

MANUFACTURING DATA MANAGEMENT SYSTEM (MDaS)

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This report is submitted in partial fulfilment of the requirements for the award of
Bachelor of Electronic Engineering (Computer Engineering) With Honours

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2011



UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : MANUFACTURING DATA MANAGEMENT SYSTEM
(MDaS)

Sesi Pengajian : 2010/2011

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Specially..
To my beloved parents
To my kind brothers and sisters
And not forgetting to all friends
For their
Love, Sacrifice, Encouragements, and Best Wishes

ACKNOWLEDGEMENTS

First at all, I would like to express my thankfulness to our God because I manage to finish my final year project for the degree within two semesters as long period final year project at Universiti Tecknikal Malaysia Malaka (UTeM) and the report is submitted exact on time. Base on that, I already fulfill the requirement of the BENU 4972 and BENU 4984.

Second, I would like to show my gratitude for those who have assisted and guided me during the development and research of this Final Year Project (FYP). FYP supervisor, Mr Siva Kumar S/O Subramaniam, does give lots of advice and assists during the development process of the project, besides he also guide and lead my project to the correct path for development. He also helps me for the project scheduling and set mile stone in order to increase my passion and ensure the project is delivering on time. He is great when he directly give help whenever is needed even he is needed to assist a lot of projects at the same time and all projects are working well with his helps.

Last but not least, my gratitude also goes to all my family members for their continuous encouragement and financial support. Thanks you all.

ABSTRACT

Industries are one of a biggest asset for a countries development. The sustainability of an industry relies to the stability of their business in the form of profit margin which they gain within their resources of manufacturing. The management in industries are responsible to reduce all the unforeseen losses and hence their profit margin is always a goal. Understanding the factors which contributes to the losses in industries is only possible when valuable production information in interpreted wisely to the management. Without realization most industries oversea their true capacity and asset which is within their resources but not to be utilized for better yield. But in most industries around the world, manual data collection for such purposes is popular due to cost of investment, accuracy of system etc. Since this data has to be recorded manually, therefore there are high probability the data is recorded is inaccurate and leads towards human made error when documentation is done. Such valuable data which is recorded could lead towards a better understanding of their resources which is none other than their workers and machines. There are many possible ways to analyze the collected data for future use by the management. Therefore, the data is very important and any mistake on the data will miss lead the direction of the management and results in a great lost for the company. Using the manufacturing data management system (MDaS), the management can overcome all the human made error and have an accurate data management system through the production process. In this system, both production time and non production time will be captured for detail analysis using programmable logic controller. The collected data will be stored, analyzed and documented in custom build software without human interventional at all time. Such a system will be a significant tool for the management in decision making process.

ABSTRAK

Industri merupakan salah satu aset terbesar bagi perkembangan negara. Keberlanjutan sebuah industri bergantung pada kestabilan perniagaan mereka dalam bentuk batas yang mana keuntungan bergantung pada sumber mereka hasilkan. Dalam industri, faktor-faktor yang menyumbang pada kerugian dalam industri hanya difahami apabila maklumat pengeluaran yang berharga dapat interpretasikan dengan betul kepada pihak pengurusan. Kebanyakan industri di luar negara tidak memafaatkan sebanyak mungkin semua sumber dan kapasiti dalam syarikat mereka. Di sebahagian besar industri di seluruh dunia, pengumpulan data secara manual untuk keperluan tersebut adalah hangat digunakan kerana kos pelaburan, masalah ketepatan sistem dll. Oleh kerana data ini perlu direkodkan secara manual, sehingga ada kemungkinan besar data yang diambil adalah tidak tepat dan memimpin manusia membuat kesalahan semasa dokumentasi dilakukan. Data berharga yang direkodkan boleh mengarah kepada pemahaman dalam sumber daya syarikat seperti pekerja dan mesin. Oleh kerana itu, data ini sangat penting dan setiap kesalahan pada data akan menyesatkan keputusan pengurusan dalam memimpin arah syarikat dan menghasilkan besar kehilangan bagi syarikat. Untuk mengatasi masalah pengumpulan data secara manual, sistem pengurusan data kilang (MDaS) dapat digunakan, system ini dapat mengatasi semua kesalahan yang dibuat oleh manusia dan mempunyai sistem pengurusan data yang tepat dalam proses pengeluaran. Dalam sistem ini, waktu pengeluaran dan bukan masa pengeluaran data akan diambil untuk dianalisis dengan menggunakan programmable logic controller. Data yang dikumpul akan disimpan, dianalisis dan didokumentasikan dalam perisian peribadi yang dibangunkan tanpa campur tangan manusia. Sistem seperti ini akan menjadi alat yang penting bagi pengurusan dalam proses membuat keputusan.

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LIST OF ABBREVIATION

MDaS	-	Manufacturing Data Management System
PLC	-	Programmable Logic Controller
OEE	-	Overall Effectiveness Equipment
IDE	-	Integrated Development Environment
GUI	-	Graphical User Interface
OOP	-	Object-Oriented Programming
VB	-	Visual Basic
ADO	-	ActiveX Data Object
COM	-	Component Object Model
SQL	-	Structured Query Language
CPU	-	central processing unit
PIC	-	Programmable Interface Controller
RISC	-	Reduced Instruction Set Computer
ADC	-	Analog-to-Digital-Convertor
MSSP	-	Master Synchronous Serial Peripheral
UART	-	Universal Synchronous Asynchronous Receiver Transmitter
A/D	-	Analog-to-Digital
D/A	-	Digital-to-Analog
SPBRG	-	Serial Peripheral Baud Rate Generator
FYP	-	Final Year Project

CHAPTER I

INTRODUCTION

This system is about designing a data collection system which can systematically collect data from a work cell in production line. The data will then be used for analysis purpose. Background of this system will be explained in later part of this report.

1.1 Introduction

Production information is very important for the management to analyze the actual or real time status of the work cells in production line. This ensures all the resources of the industry are fully utilized. The most practice conventional way in data collecting is manual data collection system. This type of data collection is quite popular in current industries due to the lack of investment, accuracy of system etc. However, there are a lot of problems are induced when using this manual data collection system. When this valuable data is collected manually, the probability of data collection inaccuracy is high because the system is interference by human. Human made error easily occur.

The production data to be automatically collected by this system are actual output unit, target unit, reject unit, and downtime due to quality issue, production

control issue and maintenance issue. These production data will be further analyzed to generate report regarding man power performance, respective department performance, production performance, and overall equipment effectiveness (OEE). These all report will be used to analyze man power performance, machine performance and overall production performance.

Typically a production system in industries can be classified into three types, which are manual, semi automated machines and fully automated machines in nature. Manufacturing Data Management System (MDaS) can be integrated in any type of these production cells.

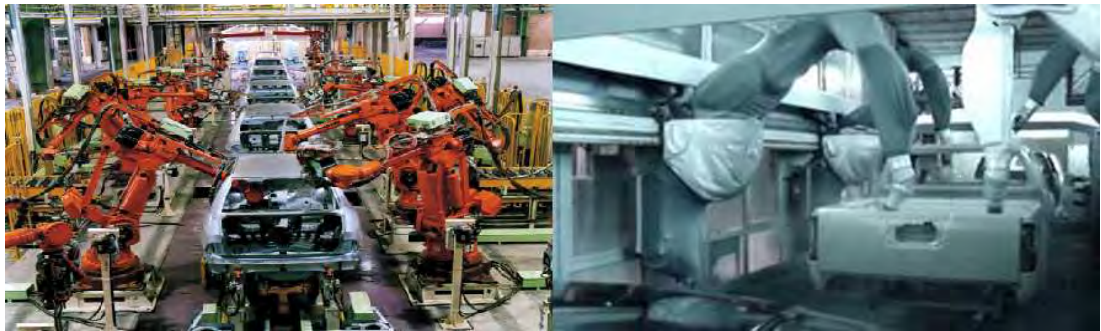


Figure 1.1: Automated production line

Production process using automated machineries as shown in Figure 1.1 is a process with high proportion of machinery in relation to workers. This type of process is suitable to serve large, relatively homogeneous populations consumers whose demand long production run and high quality output [1].

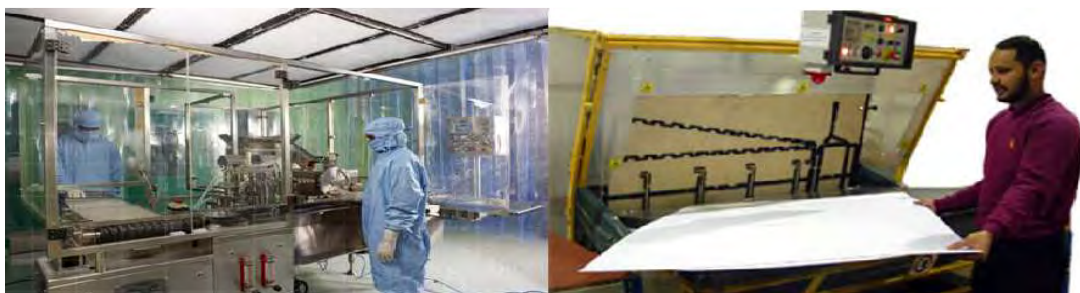


Figure 1.2: Semi automated production line

Semi automated production line as shown in Figure 1.2 consist of human and machineries working together to accomplish certain task. This type of production can only produce medium scale production output [1].



Figure 1.3: Manual production line

Manual production line is shown in Figure 1.3. Most of the work stations have their craftsman in the workbench. This type of process required skillful workers to follow procedures in producing parts. Such production lines practice for low production output [1].

1.2 Objectives

The main target of the project is focusing on designing a system which can automatically collects production data in order to improve the conventional data collection method. The objectives of the project are listed as below:

- i. To design and develop an automatic data collection system.
- ii. To have a systematic data collection system for each work cell in manufacturing company.
- iii. To provide accurate information for the management group about the status of the work cell.

1.3 Problem Statement

The current collection method used in industry is not managed to provide accurate data to the management. As a solution to overcome this problem, the whole data collection system has to be automated without human intervened.

The percentage data error of manual data collection method is high due to human intervened. For example, the operator may misread an instrument or make a mistake in a calculation when they are collecting the production information. Other than that, random error also contributes a lot for the error in manual data collection. An example of random error could be when the operator making timings with a stopwatch. Sometimes operator may stop the watch too soon and sometimes too late. These two errors may cause the valuable production data inaccurate and eventually, the management makes the decision using fault data because of the deviation of the data.

Manufacturing Data Management System (MDaS) will overcome these problems since the system collect data automatically without human intervened and interference all times. MDaS is built with custom made software which is able to analyzed collected data accurately.

1.4 Scope of Work

This system will show the current status of the work cell. It consists of a hardware display and software. Sensors will be integrated to the machine which will be link to programmable logic controller (PLC). All the signals received by programmable logic controller will be sent to the customized software. MDaS shows all the collected information on the display board as well as software.

At the end of a shift, the data can be stored in the data base for analysis purpose. The data stored in the data base will play an important role in the decision making of the company management. By using the customize software in MDaS, management can generate some data about the Overall Effectiveness Equipment

(OEE) and find out the weaknesses of current production cell.

Other than OEE report, management also can generate man power performance report, production performance report and respective department performance. From the report, management will know which part of the work cell that needs to be improved.

1.5 Methodology

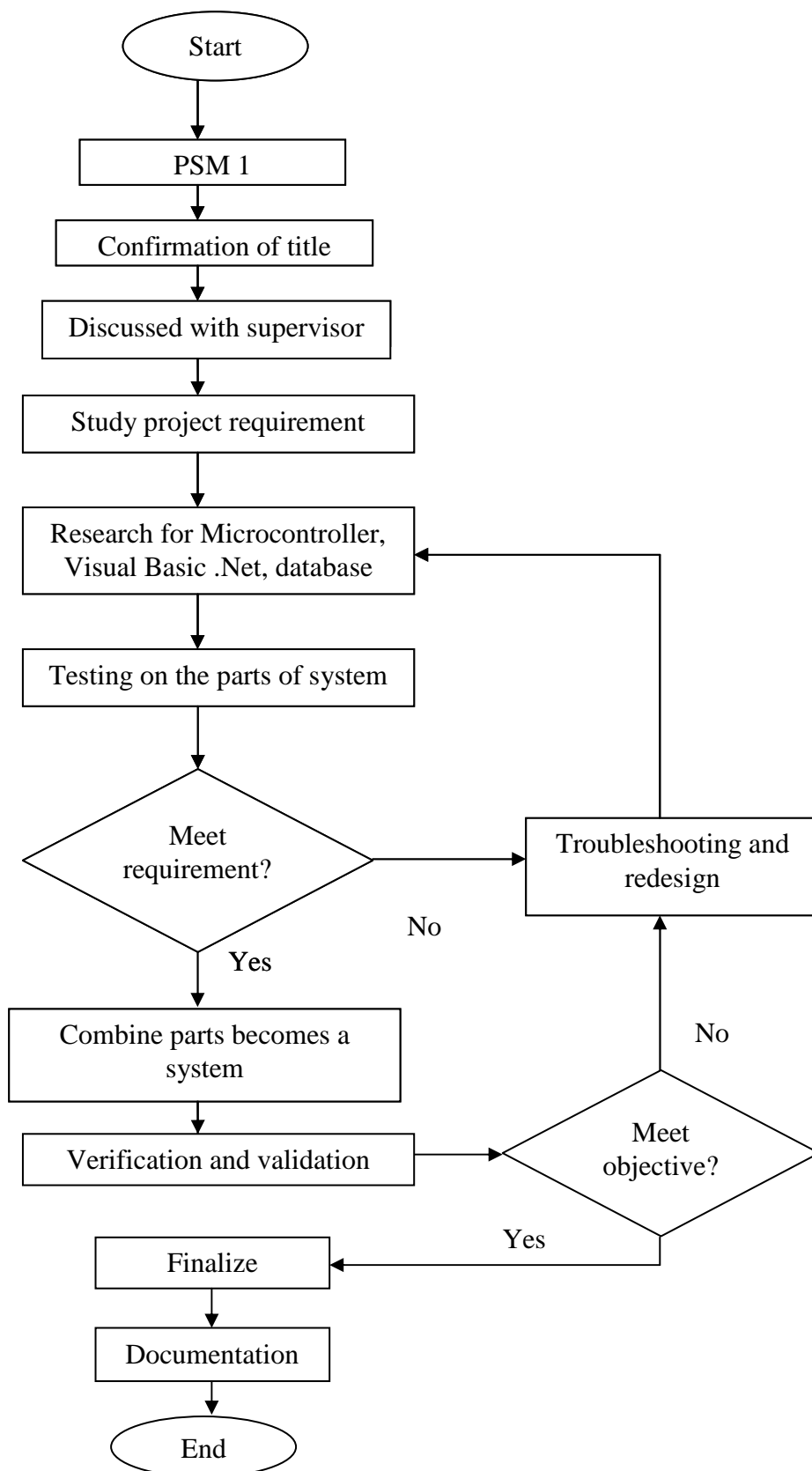


Figure 1.4: General methodology of the project

1.6 Existing Production Monitoring System

Monitoring system is a necessary tool to the industry. It is being used to improve the industries daily production output and monitor the production outcome.

The following are the existing methods used in industries to provide information on the status of each work station, machineries or production line.

1.6.1 White Board

The image shows a whiteboard divided into several functional sections:

- DEFECTIVE PARETO**: A large blank area for Pareto analysis.
- DAILY TAKT/ CYCLE TIME HOURLY CHART**: A grid for tracking production metrics over time.
- 5-S AUDIT**: A section for auditing 5S (Sort, Set in order, Shine, Standardize, Sustain) compliance.
- PRODUCTION BOARD**: A central table for production tracking.

TAKT-	SHIFT						
SHIFT	MON	TUE	WED	THU	FRI	SAT	SUN
3							
2							
1							
TOTAL							
- 5-S HOUSEKEEPING**: A section with colored bars (green, blue, red, yellow) and a small grid for tracking housekeeping activities.
- COMMENTS**: A section with horizontal lines for recording notes or observations.

Figure 1.5: Production status indicator board

Figure 1.5 shows a typically production line white board or tracking sheet. It requires operator, line leaders or supervisor to mark down how many parts were made and other production information from time to time. This system wastes valuable time because it requires operators who are responsible to do the counting and writing on the tracking sheet at all time. Human made error easily occur through the process transfer the data from counting devices to the white board.

1.6.2 Machine Controllers and Programmable Logic Controller (PLC)

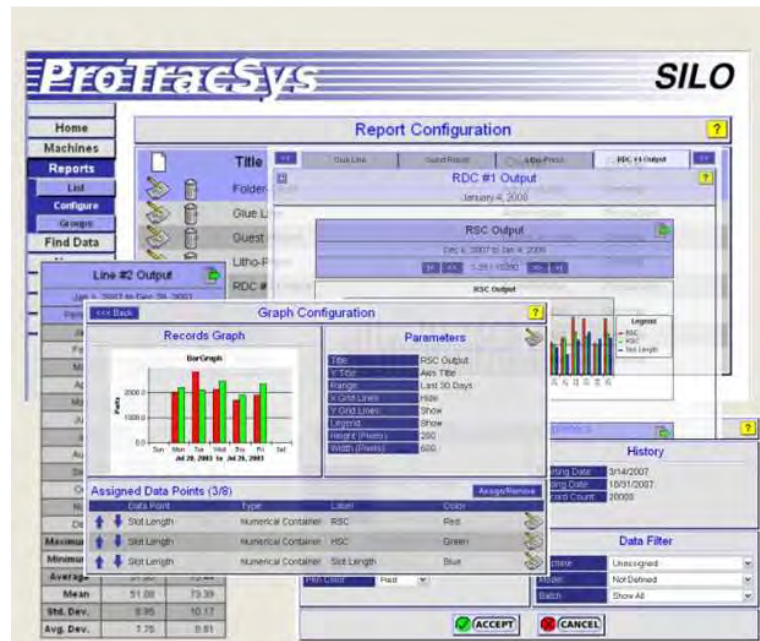


Figure 1.6: Tracking software

For automated machineries, they often have a real time tracking system as shown in Figure 1.6. This tracking software is customized made for each machine. This software can provide accurate production information but it comes at very high cost. Generally, the production output tracking system which uses a PLC or a computer based controlled machinery can only track a limited number of parameters on a fixed schedule.

1.7 Introduction to Manufacturing Data Management System (MDaS)

Manufacturing data management system (MDaS) that being developed in this project will encounter all the problems existing in manual data collection method. MDaS is an automatic data collection system placed in production line for collecting real time information. The data will be collected through the programmable logic controller and send to computer. The production information which is needed to be collected for MDaS is based on the industries standard for analyzing data. From the