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Handayani, Naniek Utami ; Rinawati, Dyah Ika ; Wiguna, Yusuf Kurniawan

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[a] Industrial Engineering Department, Faculty of Engineering, Diponegoro University, Semarang, Indonesia

Abstract

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Model of Pre-Positioning Warehouse Logistics for Disaster Eruption of Mount Merapi in Sleman Yogyakarta

Naniek Utami Handayani[1], Dyah Ika Rinawati[2], Yusuf Kurniawan Wiguna[3]
[1,2,3] Industrial Engineering Department, Faculty of Engineering, Diponegoro University
Semarang, Indonesia
naniekh@ft.undip.ac.id[1], dyah.ika@gmail.com[2], yusufkurniawan.wiguna@gmail.com[3]

***Abstract*—In generally, mitigation of natural disasters in Indonesia still be responsive and reactive to sudden disasters occur. It shows that disaster management system is not well coordinated and can't be quickly response to disaster mitigation. In this case, disaster management system need to be supported by manageable disaster logistics system. This study aims to identify the criteria for determining the location of a catastrophic disaster logistics warehouse in Sleman, Yogyakarta, and determine alternative logistics warehouse location. This research used AHP and Fuzzy-TOPSIS to select the criteria and sub-criteria in determining the location of the warehouse logistics, while Fuzzy-TOPSIS used to rank the final location, so that the optimal location selected. The results showed that the most important criterion is the stability of the national, sub importantly, social circumstances and the location chosen for the logistics warehouse is Candibinangun.**

***Keywords*—Merapi Eruption, Analytical Hierarchy Process, Fuzzy-TOPSIS, Warehouse, Distribution Logistics**

I. INTRODUCTION

Yogyakarta is one of the provinces in Indonesia, located in areas prone to volcanic eruption. In Sleman, Yogyakarta, there is Mount Merapi, which is one of the most active volcanoes in Indonesia [1]. This conditions lead to high chances of natural disasters include volcanic eruptions and volcanic earthquakes. The frequency of volcanic eruptions is high at an average of 2-5 years in the last 100 years. Merapi's danger level is very high, due to the density of the population living around the slopes of Mount Merapi. This is shown in the data the victim died as a result of the eruption of Merapi in 2010 reached 353 people. According to the head section Hazard Mitigation BPBDs Sleman, Merapi eruption in 2010 resulted in an open lava dome leads to the East, so that in case of the eruption of Merapi lava predicted would lead to Gendol River located in Sleman.

Based on interviews with head section of disaster logistics BPBDs Sleman, the Merapi eruption in 2010, there has been no disaster logistics warehouse. The supply of relief goods is often delayed due to the considerable distance between the warehouse logistics with the location of disaster victims and the difficulty of access to the location. Based on interviews with the victim, the main complaint of the activity of the Merapi eruption disaster in 2010 was the delay in the delivery of relief goods as well as mismatches kind of relief goods. This indicates that existing logistics warehouse is less effective and efficient to support the emergency response to natural disasters.

Thus, Sleman need a disaster management system that capable to support emergency response quickly and efficiently. The unpredictability of natural disasters often leads to relief operations focusing more on response rather than preparedness, so systems are reactive rather than proactive and the structure of the supply chain will determine the effectiveness of the response [2].

Preparedness is a critical step that must be met in order to reduce the risk of disaster. Preparedness actions may include the provision of disaster logistics warehouses for storage of goods support, both pre- and post-disaster. The existence of warehouse logistics allow relief supplies stored properly and distributed quickly and accurately. The location of warehouse logistics should be optimal that the evaluation process for strategic decisions have to involves several aspects, such as the proximity to the disaster area, the value of the vulnerability of the area, and changes in the value of vulnerability over time. The proximity of logistics warehouse with disaster-prone areas will simplify and improve the performance of disaster management institutions [3].

The previous study [2] and [4] focused on developing criteria to select the optimal location in generally. The characteristics of natural disaster will differ depending on the type of disaster, for example earthquake will have different characteristic with volcanic eruption or flood. Specifically, volcanic disaster will have different impact depending on the condition of eruption. So, the mitigation for each volcanoes will be different. This research used criteria in [2] and [4] to evaluate all alternatives of disaster logistics warehouses location for volcanic eruption at Mount Merapi.

II. METHOGOLOGY

A. *Determine of Criteria and Subcriteria to Selection Logistic Warehouse*

Identification of the criteria to determine the location of disaster logistics warehouse refers to models of the research

Converted Battery-Powered Electric Motorcycle and Hydrogen Fuel Cell-Powered Electric Motorcycle in South East Asia: Development and Performance Test

Joerg Dieter Weigl
Engineering Design and Innovation Centre,
National University of Singapore
engwjd@nus.edu.sg

Inayati
Chemical Engineering Department
Sebelas Maret University
Surakarta, Indonesia
Inayati_stmt@yahoo.com

Martin Henz
University Scholars Programme/School of Computing,
National University of Singapore
uspmjh@nus.edu.sg

Hamdani Saidi
Universiti Teknologi Malaysia
hamdani@ic.utm.my

***Abstract*—This paper presents the development and performance test of electric motorcycle in South East Asia i.e. in Singapore and Malaysia. National University of Singapore (NUS) team converted ICE based motorcycle (Honda CBR400) into battery electric motorcycle using lead acid battery pack and lithium polymer battery pack. Fuel Cell Vehicle Group in Universiti Teknologi Malaysia (UTM) built a fuel cell electric motorcycle which used hydrogen fuel cell system (named H2Motive® fuel cell motorcycle), lithium polymer battery pack and ultra-capacitor module. Road tests have been conducted to test the performance of both electric motorcycle types. Performance of H2Motive® fuel cell motorcycle was done by participating South African Solar Challenge 2008 in technology class. Results showed that H2Motive® fuel cell motorcycle was able to travel about 2400 km. Some roads were at steep and hilly climb and the motorcycle could stand during heavy rain. The converted CBR400 was tested in World Advanced Vehicle Expedition with 1600 km travel distance. NUS team's e-bike claimed third spot in that rally. Both type of electric vehicle performed well during the rally. It can be concluded that two of them were ready for gaining road-legal status.**

Keywords—electric motorcycle; fuel cell motorcycle; electric vehicle; lead acid battery; lithium polymer battery

I. INTRODUCTION

. Rapid increase in energy consumption is a big problem for energy security. Transportation is one of the sectors contributes to the oil consumption. Moreover, transportation is also one of the green house gases (GHG) emission contributor, i.e. about 13% if global GHG emission and more than half of global oil consumption [1,2]. This problems challenge researchers and governments to seek technology in transportation which consumes energy more efficiently and produces less emission. Electric vehicle, hybrid vehicle, fuel cell electric vehicle, and plug in hybrid vehicle are expected to be able to answer those problems.

In South East Asia, motorcycles are popular for daily transportation as it is sufficient for short range transport and is available in shelf and in affordable price. Statistics in Singapore shows that Singaporean travels about 35 km distance daily [3]. As assumption, motorcyclist in small cities in South East Asian countries travels in that distance, too. Walker and Roser (2015) compared the energy consumption of small capacity two wheeler vehicles, which included conventional, hybrid, plug in hybrid, and pure electric motorcycles. Results showed that hybridizing motorcycle is considerably benefit in fuel economy; but this configuration needed high additional cost for its electrification. Pure electric motorcycle showed as most cost effective compared to the conventional one [4].of S

This paper present the development of 2 types of electric motorcycles, i.e., converted CBR400 (a converted battery-powered electric motorcycle developed by a team from National University of Singapore, NUS) and H2Motive® (a fuel cell powered electric motorcycle developed by Fuel Cell Vehicle Team from University Teknologi Malaysia, UTM). Those motorcycles has been tested on the road to study their performance.

II. POWER TRAIN DESIGN

Basically, electric vehicle power train consists of energy storage system or energy source, electric motor, and some relevant power converter. In battery-powered electric vehicle, some batteries type can be used as energy storage system such as lead acid battery and lithium polymer battery. Direct current (DC) or alternating current (AC) electric motor can be used as propulsion system. Sometimes ultra-capacitor module

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Measurement of Partial Discharge in Needle-Plane Electrode using RC detector, HFCT, and Antenna Sensors

Nhet Ra
Electrical And Electronic Engineering Department
Institute of Technology of Cambodia
Phnom Penh, Cambodia
School of Electrical Engineering and Informatics
Institut Teknologi Bandung,
Indonesia

Umar Khayam
School of Electrical Engineering and Informatics
Institut Teknologi Bandung,
Indonesia
umar@hv.ee.itb.ac.id

***Abstract*— This paper deals with measurement of partial discharge in needle-plane electrode using RC detector, HFCT, antenna sensors. The partial discharges (PD) occur in the insulation of power apparatus when the applied electric field exceeds the electric strength of insulation. The most common electric arrangement for investigation partial discharge is needle-plane electrode which is able to produce very high divergent field around the needle tip. In this experiment, a needle-plane electrodes with 10 mm gap between the two electrodes is used to produce a high electric field. The curvature of the needle tip is 30^0 and the tip radius is 10 µm. The high voltage was applied to the electrode. PD occurring in the needle was observed by various sensors: RC detector, HFCT, and the antenna.**

Keywords—partial discharge; partial dicharge inception voltage; styling; needle-plane electrode.

I. INTRODUCTION

Electric power system used several high voltage equipment such as generators, transformers, cables and insulators. High voltage equipment using insulating liquid, solid, and gas to withstand high electric field is generated. At the time of surgery excessive electric field may occur. This excessive electric field may cause discharge. Discharge can occur in the air, called the corona, streamer on liquids, and treeing in insulating solids. The phenomenon of electric discharge in isolation may indicate aging of the insulation and in the long term this phenomenon may reduce the ability of insulation which ultimately led to the failure of the equipment [1-4].

In many case, Partial Discharge Inception Voltage is an alternatively important indicator that most researchers use for representing the integrity of the insulation [5].The definition of Partial Discharge Inception Voltage of an insulating according to the IEC 61294 is the lowest voltage at which an apparent charge occurs equal or exceeding 100 pC when the sample is tested under the specified conditions [6]. Some researchers report that the characteristic features of partial discharge phenomena greatly depend on experimental conditions such as electrode geometry, shape and amplitude of applied voltage, insulation nature and purity [7]. Therefore, the electrode geometry and shape have an important role for Partial Discharge measurement. The electrode geometry and shape will affect the Partial Discharge measurement which is related to the deployment of electric field stress around the electrode and especially at the tip. This factors also being a reason for investigation of Partial Discharge characteristic of the air insulation by using the needle-plane electrode configuration that has been used by many research groups as seen in [8-10] to model partial discharge in oil insulation. In this experiment, partial discharge was modeled using needle-plane electrode in the air insulation using 3 difference kind of electrodes configuration. The highest electric field was obtained at the tip of needle electrode [11-12]. This paper reports the measurement of partial discharge in needle-plane electrode using RC detector, HFCT, antenna sensors.

II. EXPERIMENTAL SETUP

A. Electrode Systems

The experiment was conducted in lab with the temperature and humidity in the space experiment is about 27.8 ^{o}C and 59.4% respectively. The partial discharges were generated using a needle-plane electrode in open air with separation of 4 mm. The steel needle with tip radius of 10µm and curvature angle of 30^o. This electrode arrangement was chosen to simulate a protrusion which is a very common found as electric field enhancement site in a high voltage insulation system. The electrode arrangement is shown in Fig. 1. The maximum electric field E_{max} at the needle tip can be estimated using an analytic solution expressed as [12]:

$$E_m = \frac{2V}{r \ln\left(\frac{4d}{r}\right)} \quad (1)$$

where V is the applied voltage, r is the radius of needle tip (10 µm) while d is the electrode separation.