



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**A STUDY ON DECISION SCENARIO OF TURNAROUND DAYS
OF PREVENTIVE MAINTENANCE**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Management) with Honours.

By

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FACULTY OF MANUFACTURING ENGINEERING

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

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A STUDY ON DECISION SCENARIO OF TURNAROUND
DAYS OF PREVENTIVE MAINTENANCE

IZZATI BINTI IZMAN

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRACT

Preventive maintenance is a schedule of planned maintenance actions aimed at the prevention of breakdowns and failures. The primary goal of preventive maintenance is to prevent the failure of equipment before it actually occurs. The use of preventive maintenance strategies in the workplace is meant to achieve three things: a lower cost of replacement, a minimum number of breakdown and maintenance time. This case study is related to the machine maintenance which affects the production. A plant maintenance should be used to schedule the sequence of any machine that has achieve period of rehabilitation. A well maintenance schedule needed on sufficient spare parts as well as controlling the associated costs and at the same time the total cost of benefit are also high. Statistical analysis method is applied to solve the problem in this case study. This analysis is attempts to determine the best machine maintenance turnaround days. Through statistical analysis, some scenario of machine maintenance turnaround days will be scrutinized. Based on the result, the best turnaround days for machine maintenance that can produce the highest expected total cost (benefit/loss) for one machine in one day will be proposed. The main purpose of this case study is to determine the best machine maintenance turnaround days that provide the less cost and highest benefit by using the statistical approach.

ABSTRAK

Penyelenggaraan pencegahan merupakan sebuah jadual rancangan penyelenggaraan yang bertujuan untuk mengelakkan daripada berlakunya kerosakan dan kegagalan. Tujuan utama dari penyelenggaraan pencegahan adalah untuk mengelakkan kegagalan sesuatu peralatan sebelum ia benar-benar terjadi. Kegunaan strategi penyelenggaraan pencegahan di tempat kerja adalah bertujuan untuk mencapai tiga perkara: kos penggantian yang lebih rendah, jumlah minimum masa kerosakan dan penyelenggaraan. Kajian kes ini adalah berkaitan dengan penyelenggaraan mesin yang mana mempengaruhi pengeluaran. Sebuah penyelenggaraan pencegahan perlulah digunakan untuk merancang urutan setiap mesin yang telah mencapai tempoh pemulihan. Sebuah penyelenggaraan pencegahan yang baik diperlukan untuk mengawal kos yang berkaitan dan pada masa yang sama jumlah kos manfaat juga tinggi. Kaedah analisis statistik telah digunakan untuk menyelesaikan masalah dalam kajian kes ini. Analisis diguna untuk menentukan jarak masa yang terbaik untuk melakukan penyelenggaraan mesin. Melalui analisis statistik, beberapa senario untuk jarak masa untuk berlakunya penyelenggaraan mesin akan diteliti. Berdasarkan daripada keputusan, jarak masa yang terbaik untuk melakukan penyelenggaraan mesin yang dapat menghasilkan jumlah kos tertinggi yang diharapkan (manfaat / kerugian) untuk satu mesin dalam satu hari akan dicadangkan. Tujuan utama kajian kes ini adalah untuk menentukan jarak masa yang terbaik bagi menjalankan penyelenggaraan mesin yang dalam pada masa yang sama dapat menyediakan kos penyelenggaraan yang rendah tetapi keuntungan yang tinggi dengan menggunakan pendekatan statistik.

DEDICATION

For my parent, Izman Bin Md. Idrus and Zaiton Binti Awang, for my siblings and lovely friends.

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LIST OF ABBREVIATIONS

FELDA	-	Federal Land Development Agency
MPOB	-	Malaysian Palm Oil Board
MPOC	-	Malaysian Palm Oil Council
R&D	-	Research and Development
TBM	-	Time Based Maintenance
RCM	-	Reliability Centered Maintenance
PK	-	Palm Kernel
PM	-	Preventive maintenance
CMS	-	Cellular Manufacturing Systems
MTBF	-	Mean Time Between Failure
S	-	Standard Deviation
CV	-	Coefficient of Variation
V	-	Coefficient of Skewness
AD	-	Anderson-darling

CHAPTER1

INTRODUCTION

1.1 Background of Study

Palm oil industry is one of the major contributors to the Malaysia economic growths. The palm oil or its scientific name “*Elaeis guineensis*” is native to Africa. Palm oil, coconut oil and palm kernel oil are edible plant oils derived from the fruits of palm trees. Palm oil is extracted from the pulp of the fruit of the palm oil while palm kernel oil is derived from the kernel (seed) of the palm oil and coconut oil is derived from the kernel of the coconut (*Cocos nucifera*).

Palm oil is a common cooking ingredient in Southeast Asia and the tropical belt of Africa. Its increasing use in the commercial food industry in other parts of the world is buoyed by its lower cost and the high oxidative stability (saturation) of the refined product when used for frying.

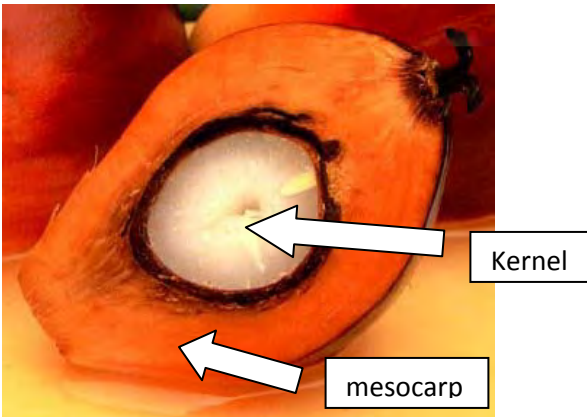


Figure 1.1: Cross-section of palm oil fruit

Although palm oil is native to Africa, Malaysia was the first country to embark on large-scale planting and processing. Palm oil was introduced to the peninsula of Malaysia, then Malaya, as an ornamental plant by the British in the 1870s. In 1917, Henri Fauconnier planted the palm for its oil at Tennamaran Estate in Batang Berjuntai, Selangor, Malaysia. Palm oil economic potential was first realized in the 1960s when the Malaysian government embarked on a poverty eradication program through agricultural diversification by planting this crop and to diversify significantly away from rubber, the principal export crop at that time. A principal agent of this development was the governments Federal Land Development Agency (Felda) which undertook forest clearance and settling of smallholders. The growth of the industry has been phenomenal and Malaysia is now the largest producer and exporter of palm oil in the world, accounting for 52 percent of world production and 64 percent of world exports in 1999.

1.2 Uses of Palm Oil

The palm oil produces two types of oils, palm oil from the fibrous mesocarp and palm kernel oil from the palm kernel. Palm oil and palm kernel oil have a wide range of applications; about 80% are used of food applications while the rest is feedstock for a number of non-food applications. Among the food uses, palm oil is used for producing

margarine, shortenings, frying fats, ice cream and others. Palm kernel oil involves in the non- food sectors, especially in industry of producing soap and detergent, pharmacy products, cosmetic products and oleo-chemical products. While palm kernel expeller, is used for animal feeds especially cattle, either alone, or after compounding with other feeds to produce a more balanced food for the animal.

1.3 Malaysian Palm Industry

Palm oil is one of the 17 major oils traded in the global edible oils and fats market. It has been consumed as food, from as long as 5000 years ago and today is found in one out of every ten food products worldwide. As one of the world's largest producers and exporters of palm oil and its products, the Malaysian palm industry is the pride of the country. The palm oil industry has been the backbone of Malaysia social and economic development. This industry has not only improved the living standards of farmers, but also provided employment to more than half a million Malaysians. This sector is under the Ministry of Plantations Industries and Commodities, and there are two agencies which are responsible for its progress and promotion that is the Malaysian Palm Oil Board (MPOB) and the Malaysian Palm Oil Council (MPOC). These agencies undertake R&D, promotions and marketing, regulatory and enforcement functions, as well as provide economic and technical advisory services. This is done to ensure that the industry will continually achieve higher yields, offer more products as well as increase its share of the global oils and fats market.

1.4 Problem Statement

Every analysis study must begin with a statement of the problem and specific issues to be addressed. The case study will take place at Felda Kernel Product Sdn. Bhd. This study focuses on maintenance aspects in palm kernel oil production that affect the

machine throughput. The purpose of this case study is found the best turnaround days for machine maintenance.

Currently the Felda Kernel Product Sdn. Bhd. faces some problems such as low machine throughput, high losses, bad quality of kernel and unstable oil extraction rate. All of these problems are related to the press machine conditions which affect the production.

Current condition of palm kernel oil plant showed that in one day about 4 to 6 machine at the final press will face breakdown. Time taken to repair this breakdown is dependent on the type of damage sustained by the machine. For example, if the machine is opened because there are wear and tear in worm and collar, the time taken to change to the new worm and collar takes within two hours to three hours. Total production of palm kernel oil and palm kernel expeller is dependent on the number of machines operating in a single day.

A plant maintenance planning should be used to schedule the sequence of any machine that has achieve period of rehabilitation. A well maintenance schedule needed on sufficient spare parts as well as controlling the associated costs and at the same time the total cost of benefit are also high.

1.5 Objective of Project

- (a) To identify the maintenance problem at Felda Kernel Product Sdn. Bhd.
- (b) To analyze the maintenance problem using statistical approach.
- (c) To determine the best machine maintenance turnaround days that provide the less cost and highest benefit.

1.6 Scope of Project

This project will focus on maintenance aspects in palm oil production at Felda Kernel Product Sdn. Bhd located in Semambu, Kuantan, Pahang. Statistical analysis will be used to analysis the data of machine maintenance in line A for final press within 2 years, from 2009 to 2010. The type of machines maintenance task that use to this analysis is recondition. The project is attempts to determine the best machine maintenance turnaround days.

1.7 Organization of The Report

a) Chapter 1 (Introduction)

Chapter 1 is the introduction of this research. In this section, this chapter will provides and explain the background of study, problem statement, objective and scope of the study.

b) Chapter 2 (Literature Review)

This chapter cover the review of literature review includes the study and research of published materials like journals, thesis, case studies, technical documents and online library. This chapter explained about all the elements used for this report. First explanation is about what is maintenance, the advantages and disadvantages, the maintenance for safety, value of maintenance and type of maintenance. Second explanation is about statistical data analysis, reliability, probability and type of distribution and their typical applications.

c) Chapter 3 (Methodology)

This chapter explains the research methodologies that were used to perform an analysis of the study and explanation on working procedures to execute the whole project. Methodology is very important to determine a direction, guideline and method to work in this project. This methodology also can show the illustration step by step to execute this project, identify the problems, method to use and analysis the problem.

d) Chapter 4 (Result and Discussion)

This chapter includes the analysis of machine maintenance and machine maintenance cost. This includes the discussion about the machine maintenance analysis that has been done. Minitab tool software will be used to perform this analysis.

e) Chapter 5 (Conclusion and Recommendation)

This chapter covers the conclusion and recommendation which finalized the results and the success of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Maintenance

Maintenance encompasses all those activities that maintain facilities and equipment in good working order so that a system can perform as intended. Maintenance can also be termed as asset management system which keeps them in optimum operating condition. Scheduled maintenance is a planned maintenance actions aimed at the prevention of breakdowns and failures. The primary goal of maintenance is to prevent the failure of equipment before it actually occurs. As example, it is designed to preserve and enhance equipment reliability by replacing worn components before they actually fail. Another goal of maintenance is to keep the production system in good working order at minimal cost. Maintenance activities such as example include equipment checks, partial or complete overhauls at specified periods, oil changes, lubrication and so on. In addition, workers can record equipment deterioration so they know to replace or repair worn parts before they cause system failure. Recent technological advances in tools for inspection and diagnosis have enabled even more accurate and effective equipment maintenance.

Past and current maintenance practices in both the private and government sectors would imply that maintenance is the actions associated with equipment repair after it is broken. The dictionary defines maintenance as “the work of keeping something in proper condition upkeep”. This would imply that maintenance should be actions taken to prevent a device or component from failing or to repair normal equipment degradation experienced with the operation of the device to keep it in

proper working order. Unfortunately, data obtained in many studies over the past decade indicates that most private and government facilities do not expend the necessary resources to maintain equipment in proper working order. Rather, they wait for equipment failure to occur and then take whatever actions are necessary to repair or replace the equipment. Nothing lasts forever and all equipment has associated with it some predefined life expectancy or operational life. The need for maintenance is predicated on actual or impending failure. Ideally, maintenance is performed to keep equipment and systems running efficiently for at least design life of the components.

Anytime when fail to perform maintenance activities intended by the equipment's designer, the operating life of the equipment must be shortened. Over the last 30 years, different approaches to how maintenance can be performed to ensure equipment reaches or exceeds its design life have been developed in the United States. In addition to waiting for a piece of equipment to fail the preventive maintenance, reactive maintenance, predictive maintenance, or reliability centered maintenance can be utilize. Regular maintenance is essential to keep equipment, machines and the work environment safe and reliable. It helps to eliminate workplace hazards. Lack of maintenance or inadequate maintenance can lead to dangerous situations, accidents and health problems.

The use of maintenance strategies in the workplace is meant to achieve three things, a lower cost of replacement, a safer environment and a more efficient use of material. When maintenance is not properly conducted or cut back, the failure of equipment or structures increases over time, because the material used in the equipment or structure ages. With a maintenance strategy, the use and the time of use for the equipment or structure can be extending. There are considerations when maintenance becomes more costly than the maintenance itself. While, using maintenance helps to maintain a constant work flow and stream of income. Maintenance is supposed to expand the amount of time equipment, machinery or a structure is able to be used in a productive manner. Having maintenance programs helps eliminate sudden slowdown or stops in production, which can cause unplanned delays. There are two basic guidelines to decide if maintenance is effective for