Development of method for ultimate longitudinal strength assessment of ship hull girder under combined loading

YAO, Tetsuya

(Osaka University, Graduate School of Engineering, Professor)

【Outline of survey】

For the strength assessment of ship structure, it is necessary to know both capacity of the structure and external load acting on it as precisely as possible. Regarding the ultimate hull girder strength, action of torsional moment and shear force as well as bending moment have to be considered. It has to be noted that both capacity and load are statistics and reliability analysis is necessary for strength assessment. On these background, the followings are to be performed: (1) Development of methods of analyses for precise evaluation of ultimate longitudinal strength, as well as for simulation of ship motion and estimation of wave-induced loads on hull girder in stormy sea; (2) development of precise method of strength assessment on the basis of reliability analysis; and (3) Construction of a total system for strength assessment of ship structure. A seies of large-scaled model test shall also be conducted to clarify the collapse mechanism of ship hull under combined loadings.

【Expected results】

It shall become possible to assess the failure probability of ship hull girder under actual extreme wave loads, which may be useful to know real safety margin of the ship structure.

At the moment, Goal-based New Ship Construction Standards is discussed in IMO, and safety-level approach is to be applied for construction of the standards. Present work is partly performed in the framework of this approach.

【References by the principal researcher】

- Yao, T., Imayasu, E., Maeno, Y. and Fujii, Y.: “Influence of Warping due to Shear Force on Ultimate Hull Girder Strength,” Proc. 9th International Symposium on Design of Ships and Other Floating Structures, Luebeck, Germany (2004), pp.322-328.
- Yao, T., Fujikubo, M., Yanagihara, D., Fujii, I., Matsui, R., Furui, N. and Kuwamura, Y.: “Buckling Collapse Strength of Chip Carrier under Longitudinal Bending – Collapse test on 1/10-scale hull girder model under pure bending -,” J. Soc. Naval Arch. of Japan, Vol.191 (2002), pp.255-264.
- Yao, T.: "Hull girder strength," Marine Structures, 16 (2003), pp.1-13.

【Term of project】 FY2006－2009

【Budget allocation】32,600,000 yen

【Homepage address】 http://www.naoe.eng.osaka-u.ac.jp/04/