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## Preface

Industrial Analysis Journal Volume 15 No 3 December 2021 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 transportation engineering, such as: Model Of Transportation Mode Choice From Transjakarta To MRT Phase II (Case Study: Transjakarta Corridor I Blok M-Kota); Reliability Analysis On The Bogie System At Indonesian High-Speed Trains In The Design Phase To Improve Service Quality and Assessment Of Electric Propulsion Application In Light Rail Transit (LRT)

The others paper published also about materials engineering: Creep Behavior Of Welded Ferrite-Pearlite 2¼Cr – 1 Mo Steel and Natural Frequency Analysis On The Base Structure Of The Cnc Milling Machine Using Simulation And Experimental Methods. There are also paper are process technology: The Synthesis of Coconut Methyl Ester Using Organic Catalytic Agents; Cut-Size Diameter Calculation of Salt Crystals from A Hydrocyclone and Prediction Analysis On Coefficient Of Consolidation Values In Improved Soft Clays.

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 April 2022. As closing remarks, the editors always call for critics and suggestions to further improve this Journal.

The Editors

**Majalah Ilmiah Pengkajian Industri**  
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## **PREDICTION ANALYSIS ON COEFFICIENT OF CONSOLIDATION VALUES IN IMPROVED SOFT CLAYS**

**Eka Fitriana, Wimpie Agoeng Noegroho Aspar, Andri Arthono, Thiya Fiantika**

### **Abstract**

Consolidation is a phenomenon in soil mechanics that often causes geotechnical problems. One solution to overcome consolidation phenomena is by speeding up process of pore water pressure dissipation. The type of soil improvement to upgrade the performance of soft clay is by applying pre-fabricated vertical drain (PVD) and pre-compression simultaneously. Geotechnical instrumentations such as settlement plates, piezometers, and inclinometers were installed at the field of study to monitor magnitude of settlement during consolidation process. After the final settlement was achieved, the consolidation parameters such as coefficient of consolidation, and rate of settlement, were back calculated. Prediction analysis of consolidations parameters was performed by means of Asaoka method. The results of this study is very interesting and provide useful engineering information. It is interesting to note that this case study may be beneficial use to practicing engineers and researchers.

**Keywords:** Settlement; Asaoka Method; Degree Of Consolidation; Geotechnical; Soft Clay; Instrumentations;

## **MODEL OF TRANSPORTATION MODE CHOICE FROM TRANSJAKARTA TO MRT PHASE II (CASE STUDY: TRANSJAKARTA CORRIDOR I BLOK M-KOTA)**

**Adita Utami, Fitriani Nurhasanah, Asep Yayat Nurhidayat**

### **Abstract**

Transjakarta Corridor 1 (TJ K1) is the corridor with the highest number of passengers among all Transjakarta corridors, where the total passengers reached 2,686,458 people by December 2019. Increasing of passengers affected decreasing performance of TJ K1, especially in load factor parameter 284.615% with total passengers of 111 people in one trip. Therefore, alternative mode is needed to improve performance of TJ K1. The purpose of this research is to know the modelling choice of mode and the probability of TJ K1 users to the MRT. The variables used are time different (TD) and cost different (CD) between TJ K1 and MRT for Blok M-Kota route. This study uses Stated Preference (SP) technique and analysis of the modal choice model with the Logit Binomial Difference Method. The results analysis the probability of switching users from Transjakarta to MRT will tend to shift when experiencing a change, which costs Rp. 7,500 more expensive than the initial Transjakarta fare with a percentage of displacement of 33.36% with the option of 20 minutes faster, 57.07% with the option of 30 minutes faster, and 77.94% with the option of 40 minutes faster time difference between Transjakarta and MRT with coefficient of determination ( $R^2$ ) of 0.5025, which mean 50.25% was influenced by variables studied.

**Keywords:** Transjakarta; MRT phase II; Stated Preference; Logit Binomial, Difference Method

## **RELIABILITY ANALYSIS ON THE BOGIE SYSTEM AT INDONESIAN HIGH-SPEED TRAINS IN THE DESIGN PHASE TO IMPROVE SERVICE QUALITY**

**Warjito. Irfan Ansori. Lukman Shalahuddin. Sahid Bismantoko**

### **Abstract**

High-speed train (HST) Indonesia is rail-based public transportation which is planned to be implemented in Jakarta - Surabaya. To maintain the HST for excellence service, it is necessary to conduct a study on the quality of the service. This paper tries to approach the Bogie system quality service from the reliability perspective in the design phase. The steps taken to maintain continuity of service quality are to identify critical sub-systems/components that affect the decline in reliability, Risk Analysis, build Reliability Block Diagram (RBD) from sub-system/components that have been identified in the bogie system, calculate initial reliability based on RBD, develop designs to minimize the potential for a decline in reliability, and compile procedure for evaluating and re-calculation the value for the reliability of the bogie system. Reliability is targeted at 0.9, which means that all service quality designs must always make the reliability value above the target. This paper is expected to provide an overview of potential that may occur based on predictions of decreasing reliability values until the operating period ends. So that anticipation of minimizing the decline in the value of reliability can be done.

**Keywords:** High-Speed Train; Bogie System; Reliability; Quality Of Service

## **THE SYNTHESIS OF COCONUT METHYL ESTER USING ORGANIC CATALYTIC AGENTS**

**Muhammad Ihsan Sofyan, Muhammad Ma'ruf, Mas Ayu Elita Hafizah, Azwar Manaf**

### **Abstract**

Biodiesel is one of the biomass materials or renewable energy, which is needed today to replace fuel from fossil energy, which can reduce global warming and has a high renewability cycle. Biodiesel is derived from plants, therefore it is also called biofuel. One type of biodiesel group is coconut methyl ester (CME), which is biodiesel obtained from coconut oil as a raw material. In this study, a synthesis of used coconut oil and methanol has been carried out with an organic catalyst based on coconut coir called the ASK catalyst. The results of transesterification have provided some important information, including: the yield is 15-19.5% after usage of the ASK catalyst consisting of amorphous phase and crystalline phase  $ClK_{0.8}Na_{0.2}$ , with the density and viscosity of products are 0.788-0.802 g/ml and 0.6-1 mm<sup>2</sup>/s. These results allow it to provide a distinctive advantage in its application.

**Keywords:** CME; FAME; Biomass; Transesterification; Organic Catalyst



## CUT-SIZE DIAMETER CALCULATION OF SALT CRYSTALS FROM A HYDROCYCLONE

Derina Paramitasari, Dhani Avianto Sugeng

### Abstract

A hydrocyclone is physical separation equipment employed in solid-liquid processing. An important parameter in hydrocyclone design is the so-called cut-size diameter ( $D_{50}$ ), which determines the minimum size of the separated solids when the equipment performs at 50% separation efficiency. This paper discusses the calculation of the cut-size diameter ( $D_{50}$ ) of a hydrocyclone operating in a salt purification pilot plant in Manyar, East Java, Indonesia. The cut-size  $D_{50}$  is calculated based on the residence time approach and compared with the collection efficiency from the mass balance.  $D_{50}$  was found to be 69.73 microns. Moreover, by using Zanker's nomograph, it was found that at the solid separation efficiency of 80.48%, the minimum diameter of salt crystal ( $D_{min}$ ) is 85 microns. Because the  $D_{50}$  of HC-1 is smaller than Zanker's design, it can be concluded that the hydrocyclone will work efficiently in separating the expected products.

**Keywords** : Hydrocyclone; Cut-Size Diameter; Salt Purification; Efficiency

## CREEP BEHAVIOR OF WELDED FERRITE-PEARLITE 2¼Cr – 1 Mo STEEL

Supriadi, H. Agus Suhartono

### Abstract

This research aimed to study the creep and creep-rupture behavior of 2¼ Cr-1Mo steel on as-received and as-welded specimens. The tests were carried out on two different specimen types of the as-received specimen and as-welded specimen. The tests were executed based on 100 hours, 300 hours, 1000 hours, and 3000 hours of rupture time under constant load at 550°C, 600°C, and 650°C, respectively. In this paper, the creep and creep-rupture behavior of this material is presented based on the results obtained and followed by related discussions. The study showed that at the same condition, the part with the weld joint has the same rupture time as the other smooth un-welded parts.

**Keywords** : Creep; Life Prediction; Ferritic Steel

## **NATURAL FREQUENCY ANALYSIS ON THE BASE STRUCTURE OF THE CNC MILLING MACHINE USING SIMULATION AND EXPERIMENTAL METHODS**

**Amar Makruf T.F., Veky. M. Fikry**

### **Abstract**

The development of national machine tools needs special attention in order to compete with foreign products. Government agency cooperates with industry partners to develop precision CNC milling tools at competitive prices in today's manufacturing industry. One of the problems that often occur in the machine structure is the vibration caused by the resonance between the components that make up the machine, which results in inaccurate machining products. Therefore, it is necessary to do a natural frequency analysis on the milling machine prototype. This research was conducted on the base structure which is the most basic component as a holder for other components. Natural frequency analysis on the base structure uses two methods, namely experimental and numerical simulation using FEA. The results of the two methods are then compared and analyzed for errors that occur. Research parameter so that design does not resonate is that rotational velocity should be 15% above or below the natural frequency. The results show comparison natural frequency error value of numerical simulation method with experimental method and analysis of safety base design against resonance.

**Keywords** : Base Structure, Natural Frequency, Experimental, Simulation

## **ASSESSMENT OF ELECTRIC PROPULSION APPLICATION IN LIGHT RAIL TRANSIT (LRT)**

**Meiyanne Lestari, Syamsul Kamar, Mustari Lamma**

### **Abstract**

In this paper, one of the most important parts of self-propelled vehicles is presented, namely the Light Rail Transit (LRT), especially the propulsion system. LRT is already operating in several major cities in the world, but in Indonesia its construction has just been completed and is currently operating in Palembang, South Sumatra, and Greater Jakarta area (Jakarta-Bogor-Depok-Bekasi). The methodology used to describe and analyze the LRT propulsion system begins by first reviewing the literature on the development of LRT-type mass transportation in developed countries, then a study of technological developments is carried out on each component of the propulsion system, especially for the propulsion of rail facilities. One of the main components of the LRT-type rail propulsion system that will be used and developed in Indonesia is the VVVF inverter, which functions to regulate the speed of the traction motor which is designed to work in a certain frequency range, for example between 0 Hz to 70 Hz. The VVVF inverter output is controlled by a very popular principle used in railways, namely the constant V/f setting technique. The initial start of the LRT requires high torque to overcome train resistance and to accelerate in a few minutes. To meet these needs while still paying attention to energy savings, the traction power (traction effort) is adjusted, which is the power needed to move the train from a speed of 0 km/hour to 30 km/hour. Traction power is adjusted by varying the frequency to control the speed, the terminal voltage is also varied so that the ratio of the constant V/f constant is maintained at 15.7 V/Hz. The maximum torque of the motor becomes constant at every speed change.

**Key Words** : Traction motor, V/f control, VVVF inverter.

