

MOTION ANALYSIS OF FLOATING BODIES

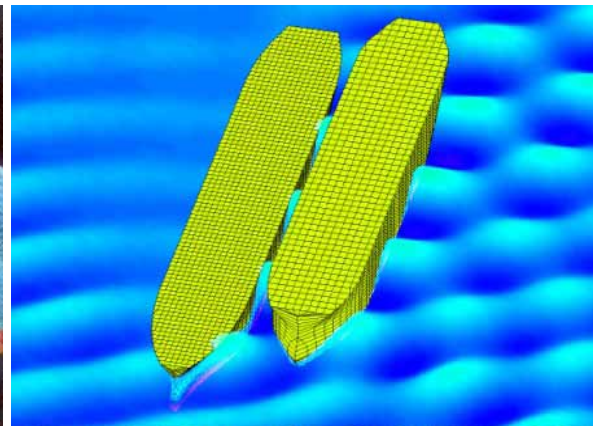
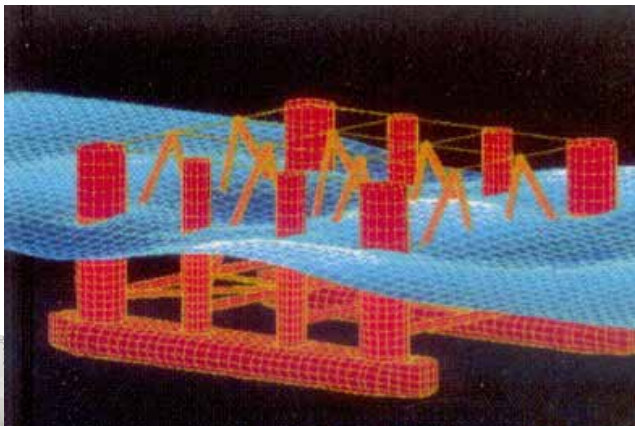
Zebec Marine Consultants can study the motions of any floating structures due to the impact of wave loads and other external forces. These studies for 6 degrees of freedom are useful to assess the safe operability in harsh environments, so that the structure and its moorings can be properly designed.

The motion analysis will also serve as a tool to assess the interaction with other structures in the vicinity, such as the interaction during ship-to-ship transfer, complex moored floating systems or ship-to-berth arrangement.

1st and 2nd order wave loads can be studied, as well as induced motions of multiple floating bodies, with or without forward speed, and the effect on the motions due to the interactions.

Some of the studies that can be conducted include but are not limited to:

- Motion analysis of vessels moored to a berth or to each other
- Alteration of vessels motion due to dynamic effect of liquid motions in the vessels tanks, and
- Downtime analysis of ship to ship transshipment at varying sea states and loading conditions
- Parametric rolling of container ships in head waves
- Analysis of non-linearity like bow slamming and green seas on deck in different wave conditions
- Dynamic effects of liquid motion in tanks
- Allowance for resonant effects of moon pool
- Wave added resistance and wave drift damping
- Fluid kinematics, vessel motion and dynamic pressure animation
- Spectral analysis and long-term estimation
- Analysis of motions of varying hull forms including catamarans and trimarans
- Motion analysis for sea transportation of heavy tall cranes for lashing and maximum accelerations

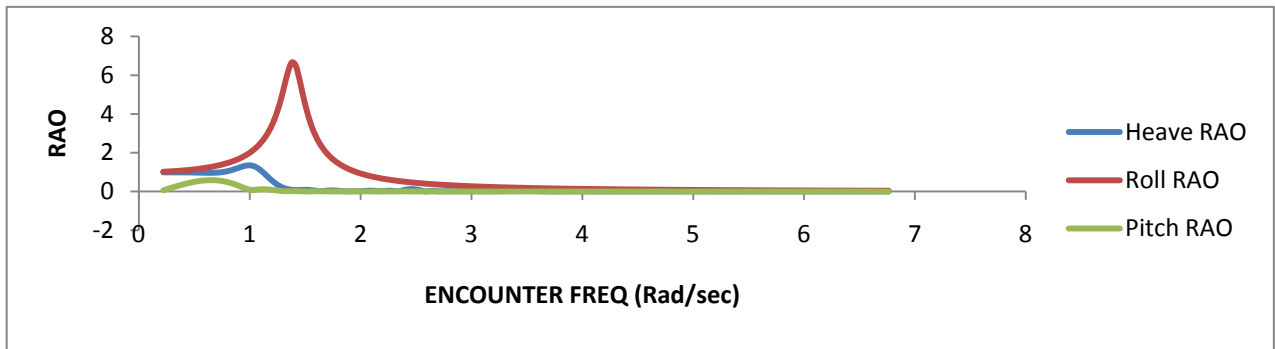


Sloshing excitation for liquids inside tanks can be assessed which can be used for studying behavior of the vessel in various loading conditions. The use of anti-roll tanks can be studied and recommended.

The modeling also takes into account the underwater hull shape of the vessel, the loading condition, and the vessels speed and heading, which will assist in optimization of the floating body design.

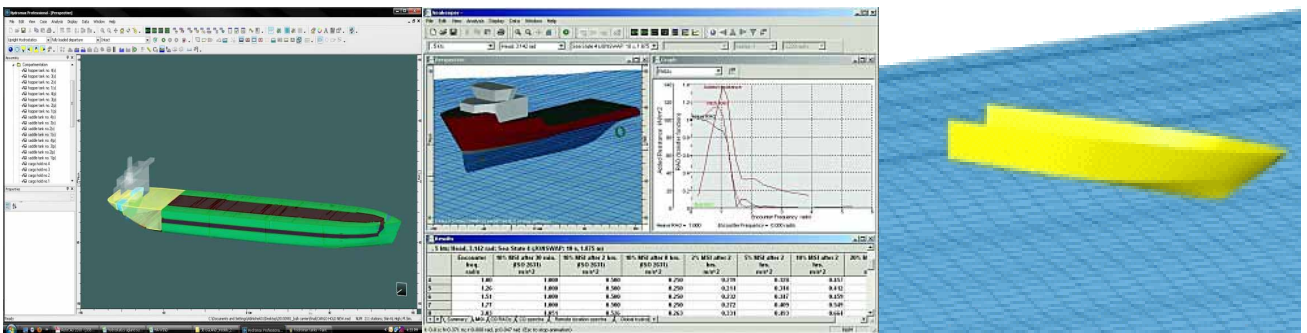
We use the software, HydroSTAR developed by Bureau Veritas for carrying out the motion analysis of vessels.

In addition, we use the software Sea-keeper for prediction of the sea keeping performance of a vessel, whilst maneuvering in a seaway. Sea-keeper is a 3 degree-of-freedom (heave, roll, pitch) vessel motion prediction program to assess vessel response under specific headings, speeds and wave spectra.



Response amplitude operators (RAOs) for heave, pitch and roll motions for each heading and speed

Passengers and shipboard personnel can be affected by the vessel's motions, and the sea sickness can be evaluated by Sea-keeper as the Motion Sickness Incidence (MSI). Further, the software can also establish the Motion Induced Interruptions (MII) which is a measure of an individual's ability to complete a specific task while on board a moving ship. This analysis can assist in analyzing the design alternatives whilst on the drawing board.



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