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Examining the relationship between the maintenance machine downtime and firm's  
production yield: The case of manufacturing companies in Malaysia

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EXAMINING THE RELATIONSHIP BETWEEN THE MAINTENANCE  
MACHINE DOWNTIME AND FIRM'S PRODUCTION YIELD: THE CASE OF  
MANUFACTURING COMPANIES IN MALAYSIA

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This report is submitted in fulfilment of the requirement for the Bachelor of  
Technology Management (Innovation Technology)

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JUNE 2016

## DECLARATION

‘I declare that this report is my own work except the summary and excerpts of everything I have to explain the source’

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## **DEDICATION**

This research paper is dedicated to my parents and family who have been my constant source inspiration. They have given unconditional support with my studies. I am honoured to have their as my parents. Thank you for giving me a chance to prove and improve myself through all my walk of life. Additionally, thank you for conditional support from my beloved friends who helping me incomplete this study to all my family thank you for believing me to further my studies.

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## **ABSTRACT**

Maintenance is defined as the arrangement of all technical and managerial actions intended to preserve the item and restore it to the state in which it can perform its required function. The essence of this function is that the maintenance has become a cornerstone for a manufacturing organization to sustain its competitiveness (Al-Najjar, B., and Alsyouf, 2004). Production efficiency and effectiveness are among top business priorities. The requirements of outstanding performance force companies to substantially consider reducing their machines downtime frequency and its consequential costs (Nepal, M. P., and Park, M, 2004). This research examines the relationship between the maintenance machine downtime and firm's production yield for manufacturing companies in Malaysia. The aims of the research is to identify the causes of longer production machine set-up time, to determine the appropriate measures to reduce downtime, and to determine the appropriate operation strategies to improve the firm's production yield. The research is purely quantitative because reliable questionnaire was used to collect data. Fabtronic Sdn. Bhd and Advance Micro Devices (AMD) are chosen as the case study because the firm is advancing in high-technology operations. The researcher employs a case study by distributing questionnaire to the 100 respondents ranging from production employees, technicians, quality control, process engineer to unit head of the Production Department and IBM Statistical Product and Service Solution (SPSS) was used in order to analyse the data. Reducing of machine downtime will succeed if the firm focus on the factor causing longer machine downtime. It will give a big impact to the industries of enhance the productivity and innovation. The firm will use it as a main of important things to consider and focus to generate the creative thinking of innovation.

Keywords: Maintenance, production, quantitative

## ABSTRAK

Penyelenggaraan ditakrifkan sebagai susunan semua tindakan teknikal dan pengurusan bertujuan untuk mengekalkan item dan mengembalikannya kepada keadaannya di mana ia boleh melakukan fungsi yang diperlukan. Intipati fungsi ini adalah bahawa penyelenggaraan telah menjadi asas kepada sebuah organisasi pembuatan untuk mengekalkan daya saing (Al-Najjar, B., dan Alsyouf, 2004). Kecekapan dan keberkesanan pengeluaran adalah antara keutamaan perniagaan. Keperluan prestasi cemerlang memaksa syarikat untuk mempertimbangkan dengan ketara mengurangkan kekerapan masa henti mesin dan kos berbangkit (Nepal, M. P. dan Taman, M, 2004). Kajian ini mengkaji hubungan antara masa henti mesin penyelenggaraan dan hasil pengeluaran firma untuk syarikat-syarikat pembuatan di Malaysia. Tujuan penyelidikan ini adalah untuk mengenal pasti punca masa penyediaan mesin pengeluaran lebih lama, untuk menentukan langkah-langkah yang sesuai untuk mengurangkan masa henti, dan untuk menentukan strategi operasi yang sesuai untuk meningkatkan hasil pengeluaran firma. Kajian ini adalah semata-mata kuantitatif kerana soal selidik telah digunakan untuk mengumpul data. Fabtronic Sdn. Bhd dan Advance Micro Devices (AMD) dipilih sebagai kajian kes kerana firma itu yang maju dalam operasi berteknologi tinggi. Kajian ini menggunakan kajian kes dengan mengedarkan soal selidik kepada 100 responden yang terdiri daripada pekerja pengeluaran, juruteknik, kawalan kualiti, jurutera proses sehingga kepada Ketua Unit Jabatan Pengeluaran dan IBM Statistik Produk dan Penyelesaian Perkhidmatan (SPSS) telah digunakan untuk menganalisis data. Mengurangkan masa henti mesin akan berjaya jika tumpuan tegas mengenai faktor yang menyebabkan masa henti mesin lebih lama. Ia akan memberi impak yang besar kepada industri untuk meningkatkan produktiviti dan inovasi. Firma akan menggunakannya sebagai perkara utama yang perlu dipertimbangkan dan memberi tumpuan untuk menjana pemikiran kreatif inovasi.

Kata kunci: Penyelenggaraan, pengeluaran, kuantitatif

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## **LIST OF ABBREVIATIONS**

**5M:** Man, Material, Machines, Methods and Money

**TPM:** Total Productive Maintenance

**TQM:** Total Quality Managements

**JIT:** Just in Time

**FMOCR:** Flat Mail Optical Character Reader

**FLM:** Flats Lift Module

**AIS:** Auto Induction Station

**SMED:** Single Minute Exchange of Die

**ABC:** Activity Based Costing

**RCA:** Resource Consumption Accounting

**OEE:** Overall Equipment Effectiveness

**RCM:** Reliability Centred Maintenance

**TEEP:** Total Equipment Effectiveness Performance Tool

**RM:** Reactive Maintenance

**PM:** Preventive Maintenance

**SPSS:** Statistical Package for the Social Science



## **CHAPTER 1**

### **INTRODUCTION**

#### **1.0 Introduction**

Globalization, trade liberalization, rationalization and competitive markets necessitate firms to embark on positive actions to increase its production yield to meet customer's demands. Equally important is for company is to be capable of producing a wide range of products to meet high demands. Customers with high products demand, look for manufacturers that have the most sophisticated and advanced production capabilities and facilities to satisfy their requirement. Companies with production power in constant competition to compete in order to get more customers. Produce quality products at competitive prices have becoming one of the most important challenges for the production manufacturing processes.

Many firms try to stay up to date with all the new manufacturing processes and formulations methodologies to create a more efficient production. One of these methods is part of lean manufacturing is setup reduction time. Set up time or downtime can be defined as the period during which machine or equipment is not functioning or cannot work. It may be caused by a technical failure, machine adjustment, maintenance, or non-availability of inputs such as material, labour, and power. Average downtime is usually built into the price of goods produced to recover its cost from the sales revenue. (Erin Sullivan, 2012)

In the system of high production, the amount of work over and over accounted for the bulk of the product lead time, the rest is usually set up time. The company seeks to minimize and if possible eliminate setup time. Although many companies seeking the set up time reduction methods today, the reduction in setup time is not a new concept. (Mario A. Aquilar, 2011)

## **1.1 Background of the Project**

The background of a project is important to create an overview of the project activities and goals. The aim of this research is to examine the relationship between Maintaining Machine Downtime and Firm's Production Yield: The Case of Manufacturing Companies in Malaysia. The report provides the production plant with a concrete analysis of their current changeover method, occasionally complicated, and suggest alternatives in short term and long term periods of time to reduce machine's setup time.

Production efficiency and effectiveness of spending is among top business priorities. Therefore, the production equipment becoming the main focus of interest as it is the backbone of the manufacturing process and key performance indicator of productivity. Excellent performance power companies needs to consider significantly reducing machines downtime frequency and its consequential costs (Nepal, M. P., and Park, M, 2004).

The business view regarding the availability indicates to the duration of process set up time along the supply chain. The higher the availability, the most increased system through put and so returns on assets and investment. The term downtime potently marked by periods when the system is unavailable due to planned or unplanned stoppages. The unplanned stoppages are primarily refers to equipment failures or interruption process. Instead, stop scheduled considered established

procedures carried out activities as calculated duration for which the machine has to be stopped. For example, the planned maintenance, setups, adjustments, inspections, shutdowns, training, breaks, cleaning, standby stated (Muchiri, P., and Pintelon, L., 2008).

In implementing this project, several causes that contribute the longer machine downtime will be identified. After identifying the causes, several strategies will be proposed identified and recommendations be implemented to reduce machine downtime. This research also aims to identify the appropriate operation systems that can adopted by firms to improve production yield.

## **1.2 Problem Statement**

Critical evaluation on the existing production lines includes the longer set up time, complex and complicated, stopping production, thereby causing firms in wasting resources, production and money. Firm need to take into account the cost of spares, overtime for maintenance personnel, communications, and resources to restore the systems in the form of lean. Clark (2009) stated that lean is an all encompassing philosophy that takes the 5M's (Man, Material, Machines, Methods and Money), and harmonizes or helps orchestrates them together for the best possible outcome in manufacturing operations. These problems would disrupt production activities and will increase the quantity of product units rejected. Corresponding to these issues, there will be also other larger issues that firm will lose customer's order for want of time agreed upon by the client. Late delivery surcharges for delayed shipments causing direct reduction in profits.

Based on A. Raouf (1994), every company has a target but if this problem occurs frequently and allowed to persist without any action, the company will fail to reach the production schedule target. After analyzing the problem at production

process, there are fall into several categories. There are maintenance/set up duration, disorganization in the workplace, disorganization of work training, and disorganization of equipment. Solving these problems would give as a result a time efficient changeover process, saving time, resources and money. Several short term and long term ideas were proposed to compensate for these problems.

According to Lincoln, A. R. (2013), the downtime costing methods that have been used by manufacturing companies they are often static in nature and inappropriate of measuring the dynamic nature of production lines. These methods lack the ability of identifying the hidden cost categories and instead emphasized on the direct cost that levied itself. Additionally, the traditional paradigms of costing downtime did not accurately trace the consequential costs of changing system behaviour in accordance to random downtime events. The downtime cost bundled with other costs in an overhead bucket, where managers cannot have a clear vision about the individual cost of downtime and thus conduct practical decisions in line of improvements.

On the light of this, the research has been previously estimated that 80% of industrial facilities were unable to quantify the cost of downtime. Furthermore, many companies underestimating the total cost by a factor of 200-300% (Crumrine, D., and Post, D. 2006). However, the research did not mention any remarkable work about the real cost of planned stoppages and how it contributes to downtime total cost (James, P.F., Jadd, R. B., and Prasad, K.Y. (2008).

Under those circumstances, the common attempts toward decreasing downtime events and further costs were restricted to applied maintenance, in which consider the crucial pivot in assuring the availability of production equipment. Nevertheless, the difficulty of selecting the optimal maintenance policy or by practicing the inefficient maintenance tactic, not only will fail to reduce downtime incidents but rather will lead to added-costs (Faccio, M., Persona, a., Sgarbossa, F., and Zanin, G. 2014). In return to Swedish industries, the role of maintenance is not exceedingly recognized. There is a need to invest more in productive maintenance, which is considered by the majority as a necessary expense (Alsyouf, I. 2009).

### **1.3 Research Questions**

This research explored the following key question:

1. What are the factors that contribute to complex and complicated machine set-up, thereby causing longer machine downtime?
2. What strategies can be implemented to reduce machine set-up?
3. What operation systems can be implemented to improve the firm's production yield?

### **1.4 Objective**

The main objective of this project is to examining the relation between maintenance of machine downtime and firm's production yield. In order to make this project successful, the objectives have been declared these objectives must be achieved in completing this project. Objectives are a guidance of any project, so the objectives have been listed below.

1. To identify the causes of longer production machine set-up time
2. To determine the appropriate measures to reduce downtime.
3. To determine the appropriate operation strategies to improve the firm's production yield.

## **1.5 Scope**

The scope of this project encompasses the causes and various measures to improve production yield through proper maintenance of machine downtime. This is based on the stated objectives and to provide for the most appropriate solutions to the problems. Fabtronic Sdn. Bhd and Advance Micro Devices (AMD) are chosen as the case study because the firms are advancing in high-technology operations. The researcher employs a case study by distributing questionnaire to the respondents ranging from production employees, technicians, quality control, Process Engineers to unit head of the Production Department.

## **1.6 Limitation**

This research will examine and focus on the process of changing the different methods and solution for the production line and will make the process more orderly and efficient by reducing the setup and maintaining machine downtime. If any process that not involved directly with this research would be out of scope. This research is limited to the companies in Malaysia.

## **1.7 Significant of the Study**

The research explores relationship between maintaining machine downtime and firm's production yield. It provides benefits to firm to learn about the best operation systems and strategies to improve production. This study can identify the causes of longer production machine set-up time and devise the appropriate measures to reduce downtime.

## **1.8 Summary**

Reducing of machine downtime will succeed if the firm focus on the factor causing longer machine downtime. It will give a big impact to the industries of enhance the productivity and innovation. The firm will use it as a main of important things to consider and focus to generate the creative thinking of innovation.

In this research, the main reason is to examining the relation between maintenance of machine downtime and firm's production yield. It consists of identifying what are the factors of causing longer machine downtime. So, from this research, the researcher will determine and identify the factors that need to have in the industries to improve production yield.

## **CHAPTER 2:**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

In this chapter, reviews of the previous researches project that are related with this project will be discussed. The information will be become additional source for the project in becoming more successful. To have a brief understanding of the researches related to the project, a few literature reviews had been done. This chapter will describe the related literature reviews.

#### **2.1 Improved production yield**

“Production is a process of combining various material inputs and immaterial inputs (plans, know-how) in order to make something for consumption (the output). It is the act of creating output, a good or service which has value and contributes to the utility of individuals.” (Kotler, P., Armstrong, G., Brown, L., and Adam, S, 2006)

“Many multinational firms have suggested they can improve production by developing strategic production improvement programmes and implementing them in their dispersed network of plants. Instead of leaving every subsidiary to solve their own improvement issues, they offer a company-specific production system: an XPS.