

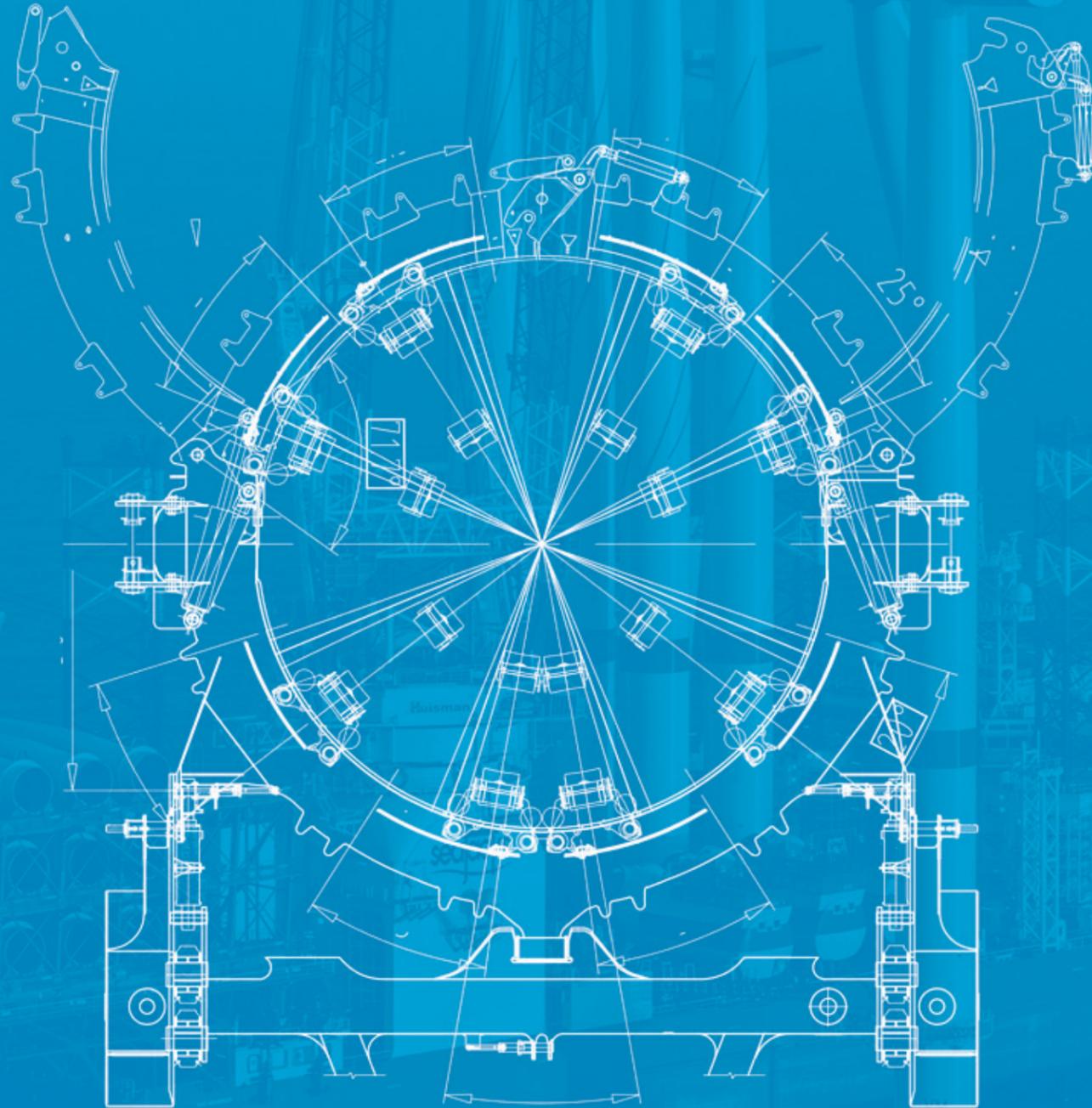
PRODUCT BROCHURE

OFFSHORE WIND EQUIPMENT

 **Jan De Nul**
GROUP

 **Huisman**
Equipped for impact

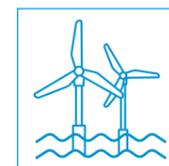
OFFSHORE WIND



Huisman Pile Gripper

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Equipped for impact

We are Huisman. We design, manufacture and service heavy construction equipment for the world's leading companies in the renewable energy, oil and gas, civil, naval and entertainment markets. Our products range from Cranes, Pipelay Equipment, Drilling Equipment and Winches, to Vessel Designs and Specials.

The history of Huisman is one of setting new industry standards. Of making impact, since 1929. With step changing technical solutions that vary from stand-alone to highly engineered integrated systems. From concept to installation and lifetime support.

In these times of transition, our passionate workforce and worldwide production, service & sales facilities make us equipped for impact.

Active in 6 Markets



Oil and gas



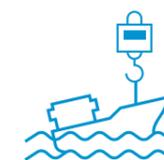
Offshore wind



Geothermal energy



Civil works



Salvage



Leisure

People



2500+
employees
worldwide

Track record



Operating
from 7
locations



203 vessels
are equipped
with our products

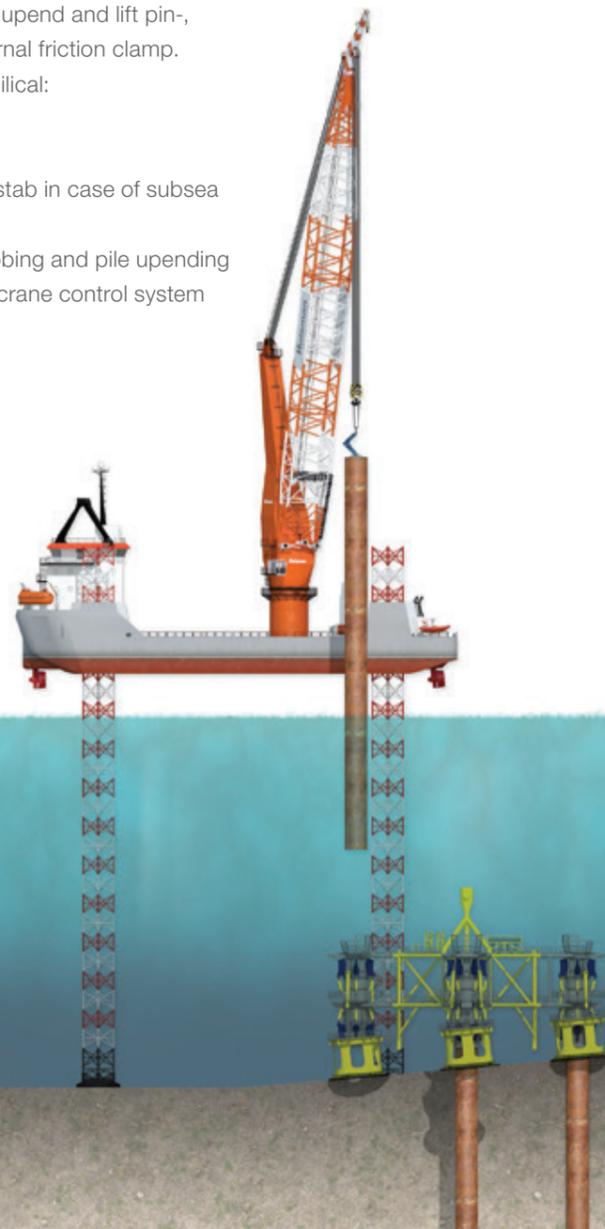
GENERAL INTRODUCTION

Huisman can deliver the full range of equipment required for installation of current and future sized wind turbines. Tools can be adjusted or designed to meet project specific requirements. The control systems of the tools can be integrated with the crane so that all equipment functions as one system, allowing for central control and monitoring. This interaction between the complete set of installation tools increases safety on board and reduces installation time.

1 INTERNAL LIFTING TOOL

The internal lifting tool is used to upend and lift pin-, skirt- and leg piles using an internal friction clamp.

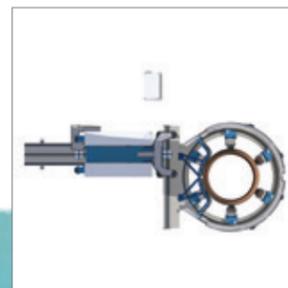
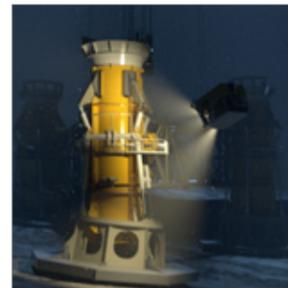
- Can be operated without umbilical:
 - On-board power supply
 - Radio remote controlled
- ROV connection through hot-stab in case of subsea operation
- Single lifting point for pile stabbing and pile upending
- Controls can be integrated in crane control system



2 CONVERTIBLE PRE-PILING TEMPLATE

The Convertible Pre-Piling Template is an economic and reliable solution for accurate piling.

- Self-levelling
- Equipped with subsea sensors to monitor pile inclination
- Adjustable for three and four legged jackets
- Suitable for different footprints matching soil conditions

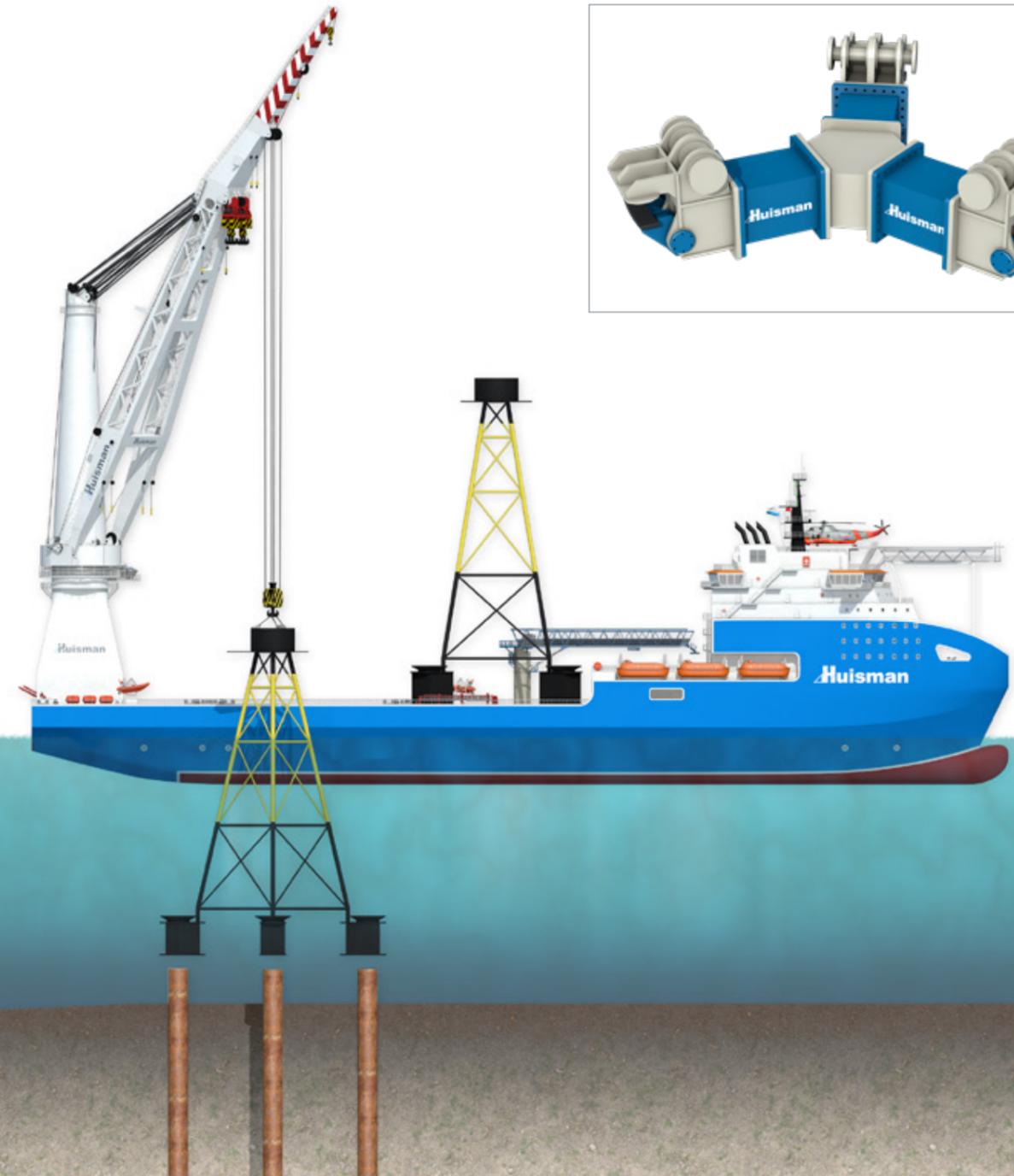


JACKET INSTALLATION SOLUTIONS

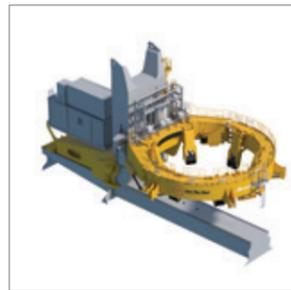
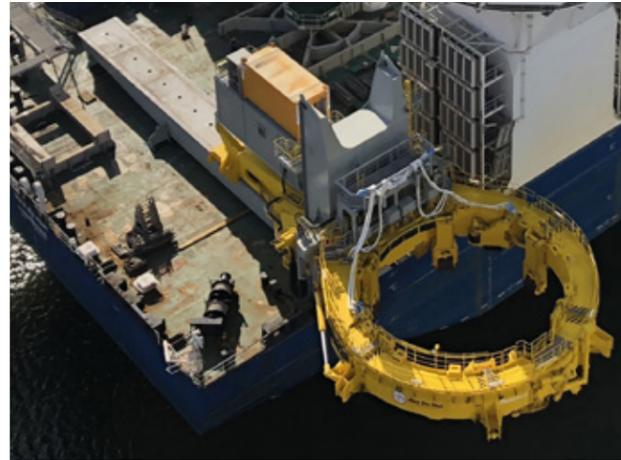
3 JACKET FLANGE LIFTING TOOL

The Jacket Lifting Tool is used to lift jackets by their flange.

- Can be operated without umbilical:
 - On-board power supply
 - Radio remote controlled
- Fail safe locking mechanism
- Adjustable diameter
- Actuated COG adjustment
- Transportable in ISO sized container dimensions
- Controls can be integrated in crane control system



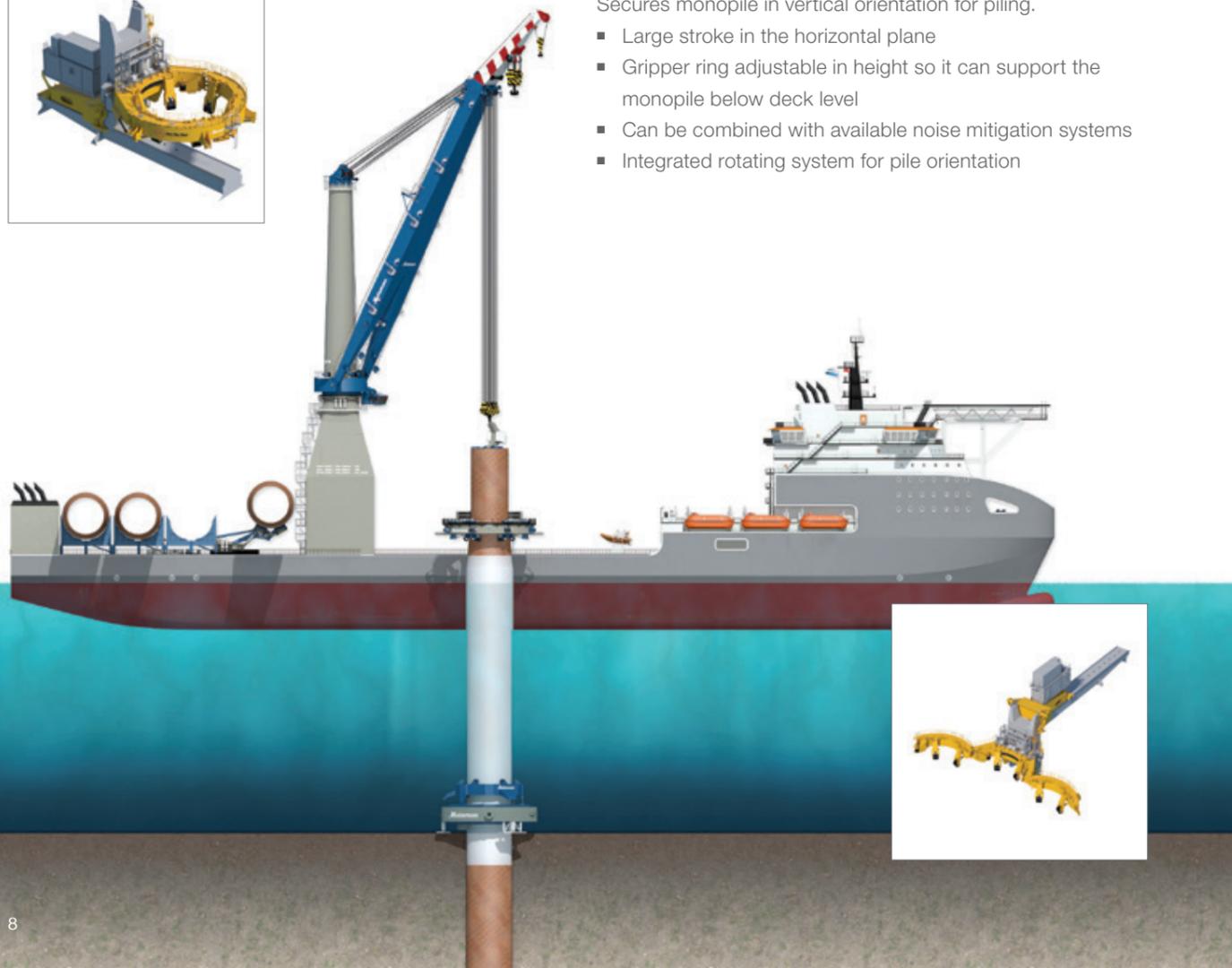
MONOPILE INSTALLATION SOLUTIONS



1 MONOPILE GRIPPER

Secures monopile in vertical orientation for piling.

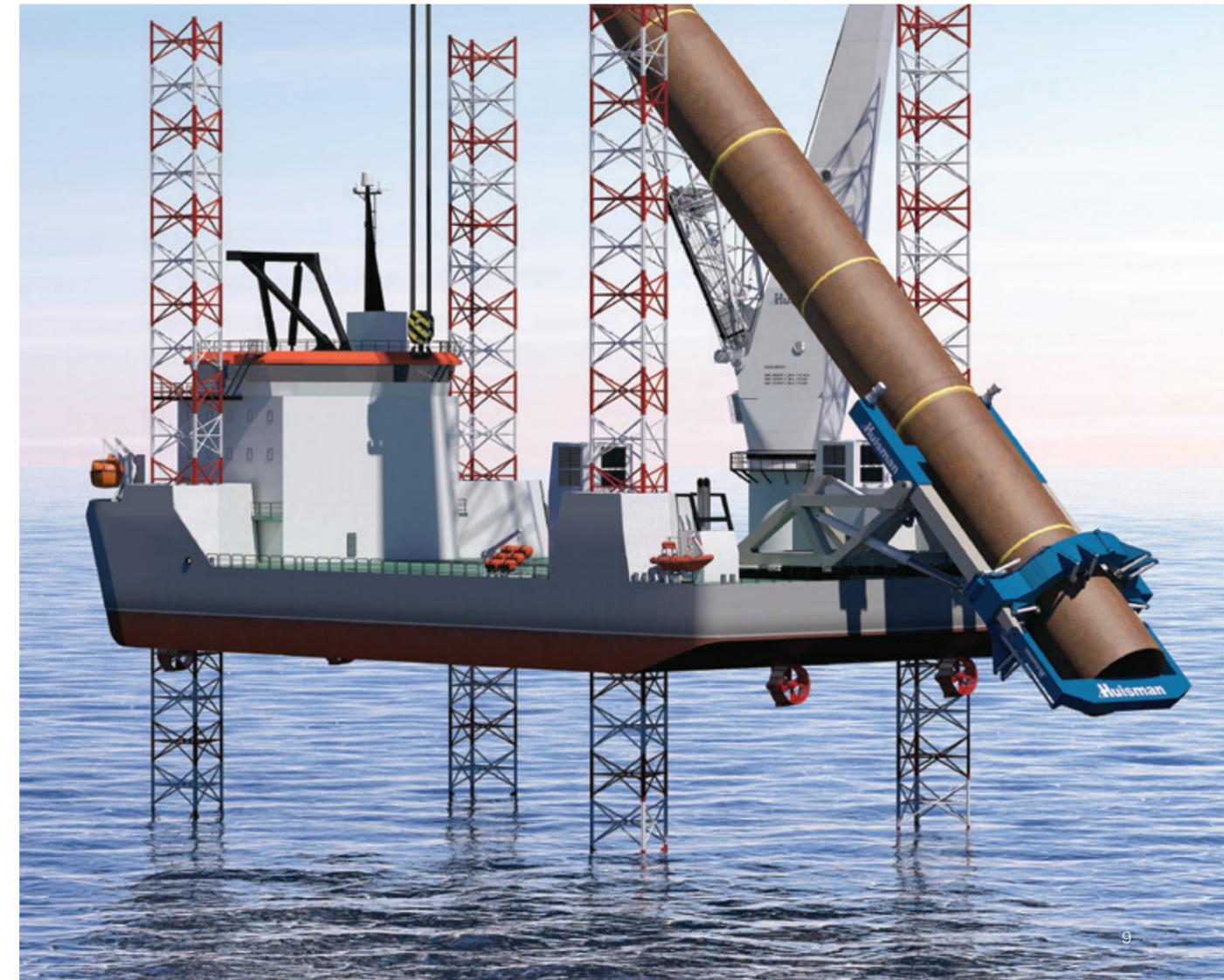
- Large stroke in the horizontal plane
- Gripper ring adjustable in height so it can support the monopile below deck level
- Can be combined with available noise mitigation systems
- Integrated rotating system for pile orientation



2 MONOPILE GRIPPER WITH INTEGRATED UP-END SYSTEM

Combines the functionality of a upend frame with a monopile gripper.

- Integrated upending system saves valuable deck space
- Avoids a handover of the monopile between the up-end system and the gripper
- Large stroke in the horizontal plane
- Gripper ring adjustable in height so it can support the monopile below deck level
- Can be combined with available noise mitigation systems
- Integrated rotating system for pile orientation

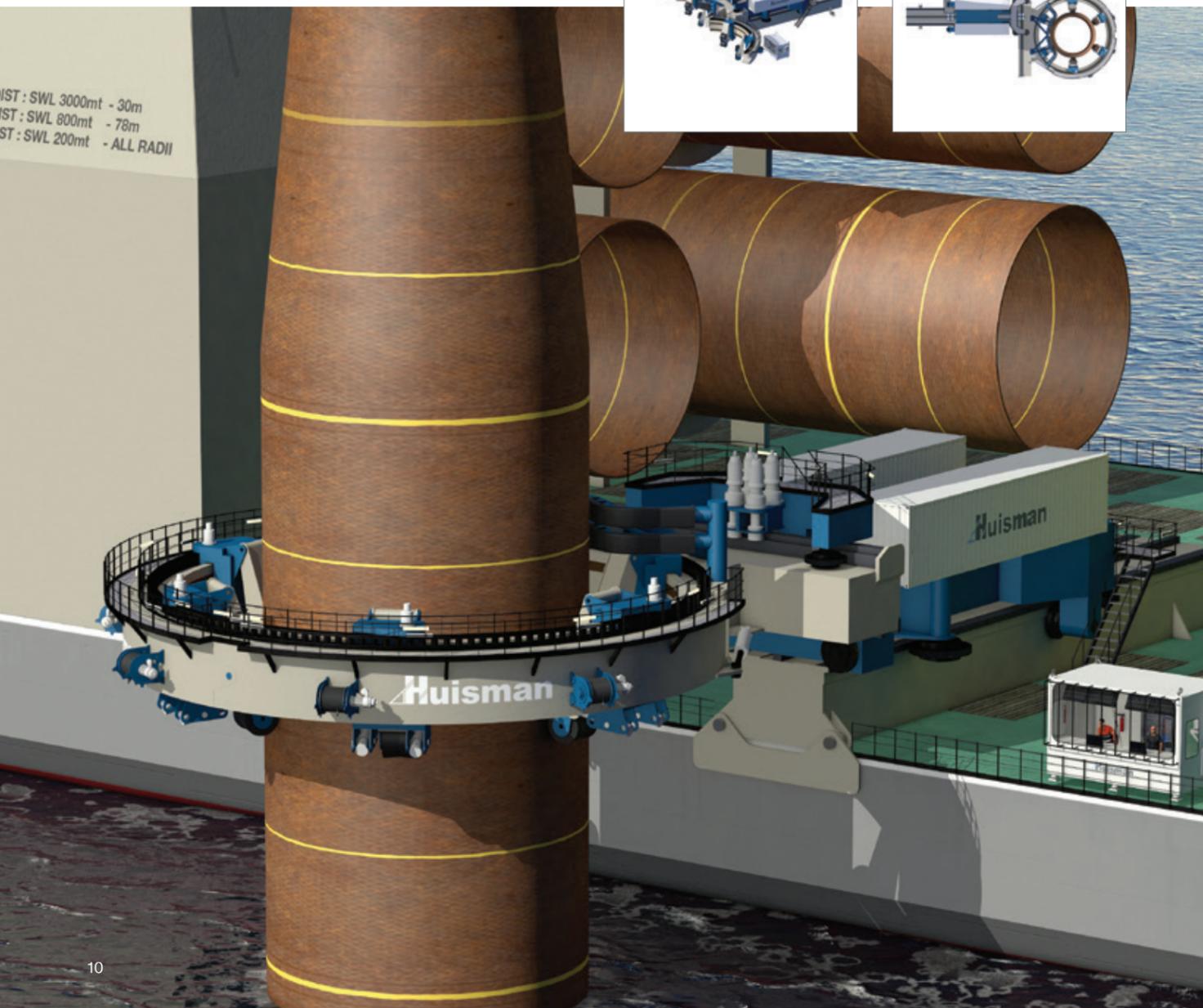


MONOPILE INSTALLATION SOLUTIONS

3 MOTION COMPENSATED MONOPILE GRIPPER

The Motion Compensated Monopile Gripper is designed to allow monopile installations from a floating vessel while controlling the vertical alignment of the monopile. The pile gripper will keep the pile vertical and stationary in the horizontal plane compensating for vessel motions and forces exerted by waves

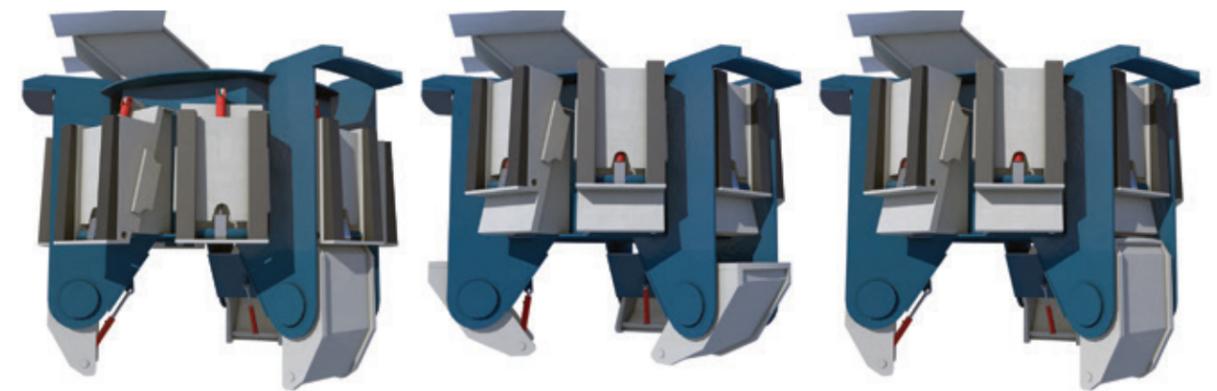
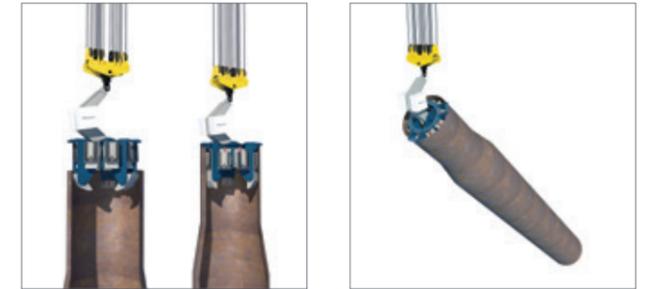
- High accuracy using electric drives
- Full redundancy on all primary drives and sensors
- Accurate verticality measurement in any weather condition
- Absolute position measurement
- Can be combined with various types of noise mitigation systems



4 MONOPILE INTERNAL LIFTING TOOL

The internal lifting tool is used to upend and lift monopiles using an internal friction clamp.

- Can be operated without umbilical:
 - On-board power supply
 - Radio remote controlled
- Can be equipped with grippers for flanged interfaces
- Fail safe clamping mechanism
- Adjustable for different pile sizes
- Controls can be integrated in crane control system



5 MONOPILE CONVEYOR

Monopile conveyors can transport monopiles in offshore conditions in an efficient and secure way without trailers.

- More storage capacity for monopiles, as monopiles can be stored out of crane reach
- Vertical, longitudinal and transverse movement

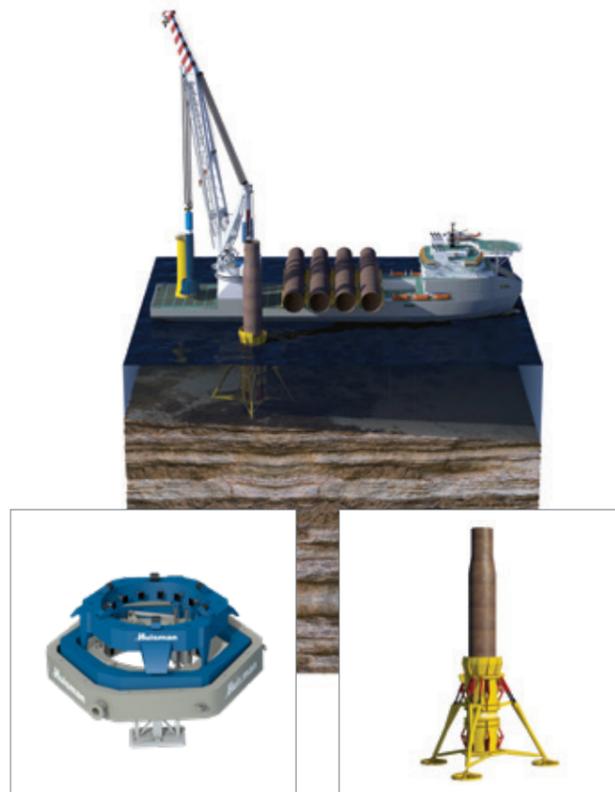


MONOPILE INSTALLATION SOLUTIONS

6 MONOPILE PILING TEMPLATE

The monopile piling template can hold and actively lower the monopile during piling or drilled installation.

- The monopile weight can be completely supported and lowered by the template
- Cardanic suspension for an inclined seabed



7 MONOPILE SPREADER

The monopile spreader is used to lift monopiles in an efficient way.

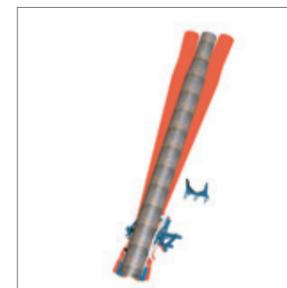
- The spreader can be parked on the next monopile so that the crane can continue with other operations while the monopile is rigged to the spreader
- Rigging operation is facilitated by sling handling winches and padeyes with actuated pins
- Can be optimized for different lengths
- Can be operated without umbilical:
 - On-board power supply
 - Radio remote controlled



8 PILE UPEND FRAME

The pile upend frame is used to upend monopiles in a safe and controlled way.

- Pivot point is located close to the center line of the monopile for safe and controlled upending
- Cardanic suspension allows a larger misalignment of the pile during upending
- Monopiles can extend further outboard prior to upending
- Accurate and controlled load sharing with crane



9 FLANGE LIFTING TOOL

The flange lifting tool is used to upend and lift monopiles by engaging the flange of the monopile.

- Upending and lifting of tower section
 - On-board power supply
 - Radio remote controlled
- Fail safe locking mechanism
- Transportable in ISO sized container dimensions
- Easy pile stabbing with guiding tracks



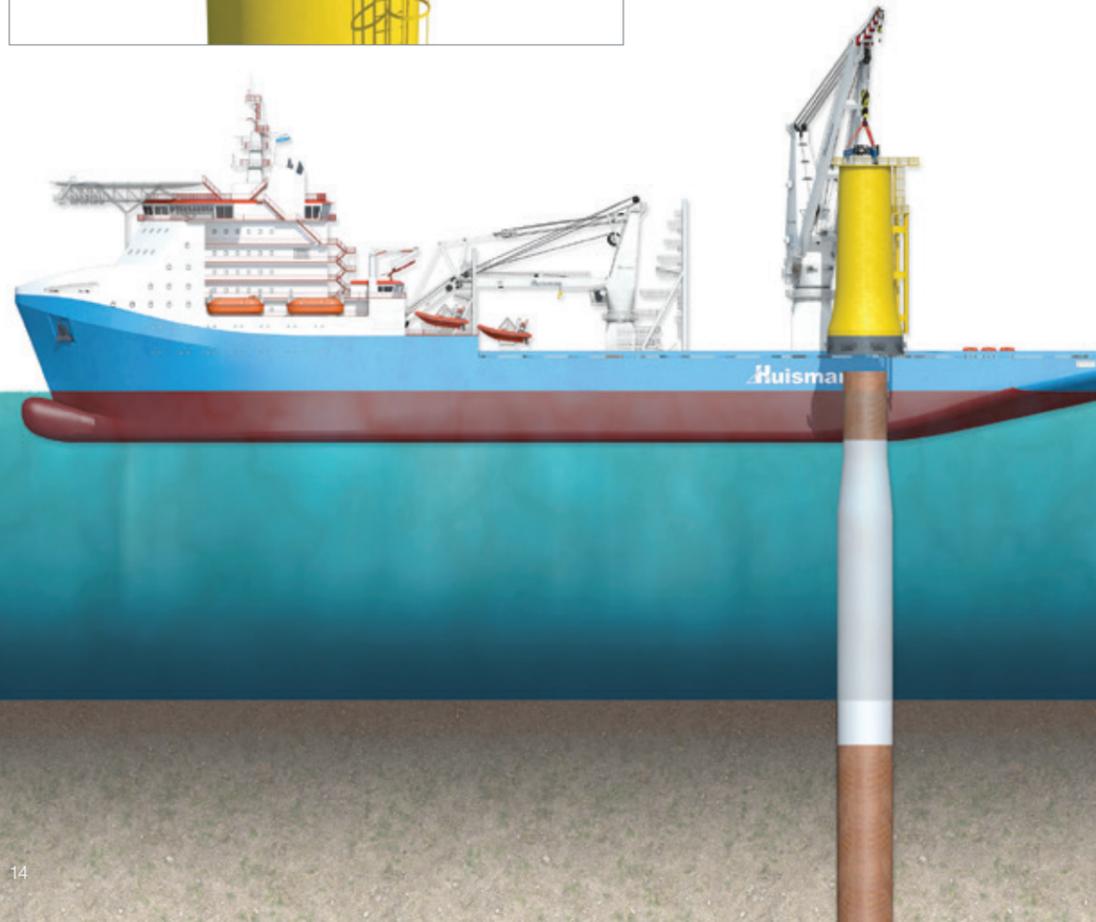
WIND TURBINE INSTALLATION SOLUTIONS

1 TRANSITION PIECE LIFTING TOOL

The transition piece lifting tool is used to lift and install transition pieces.

- Fail safe locking mechanism to transition piece flange
- Can be operated without umbilical
 - On-board power supply
 - Radio remote controlled

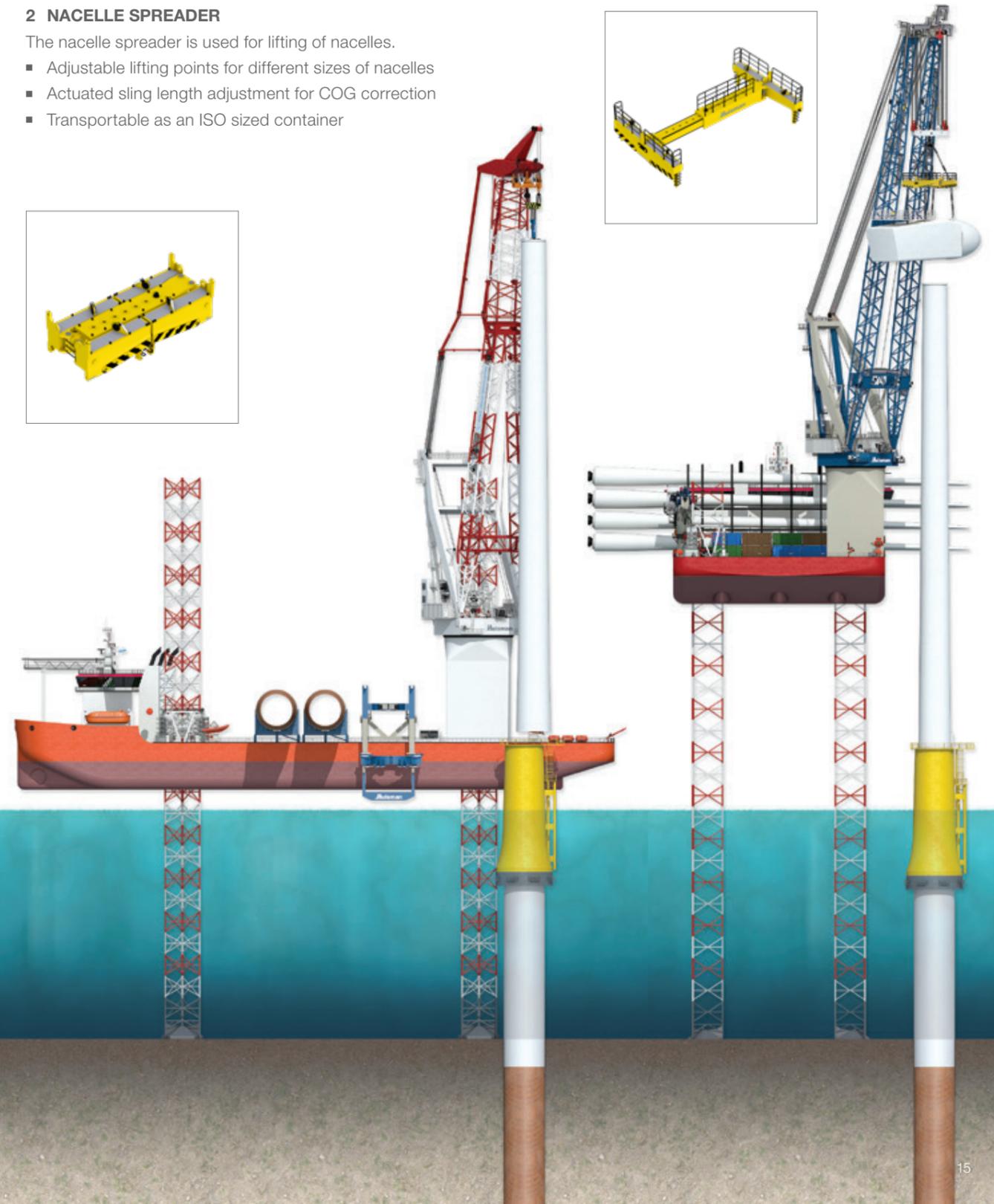
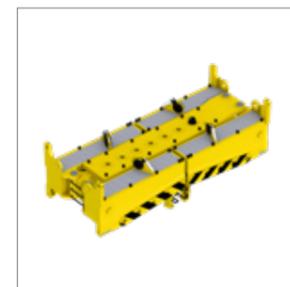
- Controls can be integrated in crane control system
- Adjustable for different flange diameters
- Actuated COG adjustment
- Transportable in ISO sized container dimensions



2 NACELLE SPREADER

The nacelle spreader is used for lifting of nacelles.

- Adjustable lifting points for different sizes of nacelles
- Actuated sling length adjustment for COG correction
- Transportable as an ISO sized container



UNIVERSAL QUICK CONNECTOR

Rigging operations can take up valuable time of your consecutive offshore operations. The Universal Quick Connector is a safe and efficient solution to reduce your cycle time and mitigate the safety risks of people involved in changing installation tools. The Universal Quick Connector (UQC) offers unprecedented versatility for changing tools and the operational use of your crane.

INCREASED LIFTING HEIGHT

Integrating the suspension point of a tool into the lower block eliminates the need for rigging and increases the effective lifting height of your crane.

ROTATION MECHANISM AT FULL LOAD

An attached tool, of up to the maximum capacity of the crane, can be rotated to align with the object that needs to be lifted, using an integrated rotation mechanism.

POWER AND DATA CONNECTION

On docking a power and data connection is established with the tool so that the tool can be controlled and monitored from the crane's control system.

FAIL-SAFE: SELF-LOCKING

The self-locking mechanism of the UQC is fail-safe. A tool can only be released when the release mechanism is intentionally activated.

QUICK TOOL CHANGES WITH THE STANDARDISED PIN INTERFACE

The only requirement for a lifting tool, to be handled by the Universal Quick Connector, is a pin with a machined interface.

MITIGATE SAFETY RISKS

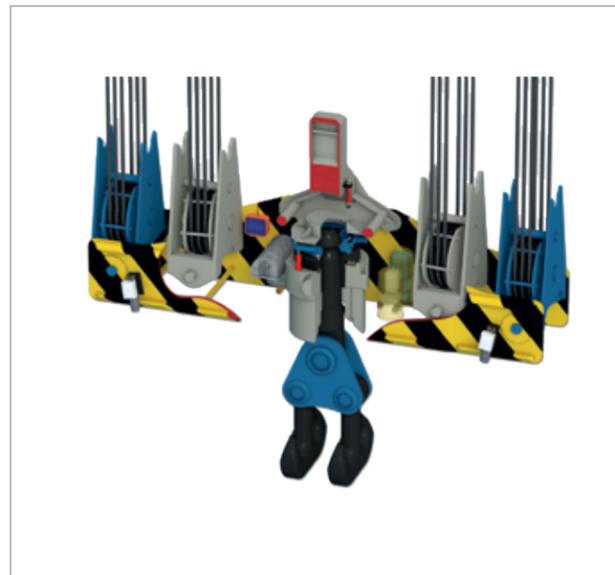
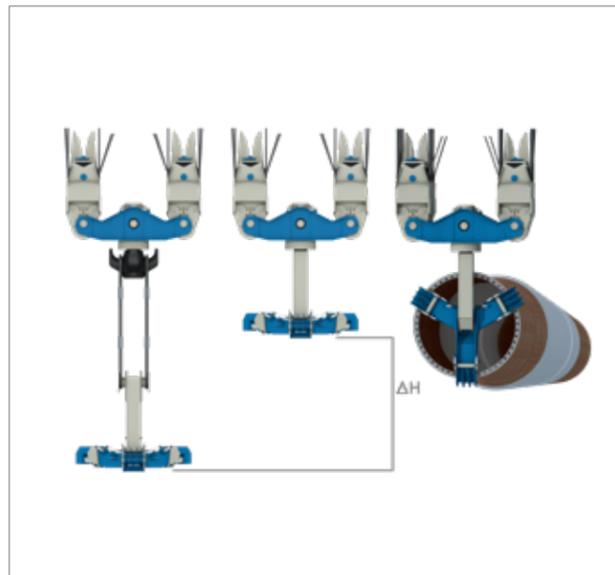
By automating tool changes, you can minimise the need for riggers and people on deck in high-risk operations.

REDUCE CYCLE TIME

The complementary range of tools can be changed quickly with the standardised interface of the UQC, optimising the operational effectiveness of your crane.

INCREASE WORKABILITY

With the UQC, tools are connected firmly to the crane block to reduce pendulum motions, enabling you to continue your operations in harsher weather conditions.



OFFSHORE WIND

MOTION COMPENSATED PLATFORM

The construction of offshore windfarms in the US is regulated by the Jones Act. The transport of wind turbine components from a US port to the field using an international installation vessel requires the use of a US feeder vessel. Although this is a Jones Act-compliant solution for this kind of logistical challenge, it does require that components need to be lifted from a moving vessel.

The Motion Compensated Platform ensures that components can be transferred quickly and safely from a feeder vessel.

OPTIMISED FOR NEXT-GENERATION WIND TURBINES

The dimensions and capacity of the Motion Compensated Platform are optimised for next-generation wind turbines, and are designed to compensate for five degrees of motion of the vessel.

INTEGRATED INTO THE HOLD OF A VESSEL

The Motion Compensated Platform can be integrated into the hold of a vessel and aligned with the main deck, making it easy to skid cargo across the platform.

FAIL-SAFE COMPENSATION

The combination of passive heave compensating cylinders and an active hydraulic system enables efficient and fail-safe compensation.

REDUCED FUEL CONSUMPTION AND CO2 EMISSIONS

The use of a feeder vessel reduces fuel consumption and CO₂ emissions compared to shuttling back and forth with a jack-up vessel.

DESIGNED TO THE HIGHEST OPERATIONAL STANDARDS

The Motion Compensated Platform is designed according to the highest operational standards.

TAILORED TO YOUR REQUIREMENTS

Our proven technology can be tailored to your specific requirements.

INCREASE WORKABILITY

The Motion Compensated Platform provides a stable deck area because it counterbalances the effects of vessel motions. This means that lifting heavy components and moving an empty jack-up vessel can be done in more difficult weather conditions, significantly increasing the weather window.

MAXIMISE OPERATIONAL TIME

By using an offshore rated feeder vessel equipped with a Motion Compensated Platform, your jack-up vessel can continue installation work without having to shuttle back and forth to load new components. Maximising the operational time results in a faster delivery of an offshore wind farm.

INCREASE SAFETY AND PRODUCT INTEGRITY

Heavy lifting off the Motion Compensated Platform is carried out in a controlled manner, which safeguards the integrity of the sensitive wind turbine components and ensures the safety of everybody on deck.

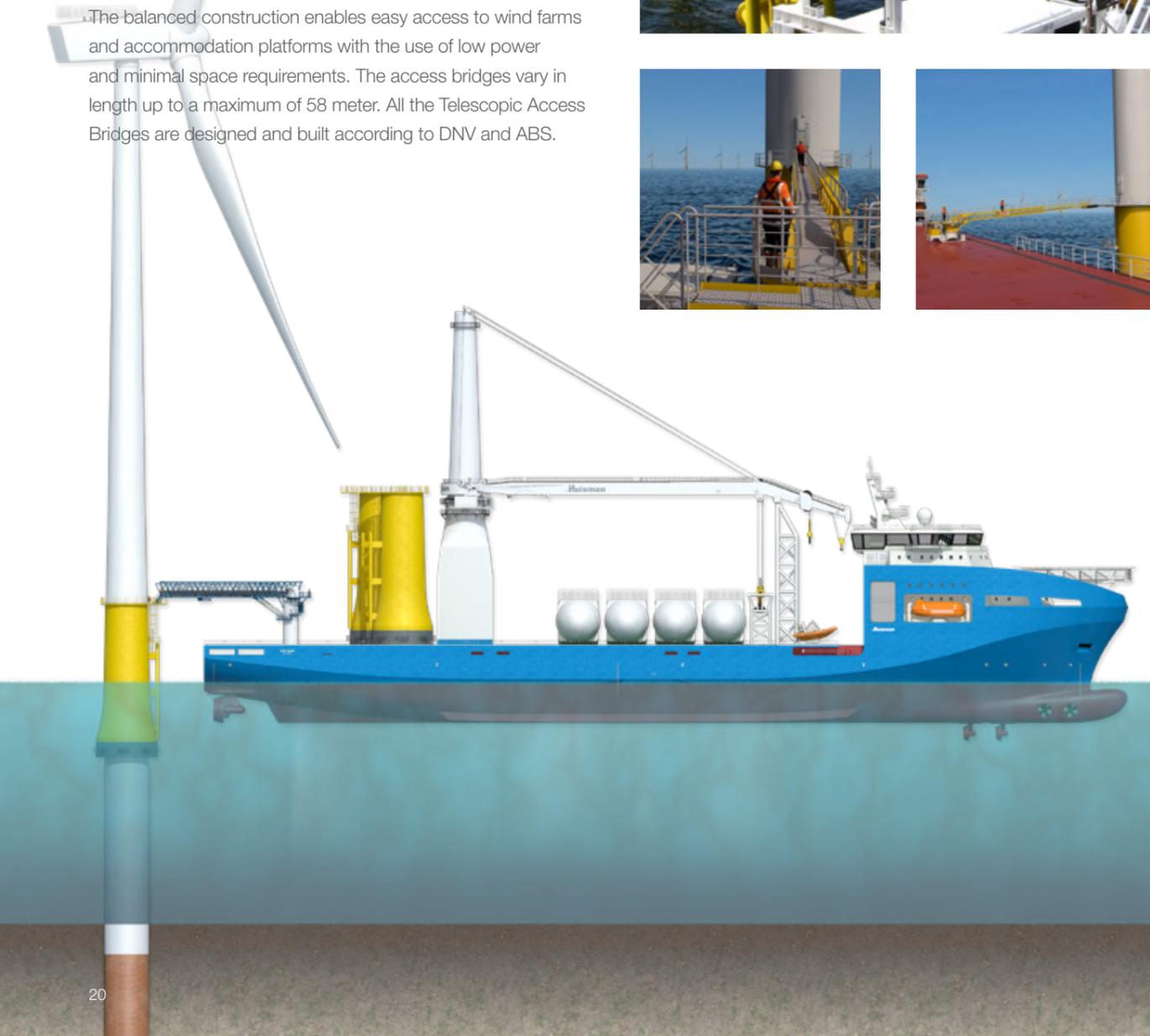
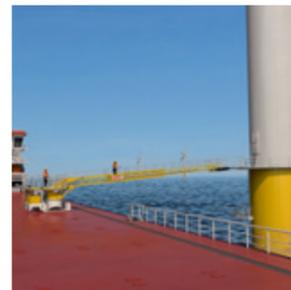
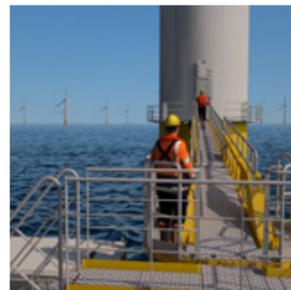


MAINTENANCE SOLUTIONS

TELESCOPIC ACCESS BRIDGES (TAB)

The Telescopic Access Bridge can transfer personnel safely from a vessel to an offshore structure or the quay side. Main functions of the bridge are luffing, slewing and telescoping to continuously compensate the motion and displacements of the vessel. Operation can be done by the vessel's crew and no large generator is needed which leads to a fast and inexpensive operation. The access bridge is built in series to provide direct and worldwide availability, for both rental and purchase purposes. A range of access bridges is available (S, M, L and XL). The Telescopic Access Bridges are designed for both walk-to-work application and cargo handling.

The balanced construction enables easy access to wind farms and accommodation platforms with the use of low power and minimal space requirements. The access bridges vary in length up to a maximum of 58 meter. All the Telescopic Access Bridges are designed and built according to DNV and ABS.



WINDFARM INSTALLATION VESSEL

To improve the efficiency of offshore windfarm installation, Huisman has developed the Windfarm Installation Vessel (WIV); a semi-submersible vessel with a 3D-motion compensated WTG installation system.

The WIV is a 180m long and 88m wide semi-submersible, providing a stable platform even in rough sea conditions. She keeps station with a DP3 system with 8 x 4MW thrusters. The vessel has 200 beds, which can be used for the construction crew, marine crew and others.

The WIV offers a viable and cost-effective installation method for both floating and fixed-bottom windfarms. This innovative installation vessel is designed to install monopiles as well as Wind Turbine Generators (WTGs), in one piece. By assembling the complete WTG on board, off the critical path, a very high workability can be achieved.

ADVANTAGES OF THE WIV

Fast scale-up of offshore wind

- 85% workability during the entire year in the North Sea, enabling year round installation.
- The WIV enables installation of > 100 complete WTG's and foundation combinations per year
- One vessel for the complete installation of windfarms (both foundations and turbines)

Sustainable

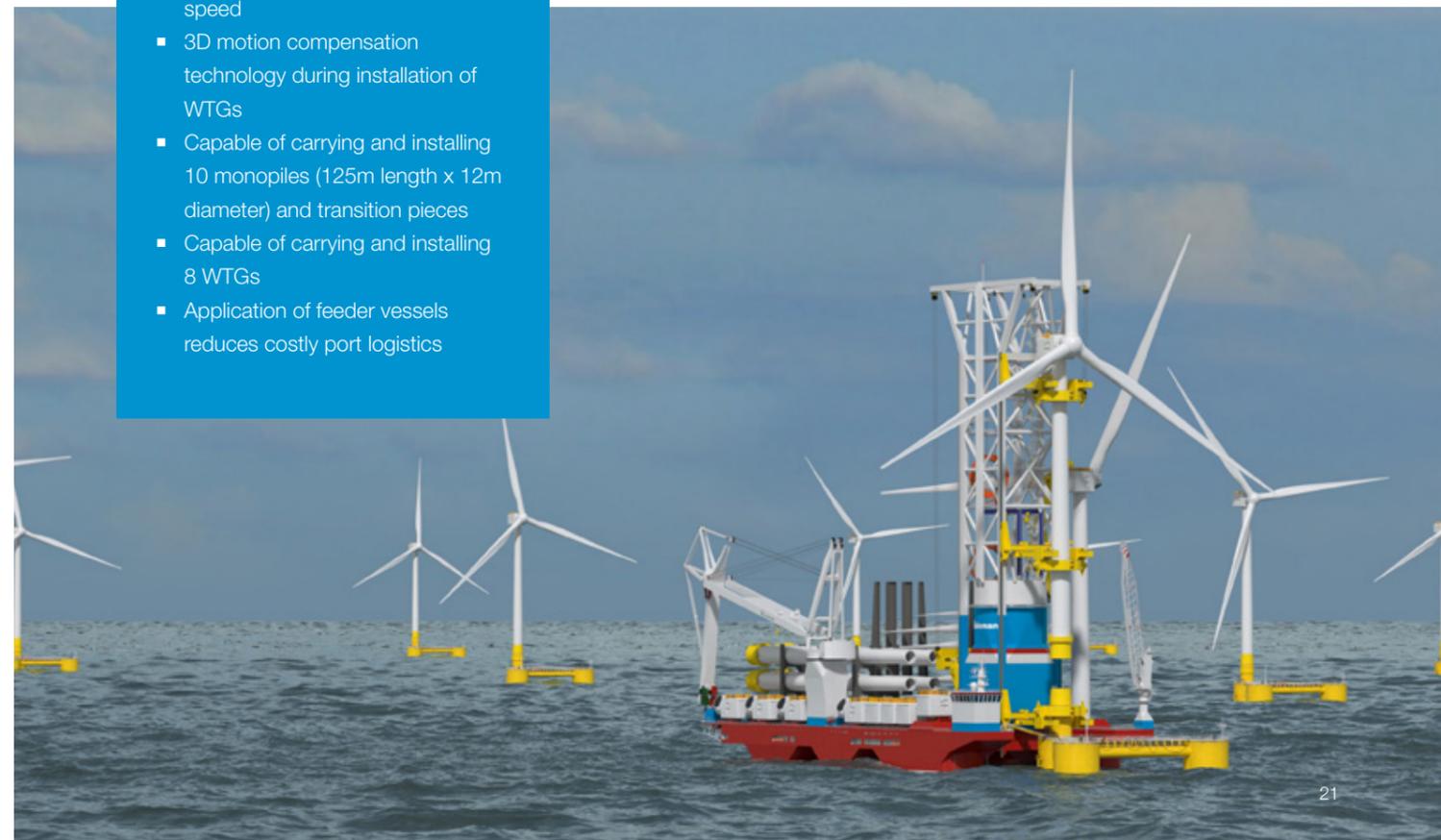
- Significant reduction of CO2 emission
- Speeding up the offshore wind farm delivery, accelerating green power generation

Cost-effective

- Enabling a substantial cost reduction per installed wind farm, compared to conventional installation methods

FEATURES

- Efficient installation: low weather dependency and high installation speed
- 3D motion compensation technology during installation of WTGs
- Capable of carrying and installing 10 monopiles (125m length x 12m diameter) and transition pieces
- Capable of carrying and installing 8 WTGs
- Application of feeder vessels reduces costly port logistics



CRANES

Huisman's in-house developed and manufactured cranes have been used within the offshore industry for over 30 years and have become the standard in the design and construction of heavy lift cranes. More recently, Huisman has translated its knowledge and know-how in a dedicated series of wind turbine installation and maintenance cranes. Clever designs result in lightweight cranes with extended weather windows and large free deck space to optimally utilise the wind turbine installation vessel. Therefore, Huisman's crane designs are very well suitable for the offshore wind turbine installation and maintenance industries. Each crane sold is a configuration of proven components and a combination of previous designs, fully adapted and tuned to our client's specific needs and operational demands. With Huisman, no single crane is the same. As a starting point, Huisman has four specific crane types suitable for the wind turbine industry:

PEDESTAL MOUNTED CRANE

- Small tail swing, optimising free deck space
- Drive system installed inside enclosed crane house, protected from the marine environment

OFFSHORE MAST CRANE

- Small footprint allows for easy integration with vessel structure, also for retrofitting on existing assets
- Small bearing diameter allows for small minimum radius and optimised free deck space
- Low CoG is ideal for installation on semi's and jack-up's

LEG ENCIRCLING CRANE

- Lightweight crane design allows for larger payload on jack-up vessels
- Small tailswing allows for optimised utilisation of free deck space

TUB MOUNTED CRANE

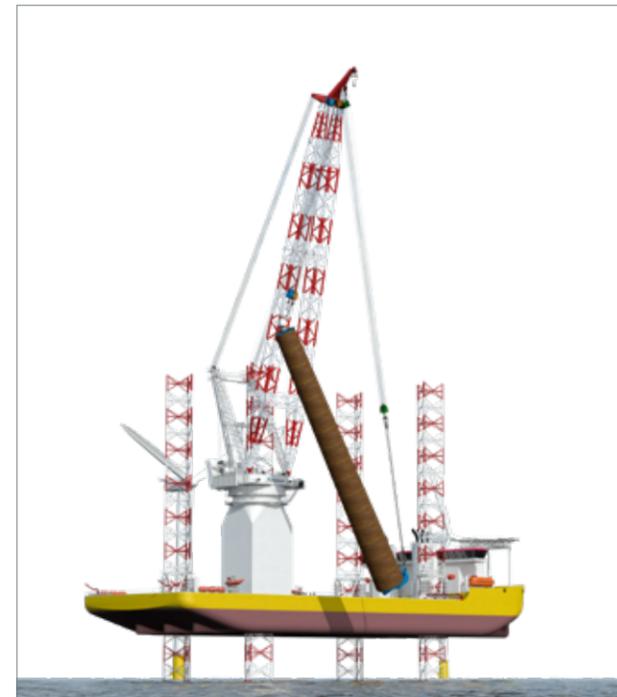
- Lightweight tub design
- Small tail swing, optimising free deck space
- No counter weight
- Crane range up to 10,000mt SWL
- Ideal for extremely long boom configurations



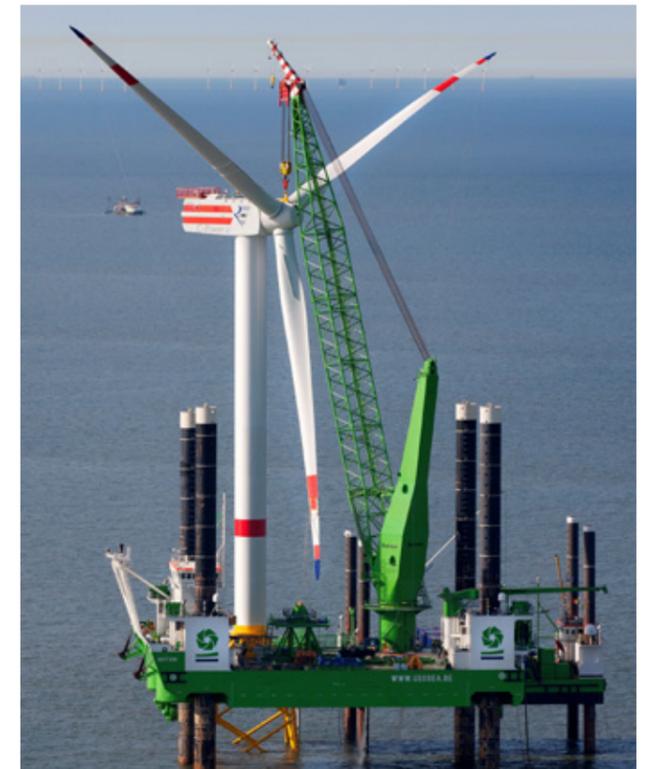
TRIPLE MAIN HOIST SYSTEM

The triple mainhoist system consist of three independent lowerblocks on the mainhoist position. This allows the Operator to upend heavy offshore structures such as monopoles and jackets with two hooks connected to one side, and one hook connected to the other side. The advantage is that once upended, two thirds of the crane's capacity remains available to lift the upended structure, instead of half, commonly seen with the double main hoist system.

In addition, the triple main hoist system can be used to install large and voluminous structures, such as substations and platforms, very efficiently, since a set-up with three main hook blocks allows for less rigging to be used, simplifying operations and reducing required hook height for slings and lifting gear.



OFFSHORE WIND





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