CHAPTER 1

INTRODUCTION

1.1. Background

Today, industry in the world including in Indonesia is growing fast. Every company has to compete each other to survive. One of the ways to make the company survive is to reduce the expenses. Production department also has a contribution to the expenses. Then one of the ways to reduce it is to make a good scheduling which can minimize the expenses.

Scheduling, according to Burbidge (1971) is determining when and where each operation needed to make or assemble a product to be started. Production time is related with production cost, if production takes long time to be done, so the production cost needed will be higher.

Makespan is total time needed to complete a group of jobs (Stevenson, 2005). It is the length of time between the start of the first job and the completion of the last job in the group. Therefore production schedule which can minimize makespan is needed.

The Production System Laboratory of UAJY has a long-term research about the effect of product structure complexity (Bill of Material / BOM), routing process, and ratio from setup and run time in makespan minimization on multilevel product scheduling. Multilevel product is a product which consists of more

than one level of the component. Product structure complexity consists of number of level and number of items in one level. Routing complexity consists of number of machines and operations.

In this research, variable which will be evaluated is lot size. Lot size is the quantity of product which will be processed. The experiment with some size of lot size is expected to produce minimum makespan. Optimum lot size is lot size decision which gives the minimum makespan.

The result of makespan is also influenced by setup and run time. Setup time is time needed to prepare machine before it starts the operation. Run time is time needed to process some products in the operation. The calculation of setup and run time ratio is average of set up time divided by optimum lot size times average run time.

The number of item to be produced in this thesis is 45 and lot sizes examined are 5, 9, 15, and 45. Product structure used in this research is 4 levels of product structure with maximum parts are 4 in each level.

1.2. Problem Statement

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

1.3. Research Objectives

a. To define the makespan and optimum lot size of each product structure and routing file.
b. To define if there is effect of product structure complexity due to optimum lot size.

1.4. Scope of Research

The scopes of this research are:

a. Multilevel product used in this research is 4 levels and maximum 4 parts in one level.
b. The number of machine used is 3 machines. And one machine represents to one process.
c. The operation of each part is 3 operations.
d. The number of item to be produced is 45 products.
e. The lot sizes examined are 5, 9, 15, and 45.
f. There are 4 replications due to generation of routing file.
g. There is no variation of process sequence in each routing file.
h. Set up time is varied from 5-10 min/lot and run time is varied from 1-5 min/unit.

1.5. Research Methodology

There are four steps used in this research.

The steps are:

a. Generating data

   Product structure is generated from possible combination. It's generated for 4 levels and maximum 4 parts in one level. Actually there were 56 product structures had been made, but in this

research it used only 10 of them which have been chosen by several reasons. The reasons will be evaluated in chapter 5. There are 4 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.

b. Data Processing Step

The Gantt chart is made manually by Microsoft Excel program in computer to obtain the makespan of each lot size for each product structure and routing file. Lot size that result the minimum makespan is called optimum lot size.

c. Analyzing Step

Minimum makespan and optimum lot size will be analyzed by ANOVA Single Factor.

d. Making report

Make final report of the research, after the data and result is obtained.

e. Research Flow Diagram

1.6. Report Outline

This thesis consists 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 basic theories from books and internet as the reference of the research.

Chapter 4: DATA

This chapter contains all the data needed. The data consists of product structure, routing file, and lot size.

Chapter 5: DATA ANALYSIS

This chapter discusses about the analysis of research result.

Chapter 6: CONCLUSION and SUGGESTION

This chapter provides conclusion and suggestion from the research.

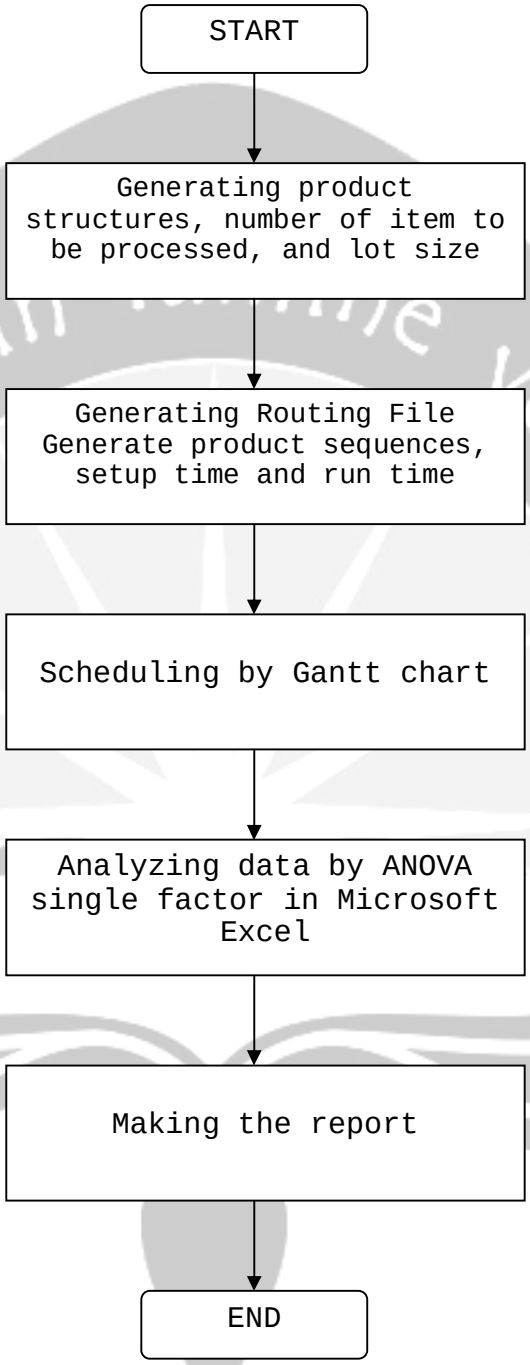

Figure 1.1. Research Flow Diagram