

Qualitative analysis of bow flare slamming using RaNS based Computational Fluid Dynamics (CFD) technique

Slamming can be classified based on the region of the hull surface where it occurs as bottom slamming, green water loading, breaking water impact and bow flare slamming. Among these kinds of slamming, evaluation of hydrodynamic loading due to bow-flare slamming is still a challenging task. It is because of:

- Bow flare slamming occurs only in particular types of ship like container ships and car carriers. Therefore, it is comparatively new kinds of slamming phenomena.
- Since bottom of the hull has high structural strength, preparing for the bottom slamming does not require many tasks.
- Extensive researches were carried out for green water loading and now-a-days practically applicable analytical and numerical methods are available to predict the loading because of it during design stage.

However, flare part of the hull surface is not prepared to withstand high pressure load and it is not practical to add high strength around entire flare part. Therefore, a method to predict flare slamming is needed for safety and total economy of the vessels.

Traditionally, strength requirements in the bow flare region are evaluated based on the empirical formula proposed by various classification societies. Study reveals that there is a considerable variation occurs in evaluated strength requirements by using classification society's empirical formula. Therefore, a direct calculation method is needed for evaluating the strength in the flare region in the design stage of hull surface. Inviscid potential-flow based numerical methods are used widely for evaluating wave resistance because of its' robustness and less computational time requirements. However, flow separation, generation of vortex and non-linear wake filed are occurred in real conditions, which is due to viscous effects. Therefore, improvement is necessary in numerical calculation methods. The possible candidate is the Reynolds averaged Navier-Stokes (RaNS) based computational fluid dynamics method (CFD).

The seminar will mainly focus on the basics of RaNS based CFD code WISDAM-X developed at The University of Tokyo, Japan; validations of WISDAM-X's predicted results with towing tank experiments and analysis of slamming by visualization of flow field.

Besides these, present scenario of shipbuilding and ship recycling industry of Bangladesh will also be discussed shortly.