Benefit Case – Stress Measurement & Monitoring

SITUATION AND CRITICAL ISSUE

Loading Rate Effects on Ship Structure of Bulk Carrier

Terminal demand for shorter loading period of the ships has caused a trend of increasing loading rates. However, some claim that higher loading rates may have a detrimental effect on the ship structure. The scope of the investigation was to document possible effect related to different loading rates.

DNV GL SOLUTION

- Install 25 fibre optic strain sensors at deck/bottom in 2 cargo holds
- Measure data continuously during the whole loading sequence using different loading rates up to 16000 tons/hour
- Document that loading plan was followed
- Conclude on quasi static and potential dynamic effects of loading rate on ship structure
- Perform FE analyses for verification of the measurements and calculation of fatigue life consumption of structural details

VALUE DELIVERED

- Knowledge on dependency of static and dynamic stresses on cargo loading sequence and rate
- Quantification of fatigue life consumption due to loading for critical structural details

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SITUATION AND CRITICAL ISSUE
Springing/whipping vibration observed for new design in operation
Severe wave induced vibration was observed for a new bulk carrier design vessel after being put into operation.
The ship owner asked DNV GL for support in equipping the vessel with a stress monitoring system to monitor and assess the actual structural fatigue loads acting on the hull.

DNV GL SOLUTION
- The owner equipped the vessel with a system which did not give data of required quality.
- DNV GL provided the list of suppliers with systems approved to DNV GL HMON notation.
- The owner chose one of these suppliers, and requested DNV GL to assess the data one year later.
- The system was a minimum system with two strain sensors on deck, with connection to the loading computer, wind sensor and navigational data.
- The system generated good quality data with 100% uptime.

VALUE DELIVERED
- The assessment revealed that the fatigue lives of critical ship details were well below 40 years, but regarded to be just sufficient in practice.
- Based on the annual assessment of the recorded stress spectra the consumption of design fatigue live of critical structural details could be quantified.

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