PREDICTION ON THE RELIABILITY OF GLOVE DIPPING MACHINE USING WEIBULL DISTRIBUTION

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This report is submitted in accordance with the requirement of the Universiti
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by

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I hereby, declared this report entitled Prediction on The Reliability of Glove Dipping Machine Using Weibull Distribution is the results of my own research except as cited in references.

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Date   : 18/12/2017

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Maintenance) with Honours. The member of the supervisory is as follow:

…………………………

(Project Supervisor)

ABSTRAK

Tujuan kajian ini dijalankan adalah untuk membuat jangkaan terhadap keboleharapan mesin sarung tangan untuk membuat sarung tangan getah menggunakan pengedaran Weibull. Sebelum membuat jangkaan keboleharapan, semua formula yang berkaitan dengan pengedaran Weibull hendaklah difahami terlebih dahulu. Formula Weibull yang terakhir adalah untuk mencari parameter iaitu a dan b. Kedua dua parameter ini adalah untuk menjangkakan keadaan mesin yang dikaji. Dua mesin yang dikaji iaitu 4/4 Gammex Pf (machine 4/4) dan 4/3 Gammex Pf (machine 4/3). Data yang telah diperolehi daripada Ansell Sdn Bhd, Semua data telah dikemaskini dalam perisian Excel sebelum dianalisa dengan mengunakan perisian Minitab. Perisian Minitab menunjukkan plot graf kebarangkalian dan juga kadar bahaya antara dua mesin. Berdasarkan itu, keadaan mesin boleh dijangkakan samaada bagus untuk disimpan (penyelenggaraan boleh dilakukan) atau tidak berbaloi untuk disimpan. Sebagai tambahan, boleh juga untuk mengetahui keuntungan atau kerugian mesin tersebut boleh diketahui jika berlaku kerosakan. Keputusan menunjukkan 4/3 Gammex Pf (machine 4/3) mempunyai keboleharapan yang tinggi. Masa untuk gagal 4/4 Gammex Pf (machine 4/4) adalah tinggi dan kadar bahaya 4/4 Gammex Pf (machine 4/3) adalah tinggi. Kerugian keseluruhan untuk 4/3 Gammex Pf (machine 4/3) adalah rendah berbanding 4/4 Gammex Pf (machine 4/4).

ABSTRACT

The aim of this research is to predict the reliability of the glove dipping machine using Weibull distribution. This investigation involved two type of machines which are 4/4 Gammex Pf (machine 4/4) and 4/3 Gammex Pf (machine 4/3). The data is collected from Ansell Sdn. Bhd, and then tabulated in Excel Software before analyse by using Minitab Software. The Minitab Software shows the graph plot probability and also hazard rate of two machines. From the result of the analysis, this study can predict the condition of the machine which is good to keep (do the maintenance) or not worth to keep. The MTTR and MTTF analysis is carried out to estimate the reliability of these two machine. In addition, the profit loss of the machine can be predict based on its breakdown time. The result shows that 4/3 Gammex Pf (machine 4/3) has the highest reliability compared to 4/4 Gammex pf. The mean time to failure for machine 4/3 Gammex pf (machine 4/3) is high and while the mean time to repair rate for 4/3 Gammex Pf (machine 4/3) is low. The total lost for 4/3 Gammex Pf (machine 4/3) is also low compare to 4/4 Gammex Pf (machine 4/4).

DEDICATION

I dedicated this study to the Almighty God. This project completed in lovingly and wholehearted offered in gratitude, respect and love to beloved parents, Mohamad Nor bin Zek and Riha Binti Ismail, families, lecturers, friends, Adam Hamdani Bin Amirul Hisham and Muhammad Hafiz Bin Omar.

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LIST ABBREVIATIONS, SYMBOLS AND

NOMENCLATURES

PM   Preventive Maintenance

MTTR   Mean Time To Repair

MTTF   Mean Time To Failure

MTBF   Mean Time Between Failure

TTF   Time To Failure

TTR   Time To Repair

NRL   Natural Rubber Latex

MLE   Maximum Likelihood Estimation

FMEA   Failure Mode and Effect Analysis

RBD   Real Block Diagram

FTA   Fault Tree Analysis

ttf Time To Failure

$R(T)$ Reliability Function

t Time

$F(T)$ Failure Function

$g(t)$ Condition Repair Rate

$\mu(t)$ Condition Repair

b Shape Parameter

a Scale Parameter

$°C$ Temperature

Ti   The Time For The Machine Working

τi The Time For The Machine Stop

CHAPTER 1

INTRODUCTION

1.0   Introduction

Maintenance is about to repair any part of mechanical, plumbing or electrical device that become broken. In maintenance, there are several type of the maintenance such as corrective maintenance, preventive maintenance and reactive maintenance. So in industry, maintenance is very important so the machine can continue working. Maintenance also has changing expectations. It is because of the rapidly growing awareness of the extent to equipment failure affects safety and environment. It is because of the connection between maintenance and product quality achieves high plant availability and to contain costs.

In maintenance, there are several alternatives that can satisfy the functional requirements of the system. According to K Lad et al(2012) apart from their cost, there are differ in their inherent failure and repair characteristic, such as time to failure distribution, time to repair distribution and failure consequences. The entire alternative will contribute differently to the reliability performance. K Lad et al.(2012) also mentioned that, preventive maintenance (PM) also can be used to improve the reliability performance of the system but it is consume resources and time which could otherwise be used for production, thereby affecting profit. In this study the reliability of the dipping machine by using Weibull distribution is presented with real data provided by industry.

The dipping machine is the machine that use to make the glove that made from the latex. There are many function to make the glove which is compounding, molding,

extrusion and vulcanization. All this process are explain about the rubber product. The dipping usually process by the machine. The manufacturer provide dipping process through Glove Dipping Machine.

Nowadays, Weibull distribution is commonly used as a lifetime distribution in reliability application. According to Yang et al. (2009) the application of the Weibull distribution is to apply to a variety of cutting process. Lin (1998) has discussed about the effect of the cutting conditions, cutting speed, feed rate and depth of cut on a tool life and cumulative probability of chipping could be presented as a Weibull distribution.

Weibull distribution is namely from a researcher and its name was WalodiWeibull (1887 – 1979). This method can choose various types of parameter and model different many type of failure rate behaviour. According to Dolas et al. (2014) this Weibull distribution can be found with two or three parameters which is scale, shape and location parameters. The parameter estimation is the method for the machine tool reliability to overcome the problem. Dolas et al. (2014) found that the knowledge and the experience of maintenance personnel is used to obtain the parameters of lifetime distribution of the repairable and non-repairable components.

1.1   Problem Statement

In industry, the operation of a machine is very critical. It can reduce damage and improve the production quality or else. The problem occurred may affect the production or quality.

Usually problem that occurs in the dipping machine is the latex dip tank blocked at the inlet valve, the power supply broken, the main drive lock sensor error. If that happens, the the quality of the product will not meet the satisfaction and this will disturb the production timeline. By measuring its reliability, the risk measures and maintenance can be determined. Reliability can be used to predict the performance of the machine, hence avoid failure of the machine. Using the stastical method i.e. Weibull analysis can help company to make an early prevention before the machine break down hence reduce the percentage of failure rate of the machine productivity.

Based on the Hasnida et al. (2012) when the unplanned downtime occurs due to the machines or the equipment failure, this will disrupt the production operation. It would be very expensive to revise the production plan in the emergency situation, and also can be causes lower product quality and variability in service level. Therefore, this project aims to reduce the risk of the dipping machine by predicting the reliability based on the data collection.

1.2   Objective

The objectives of this study are:

1. To predict the reliability of the dipping machine using Weibull distribution by estimating the MTTR.

2. To predict the reliability of the dipping machine using Weibull distribution by estimating the MTTF .

1.3   Scope of Study

The scope of this study is the prediction of the reliability of dipping machine at Ansell NP Sdn. Bhd. using Weibull distribution. The MTTR and MTTF of the dipping machine is estimated by using the data collected. Three month of data collection is used in this study which are July, August and September 2015.

CHAPTER 2

LITERATURE REVIEW

2.0   Introduction

This chapter will discuss about the literature review that related with this project. In this chapter the literature reviews that choose was related to the reliability, Weibull distribution and the dipping machine. The aim for this chapter is to give the information about the background and more related issue based on the project. The prediction of the reliability is important and it can reduce the cost of the maintenance.

2.1   Reliability

Reliability is the probability of the equipment or the components that have the life tools or the time to work for given the period time when used under specific condition. Reliability also can define as the control of the quality and it also can improve the functionality of the equipment that we investigate. Based on Manzini et al. (2010) reliability can be defined as the probability that a component (system) is performing its required the function at a given point in time when used under specific operating condition.

Reliability is very important in the industry because it can predict the life tools of the machine or the equipment or know when the time for the machine or the