling tug supply boats and a floating barge held over from the company’s former life. Four more jackup barges are under construction and due to enter into service. These include a third E-class unit and three of a new ‘S-Class’ targeted for the Southeast Asian market.
“Currently, the preference in Southeast Asia tends toward floating barges, which in heavy weather have to run for cover,” Anderson notes. “We believe we can convince that market to adopt jackup barges, because they don’t have to run from weather.”

The ability to handle heavy weather, an important differentiator in most sectors of the offshore industry, has spurred success in the North Sea of its youngest SP-SESVs, the ABS-classed sister vessels GMS Endeavour and GMS Endurance. Developed by GMS and Netherlands-based MSC Gusto, the E-Class offer a wide range of services including accommodation, construction, well intervention and workover, drilling completion and wind farm installation and maintenance. They have accommodation for 150 people (expandable to 300), provide a 1,000-m² deck space with a deck load of 11,350 tonnes, and feature a DP-2 dynamic positioning system, crane capacities up to 350 tonnes and a four-leg design for relatively fast jacking on location. The third E-class vessel, GMS Enterprise, will enter into service later this year and add to the family a water depth capability of 80 meters and a crane capacity of 400 tonnes.

The E-class is in very exclusive company; very few SP-SESVs have attained certification under the UK North Sea Safety Case, which makes them approved providers for the most demanding North Sea oil and gas service conditions.

“We’ve got a $500-million backlog, and that’s building all the time,” Anderson says. “There’s a huge competitive demand for these vessels – they get chartered months before they come off the current charter. Utilization is so high that we were able to pay back the E-class vessels within 3½ years,” he adds with some wonder. “I came here from the drilling and offshore support industries, and I have never seen that happen for a marine asset until now.”

Built at Home & Worth the Effort
All SP-SESVs in the GMS fleet are four-legged units, the design chosen because of its relatively swift jackup speed, Anderson says.

“The key for us in choosing a four-legged design was that, if we finish with one well and want to move to another nearby – say, 5 or 6 nautical miles away – we can do so in 12 hours. This speed is critical, because it often happens that, when you’re experiencing heavy weather, you’ll get a lull of about 24 hours or so. During that time we can jack down, cross to the new site and jack up before the storm comes back. A three-legged unit would take 36 hours or more to move, by the time you get it down in the water, tow it across, preload it and so on. If the weather comes back during that window, you’re stuck; you have to halt operations and your marine spread – the tugs and support equipment you hire – will be on standby until you can resume. We’ve done studies that indicate this time difference can save a million and a half dollars per move; if you’re moving the rig every three or four weeks, that means saving a lot of money in operations,” he says.
"We have used the E-class for wind farm installation, but in the future we will target the maintenance side of that market, as we do for the oil and gas sector," he adds. “We prefer to pursue long-term maintenance contracts, and that philosophy drives the type of asset that we build.”

While the blank hulls for GMS’ vessels are constructed in China, the full outfitting, including leg and jacking system engineering and installation, is done at the company's own shipyard in Abu Dhabi. Having a construction facility gives the owner distinct competitive advantages, not least of which are cost control of new units, production control, slot availability and full quality control of the vessels’ critical elements and systems.

“We live and die by the robustness of our jacking systems,” he observes, “and the biggest worry we had at the start was whether we could, indeed, build them correctly – particularly the E-Class, which are very sophisticated compared with the others. But we proved our abilities well. The Endeavour erected 55 wind turbines, jacking up and down dozens of times in the process and carrying its absolute maximum deck load, which was two sets of turbines. We examined the jacking system afterwards and found it in very good condition, which proved we engineered it all correctly; we’re very proud of that achievement.”

For Anderson, whose background is in operations, taking over a shipyard presented a host of new challenges, not least of which was learning how to price a newbuild and master the logistics of delivery.

“In operations, I was very much accustomed to calculating capital expense, operating expense, income, overhead and the margin, and that was it. Learning to manage and price these lump-sum jobs was something entirely new,” he recalls. “Lump sum work has many pitfalls. It’s a headache, but worth it,” he says, noting that that building at its own facility saves GMS some 30 percent on construction costs.

Although the company has now mastered its shipyard operation, it has no specific intent to market its building services, but sees the facility as a critical part of its supply chain.

“Because of the niche nature of the product – it’s not a commoditized asset – we can pretty much specialize in building that type of asset. There aren’t many yards that are expert at building this type of barge. In addition, if we compare our building cost to what’s on the open market, we effectively can build three vessels for the price of two.”

Looking to the Future
Following the success of the Endurance in a long-term gas recovery project with ConocoPhillips in the southern North Sea, GMS began seeing great promise in expanding its offering in enhanced oil recovery (EOR) services.
“When we built the E-class years ago, we put enough steel in the aft end of the deck so that we could install a small cantilever at some future date,” Anderson says. “We can make use of that in this application, where we'd be looking at installing intervention equipment on the stern.”

To make that vision work, GMS began looking to marry its marine expertise with someone else’s downhole expertise.

Some time ago, GMS began developing a concept for a jackup-based offering of plug-and-abandonment, decommissioning, EOR and traditional well services in a single equipment and skills package. The selling proposition is that, right now, oil companies typically employ drilling units to perform that work, but don’t actually have to because drilling is rarely needed in these operations. Instead, they could hire a properly outfitted and crewed jackup barge at a much lower day rate, hiring a drilling unit only as necessary. Then, as drilling rig day rates rise – especially among units with harsh-environment ratings – combined-service jackups would become very attractive solutions for completions and multiple plug-and-abandonment projects. With hundreds of aging wells around the world coming up for plug-and-abandonment, the profit potential in such a business line seems huge.

“We see huge potential for 2015 and beyond, in the Middle East, in the North Sea and in Southeast Asia,” Anderson says. “We have come a long way in the past six years, but, for me, this is just the beginning for GMS.”

Recently, the company found such a partner – which, because it is still early days in the union, Anderson identifies only as ‘a well-known casing and downhole tools provider’ – to develop such a combination asset. All things considered, there’s a long list of opportunities that should keep GMS building for the next five to six years at least, he believes.

“Many smaller independent oil companies don’t have the management bandwidth to efficiently pull together all parts of a well intervention package, and would really appreciate a subcontractor that is able to do it all,” he explains. “Our intention is to be able to approach such clients and say: how many holes have you got; what duration contract do you need; here is the package and here are the services we can supply.”

The E-Class vessels are already prepared for this opportunity, thanks to one farseeing design decision made when the units were being constructed.
The offshore energy service sector in the Arabian Gulf has steadily evolved in the areas of quality control and environment during the past decade. Whereas at one time shipyards throughout the region could be seen flooded with repair work on old service boats no longer desired elsewhere, today’s Gulf waters are populated by a growing fleet of young vessels featuring such modern equipment as integrated bulk systems for chemicals and mud, construction cranes to aid well maintenance and advanced propulsion packages with dynamic positioning control.

One OSV operator whose own development has mirrored the evolution around it is Dubai-based Stanford Marine. The company was founded in 1997 by Elias Nassif, who as CEO of the Stanford Marine Group remains actively involved in the operations of the company today. Starting up with two vessels in service to Qatar Petroleum and Zadco (Zakum Development Company, which works the Zakum offshore oilfield for the Abu Dhabi National Oil Company), Stanford grew steadily over its first decade of existence with a fleet focused on crewboats and workboats. Today the company operates a diverse OSV fleet that has an average age of 7.5 years; the mix includes crewboats, anchor handling tug (AHT) and tug/supply (AHTS) boats, platform support vessels (PSVs) and workboats.

Stanford Marine Group (SMG) was acquired in 2007 by The Abraaj Group, a leading Gulf-area private equity investor in global emerging markets. The Group then embarked on a fleet rejuvenation program for its chartering division, a fleet diversification and geographical expansion. As part of that program, in 2009 the group acquired Minnow Marine Projects Limited (MMPL), a Singapore-based company with a newbuild pipeline of ten high-specifications offshore service vessels. The Group not only bolstered its fleet with MMPL’s new PSVs and multi-purpose vessels (MPVs), but also brought in its experienced management team.

“We were brought on board with the remit to ensure delivery of the newbuild program and support the expansion of the Group into South East Asia” says Stanford General Manager Darren Reeves, who came to SMG as part of the MMPL acquisition.
handful of vessels working in the Far East, West and East Africa and Gulf of Mexico are a result of disciplined and opportunistic expansion.

“This is a global industry and anyone in it has to keep his eyes open for opportunity; we do it through a disciplined approach” Reeves says. “Looking forward, we’re expecting a period of growth in our core markets” he reflects. “That said, our primary focus remains the Middle East – there’s still a lot of opportunity and a lot of work to be done here.”

Another aspect of Stanford that mirrors the evolution of its region is a focus on quality, health and safety that, says Reeves, has resulted in incident rates far below industry benchmarks, and a growing emphasis on social responsibility that reaches some of the neediest segments of the local populace – among the organizations SMG supports are a training institute for children with special needs and a pediatric therapy center.

Today the majority of Stanford’s fleet works in the Middle East, concentrating on supporting production in shallow-water operations, but a

OVID’s Ode to Quality Control

While the technology of the OSV sector has been evolving, so have the standards and controls to which it is subject. Among the latest control programs to spring from industry is the OVID (Offshore Vessel Inspection Database) system, which was introduced by the Oil Companies International Marine Forum (OCIMF) in 2010.

OVID is based on the logic and methodology of OCIMF’s successful SIRE (ship inspection and reporting) program. Few people dispute that SIRE, introduced some 20 years, has, through strict vessel inspections and stern application of its standards, dramatically improved the technical quality of the tanker sector.

In introducing OVID, OCIMF Director Captain Phil Davies explained the logic behind the new system by pointing out that OCIMF’s programs for tanker assurance “have been effective and, while tankers are different from OSVs, the causes of their incidents remain the same.”

Like SIRE, OVID is a ‘voluntary’ inspection program for vessels in energy industry service. It was developed at the request of members, says OCIMF, who demanded a robust, objective inspection tool and database of inspection reports that allows oil company marine assurance and project teams to assess the service vessels their companies intend to hire. It is still early, but the program is already gaining traction – in the Arabian Gulf, for example, no OSV is allowed work in Qatar without OVID approval.

In 2011, OCIMF released the first version of its ‘Offshore Vessel Management Self Assessment (OVMSA) protocol’, a mirror of the management-directed tanker management and self assessment (TMSA) program that has been applied for the past decade to tankers.
In just a few years, a serious logistical challenge will confront the offshore drilling industry, from rig owners and equipment suppliers to shipyards and classification societies. Although difficult, this challenge offers the industry an opportunity to improve one of the key elements of its safety regime: the five-year equipment inspection and recertification cycle.

For decades, all floating drilling rigs have been required to undergo a special survey of the hull every five years. Over time, much of the drilling equipment used on these vessels also adopted a five-year cycle, with equipment inspection and recertification performed when the vessel comes to the shipyard for special survey. These shipyard visits usually involve a wide scope of work with potentially very challenging lead times.

Now, because the industry has enjoyed a building boom over the past nine years, large clusters of vessels are coming due for special survey at the same time.

Currently, about 40 rigs go into the shipyards for special survey each year. NOV examined the 185 projects for which it supplied equipment since 2005, and found that over 130 of those rigs will need to come in for recertification in 2017. That's just our portion of the newest rigs. Add in the rest of the new and the older fleet, and you have a magnitude of work over time that the industry is not prepared to handle.

The only way to efficiently handle this massive amount of work is for owners to plan ahead regarding scope of work and timeline – not just by months, but by a year or more. Advance planning is, however, only part of the solution. If we could also reduce the scope of work in equipment recertification by performing some of the work ahead of time, the process would be more efficient and rigs would spend less time in the shipyard.

We at NOV believe that, with broad industry cooperation, it is possible to rationalize equipment inspection cycles while also satisfying all safety requirements, and that doing so will benefit the entire industry by increasing efficiency and building better understanding of the equipment it uses.

One simple way to improve the process would be to swap out critical equipment before they come due for inspection – replace them with new or refurbished equipment that has a valid certificate of compliance (COC), and inspect or recertify them at a convenient time.

We could also develop recertification into a continuous process, in which the owner inspects and refreshes equipment on a regular basis, taking the opportunity, while the rig is working, to inspect equipment that is not in service.

Going further, we could develop a process for inspection of in-service equipment, perhaps using remote monitoring and condition-based maintenance processes. These technologies can give good visibility of the health of equipment. The data they provide, accompanied by in-situ inspections the owner performs, could allow the manufacturer to assess the condition of the equipment as compared to its design criteria; in turn, these findings could, with classification acceptance, be the basis for COC renewal.

As these programs proceed over time, the data they generate could be used to build a comprehensive equipment performance database, which, ultimately, could become a resource for developing a unique inspection cycle for each piece of equipment. Governing bodies like the American Petroleum Institute (API) could be enlisted to help develop standards for assembling and using such a database.

Admittedly, some of the above are long-term goals, but they build on a near-term goal that is within reach: to develop a more pragmatic and efficient process for equipment inspection and recertification.

If owners, manufacturers and classification societies work together, we can develop new equipment inspection processes that will make recertification more efficient while achieving the safety goal we all share: to make sure all offshore equipment is always ready and always working at design performance criteria.
tool is but an extension of a man’s hand, and a machine is but a complex tool. And he that invents a machine augments the power of man and the well-being of mankind.”

– American Clergyman
   Henry Ward Beecher
   (1813–1887)

Proverbs from Plymouth Pulpit