散裝船船艏擱淺行為研究

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摘 要

本文研究一艘具有初速度之散裝船正面撞擊傾斜海床，從具有初速度，至靜止擱淺於海床上。撞擊過程包含船艏結構壓潰、海床上摩擦滑動、艏部抬昇等行為。研究重點在於分析出本船之於滿載與壓載狀況下，撞擊不同傾斜角度之海床之臨界速度。亦即於多少初速度下，撞擊停止之後不致損傷最前端貨艙。此時，艏尖艙及最前端壓載水艙撞擊後雖發生破損泛水，且艏部抬昇會造成船體舯部彎矩升高，但分析顯示此時貨艙段結構應力仍在安全範圍，貨艙無損，不會造成更大規模災害與損失。本研究以理論與數學解析為主，輔以局部有限元素模型計算撞擊力量與結構潰縮能量。此分析架構能夠以儘可能少之計算資源，分析出本船抵抗擱淺損傷能力，此與全部使用有限元素法進行多種船速之撞擊才能粹取出臨界速度之方法相比，顯得更有效率。

The Bow Grounding Behavior of a Bulk Carrier

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ABSTRACT

This paper studies on the grounding scenario of a bulk carrier with initial velocity. The ship collides with an inclined seabed, slides and finally rests on the seabed. The grounding behavior includes bow structure crushing, rub against the seabed and lift of the bow. The goal of this study is to extract critical speeds of this ship for both ballast and full loaded conditions and for different seabed angles, at which the foremost cargo hold would not be damaged. Meanwhile, the forepeak tank and the foremost water ballast tank may be damaged and flooded, and the lift in bow elevation may cause high bending moment to the hull. This analysis demonstrates the cargo holds and the hull are still safe at the end of grounding, and further disaster and loss would not occur. Theoretical and mathematical methods are employed while assisted by FEA for calculating crushing force and energy. This methodology uses less computational resources as possible to look for the capability of anti-grounding. Comparing to the usage of FEA of dynamic analyses with plenty of initial speeds, this methodology is more efficient.

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