

Modeling and Simulation of Ship Structures Using Finite Element Method

Authors : Javid Iqbal, Zhu Shifan

Abstract : The development in the construction of unconventional ships and the implementation of lightweight materials have shown a large impulse towards finite element (FE) method, making it a general tool for ship design. This paper briefly presents the modeling and analysis techniques of ship structures using FE method for complex boundary conditions which are difficult to analyze by existing Ship Classification Societies rules. During operation, all ships experience complex loading conditions. These loads are general categories into thermal loads, linear static, dynamic and non-linear loads. General strength of the ship structure is analyzed using static FE analysis. FE method is also suitable to consider the local loads generated by ballast tanks and cargo in addition to hydrostatic and hydrodynamic loads. Vibration analysis of a ship structure and its components can be performed using FE method which helps in obtaining the dynamic stability of the ship. FE method has developed better techniques for calculation of natural frequencies and different mode shapes of ship structure to avoid resonance both globally and locally. There is a lot of development towards the ideal design in ship industry over the past few years for solving complex engineering problems by employing the data stored in the FE model. This paper provides an overview of ship modeling methodology for FE analysis and its general application. Historical background, the basic concept of FE, advantages, and disadvantages of FE analysis are also reported along with examples related to hull strength and structural components.

Keywords : dynamic analysis, finite element methods, ship structure, vibration analysis

Conference Title : ICADM 2018 : International Conference on Advanced Design and Manufacture

Conference Location : Paris, France

Conference Dates : July 19-20, 2018