OE OFFSHORE ENGINEER

THE FUTURE OF OFFSHORE ENERGY & TECHNOLOGY

JULY/AUGUST 2023 | OEDIGITAL.COM | VOL. 48, NO. 4

For Offshore Wind,

"You're Gonna Need a Bigger Crane ..."

Safety & Mitigating the Risk of Dropped Objects

As Dayrates Rise, Where are the New Rig Orders?

Installation Vessel Interview: Paul Johnson, Transocean

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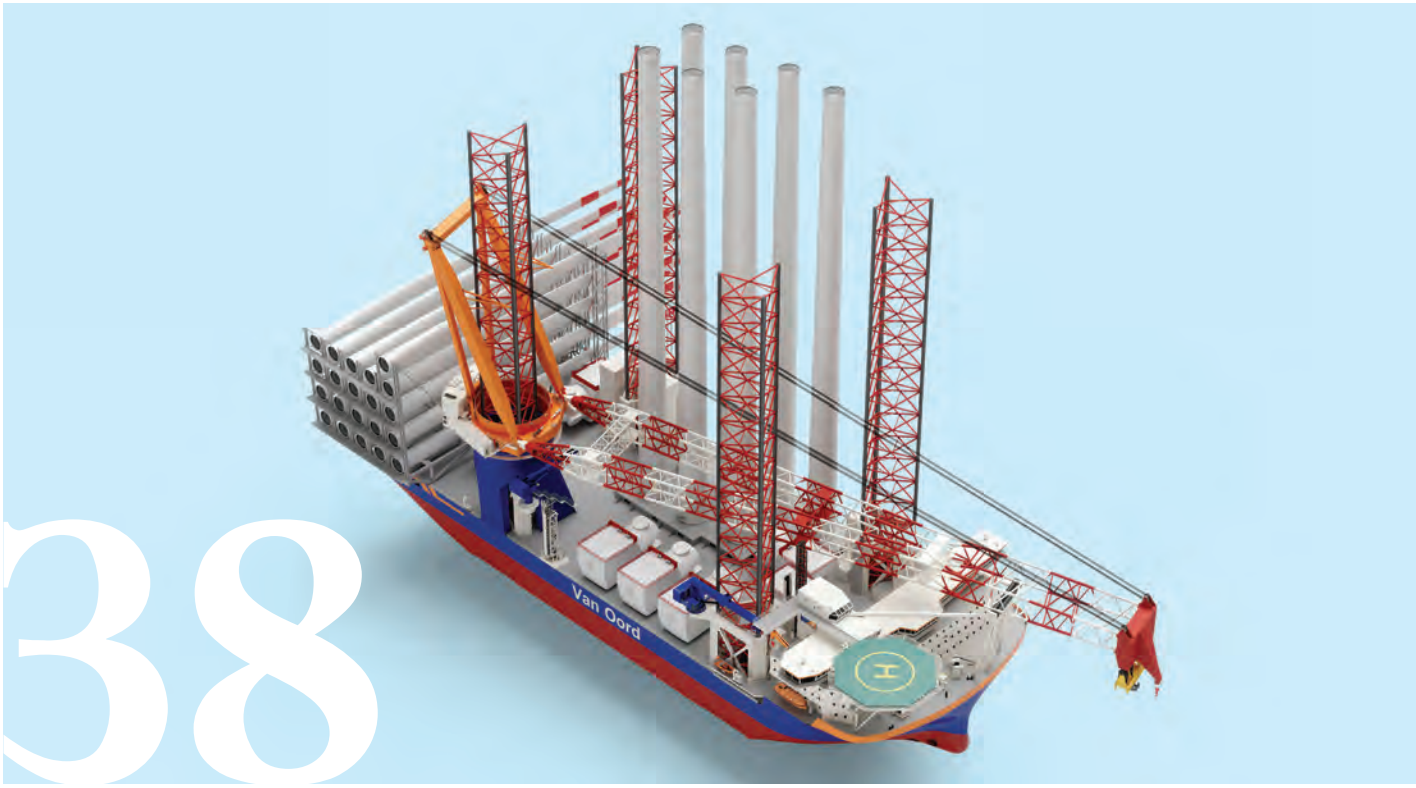

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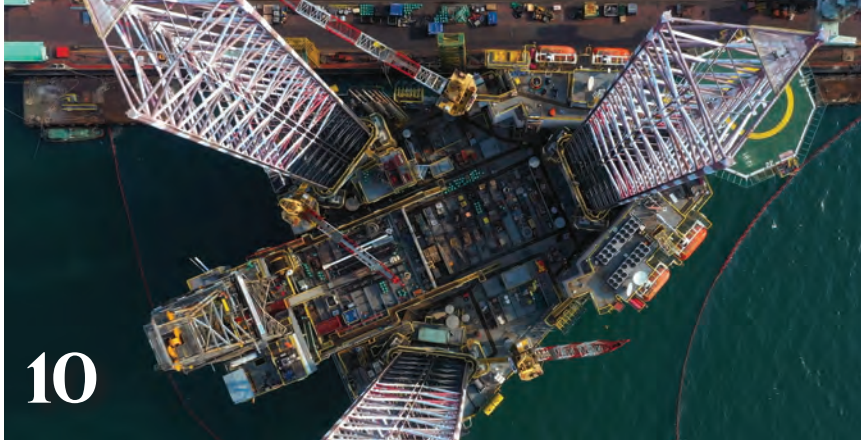

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SAFETY IS JOB 1

The stressed importance of safety, particularly from the oil majors, is legendary in the offshore sector, and this month **Wendy Laursen** takes a deep dive into the risk of dropped objects, which is a leading cause of incidents offshore. Whether you operate in the North Sea, the Gulf of Mexico, Africa or Asia, there are often prolonged periods of harsh environmental conditions at all locations, conditions that can accelerate corrosion and push corroded systems to failure. While there is no pattern, per se, the top causes of dropped objects include inadequate risk assessment, human factors, inadequate procedures, failed fixtures and fittings, poor housekeeping, collisions, and snagging.

The matter of corrosion and degradation of cranes in the offshore environment is of particular interest, due to the massive loads they are asked to handle seamlessly, efficiently, safely, day in and day out.

This is relevant too in the burgeoning offshore wind sector, as **Bartolomej Tomic** reports this month on the rapidly expanding size of turbines and it's resulting impact on the size and capability of cranes. Offshore wind turbines are reaching new heights both literally (meters), and figuratively (MW), and as the demand for larger turbines surges, so do the challenges faced by offshore installation contractors, which need to come up with bigger vessels, and, consequentially, bigger cranes.

Our feature focus this month is Huisman's Product Director of Cranes, **Cees van Veluw**, who discusses how simultaneous growth in safe working load, hook height and boom length are impacting the product line-up at Huisman and translating to the growing global fleet of vessels to carry them.

Check out the 2023 Media Kit via the QR Code Below

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OE WRITERS


Childs

Terry Childs is the Head of RigLogix for Westwood Global Energy Group. He has over 35 years of experience tracking and writing about the offshore rig market. He started his career in 1981 at IHS legacy company Offshore Data Services, followed by a period marketing rigs for ENSCO in the Gulf of Mexico. In 2009, he returned to the market intelligence side of the business, with stints at RigData and DrillingInfo, before landing at Rigzone in December 2014. He became Director of the Data Services group in February 2016 and served in that capacity until March of 2018, when Westwood Global Energy Group purchased the Data Services division of Rigzone.


Golikja

Ina Golikja is an equity and credit analyst in the Research team at Fearnley Securities. She's been covering the offshore supply vessel (OSV) space since May 2022, focusing both on Norwegian and global players.


Konowe

Celia Konowe is from Reston, Virginia, recently graduating from the University of Rochester with a degree in environmental studies. She has study abroad experience in France and Ecuador, including the Universidad de San Francisco Quito's GAIAS (Galápagos Institute for the Arts and Sciences) program. Currently, she is pursuing her master of environmental studies degree at Dalhousie University in Halifax, Nova Scotia.


Laursen

Wendy Laursen has 20 years of experience as a journalist. In that time, she has written news and features for a range of maritime, engineering and science publications. She has completed a Master of Science research degree in marine ecology as well as diplomas in journalism, communication and subediting.


Lewis

Philip Lewis is Director Research at Intelatus Global Partners. He has extensive market analysis and strategic planning experience in the global energy, maritime and offshore oil and gas sectors. Intelatus Global Partners has been formed from the merger of International Maritime Associates and World Energy Reports.


Tomić

Bartolomej Tomic is managing editor of Offshore Engineer. He has, since 2010, written hundreds of articles covering the international offshore industry. The coverage includes E&P, Drilling, Seismic, interviews with oil and gas professionals, and reporting from industry events.

Extend Safety Valve Lifespan

Combination Of Rupture Disc And Safety Valve Offers Various Opportunities

For many years emissions were an unavoidable consequence of industrial development. An increase in consciousness of environmental issues combined with subsequent legislation means that major Oil and Gas companies are under pressure to cut their greenhouse gas emissions and several have responded by setting reduction targets over the coming decades.

There are several ways in which operators can work towards emissions reductions and our focus is on the impact the use of various safety devices can have on this target.

The first point of consideration in this regard should be the safety valves in use. Valves are an obvious place to start as no valve is 100% leak-tight, and this decreases every time there is an activation and the valve re-seats. In the building of new plants, it is a fairly simple solution to specify within the design of the plant a valve with a lower leak rate. However, existing plants are looking at substantial investments to replace older designs with newer technologies. Not a viable economical solution in most cases.

While there have been significant increases in the capabilities of safety valves, they are still not the ideal product when considering future net zero targets. No safety valve is 100% leak-tight and they struggle to meet the exacting requirements of the legislators. An alternative solution is needed.

Although rupture discs have been around for many decades, they are often considered only as secondary relief. To be used where there is a possibility that the safety valve may fail. There is a lack of understanding amongst engineers in industry and a number of myths surrounding the use of rupture discs.

A rupture disc is a non-reclosing device and therefore must be completely replaced when there is an activation. Nuisance downtime leads many operators to associate rupture discs as being problematic whereas if a disc is rupturing frequently there is likely a problem with the process. It is still unrecognized by many operators that when the disc performs correctly it is not the problem, but the solution.

How can a rupture disc help to get improved performance from a safety valve? Rupture discs are 100% leak-tight. By installing a rupture disc in front of a safety valve you get double protection and a solution which can meet emission requirements. There is no more leakage through the safety valve in normal operation and where there is an over-pressure activation, the valve reseats to seal the

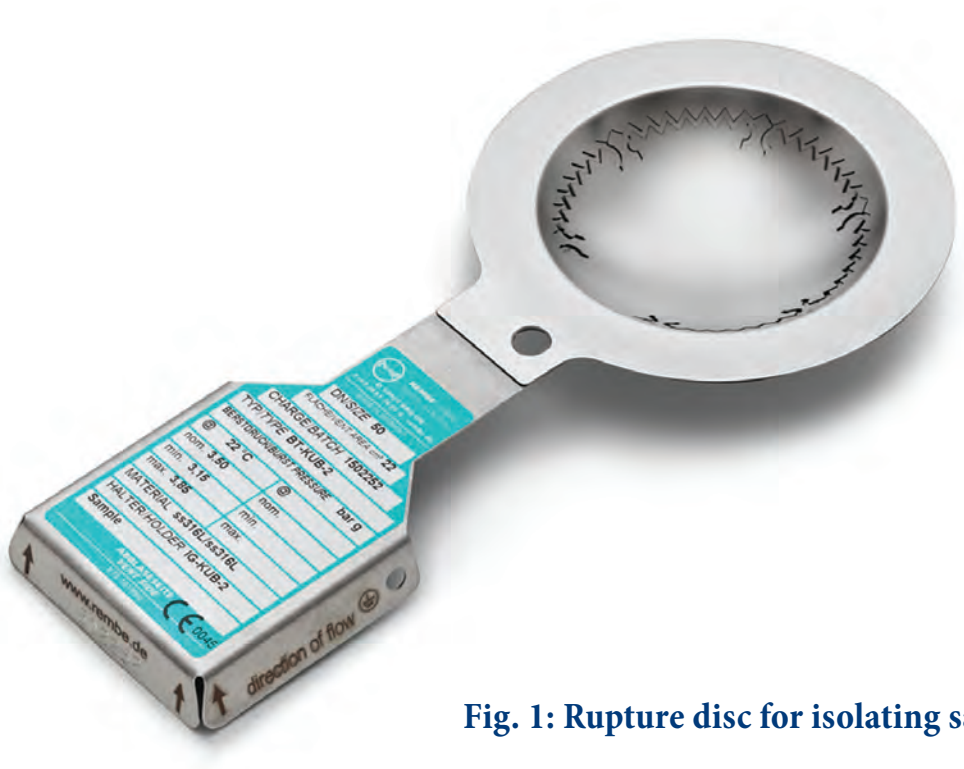

Fig. 1: Rupture disc for isolating safety valves

process once the pressure is vented.

The belief that this arrangement adds more cost into a project has been proven to be false, in fact the opposite is the case. A correctly engineered rupture disc will help lower operating costs and increase the up-time for any plant.

In processes where there is a high concentration of corrosive media, increased temperatures and an operating pressure close to the safety valve set pressure, safety valves are pushed to their limits. Poor performance is common-place. High maintenance costs are needed to keep the valve as close to original specifications as possible, increased downtime to the production for routine valve servicing and/or repairs and higher manpower costs to cover the work scopes.

The solution of the safety valve manufacturers is a higher specification valve, more exotic materials with higher capex costs as well as increased cost of spares to maintain the valves. If you consider a typical petrochemical plant with several hundred safety valves the capital expenditure is significant.

A rupture disc fitted upstream of the safety valve completely isolates the valve from the process. This protects the safety valve from the process which in turn reduces maintenance requirements. There is also the possibility of reducing CAPAX costs by sourcing a rupture disc and holder in an exotic material and a standard safety valve. The costs of a discs and holder are usually significantly lower than having to source a high specification safety valve which is compatible with the process media.

The protection of safety valves with rupture discs has become increasingly more common in recent years across several industries. However, many operators miss the opportunity to fully protect the safety valve by also isolating the valve from potential corrosion issues on the outlet of the valve.

In many cases, the valve outlet is not a separate discharge line to but is connected to other parts of the plant via a manifold which allows process gases/vapor to enter the outlet of the valve. If there is a risk that the process media can damage the valve via the inlet, this is also the case downstream.

A rupture disc can also be used to isolate the safety valve outlet and prevent any contact with the process media. The rupture disc will also block any back pressure from entering the safety valve and remove those concerns during valve selection.

Fig. 2: Ideal combination – safety valve and rupture disc

With burst sensors installed both upstream and downstream rupture discs can be monitored and connected back to the control room for system reporting across the plant, so operators know instantly which valves and discs are in a green or red state.

Another myth surrounding rupture discs is that they can leak. If the disc is to be installed as the primary safety device, that's to say, without a safety valve behind it, this can be a concern for operators looking to reduce emissions. The majority of leakages via rupture discs are caused by corrosion or damage during installation by mishandling or incorrect torquing. Rupture Disc technology has improved significantly over the years to ensure that damages caused by corrosion or incorrect handling are all but eliminated. Today's modern rupture discs no longer use mechanical scoring techniques during manufacturing which can lead to works hardening and corrosion over time. Advanced manufacturing technologies have resulted in robust rupture discs which are no longer sensitive to torque and virtually immune to damage during installation. Most spurious failures from rupture discs can be avoided by working together with the disc manufacturer to select the ideal rupture disc for the process conditions.

Overall, rupture discs can be used as a cost-effective and efficient way to create a leak-tight process and reduce emissions whether on their own or in combination with a safety valve.

About REMBE – the REMBE Alliance Introduces Itself

Most people associate REMBE with REMBE GmbH Safety+Control, the specialist for explosion safety and explosion venting worldwide. The company offers customers cross-industry safety concepts for plants and equipment. All products are manufactured in Germany and meet the requirements of national and international regulations. REMBE customers include market leaders in various industries, including the food, timber, chemical and pharmaceutical industries.

The company's engineering expertise is based on 50 years of application and project experience. As an independent, owner-managed family business, REMBE combines expertise with the highest quality standards and is involved in various specialist committees world-

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In addition to REMBE GmbH Safety+Control (www.rembe.de) with approx. 340 employees worldwide, headquartered in Brilon (Hochsauerland, Germany), and numerous subsidiaries worldwide (Italy, Finland, Brazil, USA, China, Dubai, Singapore, South Africa, Japan), four other companies operate under the REMBE umbrella brand:

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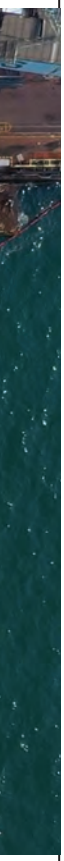
Rig Dayrates Have Risen, So Where Are The New Rig Orders?

Much has been written in recent months about the increase in offshore rig utilization and dayrates. With some key segments of the fleet at 95% utilization or higher, dayrates for recent fixtures for non-harsh environment jackups have surpassed $150,000, while floating rigs have been secured for contracts at or above $475,000. Right on cue, the talk of new rig orders has surfaced, but will it actually happen?

Terry Childs, Head of RigLogix, Westwood Global Energy Group



A lot has happened since the last newbuilding cycle took place, and there are several reasons why Westwood believes new rig construction will not occur anytime soon.

Assuming a rig owner can obtain financing, there are far fewer shipyards that would entertain building a new rig. Many have exited the business or undergone yard consolidation. As one drilling contractor put it, the yards are busy "building vessels they can actually get paid for," referring to floating production storage and offloading (FPSO) and other non-drilling units. In addition, down payment terms, which had been as little as 2% in the last cycle, would be significantly higher now.

Secondly, there are still undelivered rigs in yards that were ordered in the last newbuilding period. While mostly completed, these "new" rigs require a substantial amount of capital and shipyard time. Nevertheless, there is still inventory available, another reason not to build now. Also related to excess inventory, several cold-stacked units could undergo reactivation, providing rig owners with a cheaper and faster source for additional rigs.

Finally, there are more M&A deals that can be done. As seen in recent transactions, deals can be structured that do not require a lot of cash, making it far cheaper and faster to acquire a company and its assets versus building a new rig.

New Floating Rigs Less Likely

The prospect of building a new drillship or semi-submersible (semi) is less likely than jack-ups. Even with drillship dayrates inching closer to the magical $500,000 mark, the numbers simply do not add up at the present time.

According to rig owner estimates, the all-in cost to build a new drillship would be over $1 billion.

Assuming 90-95% utilization, the dayrate needed for a standard 12-15% return on investment (ROI) would be $650-700,000 for the useful life of the rig (~25 years). Build time would be around three years.

In addition to the economic factors, there are other notable reasons not to build. There are still 15 drillships and seven semis, many from the last newbuild cycle, waiting in various yards to be delivered (although three of the 22 units have contracts in place). Westwood believes as many as eight units may never be delivered, which leaves 11 newbuilds – seven drillships and four semis – available for rig owners to absorb into their fleets.

The investment required to get these units will vary, but the base cost is thought to be a minimum of $100-110 million (plus $250-300 million to buy the rig if necessary).

With most of these units in Southeast Asia, a mobilization fee would be as much as $35-50 million plus other upgrades necessary for a specific operator and/or region, adding another $30 million to the cost. So, excluding purchase price, an all-in cost of around $200 million would be expected. It is estimated to take 12-14 months of yard time to get one of these rigs out.

There are also 30 cold-stacked floating rigs – 13 drillships and 17 semis. We believe as many as ten are being marketed for drilling programs while a few will likely be scrapped. Between the stranded newbuilds and cold stacked units, rig owners have access to 30-35 units.

The cost to reactivate one of these rigs will vary depending on the scope of work done. For example, to reactivate a cold stacked drillship in Las Palmas, the base cost is believed to be $85-90 million alone, plus mobilization fees and additional upgrades. Shipyard time is believed to be around one year for reactivation.

A rig owner would need a minimum five-year initial term to even consider building a new unit and currently, there are just a handful of regions where operators have programs that could offer that.

Among the potential landing spots would be Brazil and Africa. TotalEnergies recently issued a tender for two drillships to work under 10-year contracts with rumors of two existing newbuilds competing for that work. The US Gulf of Mexico has taken on two newbuild drillships this year and last, but it seems unlikely the region could take on another.

Drillship Construction Cost Breakdown

Westwood Global Energy Group

Shipyard Cost	Outfitting Cost	Other Expenses	Operator Upgrades	Mob/Demob Fees	Total All-In Cost	Required Dayrate
$850mn	$50mn	$30mn	$40mn	$40mn	$1.01bn	$650-700k

Source: Westwood RigLogix

The bottom line is that while it is conceivable that some new floating rig orders could eventually take place, a sustained period of significantly higher dayrates would be needed, and that, if it happens, is still a few years away.

Jack-ups more Probable

Any new rig orders will likely be for jack-ups. Like floating rigs, multi-year contracts have been awarded, with some in the Middle East as long as 15 years.

Dayrates have nearly doubled in the past year alone and reached as high as $160,000 in some areas. Two of the largest jack-up rig owners, Borr Drilling and Shelf Drilling, say there is not enough equipment to fulfill future demand.

What about the cost to build a new jackup? It is estimated to be in the $250-300 million range for a 400ft-rated rig, depending on yard location.

Delivery time is currently thought to be 2-2.5 years. According to jack-up owners, an acceptable 15% ROI for a newbuild with 90-95% utilization would require a dayrate of $200,000-$230,000 over the useful life (~25 years) of the rig.

In the current newbuild inventory, there are 20 undelivered jackups, three of which have contracts, and one has a pending sale. The remaining 16 units, ordered as early as 2013, have been mostly completed but would need shipyard time to finish construction and undergo acceptance testing.

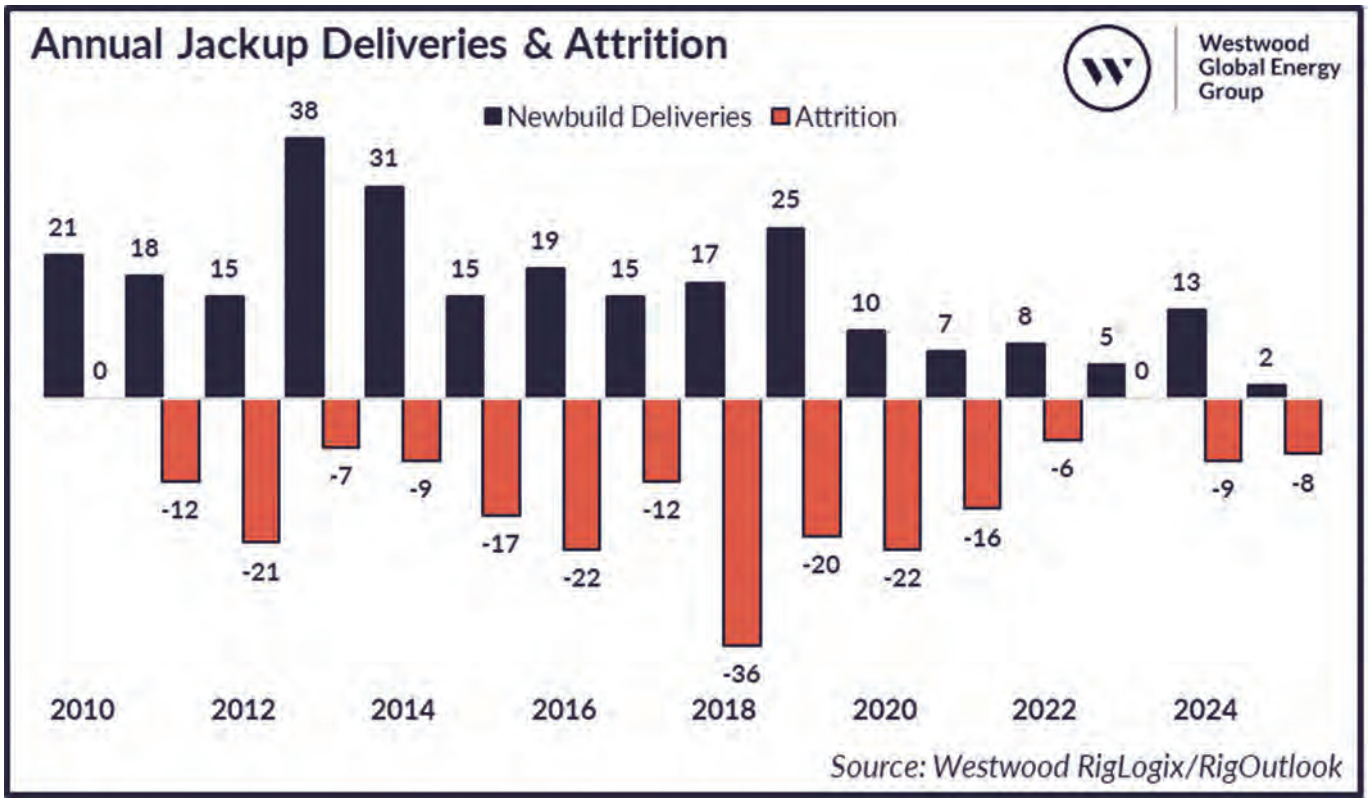
From 2010 to July 2023, the jack-up fleet increased by a net of 45 rigs, with 245 deliveries and 200 units removed. Over the 14-year period, that is an average of three rigs per year, probably not as much as one might think. And with the current cold stacked numbers versus the number of rigs still under construction, the fleet size will decline on its current path.

Looking at the cold stacked fleet, 56 are available, but closer inspection shows the number available for reactivation is much lower. Six of the units have been stacked for over ten years, making it highly unlikely they would ever work again.

After removing units that, due to design, water depth rating, age etc., would not likely be brought back into service, Westwood believes there are fewer than 15-20 units as candidates to return to the fleet.

The cost to reactivate a stranded newbuild or cold stacked jack-up varies depending on rig condition, age, time idle and level of preservation done prior to the rig going idle.

Some recent reactivations have been completed for just



under $20 million but estimates for other rigs pending reactivation are reported to be as much as $40 million. Required reactivation time is six to nine months, depending on yard availability.

Despite the high price tag, it is not out of the question that some jack-ups will eventually be ordered.

Of the current 438 marketed jack-ups in the global fleet, 100 are 40 years of age or more, 23% of the fleet.

While fewer than 10 of the 100 are idle, it is doubtful that kind of usage can be sustained for many more years.

Rumors afoot indicate operator interest in newbuilds. A few super majors, citing current climbing rig costs, could reportedly offer initial contract terms that might entice rig owners to dip their toes in new construction.

In addition, at least three jack-ups that previously retired with the intent of converting to wind farm installation vessels, will reportedly re-enter the fleet as drilling units.

Finally, ARO Drilling must be mentioned. In 2018, the company agreed to supply Saudi Aramco with 20 new jack-ups over a 10-year period.

The first two were ordered in 2020, but none since. Delivery of those was scheduled for 2022 but slipped into this year after delayed completion of a new shipyard in Saudi Arabia to build the rigs.

Assuming the remaining 18 rigs are ordered, it raises the question of whether there would be a need for additional newbuilds.

Westwood believes the reasons not to build a new rig outweigh the reasons to build at present.

Although rig owners have historically not been known for their discipline, this time is different, or at least it appears to be. No speculative rig reactivations have been carried out and there does not seem to be any appetite to repeat the overbuilding mistakes of the past.

The Resurgence Of The OSV Industry: A Journey From Trough To Triumph

The offshore supply vessel industry has weathered a tumultuous decade characterized by a prolonged trough that tested the resilience of vessel owners. However, the tides have turned, and the industry is now experiencing a strong and much-awaited revival.

By Ina Golikja, Equity and credit analyst in the Research team at Fearnley Securities

While long seen as a derelict industry by investors, improving market conditions and a number of corporate activities have recaptured investors' attention for the OSV space again.

Standard Supply, a Standard ETC spin-off, listed on Euronext Growth Oslo in June 2022 as a pure platform supply vessel (PSV) player and has been opportunistically active in the S&P market since.

Among historical names, DOF ASA underwent bankruptcy in November 2022 after long and troubled negotiations with its creditors, and DOF Group was listed in June 2023 as the new holding company. The IPO was largely oversubscribed and successfully closed after DOF rejected an offer from Subsea7.

Tidewater further strengthened its position as the OSV giant through the acquisition of 50 vessels from Swire Pacific Offshore in March 2022, and more recently with the purchase of 37 large and mid-sized vessels from Solstad Offshore. Meanwhile, share performance for several of the names has been stellar, led by Tidewater – up c. 180% last 12 months.

However, many OSV players are still battling with high level of indebtedness, legacy of the newbuild order boom back in 2014 – when optimism for future increase in demand was pervasive, and financing was both available and affordable – just to be followed by the oil price crash and the consequent downturn.

The COVID-19 outbreak interrupted the momentum building in 2019, but the OSV market came back in full swing in 2022, supported by increased global E&P spending and revitalized offshore activity. Ship owners have since experienced an overall improvement in earnings, driven by an increase in average dayrates and utilization achieved throughout all vessel segments.

Dayrates Reach Peak Levels

Dayrates for larger and in high-demand tonnage have now reached previous peak levels, with +20k BHP AHTS trading around USD 45k/day, while PSVs with 4,000+ dwt are eyeing USD 35k/day globally, with certain regions closing on USD 40k/day.

The subsea and offshore construction market is sold out and projected to reach USD 100k/d in the next years for larger tonnage (>400t SWL CON).

As the demand for OSV vessels has been recovering, the supply side of the market has undergone a profound transformation over the past decade.

The market deterioration from 2015 onwards has led to historically low orderbook, while long-term layups and scrapping of vessels have combined resulted in a finite and shrinking total fleet.

Most Old Units Not Coming Back

Although reactivations have provided some relief to the tight market, the majority of the cold-stacked units has been out of the market for close to ten years and/or are more than 20 years old, meaning it is unlikely for those units to return back to work, in our view.

Meanwhile, newbuilds are at the moment capped by limited financing, rising building costs, longer lead time at yards, and uncertainty over the prevailing fuel technology.

The continued uptick in dayrates and replacement costs has translated into higher secondhand asset values.

As an example, the 2012-built 680m2 PSV Standard Duke was recently sold for USD 11m after being purchased for USD 7m (including reactivation) a year before. Looking at larger transactions, Tidewater benefitted from the distressed sale of Solstad Offshore PSV fleet of 37 large-and-mid PSV (10 years avg, age), priced at USD 16m per vessel vs our estimated fair value of USD 30m for large and modern tonnage.

As the sector keeps heading towards full recovery, we see capital discipline to prevail among OSV owners, focusing on debt reduction and returning value to shareholders.

While newbuilds are not on the table today, several players have commented on being open to the possibility of ordering new vessels if supported by multi-year term contracts at dayrates significantly higher than current levels.

Though, limited yard capacity and financial constraints will limit newbuild influx in the short term as we see it. Meanwhile, we expect more corporate activities going forward as owners streamline their fleets and focus on core segments.

In conclusion, the offshore supply vessel industry has traversed a challenging path from a decade-long trough to a triumphant resurgence.

The firming supply-demand balance has granted vessel owners increased bargaining power, resulting in improved terms and increased profitability.

While global recession risk and rising cost of capital following interest rate hikes from central banks, represent a near-term macro risk, the underlying fundamentals – further helped by the growing offshore wind industry – support a long-term-upcycle for vessel owners, in our view.

Damen

Several market players have unveiled new vessel designs tailored to the floating offshore wind market. Damen says its FLOW-SV is specifically designed to install ground tackles for floating offshore wind projects.

Anchor Handler Construction: *What To Expect As Floating Wind Picks Up*

A fleet of newbuild specialized anchor handlers will be required to help build up the emerging floating offshore wind industry. But since the industry is still in its early days, many unknowns have made it difficult for shipyards and their partners to gear up to build this fleet. This article explores complex market demand and technical drivers that help give a better understanding of anchor handler requirements for floating offshore wind.

By Philip Lewis, Research Director of Intelatus Global Partners

Maersk Supply Service

Maersk Supply Service used the Maersk Mariner to install six mooring lines (hybrid lines of chain and fiber rope) and six drag anchors for the DemoSATH floating wind project.

Floating wind is an emerging technology currently being tested in small scale demonstration and pilot projects; at the end of 2022, global floating wind commissioned capacity was less than 200 megawatts (MW). By 2030, close to 6.5 gigawatts (GW) of commercial scale wind farms are planned to be commissioned, the majority in Europe and the Asia Pacific Region. Then, 2030-2035 will see a period a high commissioning activity as the U.S. joins established and also new European and Asia Pacific markets. Floating installed capacity is forecast to reach around 63 GW by 2035.

Whereas floating wind projects will leverage experiences from the bottom-fixed industry, there will also be many differences, particularly in how floating turbines are constructed and installed. A major difference is the need for large anchor handlers and large subsea construction vessels to pre-install mooring systems designed to maintain the position of the floating wind turbines, to tow the structures from port and to hook-up and tension the floating turbines to the pre-installed moorings. Based on a detailed review of technical drivers, Intelatus identifies the optimal size of existing anchor handling tug supply (AHTS) vessels for mooring pre-lay as having a bollard pull of at least 250 tonnes and a clear back deck of over 800 square meters. The capabilities of existing subsea construction vessels with AHC cranes of 250 tonnes and above and large clear back decks are also suitable for certain pre-lay operations. But existing oil and gas market demand and the technical requirements of floating wind projects is unlikely to be met by these existing vessels.

The above capacity projection of 63 GW by 2035 translates to the installation of over 5,000 floating turbines, more than 20,000 anchors and over to 30,000 mooring lines.

Simply put, there will be a large demand for vessels in the anchor handling segment, which has seen limited recent newbuilding activity due to poor market conditions in the core oil and gas sector; only six large anchor handlers have been delivered in the last five years. Newbuilding prices for five of these large anchor handlers were around $80-85 million at the time ordering—price levels that are not likely to be achieved in today's building market. Since then, there has been limited activity to guide price estimates, but we have seen costs rise for vessel types across the board. A capital cost estimate of at least $100 million for a similar vessel seems reasonable.

Subsea construction vessel supply is also likely to be

Jan Arne Wold / Equinor

Anchor handlers connect to first Hywind Tampen turbine to be towed to field in the Norwegian North Sea.

stretched by high demand from oil and gas projects.

As a result of market conditions, our forecast identifies a shortage of large anchor handler and subsea construction vessels toward the end of the decade. As demand in floating wind continues to grow, available supply is expected to be reduced further as activity continues to pick up in deepwater oil and gas—a sector that drives demand for large anchor handlers and subsea construction vessels.

So, what do shipbuilders and their supporting partners need to plan for?

With around 100 floating wind design concepts at varied levels of technical maturity, multiple anchor types to accommodate and three principle mooring line materials (chain, wire, and synthetic rope), there is no one single immediate dominant project solution, which drives the need for flexible installation vessels.

Our analysis indicates that the most efficient installation vessels for floating wind projects will not necessarily be classic large anchor handler or subsea construction vessels, but rather hybrid anchor handlers capable of providing flexible solutions to developers and project engineers who have a variety of floating wind technologies, anchors and mooring line concepts to consider.

Several market players are known to be developing floating wind specific vessel concepts that are evolutions of the more traditional designs. Based on our analysis of floating wind project requirements, we expect the next generation anchor handlers to feature:

- High bollard pull, anchor handlining frame and a large AHC crane
- Large back deck
- Multiple large winch drums
- Large chain lockers
- Work class ROVs
- Flexibility to support different tensioning options
- Low or zero emissions operations, battery energy storage systems, etc.
- Embedded digitalization

We anticipate such vessels to cost significantly more than existing large anchor handler designs, with reported estimates in the range of $175-200 million. Such investment requires high day rates and long-term charter commitments, which are generally not available today.

And then there are questions about economics as developers face increasing pressure to keep rising project costs at bay. Many of the builders capable of producing high-spec anchor handlers—including yards in China, Norway and Singapore—and their financial partners continue to deal with the damage of low utilization and newbuilding activity in the OSV segment post 2014.

Many owners experienced financial difficulties and were unable to pay down debts accumulated during newbuild expansion programs initiated between 2008 and 2013, while many of the traditional shipping banks that funded the newbuilding boom took significant impairments, which have left them cautious about lending to OSV projects. Many private equity vehicles suffered heavy losses from OSV investments. Finance is still available from new market entrants and alternative capital providers. However, the appetite for financing new vessels comes with many restrictions.

One thing is certain: shipbuilders will need answers (and commitments) sooner rather than later if the floating wind industry hopes to minimize the severity of projected vessel shortages.

Intelatus Global Partners has recently published a floating wind installation vessel forecast report, available here: ***https://intelatus.com/Business/FloatingWindInstallationVessels***. For more information or to inquire about the report, contact Philip Lewis at ***philiplewis@intelatus.com***.

Lhyfe

It's (Really) Not Easy B

While the jury is still out on maritime 'fuel of the future', green hydrogen is seen globally as a particularly invaluable part to the process – as well as a potential fuel – particularly in the fight to decarbonize heavy and long-haul transport industries like shipping. While the promise is real, the challenges are many, including the high cost of renewable energy sources themselves, the energy-intensive electrolysis process, and the development of infrastructure. Similar to other giant strides in technology, the mass production of green hydrogen will take a broad mix of political will (ie. funding), corporate nerve, and individual innovation.

CrossWind

Hollandse Kust Noord offshore wind farm

eing Green (Hydrogen)

Going Offshore

Producing green hydrogen in the offshore environment presents a number of advantages, led by the abundance of renewable energy (read integration into the rapidly expanding offshore wind grids globally) to generate electricity to run the power-hungry electrolysis process. In addition, readily abundant seawater can be used to cool the electrolyzers, helping to boost efficiency and reduce costs.

But these offshore pluses are weighed down with an equal, if not greater number of risks, including the much higher CapEx and OpEx costs due to the inherent challenges associated with working efficiently, cost-effectively, and safely in the offshore environment; the logistical challenges of delivering the hydrogen from the sea to the shore; and last but certainly not least, the many unknowns of operating the electrolyzers – designed and optimized for onshore operations – in the caustic offshore environment.

Despite the negatives, Lhyfe is a French company hell-bent on meeting and beating the challenges.

Earlier this summer, it announced a "world first": Its Sealhyfe pilot project has started producing green hydrogen in the Atlantic Ocean, 20 km off Le Croisic, France, and is now connected with the SEM-REV power hub.

"As of June 20, 2023, the platform began producing its first kilos of offshore hydrogen, marking a decisive milestone for the future of the sector. The progress of the Sealhyfe trial once again demonstrates Lhyfe's ability to bring about concrete advances in the hydrogen industry and at great strides," Lhyfe said in a press release.

With the aim of scaling to commercial production, Lhyfe opted to choose a challenging trial area.

Lhyfe said that the 1 MW electrolyzer supplied by Plug would be put to the test under real conditions on a floating platform, a WAVEGEM platform, engineered by GEPS Techno, that was re-engineered to stabilize the production unit at sea. Connected to Central Nantes' SEM-REV off-

shore testing hub operated by the OPEN-C Foundation, a hub that is already linked with a floating wind turbine, FLOATGEN, engineered and operated by BW Ideol.

Lhyfe's Sealhyfe platform, which is less than 200 sq. m., is designed to produce up to 400 kilograms of hydrogen a day.

In another project, Dutch offshore wind farm developer CrossWind awarded Italy's Rosetti Marino a new engineering, procurement, construction, installation, and commissioning (EPCIC) contract for an offshore green hydrogen production and storage pilot plant dubbed the Baseload Power Hub, which will be located within CrossWind's Hollandse Kust Noord offshore wind farm, 18.5 kilometers off the Dutch coast. CrossWind is a joint venture between Shell (80%) and Eneco (20%).

According to Rosetti Marino, the project will convert excess wind energy to green hydrogen through an electrolyzer and store it as green hydrogen that can be converted to electricity when needed via a fuel cell, including also battery storage for shorter-term power storage. The aim of the project is to stabilize power flow when the wind isn't blowing as briskly and/or during power demand surges.

The scope of work of the contract awarded to Rosetti Marino SpA includes detailed engineering of the Baseload Power Hub, procurement of material and equipment, construction work, transport and installation at sea, and commissioning and start-up of the platform (EPCIC). Activities are due to start immediately and are expected to be completed by the end of 2025.

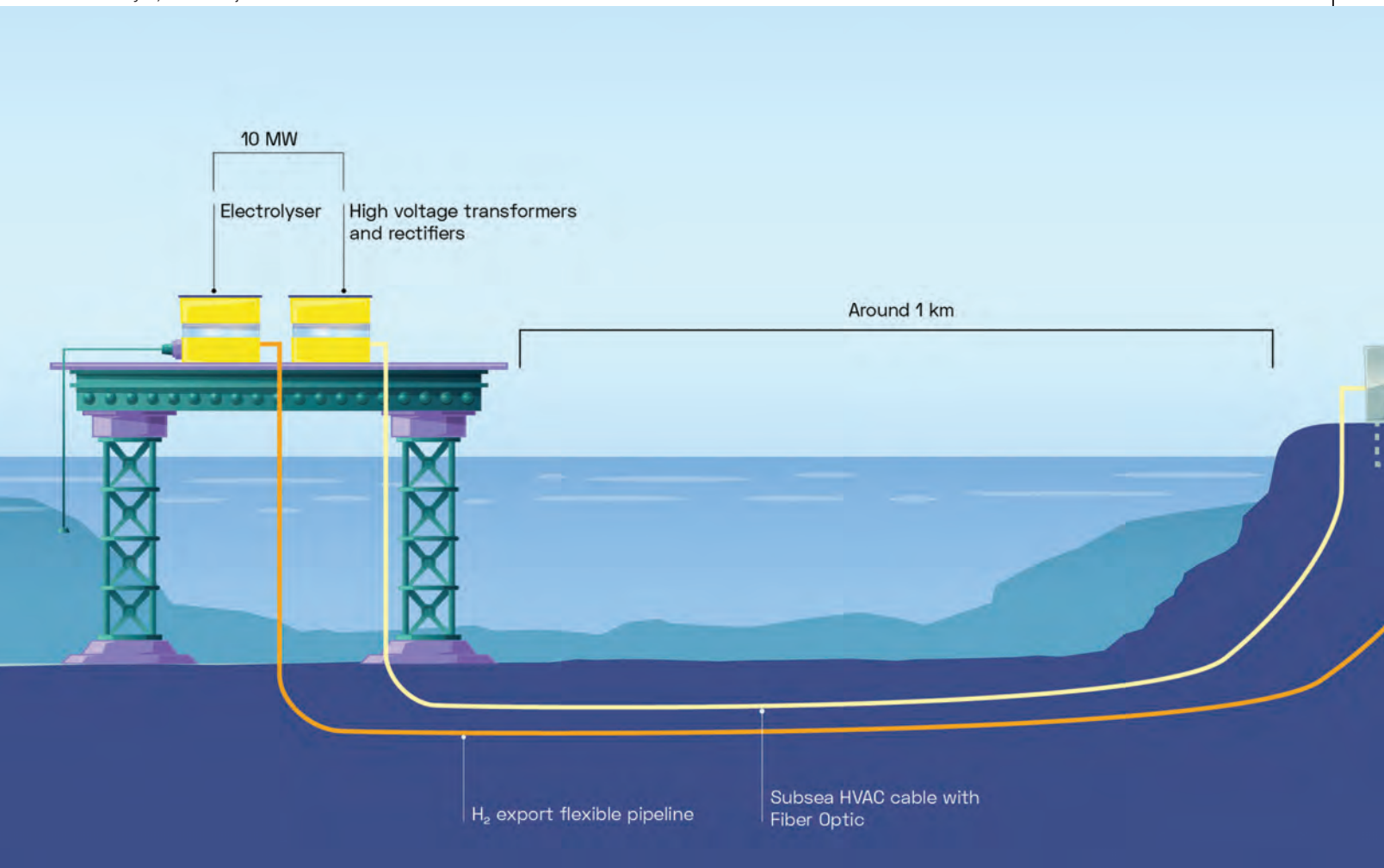
As for the Hollandse Kust offshore wind farm, it on June 19, 2023, produced its first megawatt-hours (MWh) of electricity, and delivered it via TenneT's offshore grid to the Dutch mainland. In the coming months, production capacity will be constantly increased, so the wind farm will eventually generate 3.3 TWh a year. When complete, the Hollandse Kust Noord wind farm will have a total installed capacity of 759 MW.

There is [$22m worth of] HOPE

Lhyfe also announced that the HOPE project, which it is coordinating as part of a consortium of nine partners, has been selected by the European Commission under the European Clean Hydrogen Partnership and won a 20 million euro grant (around $22 million at the time of writing).

"Through these two pioneering projects in offshore hydrogen production, Lhyfe aims to validate industrial solutions which it will submit in response to future calls for projects from various governments, to help achieve the target set by the European Commission as part of the RE-

Lhyfe / HOPE Project-



PowerEU plan of 10 million tons of clean hydrogen produced in the European Union by 2030," Lhyfe said.

To achieve this, Lhyfe has already signed partnership agreements with wind turbine developers and offshore power specialists, such as EDPR, Centrica, and Capital Energy.

Matthieu Guesné, Founder and CEO of Lhyfe, said: "Our team – supported brilliantly by our partners – has achieved a genuine feat of technology in successfully designing this first floating green hydrogen production site. We are extremely proud to be the first in the world to produce [green] hydrogen at sea. "This has been our wish since the launch of the company and we continue to move very quickly on offshore, which for us represents a tremendous development opportunity for mass producing hydrogen and decarbonizing industry and transport. We are continuing to build on the successes we have had so far, firstly to prove to the world that transition is possible today, and of course to accelerate it."

Key Innovations to be Developed via HOPE

- ***Recycled offshore barge:*** The structure housing the production unit will be a second-hand jack-up barge, demonstrating the transformation of infrastructure previously used for oil and gas while also helping to reduce costs and lead times.

- ***10 MW PEM electrolyzer:*** This compact electrolyzer will be the first of its size to be installed offshore.
- ***Seawater treatment system:*** This low-energy system which is compact, economical and able to use the heat emitted by the electrolyzer, will be used for the first time to produce green hydrogen from seawater purified by evaporation.
- ***Underwater flexible hydrogen pipeline for hydrogen export:*** The hydrogen will be exported ashore via a flexible thermoplastic composite pipeline of over a km long, which for the first time will transport hydrogen produced at sea.

HOPE Project Partners

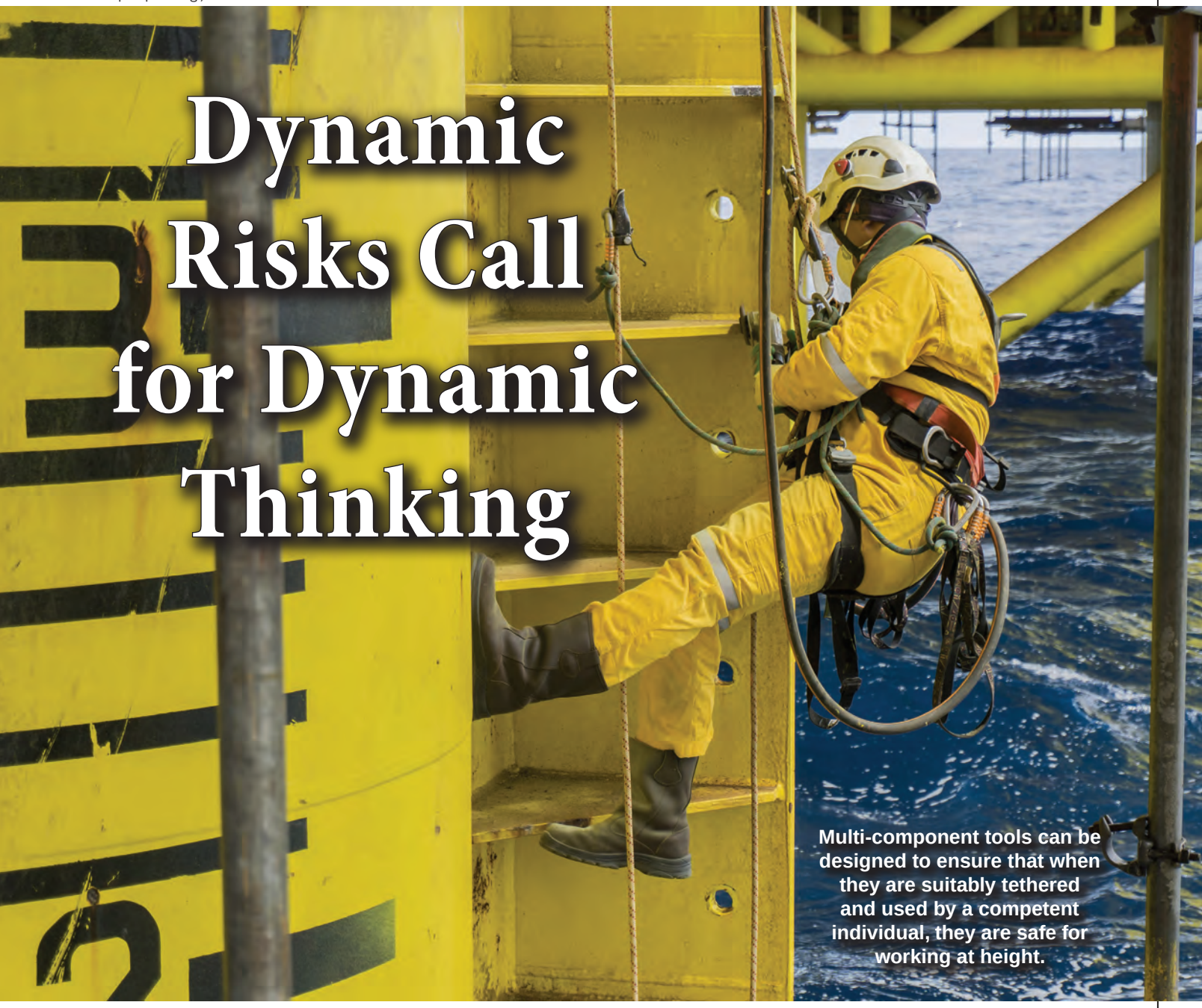
- **Lhyfe (France):** Engineering, equipment procurement, works supervision, operation, optimization of the overall production, export and distribution system, project coordination.
- **Plug (the Netherlands):** Supply and engineering of the 10MW electrolyzer.
- **EDP NEW (Portugal):** Contribution to the optimization of operations and impact analysis. Steering of techno-economic studies for large-scale developments.
- **POM West-Vlaanderen (Belgium):** Project implementation support in the testing area (studies, permits) and analysis of the social, economic and environmental impacts of the project.
- **CEA (France):** Optimization of operations via digital simulation.
- **Strohm (the Netherlands):** Supply of the subsea flexible thermoplastic composite pipeline (TCP).
- **Alfa Laval (Denmark):** Supply of the seawater treatment system.
- **ERM - Element Energy (France):** Coordination support.

The HOPE Project

- **What** Hydrogen Offshore Production for Europe (HOPE) The production site will comprise three units: production and compression (at medium pressure) at sea, export by composite pipeline, then compression (at high pressure), storage and distribution onshore.
- **How Big** 10 MW/up to 4 tons of green hydrogen/day
- **Funding** 20 million Euros grant from the European Commission
- **Where** The North Sea, off the port of Ostend
- **Why** For the first time in the world, green hydrogen will be produced at sea and then exported ashore via a composite pipeline to supply the needs of the regional ecosystem. The aim is commercialization
- **When** By mid-2026

Stopdrop Tooling / Shutterstock

Dynamic Risks Call for Dynamic Thinking



Multi-component tools can be designed to ensure that when they are suitably tethered and used by a competent individual, they are safe for working at height.

Dropped objects are a leading cause of incidents offshore, and the risks are many.

By Wendy Laursen

At present, bolts are being produced to at least 85 different industrial standards. The Dropped Objects Prevention Scheme (DROPS) Reliable Securing best practice handbook, a collaborative industry effort, notes the need for a qualified evaluation before they are used for maintenance or modifications. Bolted connections fail due to improper use/installation (30%), vibration (20%), knocks (12%), overloading (11%), wear (6%), and corrosion (5%).

A 2022 DNV report notes that Norwegian Petroleum Safety Authority incident data indicates that galvanic corrosion between fasteners and tertiary components and overload/fatigue due to wind are the most common threats leading to dropped objects.

Mike Rice, CEO of Dropsafe, a company specializing in dropped object prevention, says whether you're in the North Sea, the Gulf of Mexico, or elsewhere, there are often prolonged periods of harsh environmental conditions at all locations offshore.

He points to the dangers of counterfeit nets on the market: "The netting itself is rarely stainless steel, but even when it is, the crimps or the carabiners are not, and that is often where galvanic corrosion in secondary securing can cause an issue.

A recent **BSEE** safety alert highlighted corrosion hazards associated with cranes on idle facilities. Inspectors observed numerous instances where cables that supported blocks and balls were weakened by corrosion, resulting in components dropping from elevation.

Australia's offshore safety regulator, **NOPSEMA**, has cited a lack of consistency when describing corrosion during crane inspections as an issue. Words such as "extensive," "surface," and "local" were sighted.

"The prevalence of cranes operating in a de-rated capacity due to the corrosion of the crane structure is evidence that reports of corrosion were either not assessed or fully understood."

NOPSEMA's Head of Safety and Integrity Division, **Derrick O'Keefe**, says: "Dropped objects range in size and severity, and their occurrences generally do not form a pattern."

Revised guidance for crane operator competency was published in 2021, and he says a key part of prevention includes appropriate maintenance strategies, inspections, procedures, and trained and competent personnel.

Top Causes of Dropped Objects

According to DROPS scheme data, the top causes of dropped objects include inadequate risk assessment, human factors, inadequate procedures, failed fixtures and fittings, poor housekeeping, collisions, and snagging.

BSEE issued a safety alert in March 2023 after a 700-pound crane overhaul (headache) ball crashed to deck less than two feet from a rigger after an auxiliary line snagged during a "blind" lift.

Drilling rigs can have accentuated risks simply by the nature of the work – the lifting, the vibration.

Asset age can also be a compounding factor, especially when assets are re-activated after cold stacking.

But the risks need not be 700-pound; dropped tools and components also pose a significant risk.

Stopdrop Tooling grease guns are an example of a multi-component tool that's been designed with engineering controls to ensure that when the tool is suitably tethered and used by a competent individual, it's safe for working at height.

"Prior to Stopdrop Tooling being available, tools accounted for 15% of all dropped object incidents," says **Gary Dunn**, Global Business Manager at Stopdrop Tooling.

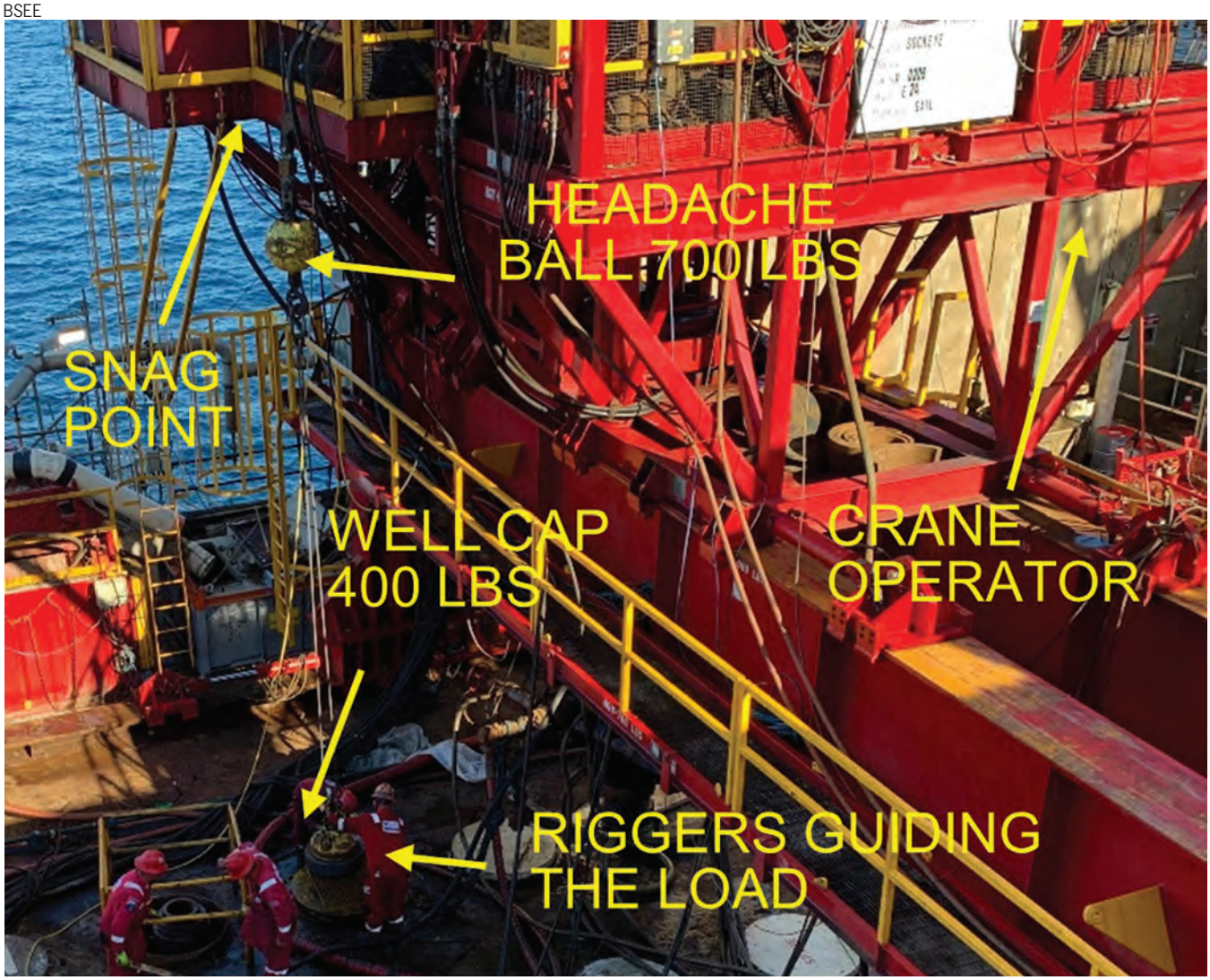
Eden Newell, VP of Business Development & Marketing at drops mitigation equipment supplier 5th Element Inspection Services, cites the US Bureau of Labor Statistics indicating that there are over 50,000 "struck by falling object" recordable injuries every year onshore and offshore in the US – that equates to one every 10 minutes. The risks are aplenty, she says.

"Why is it so hard? Why do we still see dropped object incidents as one of the top causes of lost time injuries and fatalities in the offshore industry? It all boils down to the mindset and attitude of the person doing the job; fancy product safety solutions alone cannot solve this issue. Human factors have a lot to do with dropped objects – neglect, error, and complacency are some of the most common factors that can contribute to dropped object risks."

Engineer out the hazards, if possible, says Newell. Also, continue industry collaboration among oil and gas companies, drilling contractors, shipyards, EPC companies, contractors, sub-contractors, and equipment manufacturers.

Lastly, put more emphasis on regular training by using safety statistics and data as the basis for designing more practical, hands-on, on-the-job training.

BSEE



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DROPS Metaverse

Axess Group recently partnered with DROPS Asia Chapter to develop a hazard hunt module in the DROPS Metaverse, a virtual reality (VR) application.

As part of the training, participants virtually navigate a drilling rig to look for potential dropped objects.

Allen Smith, representing DROPS Training and Admin, sees value in what he calls a second-nature prevention strategy.

"For every task, every task step, every task plan, basically everything we're doing, we take the time out to think about how we are prepared to prevent dropped objects and to mitigate the consequences."

This includes survey and inspection of equipment, the management of tools and equipment at height, exclusion zone management, and more, including DROPS awareness, asset-specific training, and consultation.

"Manufacturers can help identify what needs to be inspected and what should be corrected, but the kind of dropped objects we really need to focus on in task planning are the dynamic drops and how to recognize the sequence of events that can lead up to an incident," says Smith. He believes that even the high number of incidents reported is an under-estimate.

Stopdrop Tooling

Multi-component tools can be designed to ensure that when they are suitably tethered and used by a competent individual, they are safe for working at height.

Stopdrop Tooling

Stopdrop Tooling courtesy of BW LPG

Mike O'Berry, the GOM Public Affairs Officer at BSEE says the Bureau has seen an uptick in reported incidents involving dropped objects, with more than 60% of the reported dropped objects related to crane activities.

On average, BSEE receives five lifting incident reports each week, with approximately 17% of lifting incidents involving a dropped load. Approximately 90% occur during routine or recurring lifts. "BSEE believes that a continued focus on safety must go beyond simple compliance with regulations and toward the adoption of a meaningful safety culture that permeates all offshore energy activities."

©aerial-drone/AdobeStock

The Art & Engineering Of Converting A Drillship Into An Offshore Wind Installation Vessel

*In April 2023, **Transocean** executed a non-binding Memorandum of Understanding (MOU) with offshore wind installation services firm Eneti, and MOU with a plan to form a joint venture company that will engage in offshore wind foundation installation activities. The plan, if enacted, would see some of Transocean's drilling vessels converted into wind turbine foundation installation vessels. **Paul Johnson**, VP, Technical Services, Transocean, shares an update with **Offshore Engineer**.*

What motivated Transocean to enter the offshore wind sector and convert some of its drilling vessels into wind foundation installation vessels, especially during the times of high dayrates being secured by offshore oil and gas drilling vessels?

Transocean continuously evaluates ways to leverage its core competencies and assets. We can convert one or more vessels to offshore wind installation vessels while further augmenting our strong offshore expertise.

Of course, our shareholders expect that we will pursue business opportunities that are accretive to the value of the company, so we will always consider the various options we have available to us and only make investments in those that generate the appropriate financial returns.

What progress has been made since April? What are the next steps in the formation of the joint venture?

We continue to evaluate the offshore wind foundation installation market and engage potential customers.

Could you elaborate on the process of converting offshore drilling vessels into wind foundation installation platforms? What challenges do you anticipate during this conversion?

The conversion of a drillship to a Fixed Foundation Installation Vessel (FFIV) is quite complex and takes diligent planning and engineering. The process can be broken into four key steps:

- Remove the drilling equipment, including the drilling derrick and thrusters.
- Mobilize the vessel to a dry dock facility for the main hull modification work scope, which includes adding 8-meter-wide sponsons on either side of the ship that run nearly the entire length of the vessel. This modification adds sufficient deck space, improves the vessel's stability, and strengthens the deck. This is required for the vessel to be operationally efficient as a FFIV. In addition to the hull modification, a new anti-heeling system is installed, and the existing water ballast system is upgraded to enable the vessel to carry and install the extremely large monopiles, which could be more than 3,000 tons each. Our design would hold a maximum of six monopiles at a time.
- Add energy-efficient features to reduce the vessel's emissions.
- Install state-of-the-art equipment for handling and installing the wind turbine foundations.

Transocean

> *"We have designed the vessel to tackle the largest foundations. It would be capable of handling a 3,500-ton monopile, 12+ meters in diameter and 120+ meters in length. To handle such large monopiles, we need a very large crane. We have selected a crane with a lifting capacity of 5,200 tons.*
>
> **Paul Johnson, Vice President, Technical Services, Transocean**

What significant upgrades to the deck and the hull are required for a drillship to become an offshore wind installation vessel?

We have designed the vessel to tackle the largest foundations. It would be capable of handling a 3,500-ton monopile, 12+ meters in diameter and 120+ meters in length. To handle such large monopiles, we need a very large crane. We have selected a crane with a lifting capacity of 5,200 tons.

Do you already know which Transocean drilling vessels exactly are conversion candidates?

We have identified a class of vessels for the basic design and front-end engineering. However, this is flexible.

Can you talk about the planned deck space? Is it limited to the current drillship size, can it be expanded? How many of the currently biggest monopiles will you be able to load onboard?

When designing the vessel, multiple factors need to be considered: deck space, deadweight carrying capacity, stability, maneuverability, efficiency, and vessel speed. All of these factors were carefully considered and applied. We will be configured to carry six monopiles at a time.

In your April 2023 announcement, the company said that the converted vessels would have "efficiency-enhancing operating features." Could you elaborate on some of these features and how they will optimize the installation process?

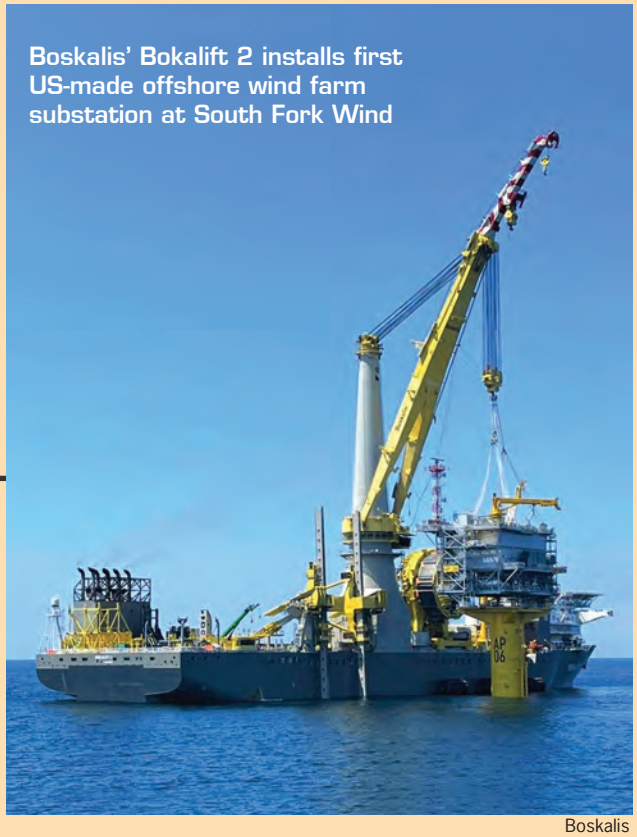
We plan to install the following energy-saving and emission-reduction features:

- Energy Storage System to reduce emissions by capturing and storing excess power for future use
- IMO Tier 3 compliance and lower emissions, uses ultra-low-sulfur diesel, NOx reduction by up to 95%, CO2 reduction by 20%+
- Dual-fuel ready

This is not the first time a Transocean drilling rig has been converted to serve the offshore wind industry. Namely, Transocean sold its Jack Ryan drillship to Boskalis back in 2017. The vessel has since been converted to an offshore wind installation vessel, and has secured and completed important work in the offshore wind space, including the recent substation installation for an offshore wind project in New York.

Read More

Boskalis Installs First U.S.-Made Offshore Substation for South Fork Wind Project

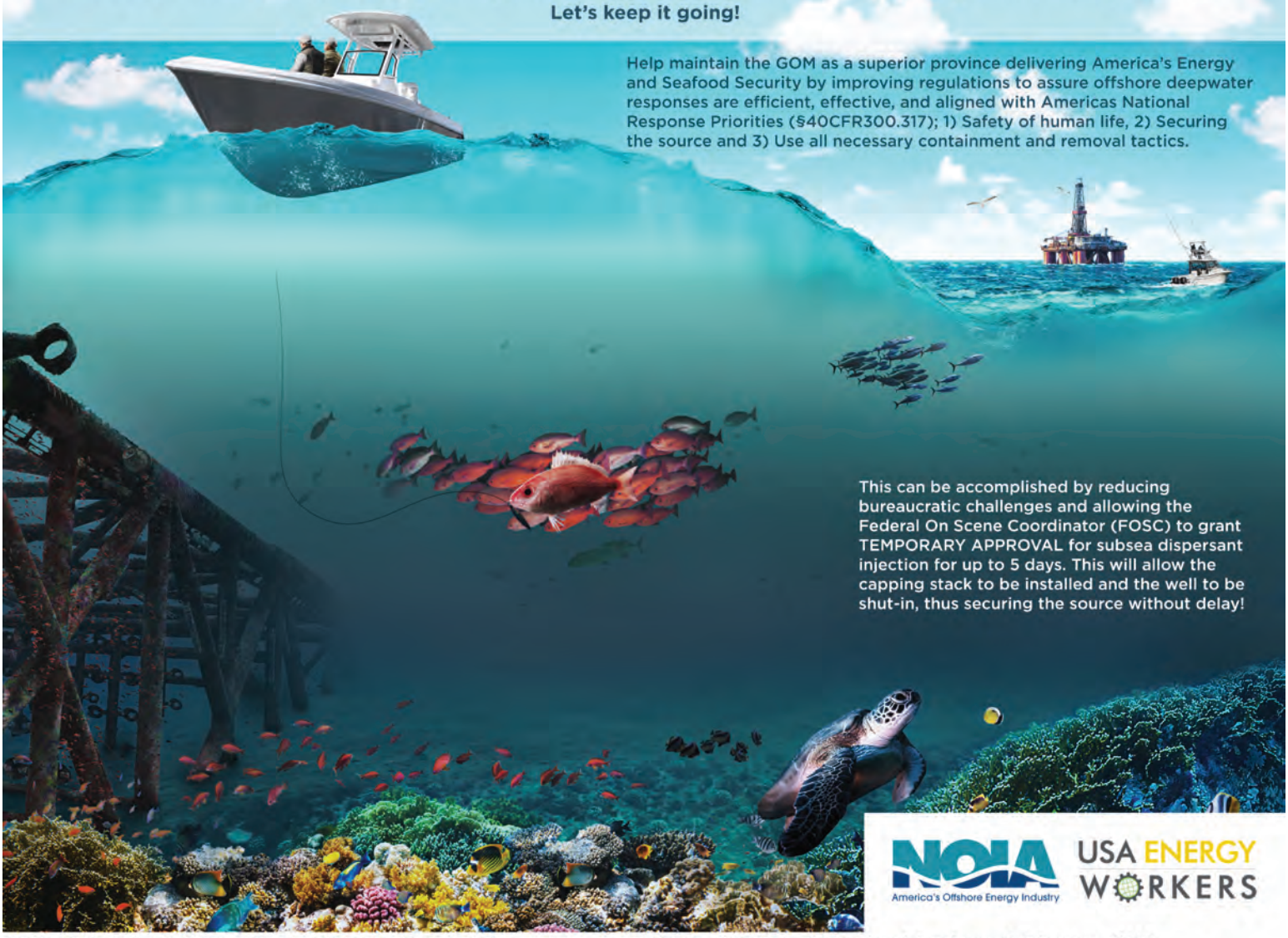


Boskalis' Bokalift 2 installs first US-made offshore wind farm substation at South Fork Wind

Boskalis

The Gulf of Mexico (GOM) has a long history of feeding and fueling America through energy and fisheries production.

Let's keep it going!



NOIA America's Offshore Energy Industry

USA ENERGY WORKERS

National Oceanic and Atmospheric Administration - NOAA Department of Commerce

"Dispersants work by breaking up oil slicks into lots of small droplets, similar to how dish detergent breaks up the greasy mess on a lasagna pan. These tiny droplets have a high surface area-to-volume ratio, making them easier for oil-eating microbes to break them down (through the process of biodegradation). Their small size also makes the oil droplets less buoyant, allowing them to scatter throughout the water column more easily."

Florida Department of Environmental Protection

"Chemical dispersants remove the oil from the surface of the water and into the water column. Once in the water column, the oil is diluted to less harmful levels, and eventually is used as a food by bacteria. Birds, marine mammals, turtles, and Florida's sensitive coast are protected when oil is removed from the water surface. Chemical dispersants do not cause the oil to sink but remain in suspension in the water column."

The chemical dispersants used today are generally not as toxic as the oil itself and, with adequate dilution, will not harm aquatic life. As an added precaution, chemical dispersants are not applied to shallow nearshore waters, mangrove areas, marshes, or waters over coral reefs and seagrass beds.

Effects of Crude Oil/Dispersant Mixture and Dispersant Components on PPARγ Activity in Vitro and in Vivo: Identification of Dioctyl Sodium Sulfosuccinate (DOSS; CAS #577-11-7) as a Probable Obesogen

"We investigated the obesogenic potential of COREXIT 9500–dispersed MC252 crude oil and identified the major COREXIT component, dioctyl sodium sulfosuccinate (DOSS), as a likely obesogen. In addition to it being a major component of the dispersant COREXIT, **DOSS is widely used in pharmaceuticals and personal care products** [U.S. Department of Health and Human Services (DHHS) 2014; Environmental Working Group (EWG) 2015a]."

Proceedings from the National Academy of Sciences - PNAS Science in support of the Deepwater Horizon response – December 3, 2012 |109 (50) 20212-20221

"Arguments in favor of subsea application of dispersants included: i) direct injection would maximize the exposure of oil to dispersant before it significantly weathered and emulsified with water, ii) compared with surface applications to slicks, significantly less dispersant would be required to achieve the same goal and iii) potential exposure of spill response workers to both airborne dispersants from surface application and volatile organic compounds associated with spill could be minimized.

Thousands of water and sediment samples from near-shore and offshore were collected and tested for major dispersant constituents, such as butoxyethanol, dipropylene glycol N-Butyl ether, propylene glycol, and dioctyl sodium sulfosuccinate (DOSS). Few water and sediment samples showed detectable levels. None of the water samples showing detectible levels exceeded EPA's aquatic life benchmarks.

The EPA conducted toxicity tests on eight dispersants listed on the NCP (National Contingency Plan) product schedule. Results indicate that none of the dispersants tested displayed biologically significant endocrine-disrupting activity; dispersants alone were less toxic than dispersant-oil mixtures. Corexit 9500A was generally similar to toxicities of other available dispersants.

After seeing images of oil and gas flowing, many people had difficulty believing that oil was disappearing rapidly from open waters, fish could metabolize PAHs (Polycyclic Aromatic Hydrocarbons), and the seafood testing was reliable.

The lack of DOSS (dioctyl sodium sulfosuccinate) in tested seafood (fishes and crustaceans) seems to support our expectation that either dispersant degraded rapidly, or it was metabolized quickly by exposed animals."

Transocean

The JOIDES Resolution in port in Ponta Delgada.

MEGA MACHINES: JOIDES RESOLUTION

When it comes to deep drillers, JOIDES Resolution takes the cake, embarking on Expedition 395 to understand the impacts of mantle plumes on deep ocean currents.

By Celia Konowe

The world's oceans, still largely unexplored, remain a treasure trove for scientists and researchers alike. Physical, chemical and biological features of the ocean interact with each other and in turn, influence oceanic, meteorological, atmospheric and even geological events. Drilling below the ocean floor for cores is a critical tool in the race to learn more about the Earth's history, current environmental dynamics, as well as their relevance for climate change and a rapidly warming future.

A leader in paleoclimatology, the study of understanding the climate and environmental change through Earth's history, is the JOIDES Resolution or JR for short. The name stands for Joint Oceanographic Institutions for Deep Earth Sampling and pays homage to Captain James Hook's HMS Resolution. The seagoing research vessel is currently embarked on "Expedition 395: Reykjanes Mantle Convection and Climate," running from June 12

through August 12. The project has three main goals, the first of which is to determine how the V-Shaped Ridges (VSR) and V-Shaped Troughs (VST) in the area along the Reykjanes Ridge (the area of the Mid-Atlantic Ridge just south of Iceland) were formed. These distinctive ocean crust patterns stretch over hundreds of kilometers on the seabed and are thought to be shaped by the mantle plume under Iceland, which is formed by hot rocks rising from deep within the Earth's interior. The second objective is to identify how the plume affects the circulation of deep cold water from the Norwegian Sea into the Atlantic Ocean (possibly through plume activity that contributed to changes in the height of oceanic gateways between Greenland, Iceland and Scotland). The third goal would determine how the structure of sediments and bedrock on the ocean floor influences how hydrothermal fluids change chemically over time.

Locations around the region were identified for sampling based on the expedition goals, seismic reflection surveys performed in the area, past expeditions and opportunities to observe and collect unique data. Site U1564, for example, is the most eastern site and located on both a perpendicular ridge and in the Gardar Drift. The drift sites are important, explained Jennifer Field, onboard outreach officer for Expedition 395, because sediments are deposited by cold-water currents from the Norwegian Sea and will indicate if the mantle plume causes an uplift and slowing of the flow. U1564 is also located away from VSRs and VSTs and will thus be used as a control site. Another promising site—and a new addition, at that—is hole U1602, which is located on an ancient VSR under the Eirik Drift, about 200 miles off the east coast of Greenland. The location is not only unexplored but may provide sediments that are millions of years old.

FULL STEAM AHEAD

Expedition 395 builds on previously collected data from 395C, which was originally scheduled for 2020 and whose objectives were partially completed in summer 2021 with only one scientist and a team of marine technicians on board. With its complement restored, Expedition 395 has a full cohort of researchers and marine technicians, allowing for preliminary conclusions to be drawn at sea. Cores revealing the age, composition and history of sediments and basaltic rocks from both expeditions will inform the scientists and aid in forming a more accurate picture of the provenance of the sediments and formation of the bedrock, explained Field. This, in turn, will help each researcher identify what types of samples they need for their individual projects. Co-Chief Scientist Anne Briais of the Centre National de la Recherche Scientifique and the Institut Universitaire Européen de la Mer at the Université de Bretagne Occidentale shared that her research is focused on basalt and the comparison between ridges and troughs. "I'm comparing the morphology of lava flows and correlating them to areas of the ocean floor further from the mantle plume. The three hypotheses of the creation of VSRs and VSTs and the role of the hot spot are crucial to understanding how mid-ocean ridges are working to build ocean crust."

DRILLING DEEPER

The JR is well-equipped with the advanced technology necessary to champion its role as a paleoclimate research vessel. Field shared that key features include a 3D x-ray scanner to see inside sediment cores, a scanning electron microscope to examine minerals inside rocks, and a mass spectrometer to measure the composition of fluid trapped in sediment. Most notable is the vessel's 60-meter derrick, which has the capability to lift more than 6,000 meters of drill string. As such, the JR is unparalleled in its use of a riser-less drilling system as the only globally operating research ship with this deep-water coring ability.

After the onboard coring technology is employed, samples go through preliminary examination to gather initial data. The cores enter a whole-round multi-sensor logger (WRMSL) and special task multi-sensor logger (STMSL), which measure properties like density and magnetic susceptibility, and then are sent into the whole-core x-ray machine. Cores are then split lengthwise, with one half set aside for archive and one for analysis onboard. Samples are taken from the working half to test for physical properties such as moisture, density and magnetism, plus minerals and biological composition are examined under a microscope. Each scientist will conduct further analysis based on individual research needs. The archived half is imaged using a section half imaging logger (SHIL) and a section half multi-sensor logger (SHMSL), which record a photographic image and properties such as reflected light and magnetic susceptibility. The intensity and orientation of magnetism is measure and a description of the core is entered into a database. Archive halves are boxed and stored in a cooler onboard and moved into a repository post-expedition for further research.

© Jennifer Field & IODP

View of the derrick from the helideck.

© Jennifer Field & IODP

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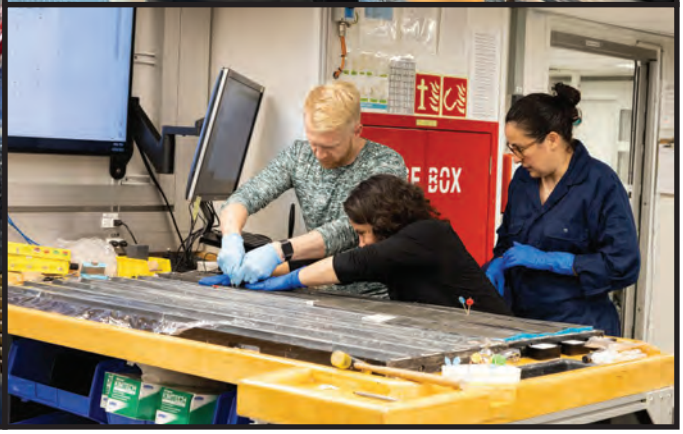


© Tiffany Liao, IODP JRSO

UNCHARTED TERRITORY

By coring through sediments in the drifts, Expedition 395 has the potential to reveal what the oceans were like during periods when the Earth was warmer, and in turn, what to expect in the current era of global warming. The team is also enthusiastic about findings from U1602, the new site on the Eirik Drift, as cores haven't been taken from that area before. "We are seeing patterns in the cores that indicate much change through geological history and we are hoping to reach sediments that are about 48 million years old," Field said.

Yet as is the cliché, all good things must come to an end. Expedition 395 marks one of the JR's last research trips with the International Ocean Discovery Program (IODP), a platform provided by the U.S. National Science Foundation (NSF) that focuses on the history and structure of the planet as recorded in seafloor sediments and rocks. The final year of full JR operations under the current arrangement will be Fiscal Year 2024, noted the NSF in a press release. The vessel is owned by Overseas Drilling Limited (a subsidiary of Siem Offshore AS) and operated by the JR Science Operator (JRSO) at Texas A&M University. The JR began working for the Ocean Drilling Program in 1985 until the IODP (then under the name of Integrated Ocean Drilling Program) began in 2003.

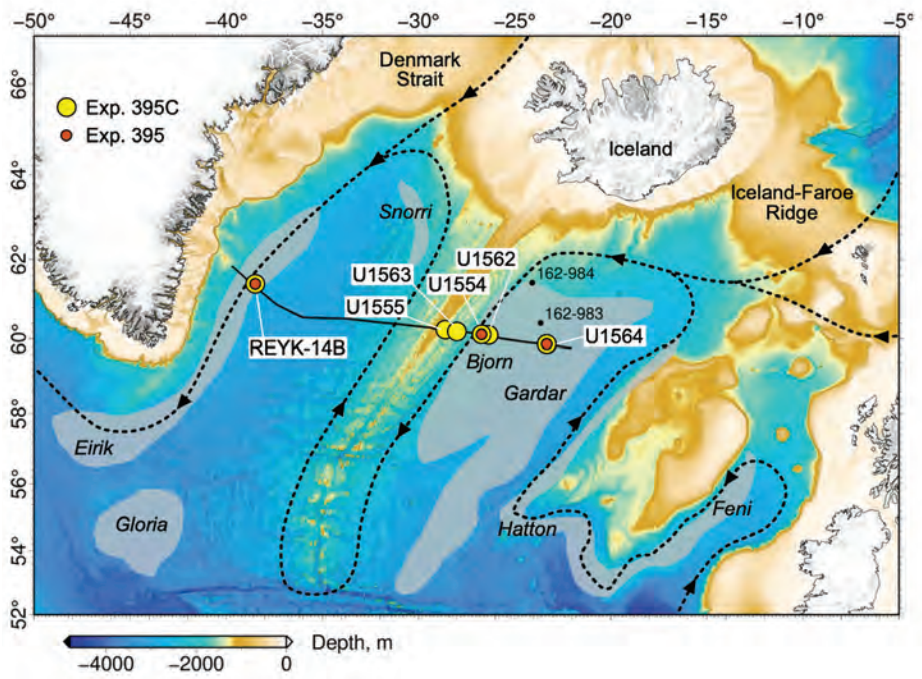
Despite not renewing its agreement with the JR due to rising operational costs, the NSF intends to continue supporting the U.S. scientific ocean drilling community through research investments and plans for future activities. "Scientific ocean drilling has significantly contributed to understanding the broader Earth system and NSF recognizes the importance of these contributions," the orga-

The Expedition 395 science party.

nization stated. "By ending support for the JR now, funds and resources can be directed towards ensuring a sustainable future for the scientific ocean drilling community."

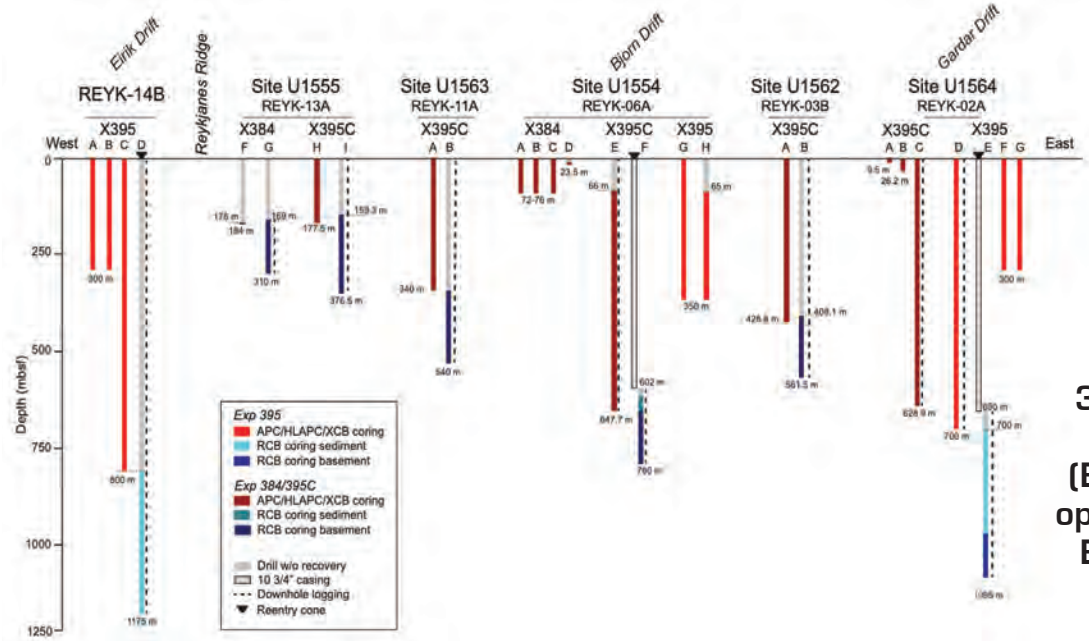
At the time of writing, the JR was exactly halfway through Expedition 395, with a month left on data collection and countless mysteries of the deep ocean and Earth's past to uncover. With the groundwork set in 2021, scientists at sea can build on previous research, make informed decisions in the field, and cohesively assemble a detailed history like never before. "We are really excited to be able to continue drilling in sites that were previously drilled in 395C as this has given us a reliable image about both dates and conditions back through the Miocene," said Field.

The sediment cores from Expedition 395 will provide unprecedented insight into mantle dynamics and how these influence changes in the planet's interior, oceans and climate. The relationships between Earth's natural processes is a complex one, as well as a precursor for future climate mitigation and adaptation. With each core the JR collects, one more piece is added to the deep-sea puzzle.



© Parnell-Turner, Briais & LeVay, 2023

Bathymetry, deepwater currents (dashed lines), contourite drifts (gray shading), Seismic Profile JC50-1 (solid line), and Expedition 395 and 395C sites.



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Summary of completed (Expeditions 384 and 395C) and planned (Expedition 395) operations for the Expedition 395 science plan.

IGP

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"YOU'RE GONN
A BIGGER CRA

Jan De Nul

A NEED ANE..."

Offshore wind turbines are reaching new heights both literally (meters), and figuratively (megawatts). As the demand for larger turbines surges, so do the challenges faced by offshore installation contractors, which need to come up with bigger vessels, and, consequentially, bigger cranes.

By Bartolomej Tomic

"What they generally need, or looking for these days, is bigger. And bigger not only in safe working load, but also bigger in hook height. And that's typically represented by the length of the boom of the crane. So, a 140-meter boom used to be a very long boom in 2020, but these days people are contracting us for booms of 155-meter boom length, and they're looking at more,"

– Cees van Veluw,
Product Director of Cranes, Huisman

When I took on the assignment to produce a piece focusing on heavy-lifting cranes and deck machinery for *OE*, I immediately thought of Huisman as a company best suited for coverage in this space, especially for its LECs (Leg Encircling Cranes).

If you type in "Huisman" in the search box of **OEDigital.com**, you'll get about 172 articles, and in recent years, most of them have been about Huisman securing orders for Leg Encircling Cranes for jack-up offshore wind installation vessels. These orders have come, amongst others, from Van Oord, Cadeler, Havfram, Eneti, Dominion, DEME Offshore, Jan De Nul, and Fred. Olsen Windcarrier – basically, creme-de-la-creme of offshore wind installation service providers.

To learn more about these offshore cranes, we turned to Huisman's Cees van Veluw.

With a background in structural engineering and mechanical engineering, Cees van Veluw's journey at Huisman began in 2005. Over the years, he has climbed the ranks to his current role as the Product Director of Cranes, a role he's held since July 2022.

His responsibilities include supporting the sales team by providing proposals and driving new technical developments for offshore cranes.

What is a Leg Encircling Crane?

Van Veluw says that the name itself explains what a leg-encircling crane is. These cranes are installed on jack-up vessels – self-elevating units with legs - and the crane circles around one of these legs.

"A jack-up vessel is lifted out of the water, legs are put on the seabed. The jacking system pushes up the vessel, and this way, the vessel has turned into a stable platform for installing wind turbines," Van Veluw explains.

"When you put the crane on, there's always a battle for space on the vessel," Van Veluw explains. But, if you circle

Van Oord

the crane around the leg, so you have the leg in the center line of the crane, this saves valuable operational space.

So this is the reason why the company came up with this design some years ago, and has since produced quite a few of them.

Basically, Van Veluw says, the whole idea started with a, "Hey, can we put a ringer crane like the PTC-35 we supplied to Mammoet? Can we put a crane like that on a jack-up vessel?"

"Well, it started that way, and then we moved on and on and on with that one. And it has been fine-tuned with many models, and this is where we are right now. And it has been quite a popular model for installation of turbines mainly, but also for installation of foundations," Van Veluw said.

All Huisman's LECs are fully electric, which, Van Veluw says, provides operational accuracy, and reliability, are less noisy, and there's no threat of hose bursting.

Customization & Installation

Huisman's LECs are not an off-the-shelf product but are tailored to meet the specific requirements of each client, an offshore wind installation firm, or a shipyard building a WTIV.

"Customization is basically done by almost all of our customers," Van Veluw says, adding that this depends on hook configurations, boom lengths, features, speeds, paint systems, operator cabin layouts, etc.

According to Van Veluw, it takes between two and two and a half years to deliver an LEC, depending on the features, the moment in time, the supply chain situation, and the level of customization.

The other aspect is installation, he says.

"It's a big crane that needs to come on a big vessel. So, the exact integration has to be discussed with the owner, and if there's a yard involved, also with the yard," Van Veluw says.

To facilitate easier installation, Huisman invested in a big Skyhook crane in its facility in China, where the company builds the LECs – it builds them in Europe, too - and, when convenient, it can install the crane on a vessel there.

Vessel Owners Want it Bigger

What do offshore wind turbine installation vessel operators call for these days, when it comes to Huisman's LECS?

"What they generally need, or looking for these days, is bigger. And bigger not only in safe working load, but also bigger in hook height. And that's typically represented by the length of the boom of the crane. So, a 140-meter boom used to be a very long boom in 2020, but these days people are contracting us for booms of 155-meter boom length, and they're looking at more," Van Veluw says.

For example, the **OEDigital.com** archive shows that in November 2015, jack-up owner Seajacks, today owned by Eneti, took delivery of the Seajacks Scylla jack-up installation vessel, at the time dubbed „the world's largest and most capable installation jackup vessel to date." The vessel featured a Huisman 1540-tonne leg-encircling crane, and Seajacks said at the time, "it can handle XL monopiles, jacket foundations, and is able to transport an impressive number of the 7 and 8MW turbines that are currently [in 2015] available in the wind market."

Since those times, turbines have grown bigger, and with them, the need for bigger cranes and vessels.

In 2020, Fred. Olsen Windcarrier ordered a 1,600mt Leg Encircling Crane, capable of installing foundations and "all known next-generation offshore wind turbines," with an illustration shared showing that the vessel could install a 12MW wind turbine „of the future." This crane was installed on an existing vessel, extending its lifetime.

But how things have changed since then, and how quickly, show the recent LEC orders Huisman has received, with LECs ranging from 2200t to over 3000t lifting capability.

Earlier this year, Huisman shipped the 2,200mt leg encircling crane to the Keppel AmFELS shipyard in Brownsville, Texas, for integration on the Charybdis, the first Jones-Act compliant WTIV.

Last year, Huisman's LEC 3200t crane was installed on Jan De Nul's Voltaire jack-up, breaking the record for the world's largest installed LEC. Jan De Nul's spec sheet of the vessel claim's a maximum crane lifting capacity of 3,200 t, with a maximum lifting height above deck of 162.5 meters.

The Voltaire has been designed to install the offshore wind turbines of the future, with turbines over 270 meters high and blades 120 meters long. The vessel will soon start installing giant 14MW turbines at the Dogger Bank wind farm offshore the UK, which will, once fully completed, be the world's largest at 3.6GW.

Also, Dutch firm Van Oord, in November 2021, ordered a 3,200t Huisman LEC, designed to be able to install turbines of up to 20MW, for its also newly ordered, 175-meter, methanol-power jack-up vessel Boreas.

"This crane will be the largest Leg Encircling Crane that Huisman has developed to date in terms of lifting capacity, boom length, installed power, and technical features," Huisman said at the time. The Boreas is expected to be delivered in 2024.

In April 2023, Huisman won a contract from offshore wind installation contractor Havfram Wind for the delivery of a 3,000mt+ Leg Encircling Crane for its second NG-20000X Wind Turbine Installation Vessel.

The LEC will be outfitted with a 155-meter boom and will have a lifting height of approximately 180 meters above deck.

We asked Van Veluw if these cranes could go even bigger, and if there was a limit somewhere.

"We are indeed looking at an even bigger version [of an LEC]," Van Veluw says, adding that the company has a model ready for a 5000t LEC version.

"It has to be seen in conjunction with the total vessel. So one of the tricky things with the vessel is the jacking system. We've also started looking into jacking systems ourselves. We have a full-scale demonstrator in our facility in Schiedam, which is open for evaluation by our clients as well. And we have seen that bigger cranes need bigger jacking systems."

"10MW is easy"

Global energy industry intelligence group Rystad said late in November 2020 that the offshore wind industry would, as early as 2024, face a shortage of WTIVs capable of installing 10MW+ turbines, and that, at the time of that report, there had only been four WTIVs capable of installing 12MW+ turbines.

"[Today,] the 10MW one is easy," Van Veluw said, adding that most of the Huisman recent LEC orders we mentioned earlier were capable of installing 15MW turbines at

least, and some of them even bigger than that.

"So people have learned from the past that you shouldn't order a crane too small. And still, turbines keep on growing and growing, and there will be another moment in time when some cranes are too small. It will happen."

As for any limits on how big these cranes could get, Van Veluw says: "Well, probably there is a limit somewhere, but the limit is not at the 5,000 ton and the boom length of, let's say, 170, 175 meters we're facing today. It can be bigger, and from the crane perspective, it can be longer."

OETV

Watch the full interview with **Huisman's Cees van Veluw** on ***Offshore Engineer TV***, as we also discussed:

- **Van Veluw's crane project of which he is most proud:** *(spoiler alert, it is not an LEC, but it is 5,000 tons);*
- **The role of the AI in the future of crane development and operation**
- **How the offshore crane order book has changed over the years from oil and gas to renewables**
- **Benefits of upgrading cranes on older vessels, and**
- **Different approaches to installing cranes based on whether a vessel is a new-build or retrofit.**

Vard

OETV
Watch the interview from Norway on *Offshore Engineer TV*

"Game-Changing" CSOV In Norway

Offshore Engineer was recently in Norway to learn more about the newly launched Construction Service Operation Vessel REM Power, and of particular interest for this magazine edition, its crane.

The vessel's owner REM Offshore is a Norwegian company, for years, best known for its vessels providing support in the oil and gas sector. However, the company has, in the past few years, been expanding into the offshore wind sector.

A testament to these new efforts is the delivery of the REM Power, which Ronny Pål Kvalsvik, Rem Offshore's Chief Commercial Officer, says this is "a game changer" for the SOV market due to the combination of equipment and technology onboard.

Delivered in May 2023, the 85-m long vessel, equipped with a diesel-electric and battery hybrid propulsion system, was completed in Vard Soviknes, in Norway.

It is the world's first vessel of the type to be equipped with Kongsberg Rim-driven azimuth propellers as main propulsion, and it is also equipped with a system that measures the vessel's environmental impacts throughout each stage of the lifecycle, from raw materials extraction to disposal.

The Crane

But, as mentioned, for Offshore Engineer's Deck Machinery and Cranes section, REM Power's innovative all-electric, 5-ton, 25-meter, heave compensated crate, developed in collaboration with Seaonics, is arguably the most exciting bit.

At the launch, the company said that Rem Power would be the world's first vessel to be equipped with VARD daughter SEAONICS' Electric Controlled Motion Compensated (ECMC) crane, securing efficient handling operations for a sustainable future.

"This system allows to always keep the load close to the crane tip from the deck level to the TP platform. The new and innovative crane ensures quick and safe cargo transfer," the company said.

Seaonic's sales manager Ståle Fure says the crane is fully 3D compensated, fully electric, and has a completely new design.

"It's on an old principle in a new design, with a telescopic and wire luffing for the luffing boom," he says.

He also talks about the benefits of going fully electric: "When you go electric, you get a very good response for your access, where you're going to do the compensation for. And this is actually one of the biggest advantages of the electrical solution, that you can get a very accurate motion compensating, and of course, also, to regenerate back power to the grid on the vessel, the AC grid or the DC grid, depends. And, of course, there is no oil in this system at all."

Where it all Started

In 2023 Seaonics won awards for its fully electric and motion-compensated crane, and at the industry conference where the award was presented, it was there that Rem's Ronny Pål Kvalsvik saw the crane concept and started thinking about ordering one.

He says "[Seaonics] presented a crane, and I [thought], this looks interesting. Where can we utilize this technology? How could we do it? And then we started discussing it between us. We have a need. We want to have this capacity. We want to have it electrical."

Capacity

And then, Kvalsvik says, the ball started rolling, the company ordered the vessel and realized they needed a higher-capacity crane.

"We needed at least a five-ton. Of course, I had to ask for seven. We need to have harbor lifts that were higher than any cranes had, also, 3D cranes. So this was the background. We needed to have something that was a bit higher than what we saw in the market, and we challenged Seaonics to come up with a solution for,"

Seaonic's Fure said. "We had a [crane] concept, but together with the REM, we actually made it better.

"And, of course, the crane got the higher SWL [Safe Working Load]. We started with two tons, then it got three tons, then we got five tons, now we got seven tons, and we got 15 tons in harbor mode."

Walk to Work

As for the Rem Power, which offers accommodation for up to 120 persons, including 93 windfarm technicians and a crew of up to 27, at the time of speaking with Kvalsvik and Fure, the vessel was working for ASSO Subsea supporting a Vattenfall wind farm construction, providing welfare and transfer services to personnel.

For easier transfer of personnel to and from the vessel and the Rem Power is equipped with a special W2W system (walk to work). The Uptime 30m AMC logistic system is said to consist of the world's first autonomous gangway with artificial intelligence, combined with an integrated elevator tower for personnel and cargo logistics.

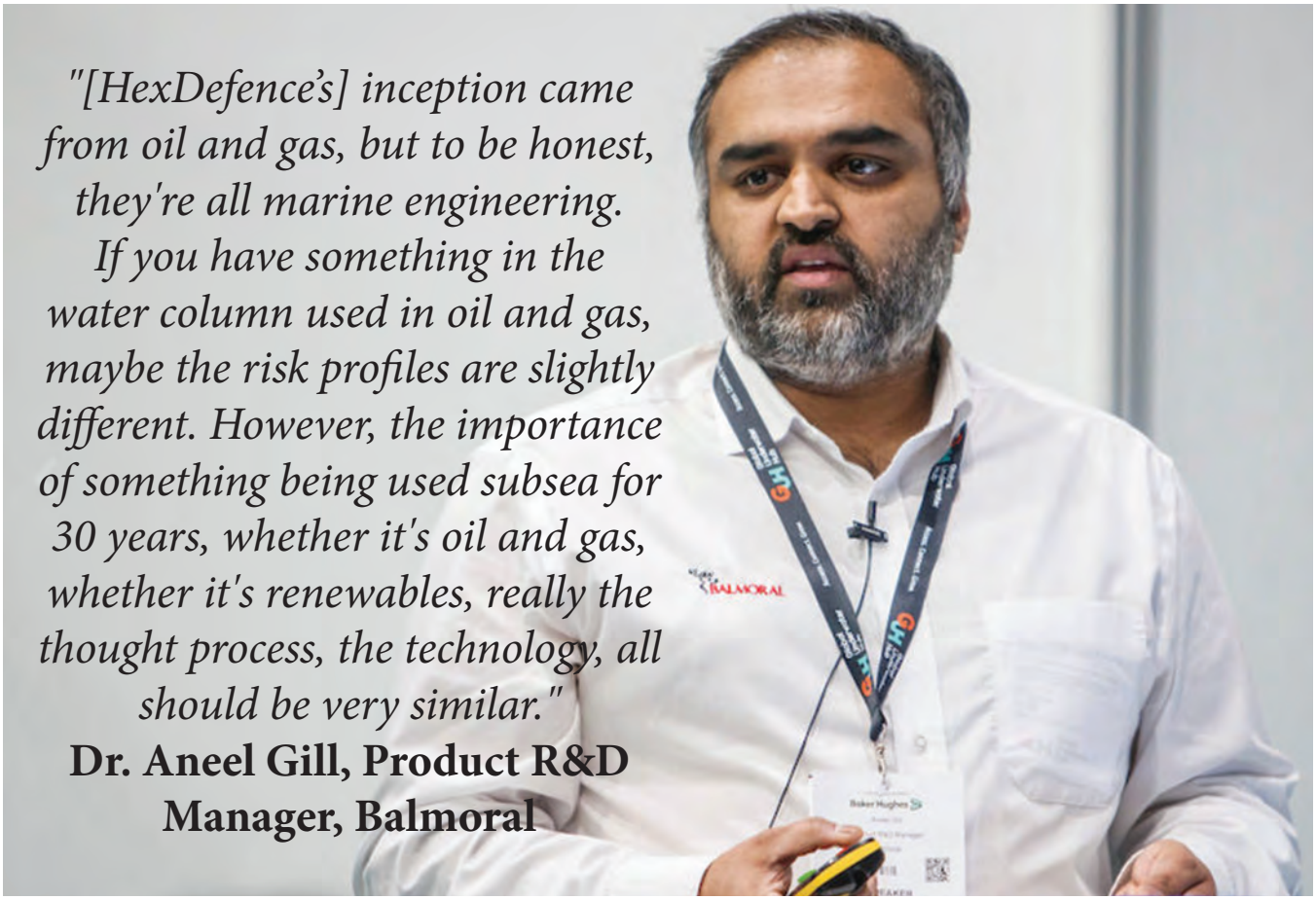
It is capable of auto-landing, slip-off detection, integrated crane function for cargo handling, integrated transferlines, and stepless access for personnel and cargo.

All images courtesy Balmoral

Tech File: HexDefence Scour Protection For Offshore Wind

As the pace of offshore wind installation accelerates globally, all eyes turn to tools and techniques that will enable efficient installation and lifecycle protection of offshore wind towers. Balmoral, with decades of experience protection offshore oil and gas infrastructure, debuts HexDefence. ***Dr. Aneel Gill****, Product R&D Manager, Balmoral, discusses the key benefits.*

By Greg Trauthwein



Much innovation comes down to filling gaps. What gap did you see in the market that let to the invention of HexDefence?

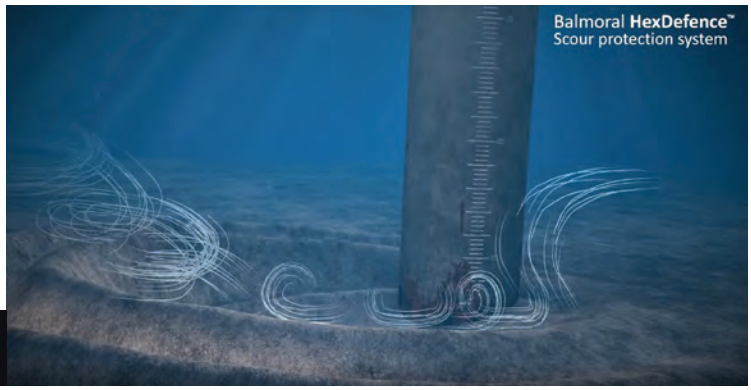
One of the main products that we have at Balmoral is a cable protection system, protecting the cable as it's coming out from a monopile or a jacket configuration, taking it past a traditional scour protection. What we were actually looking at was how do we diminish accelerated flow, which is a phenomenon of water going past a cylindrical object [as it] increases loads.

We had a product that we knew was very good in terms of its hydrodynamic performance, hydrodynamic shape within the oil and gas sector, and that was our LDV product. Looking at those feasibilities, what we found was we found a reduction in accelerated flow. But we also noticed a reduction in prevalent kinetic energy, and we used that as an indicator to say, 'maybe there's something else here. Maybe this can also reduce the shear stress at seabed', which is a key factor in the phenomena of scour.

We followed up, we've done tank testing, we've done CFD work and we've shown that the product has some really strong performance when it comes to an alternative method to scour protection.

How specifically does HexDefence work?

It's not a magical device, all we are really doing here is redistributing flow. And if we redistribute flow, we are redistributing energy and we're dropping the load cases which are occurring on the seabed. And if you think about it like a particle of sand or a particle of rock, there's a certain amount of energy that it takes to move each particle. If we are able to drop the energies down at the seabed, we're able to stabilize it, make it less prone to erosion or the forces occurring as the current is passing through or past the object, the structure within the water column. There's bit more to it, but in a nutshell that's what we're doing: we're redistributing energy; we're moving current flow away from concentrating it on the seabed.



Scour Pneumonia

HexDefence – Installation

Can you discuss a bit more about the materials that are used for HexDefence? How long are they designed to last, and what, if any, specific or special maintenance do they require?

Right now we are looking at a couple of different options. Both have different ways of manufacturer, also have different advantages. One is a GRP or an epoxy-based system, designed to be used in a seawater environment for 30 years plus. We're also looking at other materials, things like concrete and items like that, which again, have a different cost structure but also have a different advantage as well. Things like ballast, weight mass, which also helps with the product and making it more stable when it's around a monopile.

Does HexDefence come from the oil and gas sector?

Its inception came from oil and gas, but to be honest, they're all marine engineering in my opinion. If you have something in the water column used in oil and gas, maybe the risk profiles are slightly different. However, the importance of something being used subsea for 30 years, whether it's oil and gas, whether it's renewables, really the thought process, the technology, all should be very similar.

What is the process to install HexDefense and how does it save time or money in terms of alternative methods of protection?

We've had discussions with developers and installers to really hone in on a installation process that works for them. We've come up with some basic strategies, and the idea is it's sleeved over a monopile structure, and that's utilizing the same vessel, the same lift vessels that we would use for let's say the transition pieces which have to also get fitted. That's one scenario. There are obviously different scenarios within the, or different installation strategies that account happen for different fields. But one scenario would be that.

The idea here really is the total cost of ownership. It's about saying, "We'll put HexDefense on and we are able to reduce the level of rock dumping." So that eliminates the need for a number of vessels. It's also saying we are able to bury our cable much closer to the monopile, therefore it's to have reduced dynamic length and making the load cases much easier to contain on things like cables. Again, we're thinking longevity. We're thinking what can we do for the total cost of ownership of the field. And we see a lot of the time saving, a lot of OpEx cost being saved and really improving the lifespan of cables, improving the lifespan of not having to go and redo a rock dumping operation after the fact.

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50TH ANNIVERSARY

BY THE NUMBERS

RIGS

Worldwide

Rig Type	Available	Contracted	Total	Utilization
Drillship	7	74	81	91%
Jackup	200	268	468	57%
Semisub	26	51	77	66%

Africa

Rig Type	Available	Contracted	Total	Utilization
Drillship	1	13	14	93%
Jackup	16	15	31	48%
Semisub	1	4	5	80%

Asia

Rig Type	Available	Contracted	Total	Utilization
Drillship	4	5	9	56%
Jackup	90	68	158	43%
Semisub	17	6	23	26%

Europe

Rig Type	Available	Contracted	Total	Utilization
Drillship	1	7	8	88%
Jackup	15	30	45	67%
Semisub	5	21	26	81%

Latin America & the Caribbean

Rig Type	Available	Contracted	Total	Utilization
Drillship		25	25	100%
Jackup	3	3	6	50%
Semisub		12	12	100%

Middle East

Rig Type	Available	Contracted	Total	Utilization
Jackup	41	122	163	75%
Drillship				

North America

Rig Type	Available	Contracted	Total	Utilization
Drillship	1	24	25	96%
Jackup	26	23	49	47%
Semisub	2	3	5	60%

Oceania

Rig Type	Available	Contracted	Total	Utilization
Drillship				
Jackup		2	2	100%
Semisub		3	3	100%

Russia & Caspian

Rig Type	Available	Contracted	Total	Utilization
Jackup	8	2	10	20%
Semisub	1	2	3	67%

Global Average Dayrates

Floaters		Jackups	
Ultradeep water	414.7	High-spec	145.3
Deepwater	325.0	Premium	141.9
Midwater	398.7	Standard	90.8

This data focuses on the marketed rig fleet and excludes assets that are under construction, retired, destroyed, deemed noncompetitive or cold stacked.

Data as of August 2023
Source: Wood Mackenzie Offshore Rig Tracker

DISCOVERIES & RESERVES

Offshore New Discoveries

Water Depth	2018	2019	2020	2021	2022	2023
Deepwater	16	20	14	13	22	2
Shallow water	56	86	44	55	33	20
Ultra-deepwater	18	18	11	7	16	5
Grand Total	**90**	**124**	**69**	**75**	**71**	**27**

Shallow water (1-399m) Deepwater (400-1,499m) Ultra-deepwater (1,500m+)

Offshore Undeveloped Recoverable Reserves

Water Depth	Number of fields	Recoverable reserves gas mboe	Recoverable reserves liquids mbl
Deepwater	577	47,888	22,933
Shallow water	3,230	420,483	143,157
Ultra-deepwater	339	47,058	28,326
Grand Total	**4,147**	**515,429**	**194,417**

Contingent, good technical, probable development.

The total proven and probably (2P) reserves which are deemed recoverable from the reservoir.

Offshore Onstream & Under Development Remaining Reserves

Region	Number of fields	Remaining reserves gas mboe	Remaining reserves liquids mbl
Africa	577	18,421	12,058
Asia	833	15,773	7,918
Europe	758	13,460	12,237
Latin America and the Caribbean	193	6,985	41,215
Middle East	141	92,657	149,982
North America	469	2,931	13,518
Oceania	89	11,753	1,181
Russia and the Caspian	60	17,509	13,333
Grand Total	**3,120**	**179,487**	**251,442**

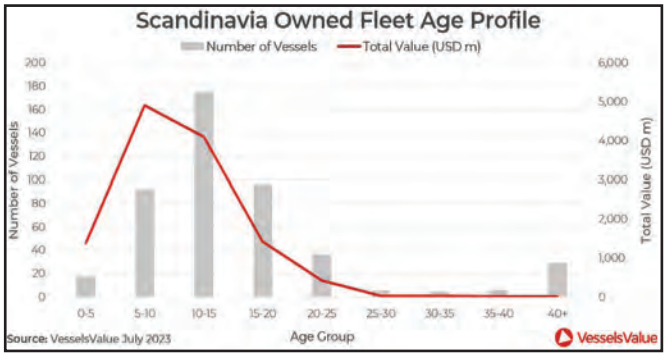
Onstream and under development.

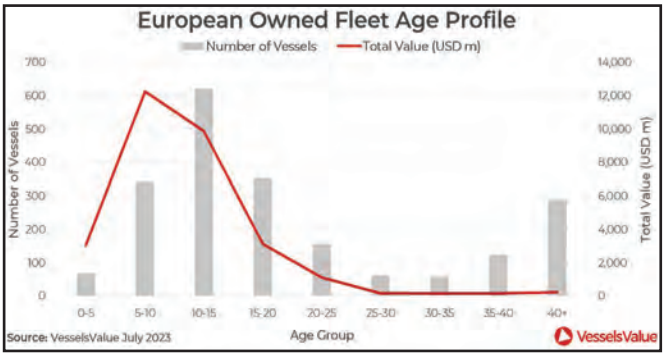
The portion of commercially recoverable 2P reserves yet to be recovered from the reservoir.

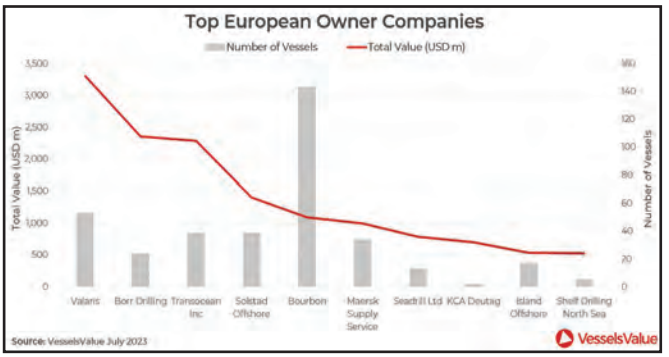
Source: Wood Mackenzie Lens Direct

SECTOR IN FOCUS

SCANDINAVIA







Scandinavia Owned Offshore Fleet

Vessel Type	Number of Vessels	Total Value USD m
OCV	92	4,695.60
MODU	57	4,046.09
OSV	318	3,872.20
Grand Total	**467**	**12,613.89**

European Owned Offshore Fleet

Vessel Type	Number of Vessels	Total Value USD m
MODU	248	13,085.68
OSV	1,674	9,754.74
OCV	173	8,193.30
Grand Total	**2,095**	**31,033.72**

Scandinavia Owned Live Offshore Fleet Utilisations

Vessel Type	Active	Laid Up	Total	Percentage Laid Up
OSV	293	20	313	6%
OCV	92	0	92	0%
MODU	46	4	50	8%
Grand Total	**431**	**24**	**455**	**5%**

European Owned Live Offshore Fleet Utilisations

Vessel Type	Active	Laid Up	Total	Percentage Laid Up
OSV	1,368	204	1,572	13%
OCV	190	7	197	4%
MODU	166	31	197	16%
Grand Total	**1,724**	**242**	**1,966**	**12%**

Data & Statistics powered by VesselsValue

24-7 OPERATIONS

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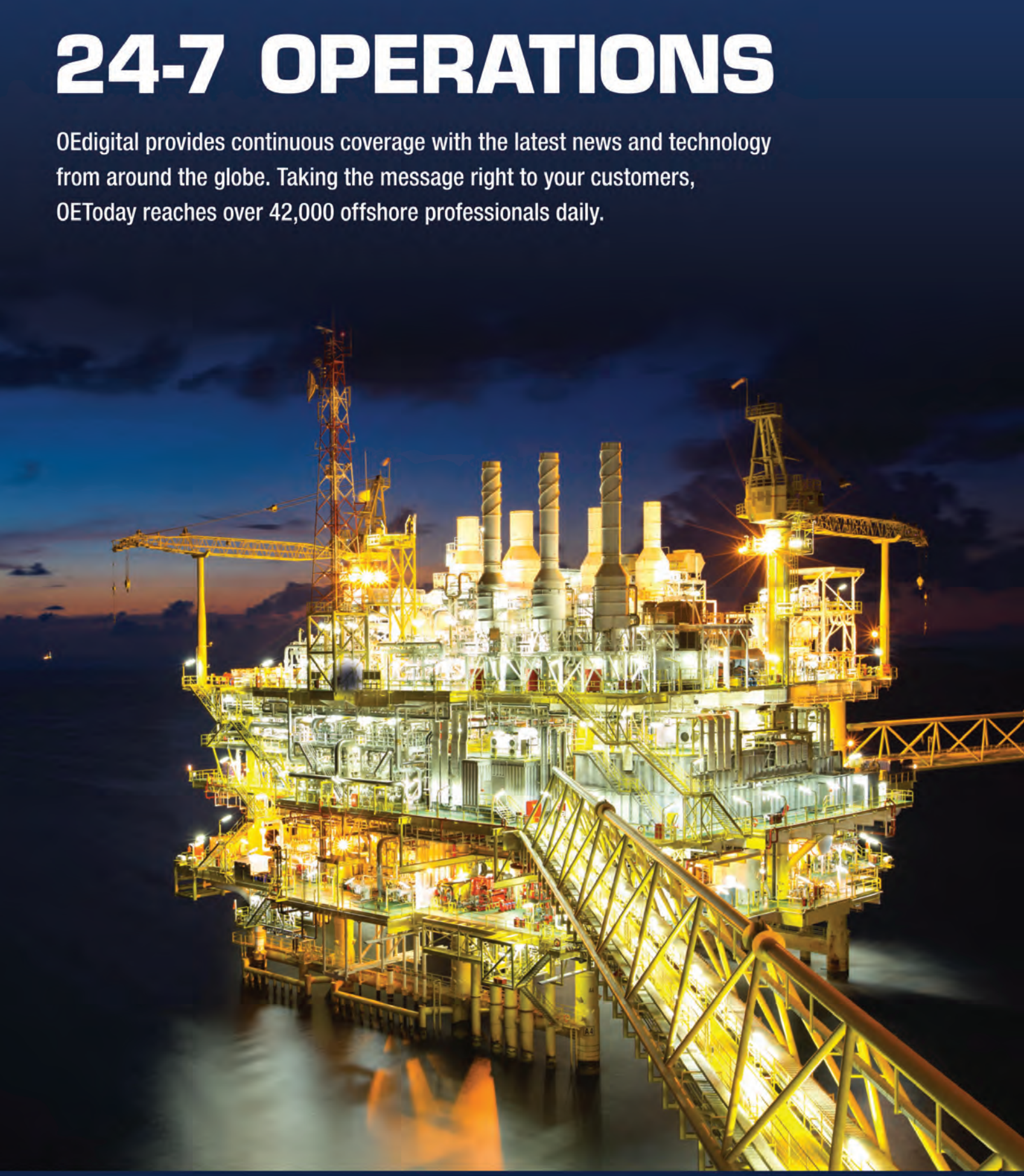

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