Numerical simulation of the ice resistance in pack ice conditions

***B.Y. Yang[1], Y.M. Wang[1], †G.Y. Zhang[1,2,3]**

[1]Liaoning Engineering Laboratory for Deep-Sea Floating Structures, School of Naval Architecture, Dalian University of Technology, Dalian, 116024, P. R. China
[2]State Key Laboratory of Structural Analysis for Industrial Equipment, Dalian University of Technology, Dalian, 116024, P. R. China
[3]Collaborative Innovation Center for Advanced Ship and Deep-Sea Exploration, Shanghai, 200240, P. R. China

*Presenting author: 534121639@mail.dlut.edu.cn
†Corresponding author: gyzhang@dlut.edu.cn

Abstract

The research about icebreaker and other polar ships has attracting much attention in the field of ship and ocean engineering. In this context, it's essential to predict the resistance of ship in the Arctic region accurately. The recent research mostly focused on the level ice condition and only a few attempts have been so far made to research in pack condition. In this study, the ice resistance under the pack ice condition was estimated using Multi-Material Arbitrary Lagrangian Eulerian formulation and Fluid-Structure Interaction analysis technique of LS-DYNA code. We especially considered the hydrodynamic loads between the ship and ice floes, which could be important for the simulation in pack ice conditions. Then we discussed the influence of the ship velocity, ice thickness and the concentration of pack ice condition. Finally, the main limitations and future work directions of the numerical simulation work are suggested.

Keywords: Fluid-Structure Interaction; LS-DYNA; Pack ice condition; Hydrodynamics.