Is state-of-the-art decision support technology all it's cracked up to be? MARIN investigates

30781 Courtesy: Jumbo Shipping.

In the coming years there will be an increasing number of heavy cargo transports and offshore installations of medium and heavy weight modules. MARIN assesses the quality and shortcomings of state-of-the-art decision support technology.

Jos Koning
Trials & Monitoring
J.Koning@marin.nl

With its brand new J-type series of vessels, Jumbo Shipping aims to play an important role in this market where ever-more complex projects are being performed. State-of-the-art design tools and decision support systems can be used to account for both extreme loads and accumulated fatigue damage to cargo, lashings and sea fastenings. A six-month research campaign was carried out on board Jumbo's newbuild 'ms Fairpartner' in order to maximise the operability and reliability of the new J-type vessels.

The project aimed to validate the assumption that besides rigid body ship motions also acceleration levels throughout the ship, generic inertial loads on cargo modules and most importantly, cargo securing loads could be calculated reliably using numerical models combined with on board available wave data. Accelerations were also compared to class rule design values.

It was demonstrated that inertial forces on a test container could be calculated reliably from local accelerations which in turn, could be derived from six degree of freedom rigid body accelerations measured elsewhere in the vessel. The largest uncertainty in the process chain was found to be the quality of wave data measured on board. In particular for conditions where large motions are likely to occur, for instance stern and stern quartering seas, relatively small variations in wave direction and period were found to induce large differences between measurements and calculations. The applicability of advisory systems with regards to ship motions thus depends greatly on the quality of available wave data and the basic algorithm that is used to match measured conditions with numerical data. This is not just essential for determination of the best course of action in case of an unfavourable condition. It is also crucial if an algorithm is used to monitor loads and raise alerts to phenomena that are not easily recognised by the crew such as fatigue loads and internal loads.

On board measurements comprised wave environment, ship motions and accelerations and also local accelerations, inertial forces and lashing loads on a container in the aft cargo hold. Sea states of up to 10 m significant wave height were encountered. Numerical models that were evaluated were the 2D strip theory SHIPMO and the Safetrans heavy transport codes. MARIN


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