IACS 共同結構規範對船體樑極限強度的要求　S1

黃建樺*　張長根*
*財團法人中國驗船中心

摘　要

造成商船重大海損的原因有碰撞(Collision)、擱淺(Grounding)、火災、斷裂(Jack knifing collapse)等，其中船體發生斷裂的原因是船體樑極限強度(Hull girder ultimate strength)不足所致。求取船體樑極限強度需考慮船體構件在超越彈性範圍後之塑性，以及後挫曲之力學特性。此極限強度的要求已被國際船級協會聯合會(International Association of Classification Societies, IACS)納入共同結構規範(Common Structure Rules, CSR)，作為新船建造時對縱向強度的要求之一。本文陳述CSR中所要求的船體樑極限強度評估準則，並針對一油輪船體樑斷裂實例，採用 CR 自撰軟體、BV Mars 2000 軟體以及有限元素法求解船體樑極限強度，比較各種求解方法之優缺點，作為進行評估時之參考。

關鍵詞：船體樑極限強度、塑性、縱向強度

The requirements of hull girder ultimate strength in IACS Common Structure Rules

C. H. Huang*　C. G. Chang*
* China Corporation Register of Shipping

ABSTRACT

Collision, grounding, fire, and Jack knifing collapse would cause great loss to merchant ships. Jack knifing collapses are the results of lacking hull girder ultimate strength. The assessment of a hull girder ultimate strength should take account of the plasticity and post-buckling behavior of longitudinal members. The ultimate strengths of newly-built ships have been required by IACS' CSR. This article depicts the ultimate strength criteria in CSR and, focusing on a collapsing case of the oil tanker, calculates the hull girder ultimate strength using CR codes, BV Mars 2000, and FEM, respectively. The pros and cons of each approach are discussed as a reference to future assessments.

一、前言

傳統船級規範對船體縱向彎曲強度的主要要求為，在船舯 0.4L 之內需具有足夠的剖面模數、斷面慣性矩。在此要求的剖面模數是為了要滿足在靜水彎矩加上 10-8 機率等級的波浪彎矩同時作用下，構件產生的應力必須小於容許應力。但在此種考量下，仍