



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**Design of an Improved Production Layout for a
Shoe Making Factory: A Case Study of a
Company**

Thesis submitted in accordance with the partial requirements of the
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By

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DESIGN OF AN IMPROVED PRODUCTION LAYOUT FOR
A SHOE MAKING FACTORY: A CASE STUDY OF A
COMPANY

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ABSTRACT

The purpose of this project is to design an improved production layout for a shoe making factory. However, not all the production layout was re-layout. The area of focused was the Making Department. This research project is done by identifying the layout problems. In the beginning, the problems, objectives and scopes of the project were determined. The scope of this project is to study the layout and the layout problems in the Sepatu Timur Sdn. Bhd, production layout. The area of study was focused at the Making Deptment. The research started by drawing the existing layout using the CATIA software. In order to draw the layout, the measurement for the machines was taken at the shoe factory. After that, the layout was analyzed to identify the problems occur. Next the layout was analyzed using the Systematic Layout Planning (SLP) methodology. The activity relationship chart was developed based on the data and understanding the roles and relationship between activities, a material flow analysis (from to chart) and an activity relationship analysis (activity relationship chart). From the analysis performed, a relationship diagram is developed. Next the space relationship diagram is developed. Using the balancing advantages and disadvantages method, alternatives are developed and evaluated. At the end of the research, the preferred alternative layout is then identified and recommended. For the future work, it is recommended to focus at other area such as Soling Department. It is also recommended to use other method to evaluate the layout.

ABSTRAK

Tujuan projek ini dijalankan adalah bertujuan untuk merekabentuk sebuah pelan susun atur yang telah diperbaiki. Walau bagaimanapun, keseluruhan pelan susun atur bagi kawasan pembuatan akan dibaik pulih. Kawasan yang akan diberi perhatian ialah kawasan untuk Jabatan Pembuatan. Projek ini dimulakan dengan mengenalpasti masalah bagi pelan susun atur di jabatan tersebut. Ianya dimulakan dengan mengenalpasti masalah, objektif serta skop bagi projek ini. Projek ini dimulakan dengan melukis pelan susun atur sedia ada dengan menggunakan perisian CATIA. Sebelum melukis, kesemua maklumat yang diperlukan iaitu pengukuran bagi semua mesin serta jarak mesin dengan mesin, jarak mesin dengan dinding dan sebagainya diambil menggunakan pita pengukur. Kesemua perkakas yang berada di dalam kawasan jabatan tersebut diambil kira. Kemudian pelan susun atur tersebut akan dianalisis menggunakan kaedah 'Systematic Layout Planning'. Setelah itu 'activity relationship chart', dibuat berdasarkan data dan hubungan antara aktiviti yang dijalankan. Setrusnya, 'relationship diagram' dibina. Dengan menggunakan kaedah keseimbangan antara kelebihan dan kekurangan, pelan susun atur alternatif yang lain telah dilakukan. Ianya kemudian akan dinilai dan dipertimbangkan. Setelah meneliti kebaikan dan keburukan alternatif pelan susun atur yang ada, akhirnya satu pelan susun atur akan dipilih dan dicadangkan. Untuk kerja masa hadapan, kawasan jabatan lain di dalam pelan susun atur ini boleh dicadangkan. Antara kawasan yang berpotensi untuk di ubah suai ialah Jabatan Suntikan. Cara kaedah yang lain juga antaranya kaedah yang lebih moden dicadangkan untuk kajian masa hadapan.

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LIST OF ABBREVIATIONS

PVC = Polyvinyl chloride

PSM = Projek Sarjana Muda

SLP = Systematic Layout Planning

CF 8212 = Cheng Feng 8212

CF 8218 = Cheng Feng 8218

CHAPTER 1

INTRODUCTION

1.1 Background

Layout is the physical arrangement of production machines and equipment, workstations, people, location of materials of all kinds and stages and material handling equipment. The importance of the facilities design process becomes readily obvious when one realizes that in addition to the need for developing new manufacturing facilities, existing plants undergo some change continually. Major relayouts of plants occur in the average of every 18 months. The need for change in layout arises from such factors as product design, methods, materials and process change.

New manufacturing plant construction is one of the largest expenses that a company will ever undertake and the layout of that plant will affect the people for years to come. The cost of product will be affected by the initial layout as well. Continuing improvements on the layout will be needed to keep the company current and competitive.

One of the most important factors to consider in designing the manufacturing facilities is finding an effective layout. A general definition of plant layout problem is to find the best arrangement of physical facilities to provide an efficient operation. Layout affects the cost of material handling, time and throughput, and hence affects the overall productivity and efficient of the plant (Hassan, 1995)).

The layout should be designed such that the manufacturing process can be carried out in an efficient way. This objective can be attained by arranging machines, material, and work areas so that material moves smoothly, eliminating all delays possible, planning the flow in such a manner that work passing can be easily identified, and planning for maintenance of conditions.

- Minimizes material handling: In an efficient layout, material handling can be reduced to a minimum by using mechanical equipment (automated guided vehicles etc.) and the distances continually traveled by the parts in transit and towards the shipping area can be shortened.
- Maintains flexibility of arrangement and operation: The layout design should be flexible enough to respond to the changes in the product design or the design process.
- Maintains a high turnover of Work-In-Process: By reducing the in-process storage of material, the overall material turnover time is shortened, and thereby the operational cost is reduced.
- Holds down investment in equipment: In a good layout with a proper arrangement of machines and departments, the number of pieces of equipment used can be reduced.
- Makes economical use of floor area: Only if each square foot of floor area in a plant is used to attain maximum advantage (the space constraint being an inherent problem in facility designing issues), the layout would be efficient.
- Promotes effective utilization of manpower: Proper layout can increase the effective utilization of labor.

- Provides for employee satisfaction: This objective can be met only if attention is given to items such as, light, heat, ventilation, safety, removal of moisture and dust.

1.2 Problem statement

In recent year, manufacturing and service industries witnessed several development in the facilities design. The problem statement is to study the old production layout that has been used for years. The new layout never changed since the factory was open. Customer demand for the product changed rapidly with time. After years, the company has to improve the facility layout in order to compete with other competitors. The factory has to adapt changes to remain with others competitor. When changing the production layout, there are several things to consider. In order to achieve the effective layout, certain method has been used. In this case study, method that has been used was defined. There will be a step by step procedure to improve the layout. The old layout has to be improved because it can cause minor or major accident while working. The problems that occur in the old production layout will be explained briefly in Chapter 4.

1.3 Scope of project

1. The use of production layout as a case study.
2. The use of Systematic Layout Planning (Muther) as the approach to analysis the existing layout.

1.4 Objectives of project

There are few objectives that must be achieved in this project:

- a) To study the problems that occurs in the production layout.
- b) Improve the plant layout using the right approach.
- c) To propose a new improved production layout

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the types of layout that exist in the industry will be explained. There are five types of layout that include in this chapter. The types of layout are important as it will affect the process flow for the factory's product. Other than that, there are also explanations about the facility layout problem and also facility layout approaches to redesign the production layout. Flow patterns that exist in the facility design also will be described.

2.2 Layout

A layout is the physical configuration of departments, workstations and equipment in the entire conversation process. It is the spatial arrangement of physical resources used to crate the product or services (Adams & Ebert, 1992). Apple said that layout is planning and integrating the paths of the component parts of a product to obtain the most effective and economical interrelationship between men, equipment men, equipment and the movement of materials from receiving, through fabrication to the shipment of the finished product.

Meanwhile Hassan (1995) said that a general definition of plant layout problem is to find the best arrangement of physical facilities to provide an efficient operation. Layout affects the cost of material handling, time and throughput and hence affects the overall productivity and efficiency of the plant. Developing a machine layout is an important step in designing manufacturing facilities due to the impact of the layout to material handling cost and time, and consequently affects the overall productivity of the shop floor. Poor layout would result in having more parts spending longer time moving from one machine to another, and thus results in increasing material handling costs.

One of the most important factors to consider in designing the manufacturing facilities is finding an effective layout. The requirements for effective layout are:

- Minimize material handling costs
- Utilize space efficiently
- Utilize labor efficiently
- Eliminate bottlenecks
- Facilitate communication and interaction between workers, between workers and their supervisors, or between workers and customers.
- Reduce manufacturing cycle time and customer service time
- Incorporate safety and security measures
- Encourage proper maintenance activities
- Provide flexibility to adapt changing conditions

The right layout for an organization, improves productivity, the quality of the product or service and the delivery rates. The layout decision is very important strategically for any organization to stay competitive in the present era. (Yang, 1994). In manufacturing, facility layout consists of configuring the plant sited with lines, buildings, major facilities, work areas, aisles and other pertinent features such as department boundaries. While facility layout for services may be similar to that for manufacturing, it also may be somewhat different-as is the case with the offices, retailers and warehouses. Because

of its relative permanence, facility layout probably is one of the most crucial elements affecting efficiency. An effective layout can reduce unnecessary material handling, help to keep costs low and maintain product flow through the facility.

2.3 Types of Layout

The type of layout most suitable to any organization is a function of the operations the organization performs. The operations function in any organization can be either intermittent or continuous (Adams & Ebert, 1992). Intermittent operations deal with made-to-order products, low product volume, general purpose equipment, labor intensive operations, interrupted product flow, frequent schedule changes and large product mix. Continuous operations on the other hand deal with standardized products made to store inventory, high product volume, special purpose equipment, capital intensive operations, continuous product flow and small product mix. Tompkins & White (1996) provide three basic kinds of layouts depending on the types of workflow they entail. These three basic kinds of layouts are process oriented, product oriented and fixed position.

Apart from the three basic, there are two other types of layouts which are cellular layout or group technology and also hybrid layout. The type of layout for the current layout for the company is the product layout.

2.3.1 Process Layout

A process layout is most appropriate operations (Adams & Ebert, 1992). The layout for a process consists of grouping like process together and placing individual process departments relative to one another based on workflow between departments (Tompkins & White, 1996). Process layout is suitable for operations when workflow is not consistent for all output.

Process layouts are found primarily in job shops, or firms that produce customized, low-volume products that may require different processing requirements and sequences of operations. The layout of process department is obtained by grouping like processes together and placing individual process departments relative to one another based on flow between departments. Typically, there is a high degree of interdepartmental flow and little intradepartmental flow. Such a layout is referred to as a process layout and is used when the volume of activity for individual parts or groups of parts is not sufficient to justify a product layout or group layout. This type of layout gives the firm the flexibility needed to handle a variety of routes and process requirements.

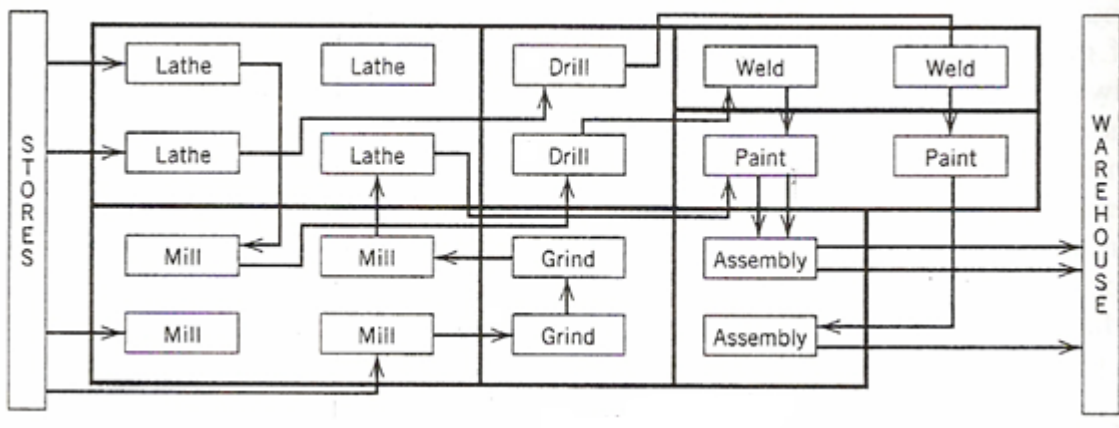


Figure 2.1: Process layout diagram (Tompkins and White, 1996)