

Wind installation – the future unfolding with the foldable offshore crane

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The development of current and future offshore wind farms is picking up with wind installation contractors further optimising their toolboxes for efficient installation of offshore wind turbines. Up to now the jack-up vessel has been the platform of choice for installation of wind turbines; providing a stable platform, which when jacked up, uses a crane which reaches high enough to install the nacelle of the wind turbines.



Boom motions



Jack-up blade installation

With these design constraints and effects in mind a new crane concept was born: the Foldable Offshore Crane, or FOC.

Building larger size jack-ups is a costly affair; the Foldable Offshore Crane offers a crane solution, which can increase the installation capabilities of such an asset, offering the same effective lift height with a shorter crane, compared to conventional fixed boom cranes while increasing the payload capacity.

With the ever increasing size of wind turbines and the need to make efficient use of the stable platform provided by jack-up vessels, it is invaluable to be able to increase the lifting envelope of the crane, both in height, width and load.

This can result in a vessel layout on which a crane boom extends far beyond the main vessel dimensions. In this setup the boom is largely unsupported during transit conditions, resulting in unwanted fatigue wear. The large overhang also makes it more difficult to manoeuvre the vessel in port or restricted areas and results in the need for a larger mooring length, increasing docking costs in port.

The unwanted fatigue wear can be resolved by adding more steel to the boom. The added steel will result in a weight increase, negatively affecting the crane's capacity and also decreases the vessel payload; all unwanted effects resulting in a weight increase, which are only needed for ensuring the crane's integrity in transit mode.

With these design constraints and effects in mind a new crane concept was born: the Foldable Offshore Crane, or FOC. It features a long boom, to which a foldable boom is attached.

The foldable boom results in two important benefits:

1. The design can stay light, since the foldable boom is fully folded in transit mode, omitting the need for fatigue strengthening of the boom.
2. An additional benefit comes from the more efficient use of the lifting height, resulting in a shorter crane boom, since the crane makes better use of its installation height and (boom) clearance. The shorter compound boom length of the FOC further helps to limit the weight of the crane design.



Transit



Boom Comparison



Blade installation side view

The FOC makes more efficient use of the hoisting height, using the foldable boom to rotate the tip to the lifting point, while maintaining boom clearance with the lifted object.

This functionality is provided by incorporating a backstay beam, which can be adjusted by an adjustable backstay.

By incorporating a second backstay beam, full folding functionality can be achieved. By fixing the position of the first backstay and the second backstay, with respect to the

booms they are attached to, minimal reeving is needed to erect the foldable boom.

With the fully folding boom, a jack-up vessel with a limited length can be equipped with a crane which does not have an overhanging boom, extending far beyond the vessels bow.

This new crane type is as light as possible, while providing a large lifting capacity and featuring a large lifting height with enough boom clearance to lift large items like the nacelle of a wind turbine.

In order to keep the weight of the FOC as low as possible, high tensile steel is used and the folding mechanism is created making smart use of backstay beams and wires. This limits the extra weight on the boom, compared to a solution where hydraulic cylinders or a telescopic mechanism would have been used.

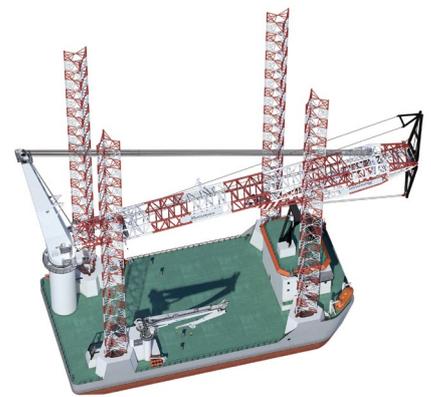
In addition to the low weight, the use of the wire folding mechanism has the added benefit of needing less maintenance than cylinder or telescopic solutions.

By introducing the folding boom, the main boom can be made shorter; with the boom hoist attached to the end of the main boom an extra weight reduction on the main boom construction can be achieved, since the buckling length of the main boom is reduced. With the boom hoist connected to the lifting end of the main boom, instead of to a full length boom, the lifting arm of the boom hoist is more effective, resulting in a lighter boom hoist package.

In order to fully use a crane's available lifting height, integrated hoisting tools, which connect directly to the hoisting block, provide additional opportunities to limit the needed rigging height. In general an abundance of rigging is used to control the load to be lifted, or pick up other intermediate tools, which sit on top of for instance a pile. By connecting tools directly to the lifting block with integrated interface points, the rigging height is kept to a minimum, resulting in a large effective lifting height.

With a hoisting block featuring a clamping mechanism, to interface with for instance flange grippers, an integrated spreader or a piling hammer, extra effective height remains below the lifting hook, which can be used for installing equipment at higher heights.

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Blade installation side view

The adjustability of the folding boom makes the FOC ideal for handling of different voluminous structures, each with their specific dimensions.



Nacelle installation

The FOC can be used as a Pedestal Mounted Crane (PMC), and to make the most effective use of space on a jack-up vessel the FOC can also be deployed as a leg encircling (LEC) variant, which frees up more deck space, which can be used for storage of payload or other equipment.

In our standard range we provide a lifting solution for a lifting height of up to 160m from deck, with a large boom clearance, in lifting capacities ranging from 90mt to 2500mt.

The Folding Offshore Crane provides a crane solution, which can open up or

unfold the capabilities of jack-up platforms which are critical in size and limited in payload, by optimising the lifting point and boom clearance, resulting in the same lift with a smaller crane.

The adjustability of the folding boom makes the FOC ideal for handling different voluminous structures, each with their specific dimensions.

Since the FOC is essentially a boom with accompanying rigging, existing Huisman cranes can be retrofitted to fully benefit from the adjustable advantages of the foldable boom.

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