Abstract

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Structural Safety of Double Hull Oil Tankers After Collision

Collision accidents continue to occur in spite of continuous efforts to prevent them. With the increasing demand for safety at sea and protection of the environment, it is of great interest to be able to predict an accident, assess its consequences and ultimately minimize the damage of an accident to ships and the environment. A ship may collapse after a collision because of inadequate longitudinal strength. It is important to keep the residual strength of damaged oil tanker after collision at a certain level in order to avoid additional catastrophic consequences. The main purpose of this thesis is to develop a theoretical calculation of the residual longitudinal strength of a double hull struck oil tanker after collision in term of the resulted transverse damage length (penetration). Also, expressions were derived to determine the struck oil tanker's critical penetration. (i.e. the value of penetration which will break the struck oil tanker into two after severe collision), as well as the critical section modulus of the midship section of struck double hull oil tanker after severe collision. These calculations introduce a design criteria to be taken into consideration during the early stages of ship's design to help the designer to predict the critical penetration at which the double hull struck oil tanker will be broken into two after collision to minimize marine pollution due to tankers' collision. Moduli of sections of three double hull oil tankers before and after damage were calculated and were compared with the minimum modulus of section required by the common structural rules as well as with the recommended residual section of modulus as required by ABS rules. A new concept of structural safety for ship's hull is introduced based on the residual strength of ships after collision. For this purpose, general computer software was created to carry out all these calculations to give at the end the value of the proposed factor of safety.