



SPARROWS

CASE STUDY

3D CRANE BOOM SURVEY AND STRUCTURAL INTEGRITY ANALYSIS

A detailed structural integrity analysis can reveal significant savings when your OEM conditions state replacement is the only option

BENEFITS

Provided a cost effective solution

Engineered solution which complied with legislative requirements

No crane and operational down time

Work scope completed ahead of time



ASSET

Jack-up drilling rig

LOCATION

UK and Singapore

Continued overleaf...

CHALLENGE

Following a Non-Destructive Testing (NDT) inspection of the three pedestal cranes on board the jack up rig, it was found that all three booms had surface corrosion covering over 50% of their total surface area. A criterion set by the crane manufacturer states that if surface corrosion exceeds 50% of the boom's total surface area, replacement is required; as a result, all three booms were condemned by the manufacturer, with a replacement cost totalling \$2.25 million. This criterion does not account for wall thickness loss due to corrosion.

Due to the high replacement costs, the customer sought a second opinion and contracted Altrad Sparrows to survey each of the three cranes using 3D laser scanning and rope access trained surveyors. This scan would then allow us to perform a structural analysis and determine the effect of corrosion on the booms' structural integrity. The study aimed to confirm whether the corroded crane booms remained compliant with relevant design codes and whether remedial repair work would suffice.

SOLUTION

- We created a 3D Finite Element Analysis (FEA) model for each of the three crane booms using available information and the 3D scan. Even though the cranes were the same make and model, all three booms were configured differently. The booms were analysed in accordance with American Petroleum Institute (API) Spec 2C, in the uncorroded condition, to obtain baseline member utilisations for comparison.
- The boom models were then modified to simulate all relevant corrosion on crane boom and analysed using the same design loads.
- The highest utilised members of each crane boom were then compared against their respective uncorroded utilisations, along with the utilisations of each corroded member and the elements surrounding the corroded members. This formed a clear picture of how the corrosion affected the structural integrity of each of the three booms. In this case, the corrosion had no major effect on the structural integrity of any of the three crane booms. The utilisation increases were minimal, and all corroded members' utilisations remained below 100% when measured against the requirements of API 2C. Therefore, all three crane booms were deemed suitable to continue service at full capacity.

- The cost of doing this analysis was significantly lower than the replacement costs for all three cranes.
- Should any of the crane booms have failed the analysis due to over utilisation, Altrad Sparrows could issue the customer with de-rated load curves based on the current state of the crane booms, along with remedial local repair options to bring the booms back to their full safe working load.

SUMMARY

- Survey of inaccessible crane structures using 3D laser scanning and rope access surveyors
- FEA
- Remedial recommendations
- Technical support
- Project management.



1.
Corrosion found on one of the crane booms.

2.
FS2000 model of crane boom.

DELIVERY ASSURED

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