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The effect of propeller cap angle and fin size of PBCF on propeller performance

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Abstract

The propeller was one of the main propulsors in ships that consumed a lot of fuel due to the viscous force acting in the ship. Therefore many studies have been carried out to increase the performance of ship propellers. One of the ways is using Energy Saving Device (ESD) to improve propeller performance . One of the ESD is Propeller Boss Cap Fins (PBCF). PBCF was used to improve the propeller performance by reducing the hub vortex during propeller rotation. In this study, we compare the propeller performance before and after PBCF installation without changing propeller dimensions. The variations of PBCF fins were made in 0,1D, 0,2D, and 0,3D with a combination of the angle of the propeller cap were 15° and 20°. The propeller performance is carried out with the computational fluid dynamics (CFD) method. It was made in the open water assumption to reduce of wall effect . B-series propeller is used in the present study. The validation of propeller performance is made using empirical results. This study aimed to determine the effect of the installation of PBCF on the performance of B-Series propellers on the Ro-Ro 1000 GT ship. The results show that variation

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Preface of SENTA 2021 Proceedings

First of all, I am very happy to warmly welcome you to one of interesting event held by Faculty of Marine Technology (MARTECH), Institut Teknologi Sepuluh Nopember (ITS), International Conference on Marine Technology (SENTA) 2021. This conference is held virtually regarding the currently Covid 19 pandemic, which the webinar is prepared and arranged to ensure the safe of all participants. I hope this conference could give you an overview of situation that positively contribute to all of us by exchanging good study, research and information between presenters and all participants.

The International Conference on Marine Technology is an annual international seminar organized by the Faculty of Marine Technology of ITS, as a maritime country, Indonesia has set maritime development as one of the top priorities in the country's development program. Regarding this reason and some important issue on maritime nowadays, the international conference of SENTA 2021 pick a theme of "**Smart and Sustainable Research and Innovation in Marine Technology**". Through this opportunity, I would like to express my appreciation for the prominent speakers, Dr. Capt. Antoni Arif Priadi (Secretary of Human Resource Development on Transportation Agency), Prof. Tomohisa Dan (Professor of Mechanical Engineering, Kobe University, Japan), Prof. Benny Tjahjono (Professor of Sustainability & Supply Chain Management, Coventry University, United Kingdom).

On behalf of SENTA committee, I would also like to extend gratitude to all the authors who contribute in the submission of the result of their latest research. The committee of SENTA received 97 full paper submissions. From those submitted paper, there are 84 papers that will be presented in SENTA 2021. Also, I would like to express my grateful to the Technical Program Committee and the reviewers for their support in the reviewing process to keep the quality of manuscripts. The committee received submission from 7 countries, they are Japan, Malaysia, Germany, Indonesia, South Korea, Taiwan, and Timor-Leste.

There are many aspects that is related to Maritime technology development which not only have impacts on human safety, but will also have an impact on the environment, economy, fishing industry, maritime-based industries, and these impacts are likely to be felt in the long term. A short and long term development on research, innovation and technology application should be conducted especially in maritime sector to support the improvement of all aspects in national industry that give a big impact on the development of economy, food security, national defense, national competitiveness and environmental issues.

Therefore, I strongly support the SENTA 2021 as a medium for exchanging ideas, information, and working together to improve academic quality and increase contributions to the nation and state.

We would also appreciate for the IOP conference publisher so that we could make an agreement to publish the SENTA 2021 proceeding to the IOP Conference Series: Earth and Environmental Science (EES).

Once again, thank you very much. I sincerely hope that the SENTA 2021 proceeding can be useful for the readers in supporting their researches related in marine technology and also further contributing to develop the technology in maritime field.

General Chair of SENTA 2021
Prof. Aguk Zuhdi Muhammad Fathallah
Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia
November 27, 2021

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The effect of propeller cap angle and fin size of PBCF on propeller performance

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Abstract. The propeller was one of the main propulsors in ships that consumed a lot of fuel due to the viscous force acting in the ship. Therefore many studies have been carried out to increase the performance of ship propellers. One of the ways is using Energy Saving Device (ESD) to improve propeller performance. One of the ESD is Propeller Boss Cap Fins (PBCF). PBCF was used to improve the propeller performance by reducing the hub vortex during propeller rotation. In this study, we compare the propeller performance before and after PBCF installation without changing propeller dimensions. The variations of PBCF fins were made in 0,1D, 0,2D, and 0,3D with a combination of the angle of the propeller cap were 15^0 and 20^0. The propeller performance is carried out with the computational fluid dynamics (CFD) method. It was made in the open water assumption to reduce of wall effect. B-series propeller is used in the present study. The validation of propeller performance is made using empirical results. This study aimed to determine the effect of the installation of PBCF on the performance of B-Series propellers on the Ro-Ro 1000 GT ship. The results show that variation with a fin diameter of 0,2D and a propeller cap of 20^0 can increase propeller efficiency by 0.03%. It can be concluded the addition of PBCF can improve propeller performance.

1. Introduction

The propeller was one of the main propulsor in ships that consumes a lot of fuel due to of viscous force acting in the ship. Therefore many studies have been carried out to increase the performance of propellers, such as Trimulyono and Kiryanto made a comparison of the effect of the number of the blade and rake angle [1]. Fitriadhy et al. did numerical prediction of propeller B-series in open water using CFD [2]. Moreover, there is also another way by using Energy Saving Device (ESD), which can reduce the loss of energy caused by propeller performance. ESD can minimize energy loss caused by propeller performance; thus, the ship's performance can be improved. In this study, The Propeller Boss Cap Fins (PBCF) is used to improve the propeller performance. PBCF is a small fin that is attached to the propeller hub to reduce the vortex hub. The flow generated on the propeller hub is able in line with the flow on the propeller blade. So that it can restore loss of rotational energy and reduce cavitation [3]. The advantages of PBCF are simple construction, easy installation, and maintenance, low investment, not requiring classification approval, and increasing the propeller's thrust and efficiency [4]. There are several aspects to consider in installing PBCF, i.e. the number of fins must be the same as the number of the blade on the propeller, the phase difference in the cross-section from the base of the propeller blade with fins varies from 20^0 to 30^0. The diameter fin is not more than 33% of the propeller diameter, and the leading edge of the fin is located between the two propeller blades [5]. Trimulyono et al. did a

Concepts of Big Data Analysis of Container Terminals in the Digital Era

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Abstract. In the last few decades, with the advance of IoT technologies throughout the most different fields have been changing the way some process is handled. However, possessing a great volume of data does not mean the operation will be handled better, in many cases the data lays in the storage and stays untouched. An increasing quantity of freight imposes container terminals to improve their capacities. Therefore, decision-making problems for operation planning, controlling, and evaluation needs to be well defined. Understanding that necessity, managers need to rely on, almost exclusively, the Terminal Operational System (TOS) to identify and solve the bother necks during daily operation. Although the TOS also had some improvements in the past years due to technological advances, it is still not enough to evaluate each operational step for the operation. This paper uses a data mining and data analysis evaluation of the container terminal's daily operation to find out specific operational issues and evaluate the main key performance indicators to keep track of the terminal efficiency.

1. Introduction

A marine terminal or port is planned to facilitate the transshipment of ships' cargo transported to and from inland locations. To provide efficient handling of cargo between ship and shore, the terminal needs to make appropriate usage of the yard equipment. The storage time in the facility should be limited, increasing the possibility for higher throughput in the terminal. Older facilities often have a large yard to storage the cargo due to the lower frequency of the carries. The concept of big facilities to store a higher number of containers is currently inconceivable, the land value, as well as the costs associated to handle the cargo inside the yard, are very high. Also, since cheaper and more frequent land transportation modes became available, this necessity for larger storage areas has decreased, consequently, the need for more efficient cargo handling increased.

Nowadays, containers account for about 60% of deep-sea cargo transportation, with rates of around 400 million TEU (Twenty-Foot Equivalent Units) per annum, increasing at an average of 8% per annum. Even though the actual container box specification has not seemed big changes over the past years, this was not happening with everything else surrounding it. Terminal handling equipment, ship, and business models have evolved as containerization became the predominant method of shipping goods from one county to another, or even domestic transfers [1][2].

Given the size of the investments involved, during the project greenfield, determine the facilities' requirements, and evaluating their economic and financial feasibility are essential for measuring the operational costs. The requirements may be based on queueing theory or computer simulations. After the terminal is built, these technologies can still be applied to evaluate the cargo handling process, but there are limitations regarding the layout or equipment type, for instance. Additionally, with the technological improvement in the past few years, new technologies can also be used in the container terminals, the Internet of Things (IoT), data mining, big data, and data analysis are some examples of new approaches that can be used to evaluate the terminal operations in its core.

Implementing 3D Model LNG Tanker Ship Cargo Handling System Equipment for Training Using Augmented Reality

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Abstract. The learning system of the vessel is very important for a marine engineer to understand the characteristic of machinery system. This can be conducted by looking at the block diagram and seeing the 3D picture or directly observing the system on a vessel in order to get a complete understanding. It is difficult to do direct observation due to safety regulations and company confidentiality, especially for LNG tanker ship. To overcome this restriction, this study will propose a 3D drawing for training that can represent the real operational condition of cargo handling system equipment of an LNG tanker vessel. Augmented Reality 3D is used to recreate the system and put necessary information about the object along with the 3D drawing. The augmented reality 3D object and information showing with the android application by scanning the object augmented reality marker. In this research, the user is satisfied with the experience and interface based on user data collected from the questionnaire method with aspect of attractiveness, uses ability, effectiveness, user interface experience, and measure the understanding about the application with questionnaire value measurement.

1. Introduction

Improvement technology for the maritime industry has become more competitive. Many new technology was added to provide a simple and efficient working environment. Digitization has the main role to improve how to manage work in the maritime industry. Beside improving the efficiency of working, digitization can improve the safety aspect of the maritime industry. The ship has many systems to operate during the voyage. Three main systems are crucial to the ship operation i.e machinery system, electricity system, and cargo handling system.

For some ships, there is a restriction area or even entered the ship due to safety regulation because of flammable and hazardous cargo. In this case is LNG ship cannot be accessed without proper safety equipment and trained crew and had many restriction areas on the cargo area, especially for the visitor cannot be accessed cargo area refers to IACS class society rules [1].

LNG tanker ship has their characteristic of the cargo handling system and constructed for transporting liquefied commonplace gas (LNG). This carriers are purpose-built tank vessels for transporting LNG at sea. During handling, LNG is transferred between the onshore storage tanks and ship tanks at soaring sail rates through single or parallel pipelines. It is forever influenced by outside disturbances outside. In general, these operations are power-intensive and signify stringent safety considerations. It is extremely necessary and vital to control the temperature and pressure to lop the risk of accidents [1] [2]. LNG tanker ship has different complexity system due to their cargo is liquified natural gas. Their operation needs to be monitored to control the stability of cargo [2]. Because of this characteristic engineer must understand the map diagram of the system, so if there is any trouble or

Prediction Performance of Two Stroke Semi Free Piston Diesel Engine with Dual Piston System

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Abstract. The design of the semi-free piston two-stroke diesel engines has been successfully implemented. Before the engine is built, it is necessary to predict its performance. Prediction is done by using the simulation method. This method is considered the most effective because it does not fabricate the machine first. Modelling and simulation are done using application software. Simulation modelling covers all parts of the engine, namely the intake system, block, injection system, and then exhaust system. Engine performance predictions are based on speed variations as well as load variations. Validation is done with a conventional machine. The difference between the two engines lies in friction losses, where the free piston concept is to reduce friction losses. The simulation results are engine performance such as torque, power, bsfc, bmep, and combustion processes such as heat release, pressure, and ignition delay. The difference in the performance of the semi-free piston compared to a conventional engine with the same combustion chamber size. Prediction results state that the difference in performance is very significant.

1. Introduction

The use of internal combustion engines in today's era relies on conventional engines. The conventional engine in this case is quite widely used as transportation media or industrial supporting media. The conventional engine that is very often used is the diesel engine. Currently, diesel engines have the highest level of efficiency. But in the future, there will be a need for engines that have higher efficiency.

Based on several studies that have been carried out, linear engines have better performance when compared to conventional internal combustion engines. The difference in performance occurs because the working principle is slightly different. The design of a linear engine can reduce the frictional force received and consequently can improve performance such as power, torque, and fuel consumption can be better. [1, 2]

The difference in working principle between linear engines and conventional engines lies in the return cycle to the top dead centre [6]. In conventional engines is using the basic mechanism of the crank rotation system. The process to the top dead centre on a conventional engine occurs because the power received from the combustion process pushes the piston and is transmitted by the connecting rod to rotate the crankshaft. While the semi-free piston linear engine with dual-piston in the process of

A Case Study Maintenance Task Allocation Analysis on Marine Loading Arm Using Reliability Centered Maintenance

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Abstract. Marine Loading Arm (MLA) supports all liquid bulk loading and unloading activities, especially imports of chemical raw materials such as NH3, H2SO4, and H3PO4. Therefore, to minimize the occurrence of failure it is necessary to have a treatment method. Reliability Centered Maintenance (RCM) is a maintenance method that focuses on increasing the reliability of components in the system. The RCM uses the principle of risk management to determine tasks and maintenance schedules appropriately. The RCM process is implemented using American Bureau Shipping (ABS) Guidelines. According to the results of this research, there are three types of maintenance tasks for MLA, in which category A has 14 maintenance tasks, category B has 21 maintenance tasks, and there are no maintenance tasks in category C. In all maintenance categories for Preventive Maintenance by 54% with 19 tasks, for Condition Monitoring of 37% with 13 tasks, while for Run-To-Failure of 9% with 3 tasks.

Keywords: Failure, maintenance task, marine loading arm, reliability, RCM

1. Introduction

PT. XYZ has its terminal equipped with tools for unloading bulk cargo. One of the equipments used for liquid bulk loading-unloading activity is Marine Loading Arm (MLA). MLA is one of the most used liquid bulk disassembly tools compared to the loading arm. MLA is more often used due to being simpler in its operation and is assessed safer during the loading process [1]. Some types of chemical fluids dismantled include ammonia (NH3), sulfuric acid (H2SO4), and phosphoric acid (H3PO4). Over time the MLA system suffered various failures. Failure to a component can affect the performance of a system. The state when the tool cannot be used because one or more components are damaged is called the breakdown term [2]. If a tool is damaged, it must be repaired immediately. While the time used to repair the tool is called downtime [3-4]. This downtime causes loading and unloading activities to be delayed from the expected schedule, and this has an impact on the company's losses. The role of MLA is very important in the chemical liquid loading process, considering that MLA is the only liquid unloading tool currently owned by the company.

Reliability Centered Maintenance (RCM) is a method of maintenance analysis that systematically establishes the appropriate maintenance tasks for assets at optimal frequencies to maintain the appropriate functions required during certain periods [5-7]. RCM regulates maintenance policies at the plant or equipment type level. RCM is a more structured way of using the best methods

The Evaluation of Maturity Level on Heavy Equipment Maintenance Management According to ISO 55001:2014

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Abstract. One of the challenges experienced by companies nowadays is keeping their value of assets which will affect the value of the companies. The companies need to provide certainty to the stakeholders from both internal and external perspectives. These things are important for companies that have a high and large value asset. PT. X is one of the shipping lines in Indonesia and with the large task of shipping companies, it has a large number and high value of assets. Heavy equipment is of the assets that have supported the company's main business process in the loading-unloading process. By now, there has never been an asset management maturity level on PT. X. Therefore, an evaluation of measurement of the heavy equipment maintenance management system is conducted based on the guidelines of ISO 55001: 2014. The results of the assessment showed that the maturity level of heavy equipment management is 2.7 and there are 13 sub-optimal sub-clauses that need improvement by the company.

Keywords: Asset management, asset maturity level, heavy equipment, maintenance management evaluation.

1. Introduction

The management of assets enables companies not only to focus on how the assets can be used but also to obtain a certain value that can be achieved in relation to the companies' goals. Every company has its own different steps and ways of determining and achieving this value. Asset management is a series of activities carried out to obtain values of the existing set of assets, the activities referred are the activities carried out in an asset management system [1], [2], [3]. Generally, the scope of asset management will include 6 parts, strategic planning, asset management decision-making systems, asset life cycle, asset information, human resource & organization, and risk & evaluation [4], [5], [6].

PT. X is one of the largest shipping companies for over half a decade with more than 20 branches spread all over Indonesia. As a large archipelago nation, PT. X has a great opportunity in the field of sea transportation to provide delivery services of goods. To maintain its consistency in being