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STUDY ON MACHINE PERFORMANCE FOR PRODUCTIVITY IMPROVEMENT

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

by

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I hereby, declared this report entitled Study on Machine Performance for Productivity Improvement is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Process) (Hons.). The member of the supervisory is as follow:

……

(Dr. Mohd. Rizal Bin Salleh)

ABSTRAK

Dalam kajian ini, Keberkesanan Peralatan Keseluruhan (OEE) telah digunakan bagi mengukur dan memantau kecekapan mesin di Jati Beringin Sdn. Bhd. untuk meningkatkan produktiviti dan mengurangkan masa pengeluaran mesin. Penggunaan OEE juga boleh diubah kepada sistem untuk menganalisis data pengeluaran untuk mengenal pasti bidang yang berpotensi untuk penambahbaikan. Mesin yang digunakan untuk menentukan OEE itu ialah S-40-2 stamping mesin dengan mengeluarkan produk J-Hook Mould 2. Pelan peningkatan akan dicadangkan kepada syarikat dan dilaksanakan pada mesin selepas analisis OEE dilakukan. Data rancangan pembaikan akan dianalisis untuk mengetahui keberkesanan mesin. Dalam syarikat ini, OEE semasa telah dianalisis dan mengenal pasti punca di dalam mesin dan pengeluaran J-Hook Mould 2. Rancangan pembaikan telah dilaksanakan di dalam mesin dan data baru OEE dianalisis. OEE menunjukkan peningkatan dalam produktiviti dan ia telah meningkat kepada 60%.

ABSTRACT

In this study, the Overall Equipment Effectiveness (OEE) was used for measuring and monitoring the machine efficiency in the Jati Beringin Sdn. Bhd. in order to enhance the productivity and reduce the production time of the machine. The use of OEE can also be transformed into a system for analyzing production data to identify the potential areas for improvement. The machine that be used for determining the OEE is the S-40-2 stamping machine with producing the product of J-Hook Mould 2. The improvement plans will be proposed to the company and implemented in the machine after an analysis of the OEE is done. The new data for the improvement plan will be analyzed to find out the effectiveness of the machine. In this company, the current OEE has been analyzed and identified the root cause in the machine and production of J-Hook Mould 2. The improvement plans are implemented in the machine and the new data of OEE are analyzed. The OEE shows an improvement in productivity and it has increased up to 60%.

DEDICATION

To my beloved parents, Puan Hajah Seri Manon Bte Misiran and Tuan Haji Juman Bin Haji Samani, my siblings and all my friends.

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I would like to praise to Allah and thanks a lot to my supervisor, Dr. Mohd. Rizal Bin Salleh for guided and helped me to finish this project. Also, thanks to Jati Beringin Sdn. Bhd. that supported and allowing me to carry out this project at their company.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

OEE	-	Overall Equipment Effectiveness
PM	-	Preventive Maintenance
PSM	-	Projek Sarjana Muda
SOP	-	Standard Operation Procedures
TPM	-	Total Productive Maintenance

CHAPTER 1
INTRODUCTION

This project is about the study of machine efficiency in order to enhance the productivity that meet the customer demand. Furthermore, it helps to increase the value of the product to the customer that is willing to pay, the sales revenue and pursuit of product perfection. Reduced lead-time to the minimum possible level and optimize on-time delivery are also to meet the customer requirement. These are important for an industry which is the profit comes from better production flow and the effectiveness of the machine performance based on customer pull.

Productivity can be defined as a something which measures output such as goods or services compared to the inputs which are labor, materials, energy, skills and others that used or produced the output. Productivity is the measurement of overall ability to produce a good or service. Particularly, how the resources are managed to achieve the stated objectives in a timely manner as set out in-terms of quantity and quality. Productivity improvement can be achieved in several ways through the increase of output or the decrease of input. If the level of output increases faster than the input, productivity will increase.

In the manufacturing operations, many companies made an important decision for the investment in their equipment. There are so many factors that caused the investment such as the upgrading of technologies and improving the productivity. So, many roles those need to be considered in the evaluation of strategies such as repairing, upgrading, or replacement of the right equipment.

The improvement of productivity can also be done well if the performance of the machine is considered. Machine performance normally is related to the efficiency of the machine. Machine performance can be measured by Overall Equipment Effectiveness (OEE). Effectiveness of machine can be assessed by the achievement of production without performing any unexpected shutdown or downtime, low speeds, and lack of supplies, also eliminate waste, inventory and over-production. Manufacturing equipment such as machine must produce no defects and no reworking in the production output. To ensure the continuity of product quality meets with the customer requirements, the machine must be maintained continuously in order to avoid unexpected damage being in effected on the machine.

To achieve maximum efficiency of the production machine, one of the strategies is to consider each element which is important for production equipment. By increasing the effectiveness of the equipment, facilities can improve the throughput and quality with less downtime and scrap. Although only stated, it involves in-depth detail. For a start, it is important to understand the equipment and managed to assess the problem of equipment. As identifying the effectiveness of the equipment, many manufacturers started to evaluate the overall equipment effectiveness. The value of the quantity of equipment OEE categories into three; availability, performance and quality, taking into consideration losses faced in each of those categories.

There is always misunderstanding between productivity and efficiency. Efficiency is usually known as the percentage of total system production potential actually achieved compared to the potential full output of the system (Narayan, 2004).

Any of these scenarios may be realized through improved methods, investment in machinery and technology, improved quality and improvement techniques and philosophies such as just-in-time, total quality management, lean production, supply chain management principles and theory of constraint.

1.1 Problem statement

In the ages of critically and challenging manufacturing, each engineer must take care about the performance of machines and productivity of each company. In order to improve the performance of the company, many challenges must be faced and developed in the researches before implementing the solution for the production or machine. Cost is the main factor and it is very significant as it is a very sensitive factor to build benefit and profit to achieve the company mission.

Nowadays, a machine in manufacturing industries would be operating without any stoppages. In manufacturing industries, the most common causes of efficiency loss are called six big losses which are breakdowns, setup and adjustments, small stops, reduced speed, start-up rejects and production rejects.

In Jati Beringin Sdn. Bhd. several machines such as pressing machine, deep drawing machine, stamping machine, grinding machine are being used in the production of Power line and telecommunication accessories. All these machines are operating almost 12 hours per day to produce the product in order to achieve the quantity of product required by the customer. Machine performance is sometimes employed ineffectively. This occurs for a number of factors caused by the failure of the machine, depending on the product from the customer orders, machine operating schedule, and operators' attitudes that influence the effectiveness of the machine.

1.2 Objectives

The objectives of this study are to:

(a) Investigate the performance of specific machine that used in the Jati Beringin Sdn. Bhd.
(b) Propose an improvement plans for enhancing the machine performance.
(c) Implement and monitor the improvement plans.
(d) Analyze the productivity improvement with the machine performance.

1.3 Scope

The scope of the project will involve several aspects that need to be focused. The project will cover the study on the machine performance of the S-40-2 stamping machine and the J-Hook Mould 2 product. It involves the activities such as proposing and monitoring the implementation of improvement plans, analyzing the Overall Equipment Effectiveness (OEE) at Jati Beringin Sdn. Bhd. for better productivity.

1.4 Organization of the report

Chapter 1 briefly discusses the introduction, problem statement, objectives and scope of study on machine performance for productivity improvement. Chapter 2 explains in details the relevant literatures related to the effectiveness of the machine. Then, chapter 3 introduces the methods that can be used to improve the machine performance in order to enhance the productivity improvement. Chapter 4 describes the company background that gave the permission to carry out this study. Chapter 5 will explains the result and discussion after this study is analyzed. Finally, chapter 6 is obtains the conclusion and future recommendations about this study.

The progress of the study should be emphasized to ensure the project could be completed according to the time constraint. Gantt chart of the study has been created as references of the progress of the study. The Gantt chart of the study is shown on the appendix.

CHAPTER 2
LITERATURE REVIEW

This chapter will review about the previous works and results on the efficiency of machines which are related to the efficiency of the operation or equipment for productivity improvement. Although the machine efficiency has gone through many phases in the development, many researchers are still trying to improve the best methods for machine performance. Several works on the machine efficiency have been done and the results were applied to the real application for productivity improvement.

2.1 Product Manufacturing

2.1.1 Production

Grimes (2008) stated that production is the process of converting resources from raw materials into products or services. It is usually measured in terms of output per time period or cost per unit of output. The objective of production operations is to meet the needs of the market in which perform at the lowest possible cost. The output of a production process can be improved by increasing the resources or by changing the process or both.

2.1.2 Productivity

Grimes (2008) also claimed that productivity is simply the measure of the ratio between output of a process and the input of resources needed for it. It is usually expressed as output divided by input. Output can be described as a unit or volume such as tons, litres, boxes, etc. Inputs are usually described as manpower, machinery and materials. As shown in the table 2.1 below.

Table 2.1: Measurement of product input

Input	Unit of measurement
Machinery	Per machine-hour
Manpower	Per man-hour
Materials	Per materials unit
Money	Per $ of input

However, since manpower often forms a low component of the total cost of a product, it is vital to consider the productivity of all resource inputs when studying the productivity of a process. The term machinery is used to cover all the machines, equipment and transport used in the process. Similarly, materials are used to cover not only the raw or semi-finished materials but also lights, power, steam and other utilities consumed (Grimes, 2008).

2.1.3 Productivity Improvement

According to Grimes (2008), the cost of any product or service is the sum of the costs of the resources used in producing it. The more productive each of those resources can be made the lower the final cost of the product. In the market, the lower cost of production and the higher customer demand will more profitable the enterprise or company, with beneficial effect on the living standards of everyone. There are several ways to improve the productivity:

(a) Increases input but get a greater increase in output.
(b) Maintain input but increase the output.
(c) Decrease input with a small decrease in output.
(d) Decrease input but maintains output.
(e) Decrease input but increase output.

Grimes (2008) also stated in all manufacturing companies cannot be evaded with productivity improvement. Every worker is playing their part in the works as their responsibilities to improve the productivity. It is not difficult to do once you know he basics involved in measurement, standard setting and method improvement. The two most difficult parts of the operation are starting it and keep it going.

2.2 Work Standardization

Standard work, as defined Ohno (1988), is a document written for the manager and the engineer, not the line worker. It contains three elements which are the work sequence, the standard inventory and the cycle time.

Wilson (2010) stated the standard work is a set of tools, one of which is a flow chart with cycle times for each process step, so a supervisor, engineer, or manager can evaluate how well the process is performing and assist in process improvement.

While according to William (2001), standard work is documentation of agreed-upon, one best way to produce a product. It serves as the communication, training, and process improvement tool for the cell. It can include such information as cycle time, takt time, designed level of work in process, operator flow sequence, material flow sequence, and staffing.