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The conversion strategy from landing craft tank into livestock carrier: An overview of technical evaluation and economical benefit

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Abstract

The conversion of Landing Craft Tank into Livestock Carrier as an alternative solution was conducted by performing technical and economic assessments. The conversion analysis of LCT vessels to Livestock Carrier was achieved by performing layout rearrangement, stability test, seakeeping, and resistance test to measure the technical change occurring due to the modification. The economic added-value analysis was conducted by calculating the payback period to determine the estimated time needed to recover the cost of an investment. The result showed that the conversion of LCT ships has a good technical assessment. The intact and damage stability performance qualifies the standard criteria given by the IMO standard. The motion result qualifies the standard according to the type of vessel in terms of heave, pitch, and roll motions. Moreover, the resistance of the Livestock Carrier is reduced due to a decrease in displacement and draft. In terms of economic assessment, the Livestock Carrier conversion project qualifies for investment projects and improves the use-value and economy of a business

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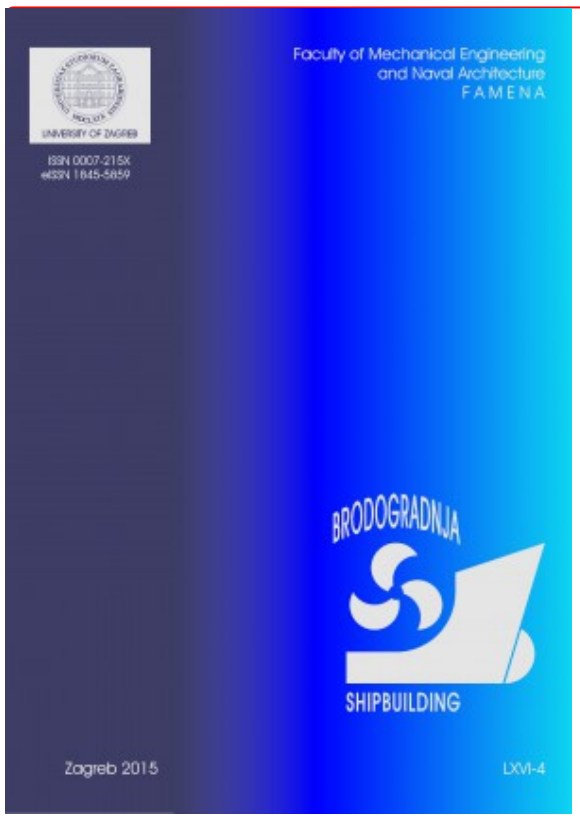

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Uredнički odbor

Časopis je posvećen multidisciplinarnim istraživanjima u područjima teoretske i eksperimentalne brodogradnje i oceanologije kao i izazovnim problemima pomorstva, gradnje broda, pomorskim tehnologijama i industrijskim pitanjima diljem svijeta. Cilj je časopisa integrirati interese u brodogradnji, pomorskom inženjerstvu, pomorstvu, unutarnjoj plovidbi, intermodalnom transportu kao izaštiti okoliša, sveukupnoj sigurnosti, hidrokinetičkim obnovljivim izvorima energije vjetra i valova i održivom razvoju prometa na morima i oceanima. Časopis je usredotočen na hidrodinamiku, konstrukciju, pouzdanost, materijale,projektiranje, optimizaciju, gradnju, vođenje projekata, popravke i planiranje održavanja, nformacijske sustave u brodogradilištima, osiguranje kvalitete kao i opremanju, pogonu, pogonskim uređajima i opremi na brodovima.

Recenzija: vanjske recenzije, podjednako tuzemna i inozemna, samo znanstveni i stručni radovi, jednostruko slijepa, dvostruka

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THE CONVERSION STRATEGY FROM LANDING CRAFT TANK INTO LIVESTOCK CARRIER: AN OVERVIEW OF TECHNICAL EVALUATION AND ECONOMICAL BENEFIT

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Summary

The conversion of Landing Craft Tank into Livestock Carrier as an alternative solution was conducted by performing technical and economic assessments. The conversion analysis of LCT vessels to Livestock Carrier was achieved by performing layout rearrangement, stability test, seakeeping, and resistance test to measure the technical change occurring due to the modification. The economic added-value analysis was conducted by calculating the payback period to determine the estimated time needed to recover the cost of an investment. The result showed that the conversion of LCT ships has a good technical assessment. The intact and damage stability performance qualifies the standard criteria given by the IMO standard. The motion result qualifies the standard according to the type of vessel in terms of heave, pitch, and roll motions. Moreover, the resistance of the Livestock Carrier is reduced due to a decrease in displacement and draft. In terms of economic assessment, the Livestock Carrier conversion project qualifies for investment projects and improves the use-value and economy of a business segment.

Key words: *ship conversion; Landing Craft Tank; Livestock Carrier; seakeeping; resistance; stability; investment analysis.*

1. Introduction

The Landing Craft Tank (LCT) ship was designed to carry combat and heavy equipment during World War II. LCT is a type of ship used by the British and United States Navy to land tanks onshore [1]. To comprehend the safety aspect based on the decision of the Directorate General of Sea Transportation of Indonesia, LCT ships are forbidden to be used as ferry transportation. LCT is prohibited from being used in shipping activities. To anticipate losses due to the operational prohibition of LCT, a function modification is needed.

One alternative to solve the problem is the conversion of LCT vessels into Livestock Carrier. Due to the lengthy sailing period required to carry cattles between islands, the vessel should be designed specifically in order to provide dependable services for animal welfare even

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NONLINEAR ROLLING STABILITY AND CHAOS RESEARCH OF TRIMARAN VESSEL WITH VARIABLE LAY-OUTS IN REGULAR AND IRREGULAR WAVES UNDER WIND LOAD

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Summary

The trimaran vessel rolls strongly at low forward speed and may capsize in high sea conditions due to chaos and loss of stability, which is not usually considered in conventional limit-based criteria. In order to perfect the method of measuring roll performance of trimaran, a set of nonlinear roll motion stability analysis method based on Lyapunov and Melnikov theory was established. The nonlinear roll motion equation was constructed by CFD and high-order polynomial fitting method. The wave force threshold of rolling chaos in regular waves is calculated by Gauss-Legendre numerical integration method. The limited significant wave height of rolling chaos in random sea conditions is deduced by the phase space transfer rate, and the complex effect of wind load is superposed in the calculation. The influence of trimaran configuration on the roll system is analyzed through the state differentiation of homoclinic and heteroclinic orbit in phase portrait. The calculation of the maximum Lyapunov exponent further verified the applicability of Melnikov method, and the topological structure change of gradual failure of the rolling system is analyzed by the erosion of safe basin. The complex changes of the nonlinear damping coefficient and the nonlinear restoring moment coefficient caused by the change of the transverse lay-outs between the main hull and side hull have a significant influence on chaos and stability, and the existence of wind load has a certain weakening effect on the stability and symmetry of the system. The conclusion also further indicates the importance of the lay-outs to the dynamic stability of the trimaran vessel, which is significant for its seakeeping design.

Key words: *Trimaran; Nonlinear rolling stability; Transverse Lay-outs; Melnikov function; Lyapunov exponent; Phase space transfer rate*

1. Introduction

In Naval Architecture, “Stability” has a wide meaning, which usually involves static and dynamic stability, and its fundamentals have wider implications for the design and operation of ships [1]. In recent years, with the continuous development of second-generation stability, the research on dynamic stability has been increasing for mono-hull ships. However, the method

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ON THE INVESTIGATION OF WIND GENERATED WAVES IN BANGLADESH RIVERS FOR THE ASSESSMENT OF STABILITY REQUIREMENTS IN INLAND VESSEL DESIGN

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Original scientific paper

Summary

Standard environmental condition is one of the main inputs in designing a vessel especially in assessment of stability condition. The performance based minimum stability requirements are determined by assessing vessels' dynamic failure modes. Winds as well as wind generated waves are the main factors that affect a specific vessel's dynamics. Wind generated waves in rivers though are usually small in comparison with ocean waves may play a crucial role behind inland vessels accidents. The river condition of a crucial location in Bangladesh inland river routes is assessed where wind velocities have been taken for a specific duration from a reliable secondary source. A narrow fetch model that considers the wave generation in off-wind direction for estimating wind wave parameters has been used to consider the spiral shape of Bangladesh inland routes. The Bretschneider energy spectrum model for short term wave state is compared with the fetch limited model JONSWAP for the estimated wave condition. This study indicates the rationality of conforming the safety level of Bangladesh inland vessels equivalent to river-sea vessels as defined by other nationals and the classification societies. The wave parameters that are estimated in this study can be used to form a limited wave scatter table for predicting short term environmental conditions to assess the dynamic stability failure modes of the vessels.

Key words: wind wave; inland vessel; stability; fetch; energy spectrum; significant wave height; peak period

1. Introduction

The dynamics of a ship is completely governed by the combination of ship dimensions, internal loads and external/environmental loads. The environmental loads are mainly due to wind and waves. The waves can be confined to wind generated waves in case of inland waterways. The IMO 2008 Intact Stability (IS) code [1] considers the environmental loads by its 'Severe wind and rolling criterion (weather criterion)' where steady wind pressure, ship roll due to wave action and gusty wind pressure are the main characteristic parameters.

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