MOTION AND TIME STUDY FOR ENHANCING THE ASSEMBLY PROCESS AT PHN INDUSTRY SDN BHD

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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 "Motion and Time Study for Enhancing the Assembly Process at PHN Industry Sdn Bhd" is the results of my own research except as cited in references.

Signature	:	
Author's Name	:	**ISMAIL BIN IBRAHIM**
Date	:	**03 / 06 / 2013**

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:

……

PROF. MADYA DR. MOHD RIZAL BIN SALLEH

(Project Supervisor)

ABSTRAK

Kajian ini bertujuan untuk meningkatkan hasil kimpalan bertompok dengan mengurangkan kadar masa mesin yang tidak produktif. Faktor-faktor seperti pergerakkan pekerja, masa yang diperlukan bagi sesuatu kerja disiapkan dan punca yang menyebabkan mesin tidak dapat digunakan secara optimum akan dipertimbangkan. Segala maklumat berkaitan dengan tajuk ini akan dikumpulkan melalui pembacaan jurnal, buku dan lain-lain selain melalui lawatan organisasi untuk mengenal pasti masalah dan skop. Beberapa kaedah boleh digunakan untuk menganalisis data seperti borang semakan, gambarajah Pareto dan gambarajah punca dan akibat. Penggunaan sesuatu mesin secara optimum dapat memberikan faedah dalam pengeluaran. Ia berhasil mengurangkan jumlah masa yang terbuang seterusnya meningkatkan kadar penghasilan. Selain itu, pengurangan kadar masa untuk menghasilkan satu unit produk juga telah meningkatkan kadar pengeluaran pada sesuatu masa. Pergerakan yang berulang dan jarak capaian yang tidak praktikal perlu dihapuskan. Dengan penggunaan perisian Simul8, semua data yang dikumpul telah dimasukkan sebagai maklumat bagi menghasilkan model proses pemasangan yang dikaji. Aliran proses semasa telah dinilai dan diperbaiki bagi meningkatkan kadar pengeluaran. Kadar pengeluaran dapat ditingkatkan sebanyak 9% dan penggunaan mesin dapat dimaksimumkan dengan sepenuhnya.

ABSTRACT

This study aims to improve productivity of spot weld process by reducing the time loss. Factors such as the movements of workers, time taken to complete the job and cause of the idle time will be measured to enhance productivity. The information about the proposed title gathered through journals, books and others besides of company visit to identify the problem statement and scope. Several methods has been used to analyze the data obtained including check sheet, pareto diagram and cause and effect diagram. Optimum use of a machine provides the benefits in production. Its managed to reduce the amount of time spent and thus increasing the rate of production. Futhermore, the reduction of time in producing a unit of product can also increase the production rate at a time. Repeated movement and access distance which is not practically done in manufacturing must be eliminated in order to increase the productivity. By using a Simul8, a simulation software for process improvement, all the necessary data have been included to visualized the model of assembly process being investigated. The current process flow has been evaluated and all the waste such as repeated movements have been eliminated and time taken to complete the sub-assembly process also has reduced to enhancing the productivity. The improved process flow show the increases of productivity by 9% and also increased percentages of machine utilization thus minimized the idle time of the machines.

DEDICATION

This work is dedicated to my beloved parents, my family, my supervisor, my friends and my lecturers. I have been inspired and encouraged by them.

ACKNOWLEDGEMENT

Alhamdulillah, thanks to Allah the Almighty for His will, I have the chance to finish up my Projek Sarjana Muda (PSM) report from the very first word till end point within the specified period.

First of all, I want express my appreciation to my PSM supervisor, Professor Madya Dr Mohd Rizal bin Salleh for his supervision, comments and guidance in order to make sure I can gain as much experience and knowledge to complete my PSM report. I really appreciate the kindness and thoughts. Thank you.

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At this juncture, it is only logical for me to pay compliment to my family. Their undivided love and support are the beacons that have continued to motivate me through the harshest of situations and I believe it will also spur me on to greater achievement in the future.

Lastly, to those who are involved directly and indirectly with my PSM report completion – I just can say thank you. Thanks for being so supportive and helpful all the way through this process. Only Allah can repay for what they have done.

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SMED	-	Single-Minute Exchange of Die
PSM	-	Projek Sarjana Muda

CHAPTER 1
INTRODUCTION

1.1 Background of Study

The automotive industry in Malaysia offers vast opportunities for global automotive and component manufacturers to set up manufacturing and distribution operations in the country.

Thus, it will result to the growth of local component industry. Dashboard component can be divided into two, dashboard upper and dashboard lower. The used of these two components are below the windshield, which place in front of the front seats. Dashboard lower component absorbs the front-side impacts. Its also served as the frame onto which polyurethane foams that act as absorption materials, and passenger-side airbags are attached to ensuring passenger safety.

This study will be focused on the optimization of spot welding robot knowns as robot 3 at PHN Industry Sdn. Bhd which is a company that produces and assembly parts and components ranging from dash board panel to parcel and frame compartment. This robot is being used to weld the lower dashboard component. Besides that, the major problems contribute to Time Loss are studied and solutions will be proposed at the end of the study.

1.2 Problem Statement

The decision making process involved in product design, manufacturing engineering, and production management have to consider many variables as products and processes are becoming more complex. Time loss is one of the problem experienced by PHN Industry Sdn Bhd. The high time loss will reduce the available machine run time and decrease the welding productivity.

Furthermore, it will reduce the organisation's operating cost. The company needs to develop the capability to shorten the time loss and reduce the idle time of the machine for maximize the production output. Time loss happened due to inconsistent setup time, changeover and frequent machine stoppage. Thus, to enable manufacturing company to increase its productivity, the reduction of time loss and waste are highly demanded.

Idle time is one of the major problem experienced in PHN Industry Sdn. Bhd. This can be found at the workstation of robot 3 where after starting spot welding process, it needs to wait for an operator to reload all parts that will be welded. The delay of robot movement will cause waste on processing time. The high time loss will reduce the available machine run time and minimize the welding productivity. Furthermore, it will increase the production output.

1.3 Aim

The aim of this study is to improve productivity of spot weld process at Robot 3 section by reducing the Time Loss.

1.4 Objectives

The objectives of the study are:

1. To investigate the major problems that cause machine idle.

2. To minimize and propose the time loss at workstation Robot 3 of Lower Dashboard Component section.

1.5 Scope

This study seeks to solve the problems at PHN Industry Sdn. Bhd which is located in Alor Gajah. PHN Industry is a company that produces parts and components ranging from dash board panel to parcel and frame compartment for an automotive manufacturer based in Alor Gajah. This study will focus primarily on the time study method. An interview and observation method also will be included to gain some information of the processes. The result of the study will be use to achieve the objectives that have been setup. The scope of this study will not cover on the factors that contribute the processing time such as machine breakdown time, maintenance and others.

1.6 Importance of Study

By identifying time loss and reducing idle time, the production output can be improved tremendously. This consequently standardizes the setup method which takes inconsistent time for every machine operator. With the elimination of waste, lead time and production cost can be reduced and it will enhance productivity efficiency to the organization.

CHAPTER 2
LITERATURE REVIEW

2.1 Productivity

Productivity usually associated with labour effectiveness in industry. It can be defined to different meanings. Productivity is a ratio of output to some or all of the resources used to produce the output. For example, labour productivity is units produced divide by hours worked while capital productivity is the ratio of output and capital input. Besides of labour and capital productivity, material productivity is the ratio of output to the materials input (Barnes, 1980).

Motion and Time study is a method that evolved over the years and designed to increase the productivity of an organization. Its objective is the elimination of unnecessary work, the design of methods and procedures which are most effective require the least effort suited for the user. Moreover, a performance index or productivity index can be determined by methods of work measurement including for an single worker, group of workers, a department or entire plant.

2.1.1 Productivity in Automotive

Malaysia offers vast opportunities for global automotive and component manufacturers to set up manufacturing and distribution operations in the country. It is because of its strategic location centrally situated in the ASEAN region with a large

population. Besides, there are other factors that contribute to the statement above such as pragmatic government policies, political, an educated and skilled labour force and economic stability with well developed infrastructural facilities. All of the factors resulted the attraction of major international automotive and components to invest in Malaysia (MIDA, n.d.).

The automotive industry also reflected to the auxiliary and supporting industries, contributed to skills development, the enhancement of technological and engineering capabilities and also boosted the development of engineering (MIDA, n.d). The national car projects also contribute to the development of an integrated motor vehicle industry where it has resulted to the growth of the local component industry. The statistic value confirmed by Department of Statistics Malaysia, there are 350 component manufacturers presence in Malaysia. It is stated that 234 of them are Proton vendors and another 135 are Perodua vendors (Uzir and Kanageswary, 2004).

Since the competitive between manufacturers in this industry is high, the automotive production has to face with a challenging set of market requirements and demands such as shorter time to market, more vehicle models and variants, higher productivity, reduce total cost of ownership, and production quality. Furthermore, the main objectives of a firm also to win market shares both domestically and internationally, to increase their profit and also to compete globally (Siemens, n.d.).

As example, the BMW assembly line in Dingolfing, Germany has built in flexibility that allows it to easily produce multiple models which is currently only assembles its 7 series model. The production flexibility enables its line to easily respond to market fluctuations and also avoiding the changeover cost. Its known that their rival typically configure their assembly lines to produce just a single model at a time and will be shut down due to produce the different model (Stevenson and Chuong, 2010).

2.2 Time Loss

In an ideal environment, the organization will have the full capacity of operations at all the time for all equipment its have. But, all of this almost impossible in real life

where there will be time loss in the operation. Time loss can be considered as time in which the equipment is not working due to operating delay or idle time of the operator or machine.

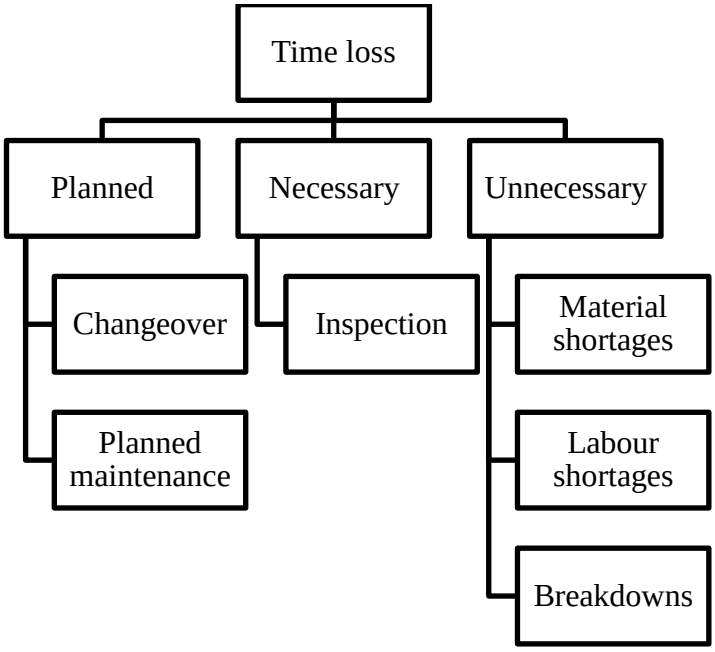

Figure 2.1: Categories of Time Loss and example

From the chart below, time loss can be divided into three major categories which is planned, necessary and unnecessary. The planned time loss is doing works that help the production process to flow smoothly. The examples of planned time loss are changeover, asset care and planned maintenance. All of the time loss can be reduced by several technique and method such as SMED (Single Minute Die Exchange), benchmarking and planned downtime log and matrix.

Next, necessary time loss is time of work that to be done because of the method itself. Inspection is a example of necessary time loss. It's needed to control the process and quality of the product. Other example of necessary time loss is minor stops where the performance is measure such as equipment failure for less than 5 minutes, fallen product, obstruction and blockages. Lastly, the unnecessary loss time that resulted from equipment failure which is more than 5 minutes, major component failure and unplanned maintenance (Unido, n.d.).

2.2.1 Idle Time

Basically, idle time is a time taken to do non value add activity or also can be defined as unproductive time on the part of employees or machines as a result of factors beyond their control such as waiting time of man, machines and parts. Waiting time can be associated with idle time since when a piece of machinery is not being used where it is in good condition and actually can be used (Unido, n.d.).

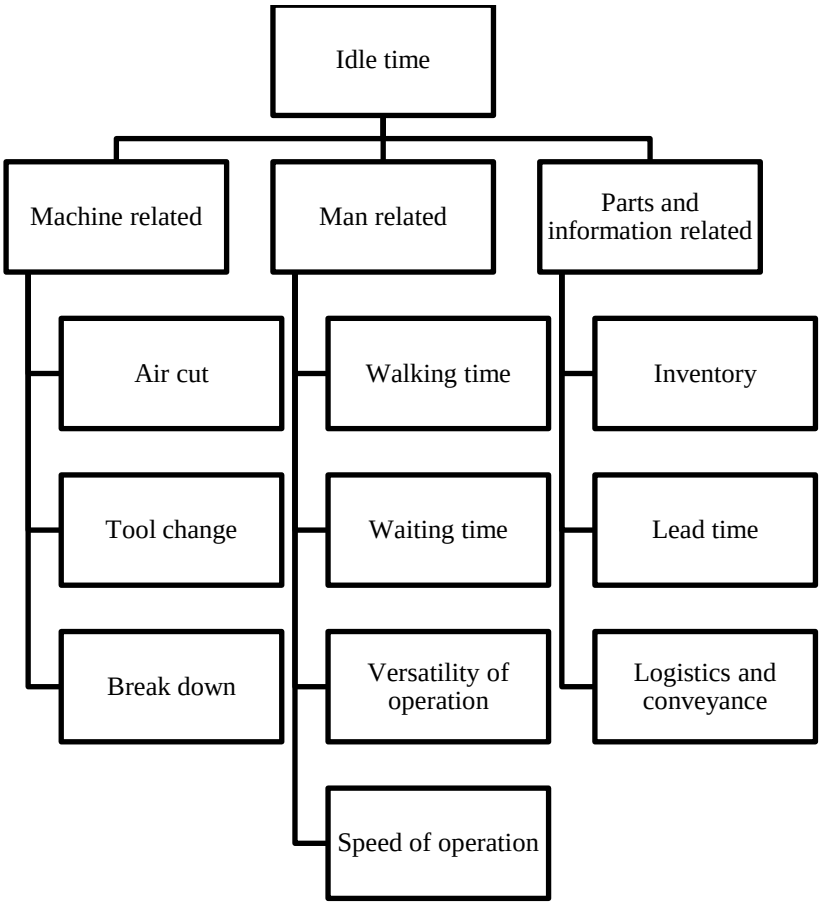

Figure 2.2: Factors that cause idle time

The figure 2.2 shows the example of factors that contribute to idle time. It is divided into three categories. First, a machine related factors such as the tool change, air cut and break down during operation hour. Nest, man related factors such as employee movement which is walking time, waiting time and speed of operation. Lastly, parts and information related such as lead time, inventory and logistics and conveyance. Carlier et. al. (2010) found that a machine that process jobs continuously without delay from the beginning of the first job until finish with the end of the last one is

machine with no-idle constraint. It is suitable for production setting which the machine must be running at all time in order to satisfy the customer's orders. It's also must running continuously to fulfil the demand although the capacity of the machine is limited.

Idle time should be avoided for high operating costs machines to increase the profit of the organizations. For example, an oven is used to heat some metal parts at a given temperature. Then, the oven will be maintained at the desired temperature while it is empty. The situation will provided waste which costly to the organizations.

2.3 Motion Study

The idea of Motion study nowadays is evolved from the work of Frank Gilbreth, where the concept was originated in the bricklaying trade in the early 20th century. Through the use of motion study techniques, Gilbreth is generally credited with increasing the average number of bricks laid per hour by a factor of 3, even though he was not a bricklayer by trade (Stevenson and Chuong, 2010).

Their contribution to the industry is large from their pioneering work in motion study. Nowadays, the principle and techniques they developed long time ago are being applied by industry at an increasingly rapid rate.

2.3.1 Definition

Motion Study is a technique used to analyze body movement of the employee into the work to eliminate or reduce ineffective movement and facilitate efficient movement. Groover (2007) states that Motion Study also can be defined as analyze of the basic hand, arm, and body movements of workers as they perform work. Motion study is the systematic study of the human motions used to perform an operation (Stevenson and Chuong, 2010).

Basically, motion study is a base for time study and should be done before a time study is made. It can be used successfully without time study but time study cannot be used without motion study since it is the foundation for time study. The main function of motion study is to eliminate unnecessary motions and to identify the best sequence of motions for maximum efficiency.

It's also to find the most economy of effort with due regard for safety and from the aspect of human. Thus, motion study can be an important avenue for productivity improvements. The total cost for human expenditure of effort can be reduced and increase the unit cost for human effort at the same time. Thus, less time is use to accomplish the same amount of work with more efficient application of human effort (Pigage and Tucker, 1954).

2.3.2 Motion Study Techniques

Motion study also is a versatile method which can be applied to any job effectively including jobs in the home, in the office, in retail and distribution fields and many others area. Motion study can be simply stated as to find out how a job is being done currently, to know the reason for each step being done on the job through question and the steps on the job that cannot be fully justified would be remove. Lastly, the new procedure for doing the job is install and standardized (Pigage and Tucker, 1954).

There are several of the possible motion study techniques which can be used where it is simply illustrate. The technique will be provided with supporting procedures will clear the relatively uniform practices prevailing at this time. Usually, the tested procedures in the study will involve the use of process chart, flow charts, operation charts and micro motion (Pigage and Tucker, 1954).