CHAPTER 1

INTRODUCTION

1.1. Background

In today's competitive business environment, manufacturing strategy is changing from mass to small batch production in order to incorporate rapid changes in customer's preferences and demand. High efficiency and capacity utilization will lead them to gain competitive advantages. Limitation on resources available and technological restriction will become the biggest constraint for company to develop their performance. Therefore, the fundamental research for finding the principles to improve the production system performance is also important as well as the improvement action in real system.

Scheduling is the allocation of resources to perform many varieties of tasks (Baker, 1974). Therefore, scheduling plays an important role in every business segment neither in manufacturing nor service industry. Scheduling operations need to be carefully planned and well-coordinated. There are several factors of scheduling should be considered, such as product structure complexity, number of operation, lot size, and process routing complexity. More complex they are, it is more difficult to schedule all parts become one single product in order to deliver it on time.

The Production System Laboratory of UAJY has a long-term research project about the effect of product structure complexity, process routing complexity, and

setup time-run time ratio on makespan minimization in multilevel product scheduling. Product structure complexity includes number of level and number of parts at one level. Process routing complexity includes number of machines and number of operations. Setup time-run time ratio is a ratio defined as a function of lot setup time divided by lot size times unit run time.

The variable evaluated in this thesis is lot size. Total number of product being processed is 32 while lot sizes examined are 4, 8, 16, and 32. This thesis is concern to evaluate the effect of lot size and product structure in minimizing the makespan as a part of the long-term research of The Production System Laboratory of UAJY.

1.2. Problem Statement

Based on the background, the problem is to evaluate the effect of lot size and product structure complexity on makespan minimization in multilevel product scheduling.

1.3. Research Objectives

1. To define the optimum lot size. Here, optimum lot size means a lot size giving minimum makespan.
2. To define the effect of product structure complexity due to optimum lot size.

1.4. Scope of Research

The research is conducted as evaluation of optimum lot size aimed to makespan minimization.

The limitation in this research:

1. Multilevel product used in this research is limited on 3 levels and maximum 3 parts in one level.
2. Routing file is limited by maximum 3 types of machine and maximum 5 operations each.
3. Total number of product being processed is 32.
4. There are 5 replications due to generation of routing file.
5. Setup time is varied from 5-10 min/lot.
6. Run time is varied from 1-5 min/unit.
7. Lot sizes examined are 4, 8, 16, and 32.
8. There is no variation on scheduling method.

1.5. Research Methodology

This research was conducted using several steps. The steps are:

1. Generating data

   Product structure was generated from possible combination. Product structure generated for 3 levels and maximum 3 parts in one level. There were 6 product structures had been made. There were 5 routing file replications had been generated, each routing file has the same operations and work centers. The difference is on the setup time and run time which is generated by random number. Setup time is twice as unit run time.

2. Data processing steps

   Gantt chart is processed manually. The Gantt chart is used to define makespan.

3. Analyzing steps

   Collecting the makespan data as a result given from Gantt chart, then analyze it using ANOVA Single Factor. After gaining the data analysis, the writer starts to make the report.

4. Making report

   Make final report of the research.

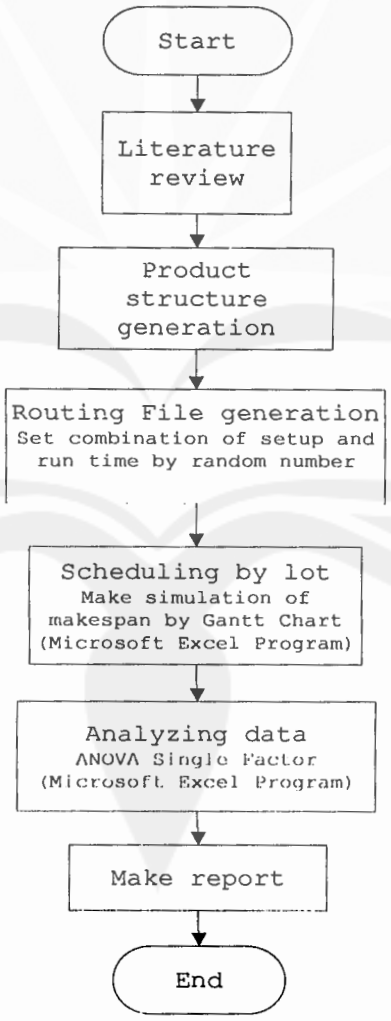

Figure 1.1. Research Steps Flowchart

1.6. Report Outline

The thesis is consisting of 6 chapters:

Chapter 1: INTRODUCTION

This chapter provides background, problem statement, research purpose, research methodology, and report outline.

Chapter 2: LITERATURE REVIEW

This chapter provides list of earlier researches and the differences between the earlier researches and the current research.

Chapter 3: BASIC THEORY

This chapter provides the theories from books and internet as the reference of the research.

Chapter 4: DATA GENERATION and SIMULATION

This chapter contains data generating. The data consists of product structure, routing file, simulation of Gantt chart and ANOVA test simulation.

Chapter 5: DATA ANALYSIS

This chapter discusses about the analysis of research result.

Chapter 6: CONCLUSION and SUGGESTION

This chapter provides conclusion from the research, and also the suggestion for further research.