Offshore engineering moves up a gear with an integrated design approach

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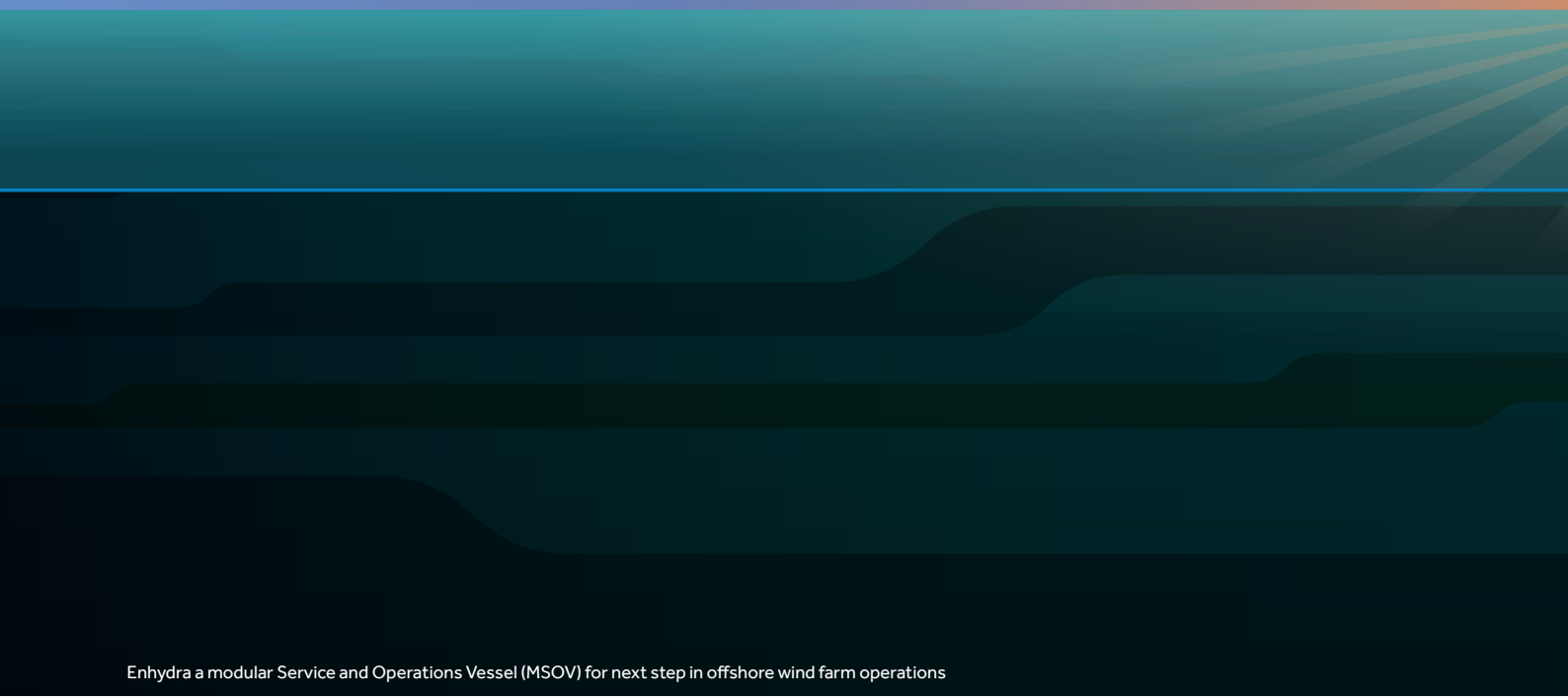


Enhydra a modular Service and Operations Vessel (MSOV) for next step in offshore wind farm operations

New challenges call for new ideas. Recognising the unpredictability of the offshore environment and understanding that when it comes to solutions and equipment, one size doesn't fit all, is an important key to success within the sector.

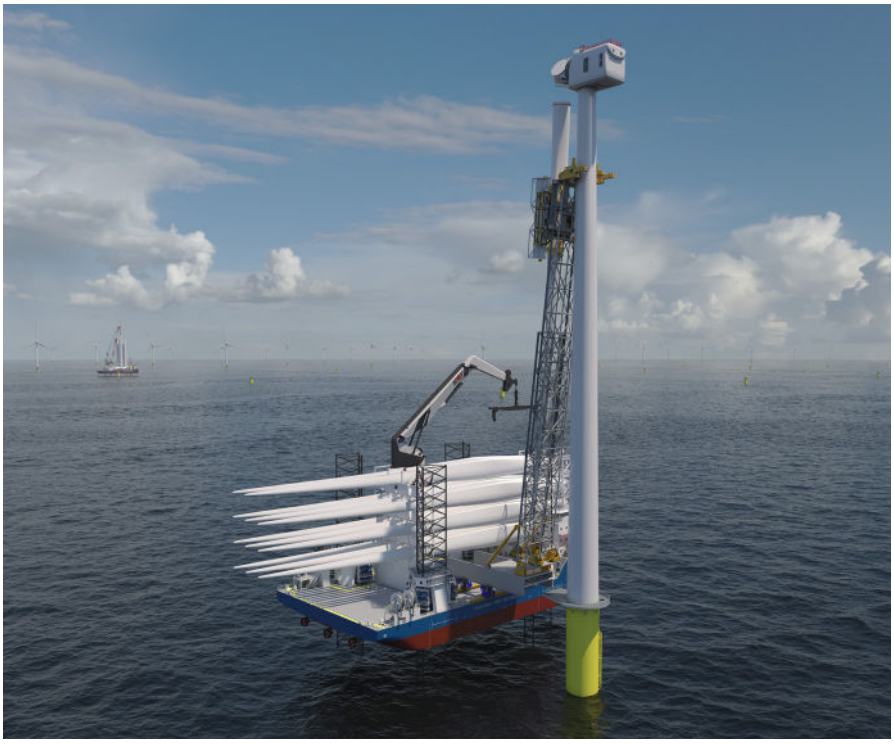
Offshore wind is a fast developing and ever-changing industry, and nowhere are the challenges greater felt than in engineering. One particular demand that has been on the increase in recent years is for larger jack-up vessels. The expected increase of weights of tower and turbines and the increased hub heights of the next generation turbines are considerable and exceed the capabilities of most of the existing fleet.

As offshore wind farms scale up in size and complexity, robust operations and maintenance strategies are needed. A modular and integrated approach may be the best way to optimize not only operations and maintenance, but also to deliver a full lifecycle approach to the offshore wind farm, from construction to decommissioning.

With the growing size of offshore wind turbines and the expanding range of locations for wind farms, the foundation weight and size also keep increasing. With monopiles of 3,500t and possibly more, and jackets becoming increasingly tall, there is now a real demand for floating foundation installation and jack-up vessels, as well as a requirement for increased variable loads and heavy lift cranes with a higher lifting capacity.

Working larger and smarter

GustoMSC has been responding to these developments, by offering increasingly large



Sjøhest blade installation methodology

wind turbine installation (WTI) vessel designs, larger capacity jacking systems and higher capacity heavy lift cranes with increased boom lengths. Smart technology is also now a big focus for the company, particularly as offshore wind expands into new geographical locations, including Asia and the US. Reducing their environmental footprint is key, with designs using alternative fuels or fuel cells, as well as new technologies all being introduced into the company's portfolio with these issues in mind.

As wind farm developments and their equipment grow, and as activity moves further offshore, costs potentially rise with them. The challenge then becomes one of keeping the whole installation process cost effective, efficient, reliable and safe, hence reducing the operational risks. And the demand for more efficiency goes beyond how the issues of weight and size are dealt with. It also applies to the ways of working, including in more difficult conditions. This is where GustoMSC places a huge amount of value on gaining customer insight and feedback. Talking to customers enables the company to discover where the bottlenecks are, before analyzing them and improving the equipment's design.

It firmly believes that as the increasing size of wind turbines continues, alternative installation methodology and a smart and an efficient integrated design approach are required. The constant demand to stretch the boundaries in the offshore wind turbine installation market, combined with the need to make the installation process more efficient, means a holistic approach to the design process is needed to be able to offer the solutions the market is looking for.

Alternative installation methods

While the industry would perhaps benefit from a pause in the development of larger turbines, or at least a standardization of turbines and foundations, this is unlikely to happen. So GustoMSC dedicates itself instead to designing and building bigger equipment, and to introducing alternative installation methods. For example, in response to the ever-growing wind turbines with larger blades, the company has introduced Sjøhest, an alternative wind blade installation methodology, with major time and cost savings.

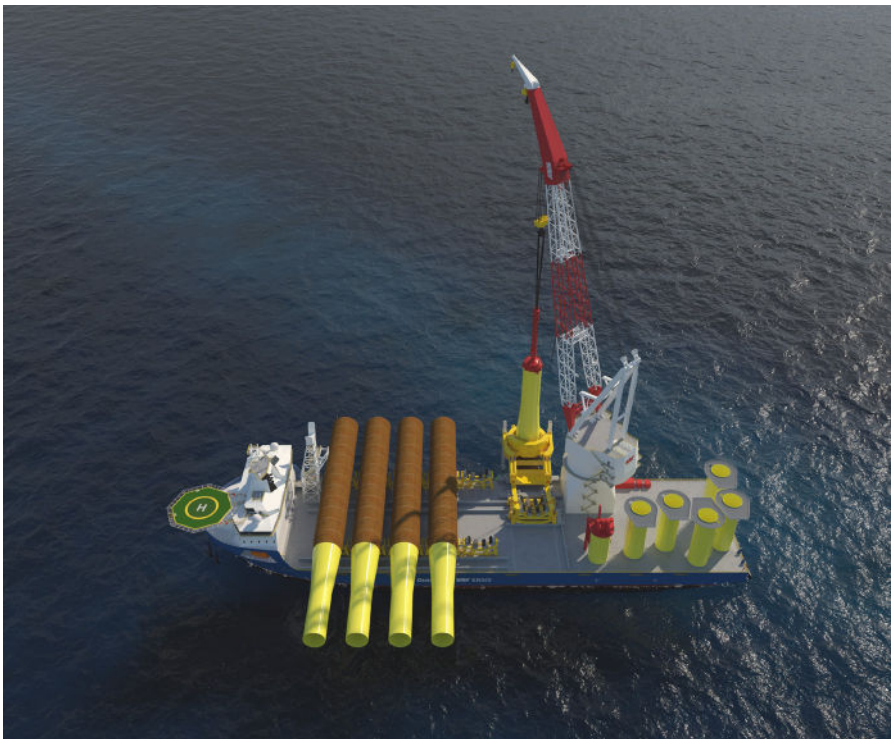
The Sjøhest Wind Blade Installation (WBI) solution consists of a dedicated new-build NG-5500XL, or a smaller converted jack-up vessel. A telescopic leader boom connects Sjøhest with the already installed tower, the leader boom connection aligns with the tower's movements, creating an aligned movement between the blade and the tower.

A smaller handling crane picks up the blades from the rack and feeds the trolley, which moves along the telescopic leader boom and feeds blades vertically into the nacelle. Creating an increased installation window allows all three blades to be installed within one day. Sjøhest combines the field-proven GustoMSC NG-5500XL design with NOV Lifting & Handling's and Liftra's innovative technologies to enhance offshore wind turbine installation efficiency and logistics.

Another example of integrated smart solutions increasing efficiency is the recently introduced Enhydra MSOV. This Modular Service and Operations Vessel is a novel and versatile concept to optimize offshore wind farm operations and maintenance for bottom fixed and floating wind.

Collaboration leads to success

As installed offshore wind power capacity increases, so will the transmission infrastructure. This increased subsea cable footprint will see more failures caused by environmental and human interactions, so



ENSIS heavy lift crane vessel

ENSIS heavy lift crane vessel

assets that can efficiently and effectively repair the grid and move the power again are needed. The MSOV's larger design allows for the mobilization of additional equipment, increased comfort, and capabilities far beyond current construction/service operation vessels. This versatile workhorse is designed for cable repair and change-out, subsea inspection and intervention, and mooring installation.

The MSOV is a collaboration across NOV's Marine and Construction business unit. A GustoMSC™ vessel design offers an extensive and flexible deck layout to integrate mission equipment, such as electric subsea cranes from the company's experienced Lifting and Handling group and proven Remacut™ cable-lay, installation, and repair equipment.

The company is a big fan of the integrated solution approach, believing that it provides optimal results with less to no need for vessel conversions in a later stage. Its integrated development of vessel design and equipment requires close interaction and collaboration between teams from different disciplines. The vessel design team, the analysis team and the equipment teams are all involved in this process.

A good example of this is with the Ensis development, with teams from various disciplines throughout the NOV Marine & Construction group were involved. The crane design team responsible for NOV Heavy-Lift Cranes is part of the GustoMSC organization, supported by specific expertise from NOV Lifting & Handling in Norway. The team for the deck equipment comes from NOV Remacut in Italy, which specializes in large-scale handling equipment. They are designing the monopile handling, upending and motion compensated gripper which are required to make the vessel an effective tool.

Expanding partnerships

GustoMSC even takes this interaction a step further, by working together with its customers and suppliers. This not only offers opportunities in the technical field, but also makes it possible to jointly support the Sustainable Development Goals (SDG) across the world and accelerate sustainable changes.

Collaboration with utility companies and turbine manufacturers is another important additional condition for global success and progress. A good wide-spread infrastructure is fundamental to the creation of successful projects. This cannot be achieved without technological progress, which is why GustoMSC is working hard to develop new solutions that can be applied under all sorts of different conditions.

To do this, it will need to develop its expertise in different areas and work together intensively with its stakeholders. It is therefore not only modernizing the global infrastructure for the supply of sustainable energy, but also adapting its own portfolio and expanding its partnerships in a targeted manner. To achieve its goals before the end of the decade, the company will need to further expand and optimize its knowledge and infrastructure. Whether it is in the West or in the East, internationally or locally, collaboration can be a huge stepping stone to increasing the sustainability of the global energy supply chain.

Smart solutions and evolving technologies are needed to further increase efficiency as the wind sector and its equipment grows. For GustoMSC, this evolution is already part of its day-to-day business, as the aforementioned Sjøhest Blade Installation Concept testifies. But can things continue to evolve quickly enough to keep up with the demand? Based on its success to date, GustoMSC is confident it will.

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