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Preface

Journal of Industrial Research and Innovation Volume 16 No 1 April 2022 edition is still managed to publish. This volume presents various fields of transportation and material sciences. Transportation engineering nowadays is among the priority programs in Indonesia, which emphasize in Infrastructures development. Material sciences are therefore very relevant in supporting this theme. Thanks to continuous submission from contributors and hardwork of editor teams.

Research and assessment were conducted by various institutions researchers in those fields. In this edition, the journal publishes important and interesting papers related to Materials engineering, such as : The Fatigue Life Assessment of Sideboard on Deck Barge Using Finite Element Methods, Corrosion of Brass Fishing Vessel Propeller in Artificial Seawater and Analysis of BLDC Electric Motor Shaft Treatment Model Using Numerical Method.

The others paper published also about Transportation engineering : Measurement of Geometric Variations of a Railway Truss Bridge (Case Study: BH77 Railway Bridge) There are also paper are process technology : Study on Assessment and Feasibility of Hythane From POME to Improve Power Plant Performance and Optimization of Cross-linking Modification on Canna Starch with Sodium Acetate Using Response Surface Methodology.

The editors always do their best to improve the quality of the Journal; especially now that we are heading towards an English language journal in order to increase the impact and citations. The next publication is scheduled with new appearance on Agustus 2022. As closing remarks, the editors always call for critics and suggestions to further improve this Journal.

The Editors

Majalah Ilmiah Pengkajian Industri
(Journal of Industrial Research and Innovation)

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The Fatigue Life Assessment of Sideboard on Deck Barge Using Finite Element Methods

Alamsyah, Amalia Ika Wulandari, Nugroho Septianda Oktaparo,
M Uswah Pawara, Muhammad Riyadi

Abstract

A Deck barge is a type of ship that has a flat hull used to transport large amounts of cargo such as wood, coal, sand, etc. The deck barge uses retaining walls to transport bulk loads on deck known as sideboards which can collapse due to fatigue life. The purpose of this research is to determine the maximum stress and fatigue life of the sideboard construction based on the height of the bulk load on the sideboard using coal as the bulk load. The method used in this research is the finite element method with a high load case of coal loading to the sideboard is 2.24 m, 2.60 m, and 2.96 m. The results showed that a high load case of 2.24 m detected a maximum stress value of 79.25 MPa and a fatigue life of 81.16 years with 10×10^5 cycles. Load case with a high load of 2.60 m detected a maximum stress value of 110.11 MPa and a fatigue life of 24.72 years with 3.53×10^5 cycle. For a high load case of 2.96 m, a maximum stress value of 146.80 MPa was detected and a fatigue life of 9.28 years with 2×10^5 cycle. There is an increasing stress value by the rise of the load height against the sideboard and there is a decrease in the fatigue life in the construction.

Keywords: Barge, Fatigue Life, Sideboard, Stress,

Corrosion of Brass Fishing Vessel Propeller in Artificial Seawater

Rizqi Ilmal Yaqin, Juniawan Preston Siahaan, Yuniar Endri Priharanto, Bobby Demeianto, Mula Tumpu,
Muhammad Zaki Latif Abrori, Bambang Hari Priyambodo

Abstract

The propeller was an important component in the fishing vessels marine propulsion system. Brass was widely used as a fishing vessel propeller. Brass was chosen because it has good mechanical properties and good corrosion resistance. The content of seawater in Indonesia has levels of 3% – 3.5% NaCl. In addition to the level of Ion Cl⁻, environmental factors can affect corrosion rate of material or metal. The environmental factors that affect the corrosion rate are the level of salinity, pH, DO, temperature and TDS. The objective of the present work was to explain the corrosion rate of brass in artificial seawater in Indonesia with exposure time. The material used for research is fishing vessel propeller commercial in Indonesia market. Measurement of the corrosion rate of brass used the principle of weight loss according to ASTM G31-72 (2004). During the corrosion test, the artificial seawater solution was tested for its pH and salinity quality over time of immersion. The result of immersion brass in the artificial seawater shows that the corrosion rate decreases in 1-to-10-days exposure time due to the increase in salinity levels above 30‰. While the results of exposure time immersion above 15 days tends to increase the corrosion rate due to a decrease in pH level. pH level of seawater depends on the environmental conditions and tends not to change significantly.

Keywords: Artificial Seawater; Brass; Corrosion Rate; pH; Salinity

Measurement of Geometric Variations of a Railway Truss Bridge (Case Study: BH77 Railway Bridge)

Anindhya Mustika L, Pariatmono, Erlangga Rizqi F, Mawardi Amin¹, Resmi Bestari M, Dimas Aryo S, Mulyadi Sinung H, Dwi Agus P, Wimpie Agoeng N. A, Thiya Fiantika, Emeraldal Insani. N. S. P. J. D. S. P

Abstract

Monitoring the condition of the railway track on a regular basis needs to be carried out regularly to minimize risk. One of the causes of the decrease in the strength of the bridge structure can be caused by changes in cross-sectional dimensions. The existing dimensions of the bridge structure need to be known because they will affect the steel frame profile area, where the steel frame area will affect the size or the small value of the deflection and stress of the bridge structure. The dimensions of the frame need to be seriously considered so that the stress and deflection values of the bridge structure remain constant. This research was conducted at the BH 77 Railway Bridge in Tegineneng, Tanjungkarang-Martapura, Lampung, which uses a type frame configuration warren truss. This location was chosen to fit the research that was also conducted by Badan Riset dan Inovasi Nasional (National Research and Innovation Agency of Indonesia). Based on the measurement of the dimensions of the bridge truss that has been carried out, the results show that there is a difference in the value of the circumference of each rod with the standard deviation for each similar profile. The biggest difference in the circumference of the truss is the profile of H beam, 113 and 115 rods with dimensions of 340×300×15×18, the initial circumference value is 1,280 mm, and after the measurement is 1,289.42 mm with a standard deviation value of 0.91 mm. while for the smallest difference, namely the H beam profile, rod 110 with dimensions of 340×310×39×21, the initial circumference value is 1,300 mm and after the measurement is 1,300.33 mm with a standard deviation value of 0.24 mm

Keywords : BH77 bridge; Bridge deflection; Bridge structure; Measurement geometry; Railway bridges; Steel structure; Structural Health Monitoring System

Study on Assessment and Feasibility of Hythane From POME to Improve Power Plant Performance

Joni Prasetyo, Era Restu Finalis, Galuh Wirama Murti¹, S.D Sumbogo Murti, Nesha Adelia

Abstract

Biogas power plant from POME is getting trendier because Indonesia is the largest palm oil producer in the world as the amount of palm oil production produces more POME and has a high COD. COD is commonly used as a base stoichiometry calculation for CH₄ conversion. Correction on COD conversion for biogas production was done by considering CO₂ rather than CH₄ only. Combining H₂ with CH₄ is a worthy breakthrough because it can increase by 15% of electricity output. Such H₂ and CH₄ mixing has some advantages on the unique combustion property of H₂ in CH₄ (hythane). Economic analysis comparison on this mixing of biogas and conventional biogas was assessed to see the improvement because of an increase in LHV value in biogas. Based on previous experiments conducted by cascading H₂ and followed by CH₄ production, with an H₂ in CH₄ ratio of 1:3, an economic analysis was calculated according to an industry capacity of 60 tonnes FFB/hour. A previous biogas power plant needed an investment of \$1,502,000 for 1.35 MWe, but \$400,000 was later invested for 1.59 MWe by hythane, increasing 15%. The investment performance of this power plant gave IRR 43.96%, 9.95% higher, and low BEP, 34%. The biogas power plant is economically safe, does not suffer from losses even produces only 34% capacity. The payback period was 2.6 years, seven months shorter. In conclusion, an additional one bioreactor on the existing power plant is economically feasible.

Keyword: POME (Palm Oil Mill Effluent); Hythane; Hydrogen Methane; Economic Analysis; Cascading Fermentation

Analysis of BLDC Electric Motor Shaft Treatment Model Using Numerical Method

Endra Dwi Purnomo, Amiruddin Aziz, Dewi Rianti Mandasari
Lia Amelia, Agus Krisnowo, Cuk Supriyadi Ali Nandar

Abstract

This research studies the shaft strength of a BLDC electric motor. A Shaft is one of the components in a rotary engine and functions to transmit power. The design calculation is needed to determine the effect of the strength of the material being treated. The strength analysis of the shaft used FEM (Finite Element Method). The shaft is modeled on the manufacturing design and tested by numerical simulation with Ansys Mechanical 14.5-BRIN commercial license software. The static simulation used a structural statics module with static and dynamic load input. The research method comparing the results of FEM simulations with two different types of materials is determined. Based on the simulation parameters, the selected material types are JIS S45C tempered and AISI 1045 cold-drawn. The simulation results represent the maximum stress (von Mises) and total deformation. The deformation value of S45C tempered material is slightly higher than that of AISI 1045 cold drawn. However, both materials have the same maximum von Mises stress.

Keyword : AISI 1045; Cold drawn; Finite Element Method; Shaft; Static Structure; S45C; Tempered.

Optimization of Cross-linking Modification on Canna Starch with Sodium Acetate Using Response Surface Methodology

Iffah Muflihati, Nur Khikmah

Abstract

Canna starch is obtained from the extraction of canna tubers. However, the unstable native of canna starch during processing makes its use limited. Crosslinking starch can make starch resistant to shear stress acid resistance and prevent viscosity decrease due to the rupture of starch granules during heating. The purpose of this study was to obtain the optimum conditions of concentration and duration of mixing sodium acetate for cross-linking modification of canna starch with viscosity as the primary response. This study used a factor of sodium acetate concentration and mixing time. The modification of canna starch by cross-linking affects the viscosity. Cross-linking in starch can strengthen the starch granules so that the starch granules are not easily gelatinized. The optimum viscosity condition was obtained from a sodium acetate concentration of 16.21% with a mixing time of 20.71 minutes to get the optimum viscosity of 43.7 cP. The high degree of substitution of sodium acetate in cross-linking modification affects the integrity of starch granules, where starch granules can affect the physicochemical characteristics of starch. The higher the DS value, the lower the amylose content and the solubility. However, increasing the degree of substitution can also increase the viscosity, swelling power, syneresis, and pH of the cross-linked modified starch.

Keyword: Canna starch, Cross-linking, Optimization, Sodium acetate.