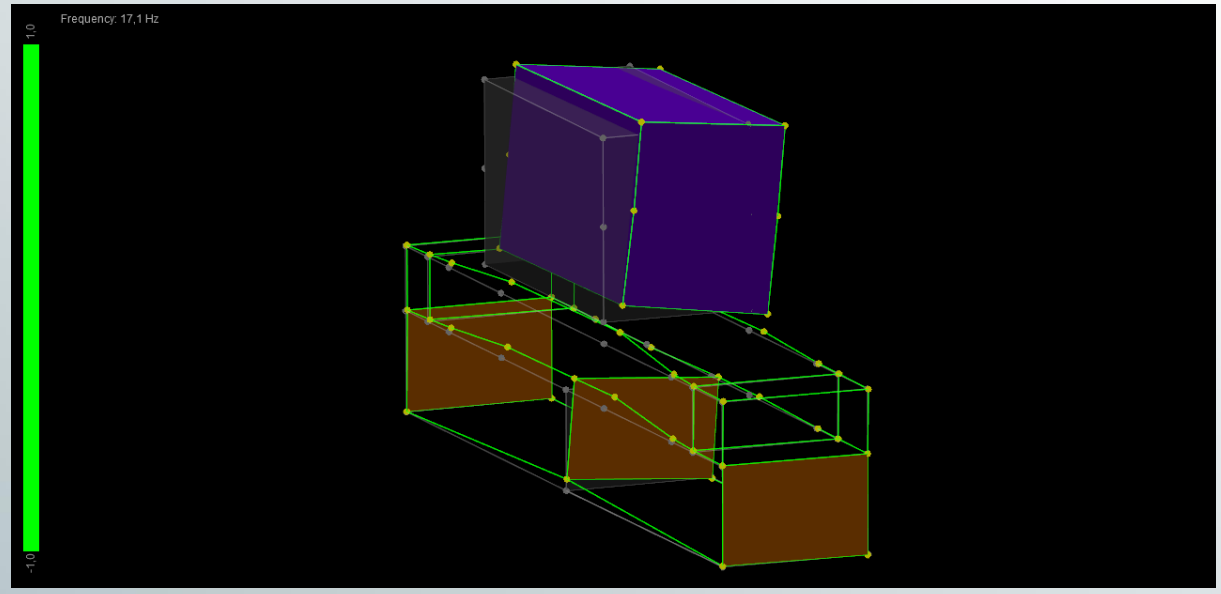
CASE

A rocking electric winch motor

Visualization of vibrations through advanced measurements and FEM calculations



Operating Deflection Shape animation showing dominant rocking mode shape externally excited by the Inboard Dredge Pump.

Customers challenge
A client observed excessive vibrations on an electric motor (up to 30mm/s RMS), part of a critical ladder winch installation. This raised concerns about potential damage. The issue was not observed on an identical sister installation, and it was reported not long after a replacement with an upgraded e-motor.

Our approach
A specialist from the MDS team was introduced to the case who suggested explorative measurements to be taken by a local service engineer under different operating conditions with an easy overall vibration level meter. This already revealed that the vibrations were particularly dominant in the horizontal direction, and not produced by the machine itself, but externally by the Inboard Dredge Pump in a specific speed range of 260rpm.

To dig deeper, MDS collaborated with IHC Life Cycle Engineering to investigate further and review the structural design of the supporting base frame. Subsequently, an MDS engineer was mobilised to take onboard advanced vibration measurements in terms of an Operating Deflection Shape. Not only did this help to visualize the vibration mode shapes, but it is also reliable input for dynamic FEM calculations.

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Root cause

The measurements confirmed a local structural resonance at 17.0Hz with a so-called rocking mode, being excited by the Blade Pass Frequency in the operational range of the dredge pumps. The ~20% higher mass of the upgraded e-motor had lowered the natural frequency. The modal analysis was compared and calibrated to the measurements to achieve a reliable basis for simulating effective improvements. This resulted in targeted reinforcements and a new natural frequency of 22.8Hz being sufficiently away from the normal excitation range. Subsequent validation measurements showed levels within common limits.

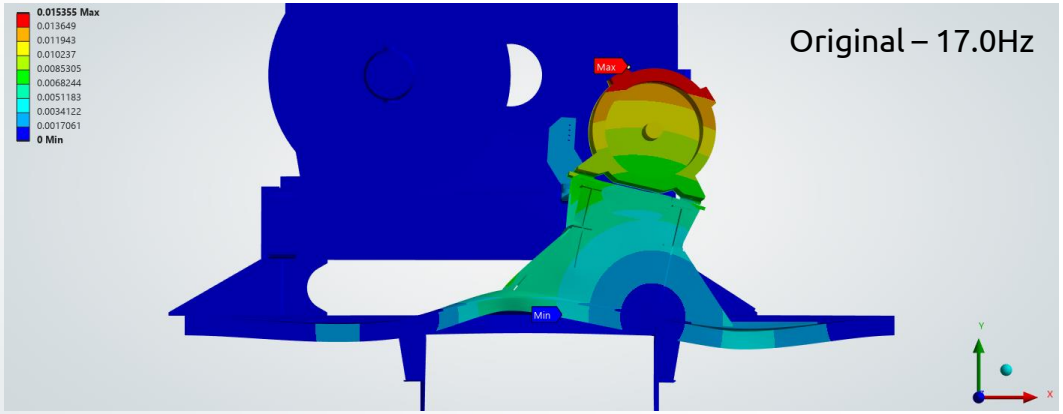
Results & key takeaways

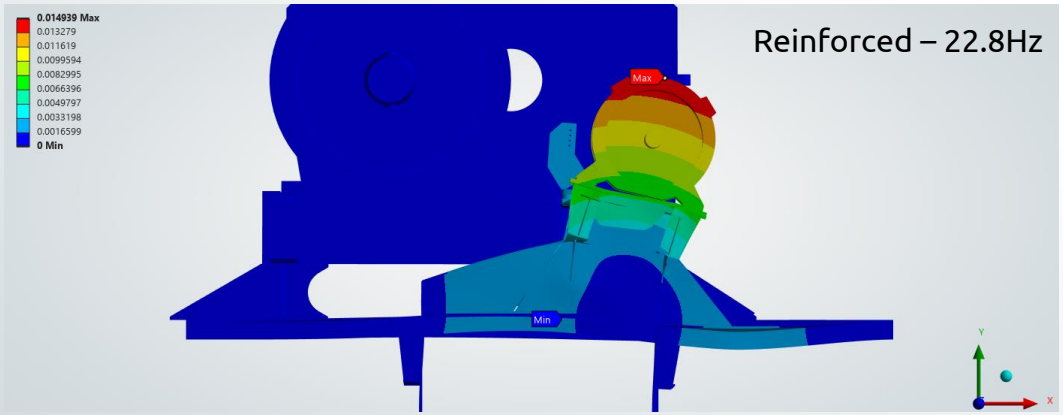
Root cause resolved: Understanding the dredging process and dynamic conditions was essential in diagnosing this vibration issue effectively.

Efficient diagnosis: The staged approach allowed for a well-prepared plan requiring only 1 visit for the MDS engineer.

Specialised expertise: The powerful combination of measuring and calculations resulted in an actionable solution with production drawings for the base frame stiffening.

Onsite insight: Our engineer on board gathered detailed information about the area with the lowest structural stiffness.





FEM calculations as calibrated on the measurements, with improvements.

Ready to solve your challenges?

If you're facing operational or reliability challenges with your critical equipment, contact us today to discover how our team Measurements & Diagnostics Services can optimise your performance and reduce downtime.

MDS@royalihc.com
+31 88 015 25 35
www.royalihc.com/diagnostics

Royal IHC