



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**IMPLEMENTATION OF PRODUCTION SCHEDULE BOARD
TO DECIDE STANDARD PRODUCTION TIME IN
MANUFACTURING INDUSTRY
(CASE STUDY: ASIA ROOFING INDUSTRIES Sdn. Bhd)**

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

By

TAN KUI SIONG

FACULTY OF MANUFACTURING ENGINEERING

2010



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Implementation of Production Scheduling Board to Analyze Production Rate in Manufacturing Industries (Case Study: Asia Roofing Industries Sdn.Bhd)

SESI PENGAJIAN: 2009/10 Semester 2

Saya **TAN KUI SIONG**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD

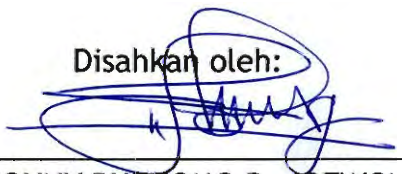
(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD



(TAN KUI SIONG)

Disahkan oleh:



(MR. JOHNY PURNOMO B. JOEWONO)

Alamat Tetap:

NO. 8 Jalan Perdana 9, Bukit Siput,
85020 Segamat, Johor

Cop Rasmi:

JOHNY PURNOMO
Pensyarah
Fakulti Kejuruteraan Pembuatan
Universiti Teknikal Malaysia Melaka

Tarikh: 25TH MAY 2010

Tarikh: 25/5/2010.

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I hereby, declared this report entitled **–Implementation of Production Schedule Board to Decide Standard Production Time in Manufacturing Industry (Case Study: Asia Roofing Industries Sdn. Bhd)**” is the results of my own research except as cited in references.

SIGNATURE :

AUTHOR’S NAME : TAN KUI SIONG

MATRIX NUMBER : B050610063

DATE : 25TH MAY 2010

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 (Manufacturing Process) with Honours. The member of the supervisory committee is as follow:

.....

(MAIN SUPERVISOR)

FULL NAME : MR. JOHNY PURNOMO B. JOEWONO
STAFF NUMBER : 01235
DATE : 25TH MAY 2010

ABSTRACT

Manufacturing industry is always a challenging area because of the unpredictable uncertainties and obstacles that might occur anytime throughout the operation. For a company to maintain a profitable growth from time-to-time, different approaches in reducing its operation cost while improving the product quality, operation efficiency, and overall control must be taken to avoid its market share being dominated by the competitors. Those approaches raised the demand of new and evolved management systems and production scheduling system is one of the management tool that been widely used in manufacturing industries and has been proven its capabilities and effectiveness through many success histories. The approach of this project is to implement a production scheduling board on a roof manufacturing company that start seeing the advantages of implementing a production scheduling system on their production floor. The implementation process is comprised of few stages, where each of the stage will be carried out according to the right sequence. The company current production flow was analyzed in order to find out the optimum production time that plays a critical role in deciding the functional ability and reliability of the proposed scheduling board. Throughout the analysis process, modifications on implemented scheduling board were identified so that the system is improved and adopted according to the circumstances. The final output of this project is that the implementation of production scheduling system shows positive and encouraged improvement based on the data collected and compared with data before the implementation where significant time were saved by using the scheduling method in managing flow of processes and orders. At the end of this project, an electronic version of scheduling board is constructed based on Microsoft Excel due the problem raised and suggestions given and finally recommendations were suggested to further improve the system and the overall process of this project.

ABSTRAK

Industri pembuatan merupakan satu bidang yang mencabar disebabkan oleh ketidakpastian dan halangan yang tidak dapat diduga dan boleh berlaku pada bila-bila masa sepanjang operasi. Untuk sebuah syarikat mengekalkan perkembangan yang mendatangkan keuntungan dari semasa ke semasa, pendekatan-pendekatan lain dalam mengurangkan kos operasinya sementara meningkatkan kualiti produk, kecekapan operasi, dan penguatsan yang menyeluruh mesti dirancang dan tindakan yang sepatut mestilah diambil supaya pasaran pelanggannya tidak dikuasai oleh pesaing-pesaing lain. Pendekatan-pendekatan tersebut mendatangkan permintaan baru dalam mengubahsuaikan dan mengembangkan sistem-sistem pengurusan yang wujud ada. Penjadualan pengeluaran ialah satu daripada alat pengurusan yang digunakan dengan meluas dalam industri-industri pembuatan dan telah terbukti keupayaan dan keberkesanan-nya melalui banyak kejayaan. Pendekatan projek ini ialah untuk melaksanakan sistem penjadualan pengeluaran pada syarikat perkilangan bumbung yang mula melihat kelebihan dalam melaksanakan sistem penjadualan pengeluaran dalam syarikat mereka. Proses pelaksanaan meliputi beberapa peringkat, di mana setiap peringkat akan dilaksanakan menurut urutan betul. Pengeluaran semasa bagi syarikat tersebut akan dianalisis dengan cara teratur untuk mendapatkan masa pengeluaran optimum yang memainkan peranan kritikal dalam menentukan kebolehpercayaan dan ketepatan bagi penjadualan system yang akan dilaksanakan. Keputusan yang diperoleh dari projek ini adalah pelaksanaan bagi sistem tersebut telah menunjukkan kesan yang positif berdasarkan data yang dikumpul dan dibandingkan dengan data sebelum pelaksanaan. Dimana masa operasi telah diijimat dengan menggunakan system tersebut. Pada akhir projek ini, system penjadualan elektronik dibina berdasarkan Microsoft Excel dengan mengadakan cadangan yang dibagi bersama dengan cadangan untuk memajukan sistem tersebut dan keseluruhan proses bagi project ini.

DEDICATION

To My Beloved Family Members

ACKNOWLEDGEMENT

This thesis arose in part out of months of research that has been done since year 2009. By that time, I have worked with a great number of people whose contribution in assorted ways to the research and the making of the thesis. It is a pleasure to convey my gratitude to them all in my humble acknowledgement.

In the first place I would like to record my gratitude to my supervisor, Mr. Johny Purnomo, for his supervision, advice, and guidance from the very early stage of this research as well as giving me extraordinary experiences throughout the work. Above all and the most needed, he provided me unflinching encouragement and support in various ways. His truly profession intuition has made him as a constant oasis of ideas and passions in study, which exceptionally inspire and enrich my growth as a student.

I gratefully acknowledge Professor Madya Chong Kuan Eng for his advice, supervision, and crucial contribution, which made him a backbone of this research and so to this thesis. His involvement has triggered and nourished my intellectual maturity that I will benefit from, for a long time to come. I am much indebted to his willingness in using his precious time to read this thesis and gave his critical comments about it.

Words fail me to express my appreciation to my family, as their inseparable support, dedication, and persistent confidence in me, has taken the load off my shoulder and inspired me through the hardship.

Finally, I would like to thank everybody who was important to the successful realization of this project, as well as expressing my apology that I could not mention personally one by one.

TABLE OF CONTENT

Abstract	i
Abstrak	ii
Dedication	iii
Acknowledgement	iv
Table of Content	v
List of Tables	viii
List of Figures	ix
List of Abbreviations	x

1.0 CHAPTER ONE: INTRODUCTION

1.1	Project Background	1
1.2	Company Background	2
1.2.1	Management Philosophy And Style	4
1.2.2	Corporate Structure	5
1.3	Problem Statement	6
1.4	Objectives	6
1.5	Project Scope	7

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1	Introduction	9
2.2	Production Scheduling	10
2.3	Issues in Schedule Quality Assessment	11
2.3.1	Measuring Individual Schedules vs. Groups of Schedules	12
2.3.2	Absolute Measurement vs. Relative Comparison	12
2.3.3	Tradeoffs between Multiple Metrics	13
2.3.4	Static Measurement vs. Dynamic Measurement	14
2.3.5	Schedule Measurements vs. State Measurements	15
2.4	Purpose of Scheduling	15
2.4.1	As a Capacity Check	17
2.4.2	To Provide Visibility of Future Plans	17

2.4.3	To Provide Degrees of Freedom for Reactive Scheduling	18
2.4.4	To Evaluate Performance	19
2.4.5	To Avoid Further Problems	19
2.5	Implications for Design and Implementation of Scheduling System	20
3.0	CHAPTER THREE: METHODOLOGY	
3.1	Introduction	28
3.2	Flow Chart	28
3.3	Detail Descriptions of Flow Chart	30
3.3.1	Identify Company and Understand The Manufacturing Process	30
3.3.2	Define the Problem, Objective, and Scope of Research	30
3.3.3	Selection of an Appropriate System	31
3.3.4	Literature Review	31
3.3.5	Understand and Perform Observation in Production Process	32
3.3.6	Select Process and Type of Product to Be Studied	32
3.3.7	Determine the Range of Data to Be Collected	33
3.3.8	Analysis of Data Collected	33
3.3.9	Implementation on ARI	33
3.3.10	Discussion of Results Obtained	34
3.3.11	Conclusion and Recommendation	34
4.0	RESULT AND DISCUSSION	
4.1	Implementation of Scheduling Board	35
4.2	Process Analysis	38
4.3	Data Allocated	46
4.3.1	Operation Description and Time Recorded	46
4.3.2	Summary of Processing Time	64
4.3.3	Calculation for Square Feet (SF)	65
4.3.4	Calculation for Average Time	65
4.3.5	Calculation for Machining Time	67
4.3.6	Standardized Total Production Time	69
4.3.7	Comparison between Calculated and Allocated Total Production Time	71
4.4	Usages of Process Breakdown Concept	72
4.5	Further Development for Production Scheduling Board	73

4.5.1	Excel Based Electronic Scheduling Board	74
-------	---	----

5.0 CONCLUSION AND RECOMMENDATION

5.1	Conclusion	82
-----	------------	----

5.2	Recommendations	83
-----	-----------------	----

REFERENCES	85
-------------------	-----------

APPENDICES

A Gantt Chart for PSM I

B Gantt Chart for PSM II

C Machining Time

LIST OF TABLES

- 4.1 Operation description and time allocated (Set 1)
- 4.2 Summary of time consumed (Set 1)
- 4.3 Operation description and time allocated (Set 2)
- 4.4 Summary of time consumed (Set 2)
- 4.5 Operation description and time allocated (Set 3)
- 4.6 Summary of time consumed (Set 3)
- 4.7 Operation description and time allocated (Set 4)
- 4.8 Summary of time consumed (Set 4)
- 4.9 Operation description and time allocated (Set 5)
- 4.10 Summary of time consumed (Set 5)
- 4.11 Operation description and time allocated (Set 6)
- 4.12 Summary of time consumed (Set 6)
- 4.13 Operation description and time allocated (Set 7)
- 4.14 Summary of time consumed (Set 7)
- 4.15 Operation description and time allocated (Set 8)
- 4.16 Summary of time consumed (Set 8)
- 4.17 Operation description and time allocated (Set 9)
- 4.18 Summary of time consumed (Set 9)
- 4.19 Operation description and time allocated (Set 10)
- 4.20 Summary of time consumed (Set 10)
- 4.21 Operation description and time allocated (Set 11)
- 4.22 Summary of time consumed (Set 11)
- 4.23 Operation description and time allocated (Set 12)
- 4.24 Summary of time consumed (Set 12)
- 4.25 Summary of processing time
- 4.26 Summary of calculated machining time
- 4.27 Comparison between calculated and allocated production time
- 4.28 Descriptions of electronic scheduling board features

LIST OF FIGURES

- 1.1 Main Building for Asia Roofing Industries Sdn. Bhd
- 1.2 Corporate Structure

- 3.1 Flow Chart

- 4.1 Newly built scheduling board
- 4.2 Layout of the scheduling board
- 4.3 Information filled at the scheduling board
- 4.4 Work procedures
- 4.5 Operator removing used coil from machine
- 4.6 Operator taking requested coil from inventory
- 4.7 Coil sheet is loaded into the machine roller
- 4.8 Coil sheet before entering roller section
- 4.9 Machine's screen panel
- 4.10 Roll forming the profile of the roofing
- 4.11 Finished roofing sheets are properly packed and arranged
- 4.12 Finished good area
- 4.13 White spots appear on roofing surface
- 4.14 Formula for calculating total production time
- 4.15 Electronic scheduling board
- 4.16 Archived scheduling board (Schedule Mode)
- 4.17 Archived scheduling board (Tasks Mode)
- 4.18 Archived KIVs

LIST OF ABBREVIATIONS

ARI	-	Asia Roofing Industries Sdn. Bhd
R&D	-	Research and Development
CAD	-	Computer Aided Design
CNC	-	Computerized Numerical Control
JIT	-	Just-In-Time

CHAPTER 1

INTRODUCTION

This chapter gives a description and overview of the project which including the background, company involved, problems given, objectives and scope.

1.1 Project Background

Manufacturing industry is a very challenging area because of the uncertainties and variations that will occur unpredictably throughout the manufacturing operation. Revenue and profit might be increased by attracting more customers to purchase the relevant products. However, without a good quality of product, a company will not be able to make those customers to become a loyal customer in future. Not only to maintain a quality of product, a company shall always find the way to become an innovative and creativity company in order to stand in the market with other competitor or to expand its current market.

Certain companies assuming that by pushing the marketing department to increase the sell volume, the company revenue will be increased and so do the profit earned. Certain company will concentrate in developing R&D department hoping that new product that invented will attract market attention and increase the company sell volume without paying much attention to overall process and quality control. However, solid data that obtained from latest researches after the current economy meltdown revealed that concentration management in specific department in a company will not help the company to withstand challenge like this because of destructible foundation formed based on that unhealthy management culture.

Asia Roofing Industries Sdn Bhd (ARI) is a leading company in manufacturing construction use products like roofing, truss, door and window frames, and etc. It is currently expanding its business into oversea markets and therefore the important of a solid company foundation is thoroughly understood by management team. By constantly review back its operation processes and customer up-to-date feedback, tools like 5S and ISO 9001 are used to solve the problems that occurred on the operation floor. However, number of customer complaints that regarding to ARI delivery issues never being successfully reduced due to its complexity of operation process and quite number of factors that always cause some operation and communication problems. All these constantly happening problems reminded management team of ARI that currently used management system is not good enough to solve and prevent the root causes of the problem from happening again. Based on this, ARI management is hoping that a suggested solution can be obtained after the completion of this project and that request inevitable becomes the outmost purpose for this study to be conducted in ARI.

1.2 Company Background

Asia Roofing Industries Sdn bhd was formed in 1990 as a manufacturer of top qualities long length tiles, industrial roofing and wall cladding under the brand name of —AJIYAL.



Figure 1.1: Main Building for Asia Roofing Industries Sdn. Bhd

ARI began its manufacturing operations modestly in a rented factory in Segamat and rapidly made in-roads into the building materials market with its innovative fabricated steel products. In 1993, ARI underwent major expansion by increasing its production lines and building its own modern factory to house its manufacturing operations and head office. In 2000, a third factory was built to cater to the increasing

demand for its products. The three factories have a combined build-up area of approximately 140,000 square feet. Due to increasing demand for their roofing materials, a few plants were set-up strategically located in Bukit Kemuning, Puchong (Central), Kota Bahru (East), Sungai Petani (North), and Senai (South) to better serve our customers throughout the country.

ARI expanded its mainstream activities with diversification into the manufacture of various steel products such as metal window and door frames, structural floor decking, hi-tensile galvanized purlins and architectural products which were developed by its Research and Development department. Aluminum and steel strip ceiling and metal sunshade were introduced during year 2000.

ARI continuously increase the value added content of its products through improvement in quality and R & D activities. ARI has the added advantage of a strong Engineering division where R & D are carried out. Research activities are enhanced by sophisticated and advanced facilities such as CAD system, a complex design software, CNC wire lathe and CNC wire cutting machine. The requirement for such sophisticated tools is a necessity in the current circumstances where the response time to the ever changing market requirement is becoming shorter.

The ready market acceptance of ARI range of products and the continuing strong support of our customers are testimony to the Company's commitment to strive for the utmost best and auger well for future growth of ARI. ARI today is one of the largest players in fabricated steel products. Its products now cater to a wide range of uses from industrial building to the common home.

ARI's most valuable assets are the people within the company. ARI has a total of 250 employees who are continuously trained to maintain high standard and quality of work. The company commitment towards quality is clearly reflected by its ISO 9001:2000 certification.

1.2.1 Management Philosophy And Style

ARI_s philosophy is to constantly strive for —Innovative and creation of quality products and services to meet the demands and needs of the market both present and future.

The ARI_s objectives, which are in line with the company_s philosophy, are met through:

1. Customer service via quick response to customer_s needs
2. Continuous research and development to generate products and services innovation in line with the latest technology.
3. Implementation of quality control, to provide quality products and services at a very competitive level to stay at the forefront of the market
4. Efficient production with flexibility in production process
5. Personnel development and training, to equip all employees with necessary skills and know-how for the development of a long term vision of the company_s future.

1.2.2 Corporate Structure

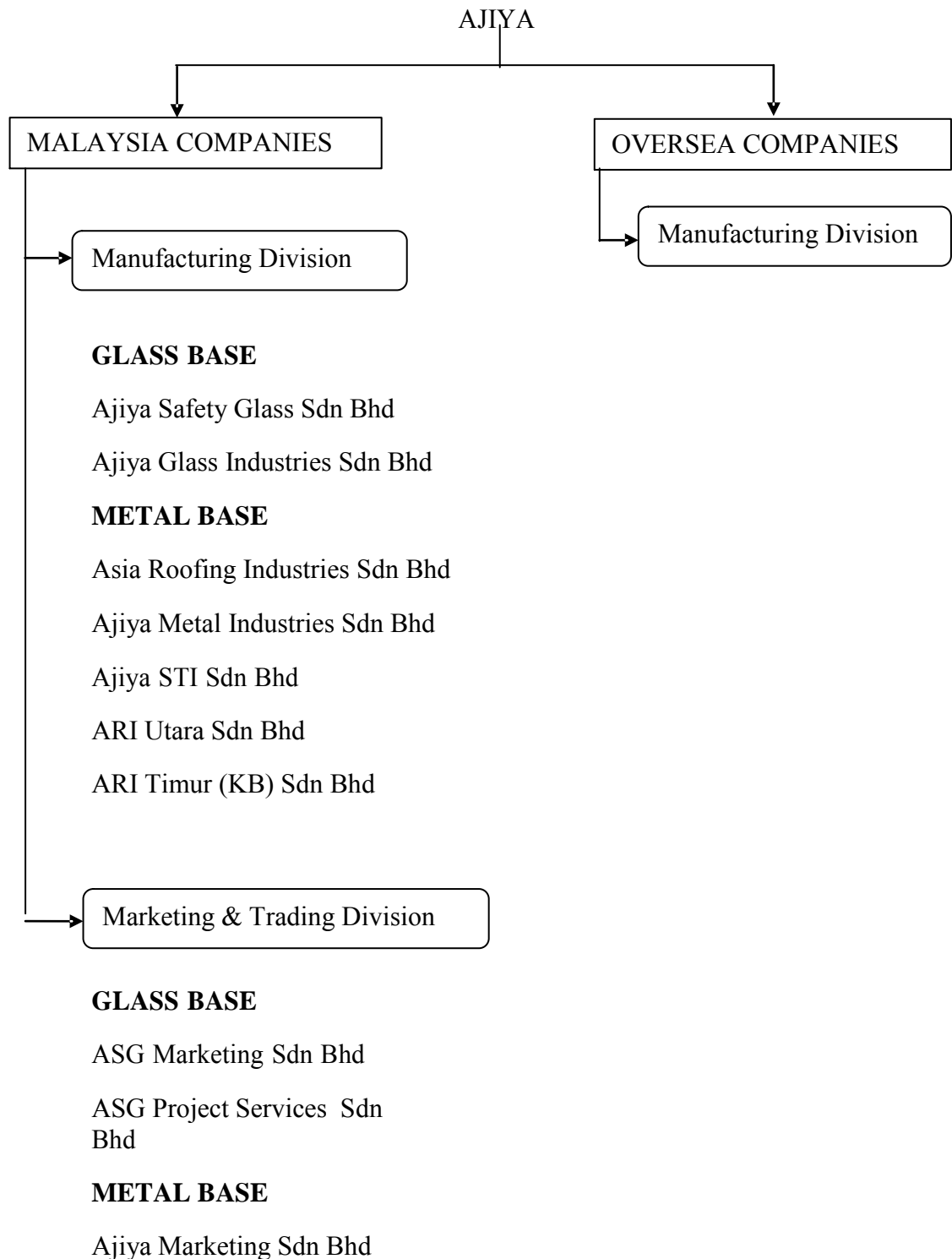


Figure 1.2: Corporate Structure

1.3 Problem Statement

ARI currently having the problem where the delivery date for the orders received are inconsistent. Depend on the amount of order received; the delivery day can be ranged from 3 working days until 7 working days, according to ARI policy. In real cases, the policy is sometime fail to be achieved under condition like high customer demands and high production volume. Normally under such condition, the delivery period should be prolonged according to the production floor capacity. The prolonged period that needed to achieve the delivery date usually determined by estimate the production current productivity and scheduled production activities. Due to the unclear feedback from the production floor about their planning and running activities, customer services mostly provided customer the incorrect delivery time and caused some unnecessary hassle to settle the additional problem raised. The mentioned unclear information is mostly contributed by the production floor unclear operation schedule where most of the time management and production officers don't know which order is being produced by production floor and how the orders received throughout a day are being arranged. Besides that, this incident also indirectly causing problem like whenever an order is received by production office, they fail to provide an achievable time frame that needed to complete the order immediately due to the lack in those required information. In conclusion, the ARI production operation is not well scheduled accordingly, operation activities did not transparent enough, and the information that related to orders that received are not displayed clearly.

1.4 Objectives

1. To understand the implementation of production scheduling in manufacturing industry.
2. To apply Production Planning Information System to obtain the standard production time in ARI.
3. To propose any possible improvements for currently used scheduling method.

1.5 Project Scope

This project will focus the study on ARI current operation system that related to the problems that stated in previous section. Although relevant studies will be conducted on ARI production floor, however, the operation parameters like machine setting, machining methods, process sequence, materials used, delivery arrangement, and etc are unchangeable to avoid any conflict on production floor that might cause severe break-of-chain on daily production operation. Besides that, a model of solution or research results would be suggested to ARI management level only, which mean the suggestion only will be bring into ARI management meeting to decide either the solution can and will be tested for long enough period to test the impact on their current operation system, so far no guarantee given by management that the suggested plan at the end of this project can be really implement in ARI to further analysis the real impact on their operation. Moreover, the results obtained throughout the researches are surely can be used to further analyze the current production rate and the impact on the production rate that might brings by the suggested solution, however, due to the scope and works covered in current research are too wide, the analysis on production rate will not be performed under current situation.

1.6 Organization of PSM Report

This project is divided into five chapters which are shown in below:

Chapter 1: Introduction

This chapter is gives an overview concept of the quality control and deals with fundamentals of quality, the use of quality control in industry. It involves the objective, problem statement and scope of study which pursued. The scope maps out the limitation and the set the boundaries to the areas of study.

Chapter 2: Literature review

This chapter discusses published information of production scheduling such as issue come from, concept of production scheduling and methods approach. The focus of this chapter is to summarize and synthesis arguments and ideas about production scheduling concept of others had approach within a certain time period.

Chapter 3: Methodology

This chapter describes the procedures step followed in order to pursue the study in the industry. It may include the step-by step account of the procedures carried out during do the research in the industry.

Chapter 4: Result and Discussion

This chapter will present the study finding in the form of figures and tables. It includes make some comment on the result to evaluate the results with regards to the hypothesis and available theories. In the discussion will explain whether the results obtained are expected or different from the result of the study. It also will discuss implications about the present and future consequences of the result.

Chapter 5: Conclusion and Recommendation

This chapter is important to evaluate this study work on the results obtained. It consists of justification of study objectives, review significant findings and recommendation for future studies. This chapter will suggest some ideas and methods to improve the current situation based on the research had done.

CHAPTER 2

LITERATURE REVIEW

This chapter provides the summaries for all the researches performed on available resources that related to the project like journals, reference books, and etc.

2.1 Introduction

Manufacturing firms are challenging by not only new market demand but also higher competition from competitors that continuously providing lower cost on same products with better service offered in order to gain bigger slice of current available market. Low cost manufacturing, faster delivery, wider variety of products, quicker and better product development, and steadily increasing quality standards are all become important facts to compete in such a manufacturing environment.

Volatility of demand, efficiency of production process, and appropriate production layout/management planning define the product volume and output. Firms are facing with the need to not only hold the line on cost while meet the demand for more frequent and smaller lot deliveries of an increasing variety of products, but also have ensure that their manufacturing process is flexible and adoptable to support the competitive priorities.

Shop floor planning plays an important role in affecting the production capacity and utilization of available resources (which will directly affects the manufacturing cost) since the planning made is mostly based on the available resources like machines, material and manpower. Below discuss all the information that related to production scheduling based on researches done and literatures gathered.

2.2 Production Scheduling

Kempf *et al* (2000) stated that schedule consists of a set of times and machine assignments for each operation of each job to be scheduled. In a manufacturing facility, the input to a scheduling system is generally derived from the current location of jobs in the system, the process plans describing the sequence of operations each job needs to undergo, due dates for the jobs and the state of the machine to process them, together with some estimates of uncertain events that may occur over the time period in the future covered by the scheduling system decisions to be made. The output from the system will be the set of job, machine, time, assignments for a given time horizon.

A schedule may be used on the shop floor in several different ways. Generally, a schedule is intended to produce certain patterns of behaviour in the manufacturing facility for which it was generated. That is, the schedule is designed to induce the occurrence of a planned set of events on the shop floor. This type of schedule shall be referred as a predictive schedule when it is released to the shop floor at a certain point in time with the intention of guiding system behaviour over a given time horizon. The period of time into the future covered by the decisions in the current predictive schedule will be referred to as the schedule horizon as mentioned by.

How strictly a predictive schedule is adhered to will vary from one manufacturing environment to another, based on factors such as manufacturing technology and organizational structure. In a strict hierarchical organization, management may insist on a predictive schedule being followed to the letter, whereas in a more distributed, team-based organization, a schedule can be viewed as advice to the personnel on the manufacturing floor, who are encouraged to take advantage of opportunities for improving it that may arise.

However, whatever the environment, there may be substantial deviations from the predictive schedule over the course of its execution due to unforeseen disruptions such as machine breakdowns or shop-floor personnel overriding the predictive schedule. The process of modifying the predictive schedule in the face of execution disruptions is generally referred to as reactive scheduling or rescheduling.