



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**APPLICATION OF GENERAL FLOW PATTERN IN FACILITY
LAYOUT**

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

by

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**FACULTY OF MANUFACTURING ENGINEERING
2010**


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
BORANG PENGESAHAN STATUS TESIS*
JUDUL: APPLICATION OF GENERAL FLOW PATTERN IN FACILITY LAYOUT
SESI PENGAJIAN: 2009-20010

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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 Management). The member of the supervisory committee is as follow:

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ACKNOWLEDGEMENT

Thankful to Allah with leave it also able to completely my Bachelor Project Report II effectively. Firstly, vote of thanks my PSM supervisor, Dr. Noor Ajian bt. Mohd Lair. She is very kindly and helpful. For me, DR Noor Ajian is appreciating her assistance and all the valuable knowledge provided in helping me to complete documentation. She has been as supportive and flexible as she could be abundant giving guidance to assignment that has been given. And also thanks to PM Dr Khaled Omar willing become supervisor to 2 in giving coaching below supervision it.

Or else, I would like to give special thanks for my dearly loved parents and family who have been giving me support and inspiration throughout my project. Finally, I also express my profound gratitude to those who straight or not directly helped me in completing this PSM project. This project is the result of the direct and indirect contributions of all these individuals. I am ever thankful to them.

DEDICATION

Dedicate for my father, mother and brother.

ABSTRACT

This research centers on the planning for the location of machines, utilities, employee workstations, and customer service areas to optimize productivity at Isuzu Hicom Malaysia Sdn Bhd . The initial idea is to design layout that can minimize cost, traveling distances and time related to the productivity. This can ensure more profit and reduced production time for the Isuzu Hicom Malaysia Sdn Bhd future. This research has identified the General Flow Pattern Method as a suitable method. This is due to the fact that the General Flow Pattern Method is simple to be coordinated and the production is in the first in and first out. The essence of the General Flow Pattern Method relies on its Tool Work, specifically the flow analysis. The flow analysis is able to minimize the distance traveled, backtracking, cross traffic and the cost production. The Isuzu Hicom Malaysia Sdn Bhd has been selected to be the case study because of their awareness on problem related to the existing layout. The problem affects the performance of thousands workers, machines, productions lines. This research aims to develop a new layout using the GFP method for the Isuzu such that the total flow distance of the products can be reduced. The procedures for adopting the GFP had been outlined in this research. Specifically, 3 matrixes has to be developed; flow, distance, flow distance matrixes. Five layouts had been developed thru the GFP. These layouts had been compared to the current layout. Comparison indicates three of the five proposed layout is better in term of total flow distance compared to the current layout. In addition, the U-Shape Pattern, specifically pattern (a), has been found to be the best pattern alternative for the General Flow Pattern, which minimizes the flow distance travel for the Isuzu products.

ABSTRAK

Penyelidikan yang dijalankan adalah untuk optimumkan produktiviti di Isuzu Hicom Malaysia Sdn Bhd pada lokasi mesin, utiliti, tempat kerja pekerja, dan kawasan-kawasan perkhidmatan pelanggan. Tujuan utama penyelidikan dijalankan adalah untuk mengurangkan kos, jarak perjalanan produk dan masa berkaitan dengan produktiviti. Ini adalah untuk memastikan faedah keuntungan dan pengeluaran yang berkurangan untuk masa depan Isuzu Hicom Malaysia Sdn Bhd. Penyelidikan yang dijalankan ini menggunakan “General Flow Pattern Method” sebagai satu kaedah yang sesuai. “General Flow Pattern Method” mudah untuk diselaraskan pada pengeluaran pertama yang masuk dan pertama yang keluar. Intipati “General Flow Pattern Method” menghubungkan pada alatan kerjanya khususnya pada aliran analisis. Aliran analisis berupaya meminimumkan jarak, ulangalik lalu lintas dan kos pengeluaran. Isuzu Hicom Malaysia Sdn Bhd telah dipilih untuk menjadikan penyelidikan dengan masalah yang wujud. Masalah ini melibatkan prestasi beribu-ribu pekerja, mesin dan pengeluaran yang banyak. Penyelidikan ini bertujuan untuk membangunkan satu aturan baru untuk Isuzu menggunakan kaedah GFP untuk mengurangkan jumlah jarak aliran produk. Prosedur menggunakan GFP telah digariskan dalam penyelidikan ini. Khususnya, 3 matrik diperlukan adalah aliran produk, jarak dan jarak aliran produk. Lima susunatur telah dibangunkan dari GFP. Susunatur ini telah dibandingkan untuk susunatur yang telah wujud. Perbandingan diantara tiga daripada lima susunatur adalah lebih baik dalam tempoh jarak jumlah aliran berbanding dengan susunatur yang telah wujud. Sebagai tambahan, U-Shape Pattern, khususnya corak (a), telah didapati menjadi alternatif corak terbaik untuk General Flow Pattern, yang mengurangkan perjalanan jauh bagi aliran produk Isuzu.

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Formulate Centroid to Relevant Department

APPENDIX B

Formulate Centroid to Centroid for Relevant Department

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LIST OF OBBREVIATIONS

GFP	-	General Flow Pattern
BOS	-	Business Operation System
QMD	-	Quality Management Department
IHM	-	Isuzu Hicom Malaysia
MTB	-	Malaysian Truck and Bus Sdn. Bhd
WBS	-	White Body Storage
JIA	-	Joint Inspection Area
CKD	-	Complete Knock Down
KD	-	Knock Down
S-Pattern	-	Serpentine Pattern
C-Pattern	-	Circular Pattern

CHAPTER 1

INTRODUCTION

Facility layout means planning for the location of all facilities such as machines, utilities, employee workstations, and customer service areas such that an optimum productivity can be achieved (IMEC, 2008). Due to this reason, this research centers on developing an improved layout for a manufacturing company.

Specifically, this chapter presents the concept of facility layout in Section 1.1, problem statement in Section 1.2, research objective in Section 1.3, research scope in Section 1.4, research methodology in Section 1.5, statement of work in Section 1.6 before finally concluding the chapter with organization of this report in Section 1.7

1.1 Concept of Facilities Layout

Facility layout and design is an important component of a business's overall operations, both in terms of maximizing the effectiveness of the production process and meeting the needs of employees (Nahmias, 2005). The basic objective of layout is to ensure a smooth flow of works, materials, and information through a system. The basic meaning of a facility is the space in which a business's activities take place. The layout and design of this space impact greatly on how the work is done—the flow of work, materials, and information through the system (Nahmias, 2005). The key to a good facility layout and design is the integration of the needs of people (personnel and customers), materials (raw, finishes, and in process), and machinery in such a way that they create a single, well-functioning systems. Facility layout means planning for the location of all machines, utilities, employee workstations, customer service areas, material storage areas, aisles, restrooms, lunchrooms, internal

walls, offices, and computer rooms (IMEC, 2008). Apart from that, facility planning is also used for organizing flow patterns of materials and people around, into and within buildings. The infrastructure services such as the delivery of line communications, energy, and water and the removal of waste water all make up basic utilities for facility layout. Most company applies this facility layout in their company to minimize movement, handling and travel distance of the material and labor while increasing overall productivity.

Why facilities layout is required by a company are due to the fact that locations of these various facilities impact the flow throughout the system. Moreover, the layout can affect productivity and costs generated by the system. However, layout alternatives are limited by the amount and type of space required for the various areas, the amount and type of space available and the operations strategy (Lee, Amundsen, Nelson and Tuttle, 2009). A properly designed facility is therefore an important source of competitive advantages. A variety of objectives have been developed to solve these layout problems. For instance, objectives for office layout might be to maximize information flow, retail firms focus on product exposure, and warehouses attempt to optimize the trade-off between storage space and material handling cost.

In general, each facilities layout has its own unique characteristics. The objectives of designing a new facility layout includes to minimize the investment required in new equipment, minimize the time required for production, and utilize existing space most efficiently, to provide for the convenience, safety and comfort of the employees, maintain a flexible arrangement, minimize the materials handling cost, facilitate the manufacturing process and facilitate the organizational structure (Meyers and Stephen, 2000). However, facility layout also has some the drawbacks. The drawbacks are higher skills required to accommodate diversity of tasks required, increased work in process and etc.

Therefore, the facilities layout has unique characteristics. Strength of facilities layout is to minimize the investment required in new equipment, minimize the time required for production, and utilize existing space most efficiently, to provide for the convenience, safety and comfort of the employees, to maintain a flexible

arrangement, to minimize the materials handling cost, facilitate the manufacturing process and facilitate the organizational structure. Generally, in facilities layout has the drawback. The limitations are higher skills required to accommodate diversity of tasks required, increased work in process and etc.

1.2 Problem Statement

Facility layout is a classical industrial engineering problem. The facility layout is optimized using some measure of production efficiency such as flow distance and cost. The facility layout aimed is to minimize cost, traveling distances and time.

This study centers on improving facilities layout for the Isuzu Hicom Malaysia Sdn Bhd, which is located in Pekan, Pahang Darul Makmur. The core business of Isuzu Hicom Malaysia Sdn Bhd (formerly known as Malaysian Truck & Bus Sdn Bhd) is manufactured and contract assembly for commercial vehicles and passenger cars. The company produces various types of product range; which include for commercial vehicles and passenger cars. Current facilities layout in the Isuzu Company is not strategic and most of their facilities are arranged not according to the flow of the process. Because of that, the worker takes a long time to finish their work. This scenario leads to long product lead-time and high inventories to buffer production.

1.3 Case Study Objectives

In general, the objective of this is to design a new layout that can improved total flow distance of the Isuzu Company.

The specific objectives of this case study are as listed below:

- a) To identify appropriate performance measure to be used in facility layout
- b) To design better and improved layout using selected tool

1.4 Case Study Scope

These case study centers on optimizing layout limited to the Isuzu Company. Hence, data collection will be limited to Isuzu current layout. In addition, a single technique is used to develop an improved facilities layout. The technique used is the general flow pattern. Moreover, this report is also limited to a single performance measure, which is the flow distance across the factory.

1.5 Case Study Methodology

The case study on facilities layout begins with identification of the problem, objectives and scope of project as illustrates in Figure 1.1. Basically, the problem statement of this case study is to optimize the flow distance in the Isuzu Company. Meanwhile, the objectives from this case study are to design a new layout that can improved space utilization of Isuzu Company and to select proper tool to solve facilities layout. The scope of the case study is limited to the data contained in the Isuzu's layout. At the same time, this case study is only limited to a single performance measure and only one method is used to solve the layout problems. After identifying the problem details, the technique and performance measure used are identified. Specifically, the general flow pattern is used to solve the facility layout using flow distance as the performance measure. Then, data collection is conducted on the selected case study company. In this research the Isuzu has been selected as the case study company. Based on the data collected, experiment is conducted. The experiment includes development of a new layout based on the collected data. The new layout is then compared to the existing layout and conclusion is drawn.

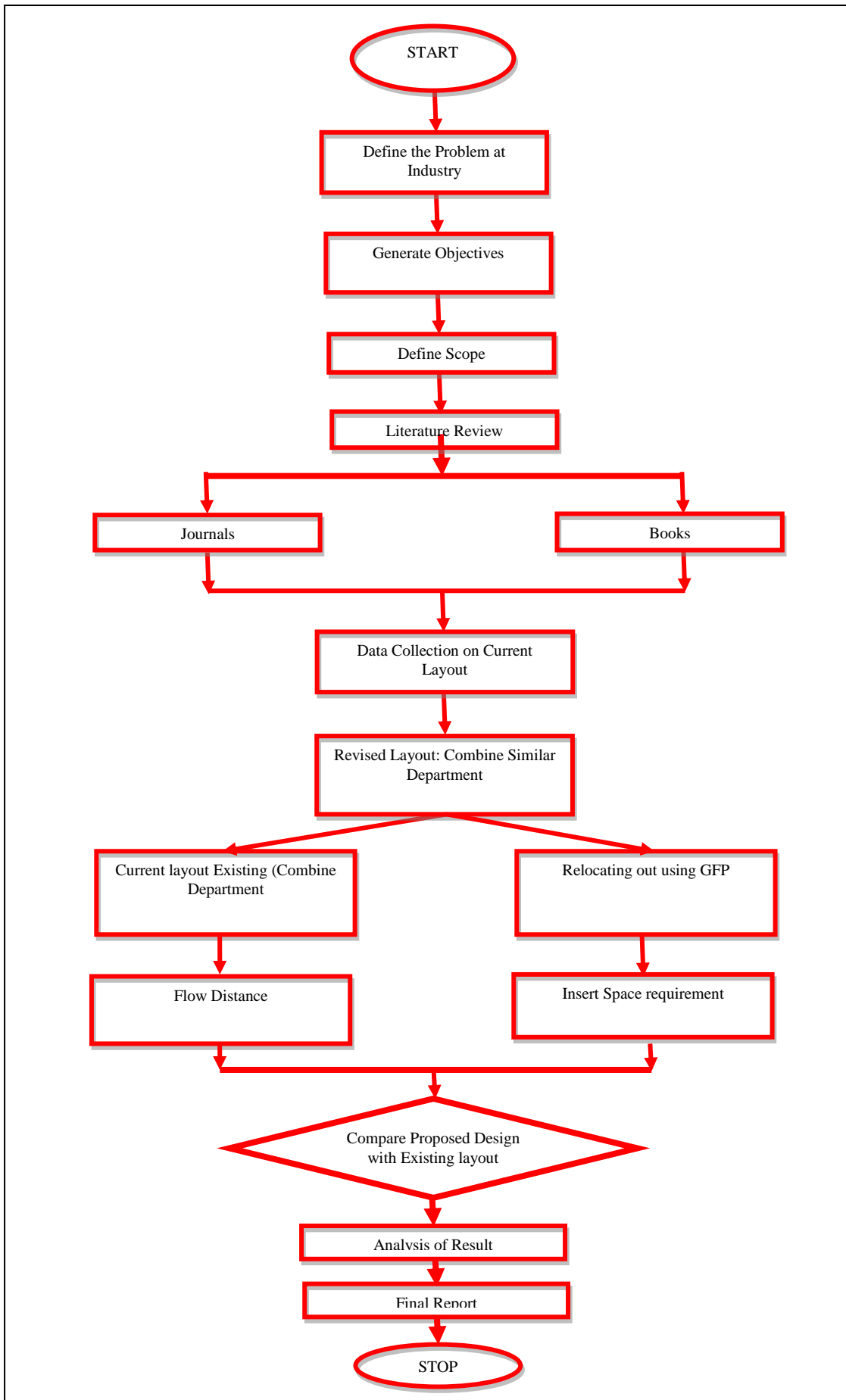


Figure 1.1: Research Methodology for this Case Study

1.7 Organization of Report

This report is meant for reporting activity for the Projek Sarjana Muda (PSM) I. The organization of this report has been constructed as followed:

1.7.1 Chapter 1

Chapter 1 presents the introduction of this case study. It covers the concept of facilities layout, problem statement, case study objectives, case study scope, and case study methodology. The concept of the facilities layout includes the definition of facilities layout, what the facilities layout used for, why we need the facility layout and the strength and drawbacks of facilities layout.

1.7.2 Chapter 2

Chapter 2 covers the review of literature. It includes the background of facilities layout, the needs for facilities layout, and literature review, which divided into method used and performance measure used.

1.7.3 Chapter 3

Chapter 3 explains on the methodology used for this case study. It describes the selection of tools or techniques suitable for facilities layout. In addition, this chapter also includes background of general flow pattern method, advantages and disadvantages this method, tool used in general flow pattern, developing a from-to-chart, general flow pattern layout procedure, and example on of general flow pattern in layout design.

1.7.4 Chapter 4

Chapter 4 shows the case study. Basically, this chapter provides introduction to Isuzu Company and presents the existing facilities layout as input data for this case study.

1.7.5 Chapter 5

Chapter 5 is presents the experimental design for General Flow Pattern in specific. In this chapter case study methodology in details are consist data collection, current layout for relevant departments, and also the step of general flow pattern may be proposed in facility layout.

1.7.6 Chapter 6

For this chapter are consist the result and discussion using GFP concept. It is represent flow distance travel for current layout and five of the layout proposed by using the GFP concept pattern.

1.7.7 Chapter 7

Represent the background of case study and background findings. Other than that, proposed a few of recommendation to the further research.

CHAPTER 2

LITERATURE REVIEW

Designing proper facilities layout is significant for manufacturing activities. A good facility layout may minimize movement, handling and travel distance. This minimization leads to shorter manufacturing lead time.

Due to the significant of facilities layout, this chapter laid foundation towards understanding the concept of facilities layout in section 2.1. Then, in section 2.2 describes the need for facility layout. Section 2.3 present, current scenarios in facilities layout case study before finely conclude the chapter in section 2.4.

2.1 Background on Facility Layout

Facility layout means planning for the location of all machines, utilities, employee workstations, customer service areas, material storage areas, aisles, restrooms, lunchrooms, internal walls, offices, and computer rooms (IMEC, 2008). Apart from that, a facility planning is also used for organizing flow patterns of materials and people around, into and within buildings. The infrastructure services such as the delivery of line communications, energy, and water and the removal of waste water all make up basic utilities for facility layout. Most company applies this facility layout in their company to minimize movement, handling and travel distance of the material and labor while increasing overall productivity.

Another meaning of facility layout is as a key decision that determines the long-run efficiency of operations (Heizer and Barry, 2009, 2007, and 2005). Layout has

numerous strategic implications because it establishes an organization's competitive priorities in regard to capacity, processes, flexibility and cost as well as quality of work of life, customer contact and image. The effective layout helps organization in achieving better strategy to support differentiation, low cost or response. In this situation, facility layout strategy is to develop an effective and efficient layout that will meet the firm's competitive requirements (Heizer and Barry, 2009, 2007, and 2005). In addition, a facility layout problem is also concerned with finding the most efficient arrangement of N indivisible departments with unequal area requirements within a facility (Castillo and Sim, 2003).

Fruggiero, Lambiase and Negri (2006) defined facility layout design (FLD) as concerned with the physical organization/allocation of a production system. In this facility layout problem, they determined criteria which maximize/minimize some objectives such as qualitative and quantitative liked production time, flexibility in volume and variety, allocation space, product quality and etc. The aim is to find the most efficient arrangement of M indivisible departments with unequal area requirement within a facility. In addition, plant layout process design is one of industrial engineering's activities. Specifically, layouts are designed in such a way that the activity of a fixed asset can give the best support in order to reach the objective of the activity.

2.2 The Need for Facility Layout

A good facility layout is important for a company. This is because location of these various areas affects the flow through the system. This flow, on the other hand, may affect productivity and costs generated by the system. However, layout alternatives are limited by the amount and type of space required for the various areas, the amount and type of space available and the operations strategy. A properly designed facility is therefore an important source of competitive advantages. Specifically the company may operate at low cost, provide fast delivery, accommodate frequent new products, produce many variety of products, produce many varied products, produce high or low volume products, produce products at the highest quality level and provide unique services or features (Lee, Amundsen, Nelson and Tuttle, 2009).