



Case-study – Marine propulsion

Propulsion shaft thrust, torque, and bearing loads, measured and validated on a Marine gearbox.

Validated with

REINTJES

DAMEN

FVA-Workbench

Challenge

Measuring thrust and torque on a ship's propulsion shaft is one of the hardest instrumentation problems in marine engineering. Without operators can't separate hull fouling from propeller degradation from engine inefficiency, so fuel waste goes undiagnosed and hull and propeller monitoring stays theoretical.

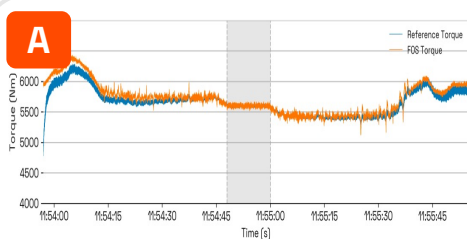
Solution

Two LumiSens Bearing sleeves with 13 FBG sensors each were installed on the outer ring of the CRB and TRB ,bearings of a REINTJES marine gearbox low-speed shaft. The system was tested on a back-to-back end-of-line test rig across multiple torque levels and speed profiles, both forward and backward.

Result

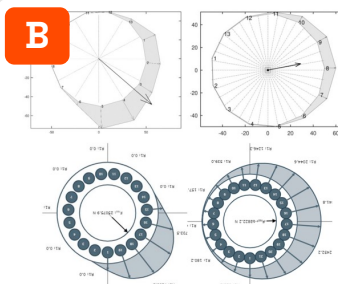
Torque and speed matched the reference sensors within 0.1%. Bearing loaded zones matched FVA-Workbench predictions and revealed real clearance conditions the simulation missed. Gear mesh and bearing fault frequencies clearly visible in frequency spectra.

Test results



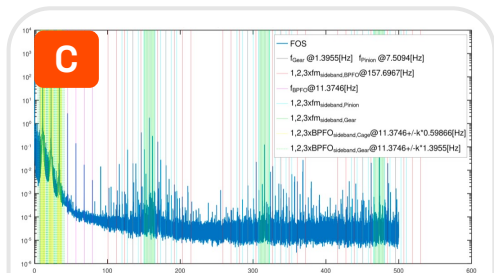
Torque validation:

LumiSens Bearing torque estimate (orange) vs. reference sensor (blue) close fit across full operating range.



Bearing loaded zones:

LumiSens measurement (top) vs. FVA-Workbench simulation (bottom).



Condition monitoring:

Frequency spectrum showing gear mesh, ball pass, and shaft frequencies, early fault detection capability proven.

5594 NM

Torque vs 5598 NM
reference (0,07 % diff)

1659 RPM

Speed vs. 1652
reference (0,4% diff)

13 x 4

FBG sensors across
two bearings

24 kHz

Sample rate for
condition monitoring

What LumiSens bearing delivers



Torque & thrust

Real-time shaft torque and propeller thrust force validated.



Bearing load zones

Radial and axial bearing load distributions, revealing actual clearance.



Vibration spectra

Gear mesh, ball pass, and shaft frequencies, enabling early detection of faults.