

DESIGN A MAINTENANCE SCHEDULE USING RELIABILITY EVALUATION FOR ROLLING
MACHINE AT POWER BOOSTER ENGINEERING & MAINTENANCE SDN. BHD.

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DECLARATION

“I hereby declare that the work in this report is my own except for summaries and quotations which have been duly acknowledged.”

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SUPERVISOR DECLARATION

“I hereby declare that I have read this thesis and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Design & Innovation)”

Signature :

Supervisor : Dr. Mohd Asri Bin Yusuff

Date :

DEDICATION

To my beloved mother and father,
My siblings,
My brother and sister in laws,
My nephews and nieces,
And to all my friend.
Thanks for all the support and ideas.

ABSTRACT

Maintenance is a process to conserve, maintain, operate and regulate its buildings, equipment, system or machine. In the industry that fully operated by machine, maintenance work are important to avoid from effect product production. If there is problem on the machine, production will be delay, fault and this will company face losses. A good maintenance will help to prolong life of the machine. Besides that, a good maintenance will help company bearing the cost of machine maintenance. Reliability of the system or machine are depend on good maintenance. In this study, one machine had been chosen to find reliability values and mean time to failure. Data needed in this study are time to machine having failure. An analysis will be used to determine failure distribution whether Weibull Distribution, Lognormal Distribution or Exponential Distribution. This will conduct by using software Weibull++. Once the failure distribution had been determined, mean time to failure of the machine will be find using specific formula in the distribution. With the values of mean time to failure, one maintenance schedule can be proposed.

ABSTRAK

Penyelenggaraan adalah satu proses memelihara, menjaga, mengendali dan mengawalselia bangunan, kelengkapan, sistem atau mesin. Di dalam sesebuah industri yang menggunakan penggunaan mesin dalam barisan produksi, penyelenggaraan ke atas mesin amatlah penting bagi mengelakkan dari mengganggu pengeluaran sesuatu produk. Jika berlaku sebarang masalah ke atas mesin, pengeluaran sesuatu produk akan menjadi lewat, produk akan mengalami kerosakan dan ini akan menyebabkan syarikat menanggung kerugian. Penyelenggaraan yang baik dapat membantu meningkatkan jangka hayat sesebuah mesin. Bukan itu sahaja, penyelenggaraan yang baik dapat membantu syarikat daripada menanggung kos kerugian untuk membaiki mesin tersebut. Keboleharapan sesebuah sistem atau mesin untuk beroperasi adalah bergantung kepada penyelenggaraan yang baik. Di dalam kajian ini, sebuah mesin telah dipilih dari sebuah kilang untuk dijadikan bahan ujikaji untuk mendapatkan nilai keboleharapan dan juga mendapatkan nilai masa untuk mesin itu gagal. Data yang diperlukan dalam kajian ini adalah masa untuk mesin mencapai kegagalan. Satu analisis akan dilakukan untuk mengenal pasti taburan kegagalan sama ada taburan weibull, taburan lognormal atau taburan exponential dengan menggunakan perisian Weibull++. Apabila taburan kegagalan dikenal pasti, pengiraan untuk mendapatkan purata masa untuk gagal bagi mesin tersebut dapat dicari. Dengan menggunakan purata masa untuk gagal, satu jadual penyelenggaraan dapat di cadangkan.

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LIST OF ABBEREVATIONS

MTTF	Mean Time To Failure
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
PDF	Probability Density Function
PSI	Pound per Square Inch
CDF	Cumulative Density Function

LIST OF SYMBOL

σ_{T_1} = Standard Deviations of the natural logarithm of time to failure

μ' = Mean of the natural logarithm of time to failure

λ = Scaling factor = Failure rate

γ = Location Factor

β = shape parameter

η = scale parameter

t= time

CHAPTER 1

INTRODUCTION

This study had been conducted through the whole year in order to design optimum maintenance schedule for rolling machine at Power Booster Engineering & Maintenance SDN BHD and need to study the previous maintenance record for the machine.

1.1 PROJECT OVERVIEW

Preventive maintenance is done in time available in an attempt in order to avoid costly failure later which the maintenance activity includes cleaning, adjusting and recognizing incipient failure before they occurs. For every maintenance that done towards the machine it will be record in maintenance schedule form which followed the timing of the inspection either yearly, monthly, weekly, daily and hourly follow the frequency that needed. Maintenance schedule are plan or schedule that detail when work, either major or minor which need to be completed. The maintenance activity can be required simply because of the age of the machine which sometimes users do not expect the failure until the component or the systems of the machine fails. When a part of the component in the machine fail, it will affect overall the machine functional which will bring to downtime.

The optimum maintenance for every machine are play role to every industries or factories in order to ensure the machine always in good condition and performance to increase the lifespan of the machine. Other than, optimum maintenance very important to minimize the maintenance cost that happen at all industry.

The study had been conducted toward the rolling machine which is used widely by the vessel manufactures. In order to fulfill this study, the information of machine operation record for daily and monthly had been collected. Operation record is defined as the time taken for the machine to run or to process the product, per hour for each day. The data collection is focused on maintenance record of the machine which is part service, part changing and shutdown. The data is collected by months for year and all the raw data are convert to a statistical distribution for ease to analyze and process by using a suitable method in order to get result for this study.

1.2 Problem Statement

In manufacturing engineering work, some machine are required to do some process. In Power Booster Engineering SDN BHD, there manufacturing pressure vessel tank. Some of the machine that use to manufacturing the pressure vessel tank is by using rolling machine. The machine are used to form body shell of the pressure vessel tank. In this company, there have two size of this machine which are bigger size and small size. Its price is quite high, so to prolong the lifespan of the machine, maintenance are required. If this machine have any problem or breakdown, production work will be delay and this will effect to company. Other than that, the efficiency of the machine is being low.

This problem is actually plays a big role on effecting to company and then will effect to clients. The main effect is it will costing to company to spending a lot of money for maintenance process. Besides that, because of efficiency of the machine getting low, the time required to manufacturing process take a long time and this will reduce the quantity of product produced.

To solve that problem, rolling machine at Power Booster Engineering SDN BHD must always be maintenance in some period. Every component and part on the machine must be maintenance. Technicians that handle of the machine must be monitor and record if has any problem with the machine. So, the systematic maintenance schedule must be design to reduce the damage caused to the machine and thus increasing the efficiency of the rolling machine at Power Booster Engineering SDN BHD.

1.3 Objective

This project has several objective that have to be achieved which are:

- i. To design maintenance schedule to increase reliability of rolling machine at Power Booster Engineering SDN BHD.
- ii. To investigate how maintenance schedule will help to prolong the life of rolling machine at Power Booster Engineering SDN BHD.

1.4 Scope of Project

This research will only focus on maintenance schedule by using reliability evaluation of rolling machine at Power Booster Engineering SDN BHD. Collecting record of machine maintenance for few month will be done as the first step any analyzing work take place. Every function for each component and part of the rolling machine has been study before proceed to research to help more understanding of the machine. To narrowing the research, one rolling machine at Power Booster Engineering SDN BHD have been chose to be the specimens.

The data record of machine maintenance for a few year will be analyze to study how many maintenance in some period, failure of the machine and which component are always have a problem. This will getting help from technician that handling the machine.

The result will be interpreted and finding solution on how to design maintenance schedule. These solution will be suggested to improving and increasing the efficiency of conventional lathe machine.

1.5 Project Methodology

The actions that need to be carried out to achieve the objectives in this project are listed below.

- i. Literature review
Journals, articles, or any materials regarding the project will be reviewed.
- ii. Analysis
Weibull and Fault tree analysis will be use and based on the analysis, solution can be proposed.
- iii. Calculation
Failure through time will count by using poison processes and possibility that events may be more likely to occur at certain times that at another time will count by nonhomogeneous Poison processes
- iv. Proposed solution
Solutions will be proposed based on the analysis.
- v. Report writing
At the end of the research, it will come out with report.

CHAPTER 2

LITERATURE REVIEW

2.1 Rolling Machine

Nowadays, with technology many work can be done easily. In industry, many type of machine are used to manufacturing a product which is to cut, assemble, and shaping. Normally, in industry they manufacturing metal product, so they need some machine in cutting process and shaping process to help in manufacturing process. One of the machine is rolling machine (Figure 2.0). The functioning of this machine is make a round or conical shape by roll metal plate. The form of metal plate shape is by going a process bending continually of the piece along a linear axis. This process will cause metal plate change from original shape to round or conical shape.



Figure 2.0: Rolling Machine

Rolling can be defined as one process of plate passing through between the rolls and plastically deforming has occurred. Rolling is the most widely used forming process, which provides high production and close control of final product. The metal is subjected to high compressive stresses as a result of the friction between the rolls and the metal surface (Tapany Udomphol, 2007)

2.1.1 Type of Rolling Machine

According to David Donnel (2010), there are two categories for metal plate bending rolls which are single or double pinch and each category has its own geometry and style. There are few general machine styles which are three-roll double-pinch, three-roll initial-pinch, three-roll variable translating, four-roll double pinch, three-roll pyramid and two-roll system. Every machine has its limit of material that can apply to it and normally 36,000 to 38,000 pounds per square inch (PSI) baseline material yield strengths.

2.1.2 Machine Component

Rolling machines consist of three main parts (Figure 2.1(a)) which are rigid forming rollers, free floating rollers and a drive roller which are arranged triangularly with two handles for shape-rolling. The process of shaping metal plates is continuous until the metal plate changes into a conical shape.