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WHITEPAPER CRANE BOOM REPLACEMENT

INTRODUCTION - PROBLEM DEFINITION

With the aging of offshore facilities, concerns arise about the platform deck cranes. The deck cranes are aging together with the platform but offer different challenges.

The deck crane can reach design life before the extended design life of the platform

The deck crane OEM cannot guarantee delivery of spare parts

The structural integrity cannot be guaranteed

The crane boom is one of the critical components of deck cranes. It is a structural element, which is part of a mechanical system. The design life of the deck crane is limited by the design life of the crane boom. Operators are forced to perform repairs or replacement of their crane booms.

This whitepaper is written for project teams tasked with the replacement or repair of crane booms in offshore environments. It provides a starting point for any crane boom replacement project, or it can be used as a checklist.

SAFETY

WORKING AT HEIGHT

There is a difference in rope access work and work at height. When working at height, technicians are working from a (temporary) fixed platform. Rope access work is conducted from within rope systems. Both access methods have a unique set of risks.

Rope access work is executed according to the IRATA guidelines. Working at height is governed by best industry practices. A job specific HSE report is drafted, and a job safety analysis covers the risks involved. An experienced crew will minimize the safety risks as much as possible.

HANDLING HEAVY COMPONENTS

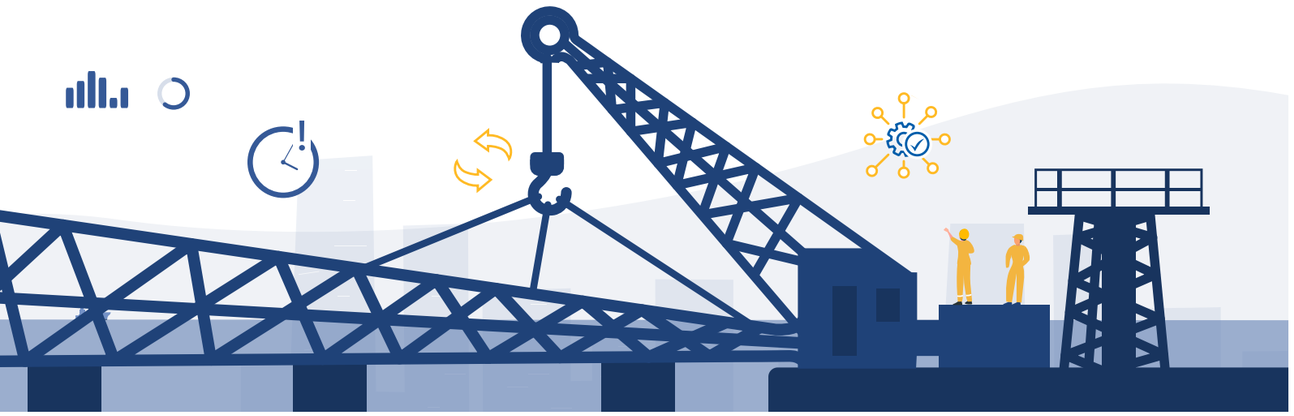
During engineering phases, construction is not always the most prominent factor. By involving field technicians in the engineering process, often the risks of too heavy components are addressed at an early stage. It prevents the necessity of having to handle heavy components, e.g., very large lifting equipment.

WEATHER

The weather has a lot of influence on most brownfield activities. For crane boom replacements, plans are needed for a system to fasten the gantry structures and crane boom sections. This might seem obvious but consider that the crane might not be available when there are weather changes.

During engineering and project preparations, many safety risks are identified. Some of key risk areas are:

- Working at Height
- Handling Heavy Components
- Dropped Objects
- Working on a Live Asset
- Weather



TIME CHALLENGE

The platform should return to normal operations quickly. The time that the crane is not in operation can add costs to the project indirectly. Decreasing the total project duration will decrease the amount of lost revenue.

The time challenge will pressure the people involved in the project. Operators should plan for the operation carefully. There should be sufficient time to prepare for the offshore work. The better the contractor is prepared, the smoother the offshore operation will be completed.

ENGINEERING CHALLENGE

The different challenges described in this whitepaper all contribute to the engineering complexity. Most of the engineering activities are dedicated to creating workplans and method statements.

The analysis of all the loads resulting from the operation will need to be done. The gantries are designed with lightweight components. Engineering is required to show the suitability of the selected equipment. Loads need to be introduced onto the platform carefully. Load spreading arrangements will be required.

The guy wires that secure the gantries will be tensioned according to pre-set values. These values need to be calculated and the loads running into the offshore facility need to be checked.

The crane boom replacement will be subject to approval of a Marine Warranty Surveyor. Obtaining this third-party approval might require different engineering. A typical additional request is to provide assurance that the supply vessel can remain alongside for the specified time.

REPLACEMENT METHODS

There are many ways to replace a crane boom. The selection is based on offshore parameters, safety, and costs. Traditionally, crane booms are replaced by heavy lift vessels. In former days, not as many crane booms were due for replacement. With the frequency increasing, different methods have been developed. More recently, we have been swapping out crane booms without crane vessels, which is the method described in this whitepaper. The preferred replacement method uses the existing crane to bring the new crane boom onto the platform. After replacement, the old boom is removed with the overhauled crane. First, let's identify the different steps offshore. Afterwards, we will explain, in detail, the replacement steps and the equipment.

INSTALL STRUCTURAL TOWERS

Lift components of a new crane boom onto the platform. Component sizes to be optimized according to the SWL for offshore lifts.

Assemble components at deck level, meeting the maximum onboard lifting capacity of the existing crane.

Overview of offshore activities:

1. Lift the components of the new crane boom with the existing crane and position on top of the structural tower
2. Assemble the new crane boom on top of the structural towers
3. Position the existing crane boom on the structural towers
4. De-reeve and disconnect existing crane boom
5. Remove pivot pin of existing crane boom
6. Skid the existing crane boom away from the crane house
7. Skid the new crane boom into position
8. Install new pivot pin
9. Reeve wires, and connect the new crane boom
10. Commission the new crane boom
11. Load test the new crane boom (by OEM), including third party verification
12. The overhauled crane lifts the components of the old crane boom from the structural tower and places the sections on a supply vessel

MANPOWER AND EQUIPMENT

The offshore crew will be selected to meet the project requirements. Typically, rope access technicians, riggers, and on-site machinists are part of the offshore team. They will be working with specialized tools and equipment required to complete the crane boom replacement project.

EQUIPMENT

For the replacement process, structural towers, access material, mechanical equipment and rigging as well as skidding equipment are needed.

STRUCTURAL TOWERS

The main equipment used in the replacement project are the structural towers. Traditionally, load bearing scaffolds were required to create these towers. The footprint of these scaffold structures is often too large to be accommodated on an offshore platform. This is probably the main reason for using heavy lift vessels instead.

One way to overcome the limited space is to erect gantry-type towers, which are assembled from modular components. The gantries have a small footprint and can be placed at different locations on the deck. To increase stability, guy wires are installed. These guy wires are tensioned to maintain stability. The structural towers are equipped with aluminum working platforms. These platforms are only installed where extensive access is required.

Offshore teams use riggers, and gantry-type structural towers with specialized equipment for crane boom replacement.

SKIDDING SYSTEM

To move the crane booms over the structural towers, a skidding system will be integrated into the horizontal top beams of the gantry structures. To skid the crane booms over the gantry structure, skid tracks or sliding tracks can be used. Conbit prefers to use sliding tracks, since not a lot of additional weight is added to the structural towers and there is a limited amount of equipment required to perform the skidding operation.

In both systems, skid shoes need to be installed. These skid shoes have multiple functions:

Prevent damage to the crane booms during the skidding operation

Allow for pulling and pushing the crane booms over the tracks

The installation of the skid shoes requires rigging equipment. The location of the skid shoes is important, so the installation method needs to allow for careful maneuvering.

ROPE ACCESS

Rope access techniques are mandatory when working with gantry-type structural towers. Technicians need to gain access to the crane booms, which are lying on top of the towers. Depending on the height of the structural towers, additional means of access can be arranged, such as stairs, power ascenders, etc.

MANPOWER

The total scope of work requires the composition of the offshore team. A typical crane boom replacement project requires the following trades to be part of the team:

Riggers

Crane Operators

Onsite Machinists

Technicians

Crane Commissioning Technician

The majority of the listed personnel will possess rope access skills (IRATA certification).

Riggers form most of the team. They will assemble the structural towers, de-reeve the crane, perform the rigging and skidding during the replacement procedure and reeve the crane configuration.

On-site machinists are required to remove the pivot point of the crane boom. Often, these pivot points cannot be removed by hydraulic cylinders and must be removed by line boring techniques.

Not all crane boom replacement projects require welders on site. However, in unforeseen circumstances, it is advantageous to have them part of the team. They can install lifting points, make modifications to existing structures, and create strong points for the guy wires. Consider that crane booms are often fabricated from exotic steel types and require a specific welding technique.

After the new crane boom is installed and reeving is completed, the new crane configuration will need to be commissioned and tested. For these activities, a specialist commissioning expert needs to be added to the team at the end of the project. He will be supported by the team of riggers.

HOW TO PLAN FOR A CRANE BOOM REPLACEMENT

The first step is to decide the End-of-Life strategy for the crane. How long will it still be in operation and is the full capacity required? Different options include mothballing the crane, removing the complete crane, downgrading, repairing or replacing.

Once the decision is made to replace it, start by procuring the replacement crane boom. Currently, lead times for new crane boom are long and will govern the project planning. With the number of platforms to be mothballed or taken from the field, there is an active second-hand market, which might offer a short-term remedy for the need for a new crane boom.

The preparations for the offshore work should commence six to nine months before. Within that period, specialist contractors should be contacted.

The type of contractor needed depends on project specific requirements. Preferably, a representative of the crane manufacturer will be onboard to commission the crane and supervise the reeving. If the crane manufacturer is unable to provide this service, your main contractor will need to add this service into his scope of work.

Once the replacement crane boom is on the quayside, the offshore crew will need to be mobilized to the platform.

The crane will be out of operation for a period of 2-4 weeks. The complete offshore project will be completed in approximately 6 weeks.

CONCLUSION

There are many crane booms that require replacement for a variety of reasons as a side effect of aging platforms. This growth in demand has resulted in innovative solutions for replacing them. There are many alternatives that do not require a crane vessel. In this whitepaper, we outlined what to consider when replacing crane booms offshore without the use of crane vessels. At first glance, the project seems relatively straightforward. When taking a closer look, the challenges will be identified. The project will result in not having a crane available, which impacts the platform operations. The deck crane cannot be relied upon to support the replacement project.

In all, the project requires careful planning and preparation. A specialist will allow your project to run smoothly. Conbit is one of those specialists. Contact Conbit nine months before the offshore work should commence. This allows plenty of time to prepare. Of course, shorter lead times are possible as well. In that case, a specialist like Conbit really needs to benefit from their experience.

NEXT STEP

Conbit has many resources available to plan for a crane boom replacement project. Some things we can support you with are:

- Standard Document Register List
- Typical replacement methods
- Typical project schedules
- Explanatory videos

Reach out to Conbit's sales team to request the information you require. You can also request a FREE demo or ask a specific question.

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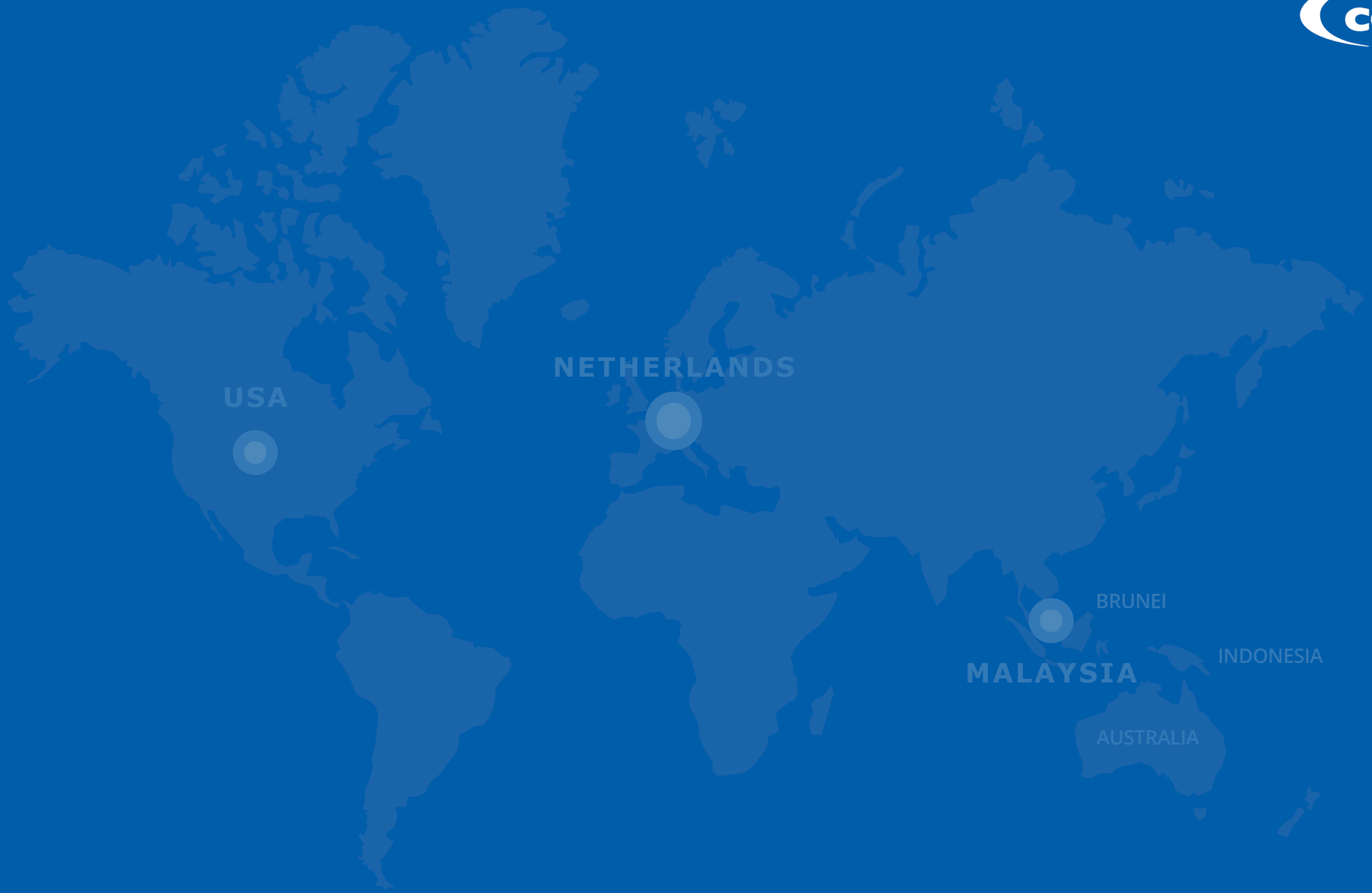

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