UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Development Of An Electronic Scheduling Template For Manufacturing Company

Report submitted in accordance with the requirements of the Universiti Teknikal Malaysia Melaka for the Bachelor Degree of Manufacturing Engineering in Manufacturing Process

By

Norhafiza Binti Mohamed

Faculty of Manufacturing Engineering
April 2008
DECLARATION

I hereby, declared this report entitled “Development Of An Electronic Scheduling Template For Manufacturing Company” is the results of my own research except as cited in references.

Signature : ............................
Author’s Name : Norhafiza Binti Mohamed
Date :
APPROVAL

This PSM submitted to the senate of UTeM and has been as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process). The member of the supervisory committee is as follow:

………………………………
Mr. Wan Hasruhnizzam Wan Mahmood
Project Supervisor
Faculty of Manufacturing Engineering
Universiti Teknikal Malaysia Melaka
ABSTRACT

This project is performed to develop an electronic scheduling template for a selected company. The company is a Manufacturing Company which is one of the supplies for Airbus in Aerospace Industry based on composite technology. For the application of template, a product was selected for validation. Moreover, data collections consist of primary and secondary data. Primary data includes focus group discussion, site visit and survey. In addition, secondary data are the information from books, Internet and journal. Furthermore, the data includes BOM, process flow and cycle time to develop a scheduling system template. The results positively show the improvement of time to predict the data and the accuracy of the data. In addition, it will provided graph for references.

Keywords: Scheduling, Electronic Template, Manufacturing Company.
ABSTRAK

DEDICATION

For my beloved parents:
Mohamed Bin Kassim
Khalshom Binti Hj Othman

And for my adored brother and sisters:
Hamaly Yady Bin Mohamed
Noraiza Yanty Binti Mohamed
Azura Binti Hashim
ACKNOWLEDGEMENTS

Praise to Allah for giving me a chance to complete my PSM. First at all, I would like to thank my beloved parents, En. Mohamed Bin Kassim and Pn. Khalshom Binti Hj Othman for their full support and always with me give ideas. I would also like to thank all Faculty Manufacturing Engineering, UTeM lecturers and staffs especially to my PSM Supervisor, En. Wan Hasrulnizzam Bin Wan Mahmood for his great supervision.

Besides, I wish to state the extremely significant contribution of all CTRM Aero Composites Sdn. Bhd. staffs, especially to Manufacturing Head of Department, En Ahmad Shibbli Bin Ahmad Kusasi, Material Support Head of Section, Pn Azura Binti Sahet, A320 Planner, En Rizan Hamsan, En Shamsul Amri and others who are involved. I would like to give a lot of thanks for their support, help, knowledge and information that I gain during my research in CTRM AC.

Last but not least, I also offer a few words of thanks to my beloved sister, Noraiza Yanty Binti Mohamed and to my friends those people who have been rather helpful during research. Without all of you, I can not achieve what I have today. Thank you again.

Wassalam…

Norhafiza Binti Mohamed
# TABLE OF CONTENTS

Declaration.................................................................................................................................. ii  
Approval................................................................................................................................... iii  
Abstract...................................................................................................................................... iv  
Abstrak......................................................................................................................................... v  
Dedication.................................................................................................................................. vi  
Acknowledgements................................................................................................................... vii  
Table Of Contents...................................................................................................................... viii  
List Of Figures............................................................................................................................. xiii  
List Of Tables.............................................................................................................................. xvii  
List Of Abbreviations, Symbols, Specialized Nomenclature....................................................... xviii

1. INTRODUCTION.................................................................................................................1
   1.1 Background....................................................................................................................... 1  
   1.2 Objective ....................................................................................................................... 2  
   1.3 Scope of Project.............................................................................................................. 2  
   1.4 Importance of Project..................................................................................................... 3  
   1.5 Report Outline............................................................................................................... 3

2. LITERATURE REVIEW...........................................................................................................4
   2.1 What Is Scheduling....................................................................................................... 4  
   2.2 Model of Scheduling................................................................................................. 6  
   2.3 Application of Scheduling Models............................................................................. 8  
   2.4 Report of Scheduling.................................................................................................. 11  
      2.4.1 A Paper Bag Factory............................................................................................ 11  
      2.4.2 Gate Assignments at an Airport........................................................................... 12  
      2.4.3 Scheduling Tasks in A Central Processing Unit (CPU)....................................... 13  
   2.5 Scheduling Techniques............................................................................................... 14  
      2.5.1 Backward Phase..................................................................................................... 15  
      2.5.2 Forward Phase....................................................................................................... 16
2.6 Scheduling Techniques Problem..........................................................17
2.7 Implementation of Scheduling............................................................18
  2.7.1 Scheduling in Manufacturing.........................................................19
  2.7.2 Scheduling in Service.................................................................20
2.8 Basic Requirements of Scheduling....................................................21
2.9 Technical Requirements of Scheduling.............................................23
2.10 The Proposed Framework of Scheduling Solution..............................24
  2.10.1 Effectiveness..............................................................................25
  2.10.2 Robustness................................................................................26
  2.10.3 Flexibility..................................................................................28
2.11 Benefits of Scheduling Technique....................................................29
  2.11.1 Scheduling Provide Significant Benefits to Management..............29
  2.11.2 Scheduling Confer Significant Benefits on Operation and Production..30
  2.11.3 Scheduling Benefits to Maintenance Supervisors.........................31
  2.11.4 Scheduling Benefits to Purchasing and Scheduling.......................32
2.12 Material Requirement Planning (MRP)..............................................32
  2.12.1 Master Production Schedule (MPS)..............................................34
  2.12.2 Bill of Material (BOM)...............................................................36
  2.12.3 Lead Time..................................................................................37
  2.12.4 Inventory Data...........................................................................37
  2.12.5 Purchasing Data.........................................................................38
  2.12.6 Benefits of MRP........................................................................38
2.13 Cycle Time.......................................................................................39
2.14 Enterprise Resources Planning (ERP)..............................................39

3. CASE STUDY COMPANY..........................................................................40
  3.1 Profile of CTRM...............................................................................40
  3.2 Project and Customer.......................................................................42
  3.3 Description of Selected Project.......................................................43
  3.4 Process Flow of Spoiler A320..........................................................44
  3.5 Scheduling Process in CTRM..........................................................45
  3.6 Process Flow and Time Taken At Each Section................................47
3.6.1 Process Flow and Time Taken At Section Kitting by Panel.................47
3.6.2 Process Flow and Time Taken At Section Clean Room by Panel........48
  3.6.2.1 Lay Up Process.................................................................48
  3.6.2.2 Bonding Process............................................................50
3.6.3 Process Flow and Time Taken At Auto Clave by Set.......................51
3.6.4 Process Flow and Time Taken At Section Demould By Panel........51
3.6.5 Process Flow and Time Taken At Section Trimming By Panel.........52
3.6.6 Leading Edge Surface Preparation Process................................53
3.6.7 Leading Edge Glass Wrap Process........................................53
3.6.8 Process Flow and Time Taken At Oven Glass Wrap by Panel..........55
3.6.9 Process Flow and Time Taken At De Bag Process By Panel...........56
3.6.10 Process Flow and Time Taken Of NDT By Panel.........................56
3.6.11 Process Flow and Time Taken Of Paint Shop By Panel...............56

4. METHODOLOGY...................................................................................58
  4.1 Planning of Project........................................................................58
  4.2 Gantt Chart...................................................................................60
  4.3 Data Collection.............................................................................60
    4.3.1 Primary Data...........................................................................62
      4.3.1.1 Focus Group Discussion..................................................62
      4.3.1.2 Site Visit.........................................................................62
    4.3.2 Secondary Data.................................................................62
  4.4 Analysis Data................................................................................63
  4.5 Development of Scheduling System Template.................................64
  4.6 Software.......................................................................................65
    4.6.1 Microsoft Office Excel 2003..................................................65
    4.6.2 Selection of Software..........................................................65
  4.7 Formula..........................................................................................66
  4.8 Elements.......................................................................................67
5. DEVELOPMENT OF SCHEDULING SYSTEM TEMPLATE..........................68

5.1 Basic Excel Screen.........................................................................................68
5.2 Preparation of Worksheet................................................................................69
  5.2.1 Preparation of Data Entry Worksheet.......................................................71
  5.2.2 Preparation of Cycle Time Data Worksheet.............................................71
  5.2.3 Preparation of BOM Data Worksheet.......................................................73
  5.2.4 Preparation of Data Page Worksheet........................................................74
  5.2.5 Preparation of Material Worksheet...........................................................74
  5.2.6 Preparation of Monitoring Chemical Worksheet......................................77
5.3 Development of Cycle Time System..............................................................82
5.4 Development of Material Usage System.......................................................84
5.5 Development of Guidance Chemical Usage System.................................87
  5.5.1 Development of Summary Guidance Chemical Usage System..............90

6. SCHEDULING SYSTEM TEMPLATE.............................................................97

6.1 Electronic Scheduling System Template.......................................................97
6.2 Estimate Cycle Time.......................................................................................99
  6.2.1 Tools for Cycle Time System .................................................................100
  6.2.2 How to Utilize the Cycle Time System..................................................100
6.3 Estimate the Usage of Material.....................................................................103
  6.3.1 Tools for Material Usage System...........................................................103
  6.3.2 How to Utilize the Material Usage System..............................................106
6.4 Generate the Chemical and Ancillary Material Usage...............................109
  6.4.1 The Tools for Material Usage Guidance System.................................110
  6.4.2 How to Utilize Material Usage Guidance System.................................115
6.5 Maintenance the System................................................................................118
  6.5.1 The Tools for Data Page..........................................................................118
  6.5.2 How to Maintenance the Data Page.......................................................122

7. DISCUSSIONS.................................................................................................124

7.1 Validation.....................................................................................................124
7.2 SWOT Analysis.............................................................................................128
7.3 Assumption..................................................................................................................131

8. CONCLUSION AND RECOMMENDATIONS.................................................................132
8.1 Conclusion..................................................................................................................132
8.2 Recommendations....................................................................................................133
  8.2.1 To CTRM AC.....................................................................................................134
  8.2.2 To Academic......................................................................................................134
  8.2.3 To Others..........................................................................................................135
REFERENCES..................................................................................................................136

APPENDICES

A Work Instruction Spoiler A 320
LIST OF FIGURES

2.1 Information Flow Diagram in Manufacturing System  19
2.2 Information Flow Diagram in a Service System  20
2.3 Structure of the MRP System  33
2.4 The Planning Process  35

3.1 Group Structure of CTRM Sdn. Bhd.  41
3.2 Products and Customer of CTRM AC Sdn. Bhd.  42
3.3 Spoiler A 320  43
3.4 Process Flow of Spoiler A 320  44
3.5 Process Flow of Scheduling for Spoiler A 320  46
3.6 Process Flow at Section Kitting  47
3.7 Process Flow at Lay Up  49
3.8 Process Flow at Bonding Process  50
3.9 Process Flow at Auto Clave Section  51
3.10 Process Flow at Demould Section  51
3.11 Process Flow at Trimming Section  52
3.12 Process Flow at Leading Edge Process  53
3.13 Process Flow at Leading Edge Glass Wrap Process  54
3.14 Process Flow at Oven Glass Wrap Process  55
3.15 Process Flow at De Bag Process  55
3.16 Process Flow at NDT Section  56
3.17 Process Flow at Paint Shop Section  57

4.1 Flow Chart for Planning of Study  59
4.2 The Generic “Vee” Development Model  65

5.1 The Elements of Basic Screen Excel  68
5.2 Step to Insert Worksheet  70
5.3 The Complete Worksheet  70
5.4 The Data Entry Worksheet
5.5 The Cycle Time Data Worksheet
5.6 The Total of Cycle Time
5.7 The BOM Data Worksheet
5.8 The Data page Worksheet
5.9 The Material Worksheet
5.10 The Linkage with Data Page Worksheet
5.11 The Linkage with Material Worksheet
5.12 The Linkage with Data Entry Worksheet
5.13 The Linkage with Material Worksheet
5.14 The Chemical Monitoring Worksheet
5.15 The Summary for Chemical Material Worksheet
5.16 The % Difference Summary Graph Calculation
5.17 The Three Part of Monitoring Chemical Worksheet
5.18 The Step to Linkage the Unit of Material
5.19 The Linkage with Unit of Monitoring Chemical
5.20 After the Linkage Between Data Page and Chemical
5.21 The Complete of Linkage the Unit
5.22 The data Entry Worksheet
5.23 The Equation to Produce Cycle Time in Hours
5.24 The Linkage of Welcome Worksheet to Produce Cycle Time
5.25 The Equation to Produce Cycle Time in Days
5.26 The Linkage between Data Entry Worksheet
5.27 The Linkage between Data Entry Worksheet and BOM Data
5.28 The Equation to Convert the Usage with another Unit
5.29 The Data Page Worksheet Involve to Convert the Unit
5.30 The 1st Step to Linking with Material Worksheet
5.31 The Linkage with Material Worksheet
5.32 The Equation of Total Actual Usage
5.33 The Equation of % Difference of Material usage
5.34 The Complete Linkage of Chemical Monitoring Usage
5.35 The Linkage Between Summary Chemical Usage and Chemical
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.36</td>
<td>The Linkage of MPS Dimension and MPS Usage</td>
<td>91</td>
</tr>
<tr>
<td>5.37</td>
<td>The Equation of Miss Material Category</td>
<td>91</td>
</tr>
<tr>
<td>5.38</td>
<td>The Equation of Hit Material Category</td>
<td>92</td>
</tr>
<tr>
<td>5.39</td>
<td>The Equation of Above Material Usage</td>
<td>92</td>
</tr>
<tr>
<td>5.40</td>
<td>The 1st Step to Produce a Chart</td>
<td>93</td>
</tr>
<tr>
<td>5.41</td>
<td>The 2nd Step to Produce a Chart</td>
<td>93</td>
</tr>
<tr>
<td>5.42</td>
<td>The 3rd Step to Produce a Chart</td>
<td>94</td>
</tr>
<tr>
<td>5.43</td>
<td>The 4th Step to Produce a Chart</td>
<td>94</td>
</tr>
<tr>
<td>5.44</td>
<td>The Chart of Planned Usage versus Total Actual Usage</td>
<td>95</td>
</tr>
<tr>
<td>5.45</td>
<td>The 1st Step to Produce a Pie Chart</td>
<td>95</td>
</tr>
<tr>
<td>5.46</td>
<td>The 2nd Step to Produce a Pie Chart</td>
<td>96</td>
</tr>
<tr>
<td>5.47</td>
<td>The Pie Chart of % Difference Summary Chart</td>
<td>96</td>
</tr>
<tr>
<td>6.1</td>
<td>The Data Entry Sheet of the System</td>
<td>99</td>
</tr>
<tr>
<td>6.2</td>
<td>The Cycle Time system</td>
<td>100</td>
</tr>
<tr>
<td>6.3</td>
<td>The Cycle Time system</td>
<td>101</td>
</tr>
<tr>
<td>6.4</td>
<td>The Cycle Time system</td>
<td>102</td>
</tr>
<tr>
<td>6.5</td>
<td>The Data Entry Sheet System</td>
<td>104</td>
</tr>
<tr>
<td>6.6</td>
<td>The Material Usage System</td>
<td>104</td>
</tr>
<tr>
<td>6.7</td>
<td>The Data Entry Sheet System</td>
<td>106</td>
</tr>
<tr>
<td>6.8</td>
<td>The Material Usage System</td>
<td>107</td>
</tr>
<tr>
<td>6.9</td>
<td>The Material Usage System</td>
<td>107</td>
</tr>
<tr>
<td>6.10</td>
<td>The Material Usage System</td>
<td>108</td>
</tr>
<tr>
<td>6.11</td>
<td>The Material Usage System</td>
<td>109</td>
</tr>
<tr>
<td>6.12</td>
<td>The Material Usage Guidance System</td>
<td>110</td>
</tr>
<tr>
<td>6.13</td>
<td>The Material Usage Guidance System</td>
<td>111</td>
</tr>
<tr>
<td>6.14</td>
<td>The Material Usage Guidance System</td>
<td>111</td>
</tr>
<tr>
<td>6.15</td>
<td>The Material Usage Guidance System</td>
<td>112</td>
</tr>
<tr>
<td>6.16</td>
<td>The Material Usage Guidance System</td>
<td>112</td>
</tr>
<tr>
<td>6.17</td>
<td>The Material Usage Guidance System</td>
<td>113</td>
</tr>
<tr>
<td>6.18</td>
<td>The 1st Step of Material Usage Guidance System</td>
<td>115</td>
</tr>
</tbody>
</table>
6.19 The 2nd Step of Material Usage Guidance System 116
6.20 The Material Usage Guidance System 117
6.21 The Material Usage Guidance System 117
6.22 The Time Data Sheet 119
6.23 The BOM Data Sheet 120
6.24 The Data Page Sheet 121
6.25 The Time Data Sheet 122
6.26 The Time Data Sheet 123
6.27 The Time Data Sheet 123

7.1 Graph of Planned Vs. Actual Usage 126
7.2 Category of Usage Material 126
7.3 Pie Chart for Category of Material Usage 127
7.4 SWOT Analysis Framework 128
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Example of BOM</td>
<td>36</td>
</tr>
<tr>
<td>4.1</td>
<td>Gantt Chart for the Study</td>
<td>61</td>
</tr>
<tr>
<td>5.1</td>
<td>The Functional of Elements in Basic Excel Screen</td>
<td>69</td>
</tr>
<tr>
<td>6.1</td>
<td>The Name, Usage and Purposes of Sheet</td>
<td>98</td>
</tr>
<tr>
<td>6.2</td>
<td>The Description of the Time System</td>
<td>100</td>
</tr>
<tr>
<td>6.3</td>
<td>The Tool of Material Usage System</td>
<td>105</td>
</tr>
<tr>
<td>6.4</td>
<td>The Description of Material Usage Guidance System</td>
<td>113</td>
</tr>
<tr>
<td>6.5</td>
<td>The Description of Time Data Sheet</td>
<td>119</td>
</tr>
<tr>
<td>6.6</td>
<td>The Description of BOM Data Sheet</td>
<td>120</td>
</tr>
<tr>
<td>6.7</td>
<td>The Description of Data Page Sheet</td>
<td>121</td>
</tr>
<tr>
<td>7.1</td>
<td>System SWOT Analysis</td>
<td>129</td>
</tr>
<tr>
<td>7.2</td>
<td>The Improvement of Scheduling Template</td>
<td>131</td>
</tr>
</tbody>
</table>
### LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFT</td>
<td>Average Flow Time</td>
</tr>
<tr>
<td>AL</td>
<td>Average Lateness</td>
</tr>
<tr>
<td>ASUTj</td>
<td>Average Setup Time over jobs</td>
</tr>
<tr>
<td>ASUTm</td>
<td>Average Setup Time over machines</td>
</tr>
<tr>
<td>AT</td>
<td>Average Tardiness</td>
</tr>
<tr>
<td>BAL</td>
<td>Balance index</td>
</tr>
<tr>
<td>BOM</td>
<td>Bill of Material</td>
</tr>
<tr>
<td>BS</td>
<td>Benchmarking Service</td>
</tr>
<tr>
<td>CPU</td>
<td>Central Processing Unit</td>
</tr>
<tr>
<td>CTRM</td>
<td>Composite Technology Research Malaysia</td>
</tr>
<tr>
<td>CTRM AC</td>
<td>Composite Technology Research Malaysia Aero Composite</td>
</tr>
<tr>
<td>D</td>
<td>Due date</td>
</tr>
<tr>
<td>DSAR</td>
<td>Daily Schedule Review</td>
</tr>
<tr>
<td>EDD</td>
<td>Earliest Due Date</td>
</tr>
<tr>
<td>EOP</td>
<td>End of Part</td>
</tr>
<tr>
<td>ERP</td>
<td>Enterprise Resource Planning</td>
</tr>
<tr>
<td>ESS</td>
<td>Evaluation of Scheduling Solutions</td>
</tr>
<tr>
<td>ETPI</td>
<td>Effectiveness TOPSIS Performance Indexes</td>
</tr>
<tr>
<td>FCFS</td>
<td>First Come First Serve</td>
</tr>
<tr>
<td>FIFO</td>
<td>First In First Out</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>I</td>
<td>Penalty</td>
</tr>
<tr>
<td>j</td>
<td>Position</td>
</tr>
<tr>
<td>k</td>
<td>Lag between Two Jobs</td>
</tr>
<tr>
<td>LOB</td>
<td>Line of Balancing</td>
</tr>
<tr>
<td>LPT</td>
<td>Longest Processing Time</td>
</tr>
<tr>
<td>M</td>
<td>Generic Measure</td>
</tr>
<tr>
<td>m</td>
<td>Machine</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>MAK</td>
<td>Makespan</td>
</tr>
<tr>
<td>maxL</td>
<td>Maximum Lateness</td>
</tr>
<tr>
<td>maxT</td>
<td>Maximum Tardiness</td>
</tr>
<tr>
<td>MDOs</td>
<td>Multimedia Data Objects</td>
</tr>
<tr>
<td>MPS</td>
<td>Master Production Schedule</td>
</tr>
<tr>
<td>MRP</td>
<td>Material Requirements Planning</td>
</tr>
<tr>
<td>N</td>
<td>Number of Jobs</td>
</tr>
<tr>
<td>NDT</td>
<td>Non Destructive Test</td>
</tr>
<tr>
<td>PMS</td>
<td>Performance Measurement System</td>
</tr>
<tr>
<td>PO</td>
<td>Purchase Order</td>
</tr>
<tr>
<td>QC</td>
<td>Quality Control</td>
</tr>
<tr>
<td>RHD</td>
<td>Relative Hamming Distance</td>
</tr>
<tr>
<td>RTPI</td>
<td>Robustness TOPSIS Performance Indexes</td>
</tr>
<tr>
<td>SCOR</td>
<td>Supply Chain Organization Reference</td>
</tr>
<tr>
<td>SO</td>
<td>Schedule Overlap</td>
</tr>
<tr>
<td>SPT</td>
<td>Shortest Processing Time</td>
</tr>
<tr>
<td>SSS</td>
<td>Steady-State Stability has</td>
</tr>
<tr>
<td>STD</td>
<td>Starting Time Difference</td>
</tr>
<tr>
<td>T</td>
<td>Sum of Processing Time</td>
</tr>
<tr>
<td>TC</td>
<td>Total Cost</td>
</tr>
<tr>
<td>TFT</td>
<td>Total Flow Time</td>
</tr>
<tr>
<td>TOPSIS</td>
<td>Technique for Order Preference by Similarity to Ideal Solution</td>
</tr>
<tr>
<td>TQT</td>
<td>Total Queue Time</td>
</tr>
<tr>
<td>TST</td>
<td>Total Setup Time</td>
</tr>
<tr>
<td>UR</td>
<td>Utilization Rate</td>
</tr>
<tr>
<td>UTeM</td>
<td>Universiti Teknikal Malaysia Melaka</td>
</tr>
<tr>
<td>VCO</td>
<td>Value of Cancelled Orders</td>
</tr>
<tr>
<td>WIP</td>
<td>Work-In-Process</td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION

This chapter provides the background of the project that includes problem statement, objective, scope of the study, importance of projects, and report outline.

1.1 Background

CTRM AC produces the product by using backward scheduling technique which provided by Manufacturing Planner. However, the actual process flow cannot meet the lead time target in producing the product. As a result, productions always fail to deliver on time to customer. In addition, it also affected the over time of the workers for the whole week to fulfil the shipment. It was reduced the productivity and flexibility of the system. The current problem is due to none specific scheduling system in order to calculate or predict the process flow and the usage of material. CTRM AC is always searching for the best approach to reduce the problem above in order to have a systematic scheduling system. This project is to introduce an electronic scheduling system to support the manufacturing schedule. By having an electronic scheduling system, manufacturing planner is believed to plan the shipment date and material in production more easily.
1.2 Objective

Specific objectives of this project are:

1) To study the scheduling technique and the monitoring system used at CTRM AC.
2) To develop an electronic scheduling template through software (Microsoft Office Excel).
3) To analyse the effectiveness of the scheduling template in CTRM AC.

1.3 Scope of Project

This project is performed to develop an electronic system for manufacturing scheduling. This project is conducted at CTRM AC and A 320 spoiler product is used for the case study. This system includes BOM, cycle time and process flow; it have been developed by using Microsoft Excel 2003 to schedule the product. This data is taken stated on 4 May 2007 until 3 August 2007 that is includes the operation of producing Spoiler A 320. By implement the system, users can calculate the processing time and the materials to be used. The results may not be applicable for different product at CTRM AC.
1.4 Importance of Project

The importances of the project are:

1) To promote a user friendly system in production schedule especially for CTRM AC.
2) To reduce mistakes/errors in forecasting product in CTRM AC.
3) Development of the electronics scheduling template to improve productivity and increase efficiency in production system.
4) As a reference for academic studies related to scheduling technique and monitoring system by using electronic approach.

1.5 Report Outline

This report will cover Chapter 1: Introduction, Chapter 2: Literature Reviews, Chapter 3: Case Study, Chapter 4: Methodologies, Chapter 5: Development of the System, Chapter 6: Manual Scheduling System Template, Chapter 7: Discussion and Chapter 8: Conclusion and Recommendation. Chapter 1 covers the background of the project, objective, importance of project and report outline. Chapter 2 discusses all the definition and meaning of scheduling. This chapter also define scheduling techniques, the problem occur, previous case study, implementation of scheduling and the tools involve in scheduling technique. Chapter 3 that is case study mentions about the company profile of project. This chapter also discusses the product of project; process flow and time taken to complete the process. Chapter 4 explains the planning of project, Gantt chart, the data collection for the project, analysis data and development of scheduling template system. Chapter 5 mentions about how to develop the system. In this chapter, it shows step by step how the system linkage with another. Chapter 6 discuss about the description of the system. This chapter also shows the guidance for the user. Chapter 7 mentioned about the validation have been compared between using the system and without using the system. Chapter 8 conclude the functional of system and the recommendation to the company, academic and others company.
CHAPTER 2
LITERATURE REVIEW

This chapter provides the definition, concept, techniques, toll and advantages of scheduling technique. Besides that, the previous case studies in the implementation of scheduling technique will also be discussed.

2.1 What Is Scheduling?

Many authors have given the definitions of what is scheduling. According to Sule (1996), scheduling is an act of defining or arranging activities to meet certain requirement, constraints, or objectives. While Pinedo (2002) explained that scheduling is a form of decision-making that plays a crucial role in manufacturing and service industries. Within an organization, scheduling pertains to establishing the timing of the use of specific resources of that organization, it related to the use of equipment, facilities, and human activities (Stevenson, 2007).

Scheduling is concerned in determining the quantity and timing of production for the intermediate future, often from 3 to 18 month above (Heizer and Render, 1999). Meanwhile, scheduling plays undoubtedly a critical role and it is the final temporal decision-making phase where industrial managers have to act for fixing any short noticed variations preserving at the same time expected medium-term efficiency performance (Cavalieri, et al., 2007).
Looking at the operational problems such as the lead time of operation and loading strategies, scheduling seems to be useful to address these issues. All the operation in manufacturing and service industries depends on scheduling to operate their production. The simple term that match with scheduling is the “brain and heart” of the manufacturing. The successful scheduling will produce a successfully operation. A schedule shows the planned time when processing of a specific job will start on each machine that the job requires (Sule, 1996).

Several scheduling approaches exist, from the traditional off-line scheduling systems, which elaborate a production plan (e.g. according to static rules and algorithms) for a specific plan period, to on-line production scheduling systems, which are intrinsically able to modify an existing schedule or regenerate a completely new one for managing upcoming events which could alter the original plan (Cavalieri, et al., 2007).

Meanwhile Ganesan and Sivakumar (2006) give explanation that large product varieties, awareness to improve product quality and need for shorter production times necessitate an integrated procuring, production and delivery system as a whole. In addition, to maintain and improve the market share, manufacturing/service systems must respond by delivering required products at right points and time. This demands efficient, effective and accurate scheduling which is a complex task even in the simplest of production environments. Hence, in many production systems, apart from the objectives of minimizing completion time and due-date related measures, scheduling jobs ensure closeness of their completions to each other which are important. In addition to achieve closeness of job completions, a schedule with minimum length is preferred for each job from the time of receipt of the orders, irrespective of the requirements of the individual jobs.