



Installation vessels, a new bottleneck?

Our industry is ever changing and the increase in size, height, length and weight of the new foundations and turbines have created a need for new lifting equipment able to handle these loads. PES is pleased to bring you an innovative solution from GustoMSC, who will be able to assure deliveries and installations to the new mega sites.

Introduction

Offshore wind turbines are predominantly installed in five steps: Tower in one single lift, nacelle in a single lift and then the three blades separately. Most modern, purpose built wind turbine installation vessels are capable of lifting the current 6-8 MW

turbines, reaching the necessary height and have sufficient variable load and deck space to carry an economically efficient number of turbines for each round trip.

However, over the last few years, the turbine installation market for the 6-8 MW range has been characterised by low

installation volumes and vessel overcapacity.

Adding the introduction of the new generation turbines with the challenge of installing higher and heavier wind turbine components, these are challenging times for installation contractors. GustoMSC has



been cooperating closely with the offshore wind installation contractors and has provided integrated and efficient installation technology to face these challenges.

Both floating and Jack-up technologies are being developed, combining practical innovative ideas and our proven technology to enable safe and efficient installation. This article demonstrates how the Jack-up solution is able to solve the installation bottleneck of near future wind turbines.

Current and future market perspectives

During the recent Offshore Wind Energy exhibition in London, a significant scale up in turbines was announced, by the main turbine suppliers. These turbines are a step up in size and as a consequence, both weight and expected hub heights pose a new challenge to the current fleet of installation equipment.

Without the introduction of new installation concepts, technologies, vessels or major upgrades, the apparent oversupply in installation equipment will almost overnight turn into a new bottleneck in the supply

chain. This is not a gradual process, but more a binary sort of cut-off; an installation vessel is either capable of making the lifts or it is not.

Extra-large monopiles of over 1,500 t cannot be lifted by any of the current installation Jack-ups and Jack-up operators will face strong competition by floating crane vessels, which are capable of handling this type of heavy installation.

In the case of a new turbine installation unit, intended to execute a fair share of foundation work as well, a 2,000-2,500 t lift capacity would normally be required. In order to be safe and stable the Jack-up will inevitably grow in size, which will have effect on the vessel's capex.

Furthermore, the expected nacelle weights beyond 800-900 t will eliminate half of the existing installation units as serious options. Hub heights beyond 120 m, water-depths around 35-45 m and soil penetration will decimate the remaining available fleet.

A real bottleneck exists when relying only on the existing fleet. This can only be

overcome by smart, balanced upgrades and next generation installation equipment and methods. In case of upgrades the optimized envelope of design parameters is pushed beyond the original boundaries.

To close the gap towards future turbines, a balanced set of upgrades may be considered. If existing Jack-ups can be re-outfitted or upgraded, the investment may be relatively limited. However, the likely impact on efficiency (fewer turbines on board, less efficient layout and thus slower) may lead to somewhat longer installation times. This may translate in extra overall wind farm development costs and delayed start of revenues, as the grid connections will be established later in the process.

Meanwhile, a new generation of vessels that is capable of serving the 6-8 MW turbine range and the upcoming 10-12 MW range and beyond, will require significant investments. Commitment from the market is needed, as was required for the current generation of wind turbine installation units in the past.



Solutions

GustoMSC has developed a unique solution to resolve the above described challenges. The novel solution based on smart interfacing between crane and jacking system allows a substantial increase in crane size, while maintaining a solid, stable and safe platform, keeping the increase of the unit and associated costs limited. GustoMSC has created the innovative telescopic leg crane to enable this combination.

The crane offers a combined advantage. It has a high lift capacity at a limited height, suitable for the installation of heavy foundations. Meanwhile, at extended reach, it facilitates safe turbine installation at the next generation hub heights.

The telescopic crane allows for installation of foundations through the splash zone by increased side lead and off lead capabilities. During transit and in harbour manoeuvring the boom is retracted, reducing fatigue

loads on the crane and enabling easy manoeuvring in the harbour without the large crane boom overhang that is typical for the standard cranes.

This crane is very well suited to the next generation Jack-up, the NG-20000X. This Jack-up is the largest of its kind, offering robustness on the basis of the proven platform technology and operational efficiency through the proven methods for which it is designed.

The design is the larger successor to the NG-14000X series, proven by the Seajacks Scylla to be a very successful example, offering largest capability and highest market efficiency and being the preferred choice for developers.

This is the way GustoMSC is committed to resolve market bottlenecks and offers potential for vessel owners to take the next step.

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NG-20000X with telescopic crane

From 2010 until 2016, around 2,600 turbines were installed in the North Sea of which over 75% were installed by GustoMSC designed Jack-ups with GustoMSC jacking systems, for a large part using GustoMSC designed leg encircling cranes.

The NG-20000X design is based on the same design principles as these successful Jack-ups, making full use of the proven technology and feedback of these units. By scaling up the Jack-up design and jacking system and solving the challenging crane requirements in an innovative manner, the NG-20000X represents the next generation wind turbine installation Jack-up in all its facets.

This self-propelled Jack-up design is characterized by a high variable load and large water-depth capability. Equipped with the GustoMSC integrated telescopic leg crane, the NG-20000X is capable of installing heavy foundations and when the boom is fully extended it reaches adequate lifting height and capacity to install future generation wind turbine components.

Main characteristics

- Hull length 152.0 m
- Hull width 58.0 m
- Hull depth 12.0 m
- Accommodation 130 PoB
- Water depth (survival) up to 70 m
- Variable load $\pm 16,500$ t

Deck area 5,600 m²

Deck load 10 t/m²

Legs

- Type: Triangular, open truss, X-braced
- Leg length max. (incl. spud-can) 120.0 m
- Leg length max. under hull ± 90.0 m

Jacking system: Rack & Pinion with Variable Speed Drive

- Pre-load 20,000 t / leg
- Jacking moves 150 / year

Telescopic leg crane

- Capacity retracted 2,500 t @ 30 m
- Lifting height above deck ± 121 m
- Capacity extended 1,250 t @ 47 m
- Lifting height above deck ± 161 m