IMPROVE MATERIAL HANDLING SYSTEM IN HIROTAKO ACOUSTIC SDN.BHD'S LOGISTIC DEPARTMENT AREA

LINGENTHIRAN A/L SAMYLINGAM

Report submitted in partial fulfilment of the requirements
for the award of the degree of
Bachelor of Manufacturing Engineering

Faculty of Manufacturing Engineering
UNIVERSITI MALAYSIA PAHANG

ABSTRACT

This thesis deals with the improvement of material handling system in Hirotako Acoustics Sdn.Bhd. Logistic Department area. The first objective of this thesis is to reduce the unnecessary movement of the forklift in reducing the travelled distance and eliminate excessive oil usage. The second objective of this project is to reduce the time taken to load and unload racks and also the lead time of delivery. A video recorder was used to record the routines and then the data was analysed through the time study sheet which was provided in the company. Three different experiments were used in order to determine the correlation between the time taken, distance travelled and also oil usage. As result, it has been observed that as the distance decreases, the time taken to load and unload decreases, which indirectly reduced the lead time of delivery. By applying the new method the excessive oil usage can be reduced. As for the recommendation, we need to take into consideration about the time taken, oil usage, cycle time, the distance travels and also the unnecessary motions. So in future, we can measure the above mentioned properties to optimally select a proper material handling system for its specific application. The other alternatives such as electric forklift which consumed less oil and have more advantages than normal forklift also can be considered in order to less the expenses on oil.

ABSTRAK

Tesis ini membentangkan tentang penambahbaikan sistem pengendalian bahan di Hirotako Acoustics Sdn.Bhd. Jabatan Logistik. Objektif tesis ini adalah untuk mengurangkan pergerakan yang berlebihan forklift untuk mengurangkan jarak perjalanan dan mengurangkan pengunaan minyak berlebihan, serta mengurangkan masa yang diambil untuk memunggah dan memuatkan rak. Perakam video telah digunakan untuk merekod rutin dan data dianalisis melalui lembaran kajian masa yang telah diperuntukkan dalam syarikat. Tiga eksperimen yang berbeza telah digunakan untuk menentukan korelasi antara masa yang diambil, jarak yang dilalui dan pengunaan minyak. Hasilnya, didapati bahawa apabila jarak dilalui berkurangan, masa yang diambil turut berkurangan dengan penggunaan minyak. Ini bermaksud masa kitaran dapat dikurangkan di samping menjimatkan penggunaan minyak dengan penggunaan kaedah baru. Sebagai cadangan, kita perlu mengambil kira tentang masa yang diambil, penggunaan minyak, masa kitaran, jarak perjalanan, dan juga pergerakan yang berlebihan. Pada masa yang akan datang, kita boleh mengukur kriteria yang disebutkan di atas untuk memilih sistem pengendalian bahan yang sesuai untuk aplikasi khusus secara optimum. Alternatif lain seperti forklift elektrik yang menggunakan kurang minyak berbanding forklift biasa, dan yang mempunyai kelebihan baik daripada forklift biasa juga boleh dipertimbangkan untuk menjimatkan kos.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FORMULAES

CHAPTER 1

INTRODUCTION

1. 1 HISTORY

Material handling and logistics, as defined by the Material Handling System authored by Lindsay in 2000, which is the movement, protection, storage and control of materials and products throughout the process of the manufacture and distribution, consumption and disposal.

The modern roots of the industry can be traced back to the middle of the 19th century. From then until the early 20th century, developments were made that led to today's modern forklifts. Railroad construction led to battery-powered platform trucks, and World War I saw the creation of several different types of material handling equipments. In 1917, the first lift trucks were manufactured, and then the industries soon began to take off. During World War II, as production of equipment and artillery increased, material handling grew as well. Till current year the material handling system evolve and become engineered system which have manual, automatic and semi auto material handling system.

1. 2 BACKROUND OF STUDY

Basically, in most of the industry the material handling system play a major role to transfer the material from a place to a place. Material handling system can be defined as the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing, distribution, consumption and disposal.

In Hirotako Acoustic Sdn. Bhd (HASB) logistic department area using material handling tools such as pallet, boxes and forklift to transfer parts. The material handling tool used in HASB logistic department most of the time is forklift. The unnecessary movement of the forklift cost them a lot of money. The data are shown in Table 1.1:

Table 1.1: Oil usage study

OIL USAGE STUDY (MATERIAL HANDLING) MONTH OF JULY UNTIL (25TH OF JULY)

	(4 days) 1	(4 days) 2	(3 days) 3	(4 days) 4	(3 days) 5
What time filling up the oil	20/7/2011 5.45 pm	15/7/2011 5.36 pm	12/7/2011 3.50 pm	7/7/2011 6.00 pm	4/7/2011 5.00 pm
Usage of the oil (liter)	38 liter	34 liter	36 liter	31 liter	33 liter
Price per liter	RM 2.75	RM 2.75	RM 2.75	RM 2.75	RM 2.75
Total price	RM 104.50	RM 93.50	RM 99.00	RM 85.25	RM 90.75
What time the oil used up	25/7/2011	20/7/2011	15/7/2011	12/7/2011	7/7/2011
Liter per day and the cost	≈ 9.5 liter RM 26.15	≈ 8.5 liter RM 23.40	≈ 12 liter RM 33.00	≈7.75 liter RM 21.30	≈11 liter RM 30.25

From the table above the company spend RM 2750 over 5 months [statistic by Mr.Wong, HOD Logistic, HASB] just for forklift oil usage. The time taken to load and unload racks in the delivery bay is quite longer that is about 3 to 4 minutes. This can cause the lead time to increase and reduce the perfomance of the company. The longer time the foklift take to load and unload parts, the more oil it consume. This can lead to excessive oil usage which increases the cost of oil.

There are many unnecessary movements involve during loading and unloading the racks which cause the forklift to travel at a longer distance than normal. The more distance the forklift travel the more oil is needed. Thus, the oil usage is increased and cause the company to spend a lot on oil budget.

1. 3 PROBLEM STATEMENT

The main problem in the material handling system in HASB logistic department area is the usage of forklift which cause the cost of oil, and a lot of unnecesarry movement of forklift during loading and unloading racks. The movement of the forklift during loading and unloading is shown in Figure 1.1:

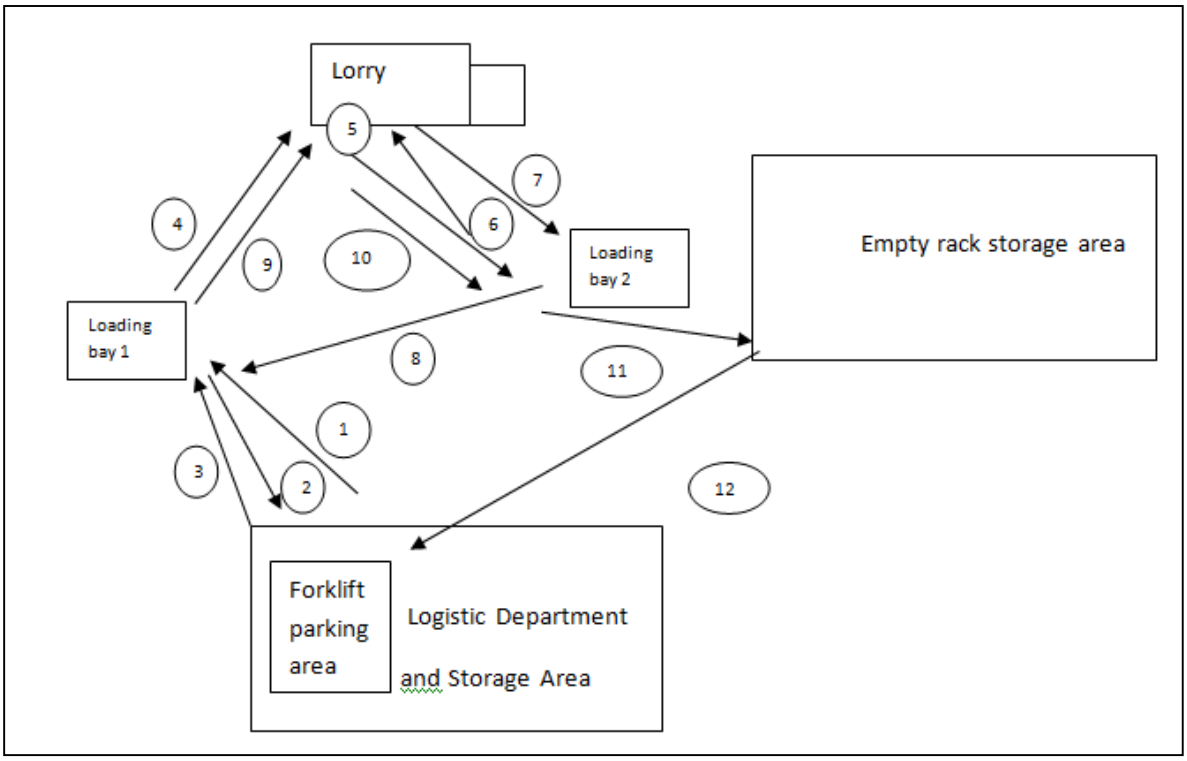

Figure 1.1: The loading and unloading of parts in HASB

Legend:

1. The parts in the racks are transferred from logistic department to the loading bay 1
2. The forklift return to storage area
3. The parts in the racks transferred to the loading bay 1
4. The forklift moves to the lorry
5. The empty racks unloaded to loading bay 2

6. The forklift moves to the lorry
7. The empty racks unloaded to loading bay 2
8. The forklift moves to the parts in loading bay 1
9. The forklift loads the parts to the lorry (forklift return to the loading bay and load the parts depends on the quantity of racks)
10. The forklift moves to the empty racks in loading bay 2
11. The forklift transfer the empty racks to the empty racks storage area (the forklift return and transfer the empty racks depends on the quantity of racks)
12. The forklift return to the forklift parking area.

(note: the step no 3, 4, 6 and 7 depends on the quantity of racks)

The main problem is the unnecessary movement of the forklift in the loading bay which cause the cost of oil usage increases. The oil usage for forklift in logistic department is stated as RM 2750 for five months usage by Head of Logistic Department Mr.Wong.

The empty rack storage area is far from the loading bay about 10 meters which means the forklift must travel abit far to load and unload where it leads to a longer lead time.

1.4 OBJECTIVE

1) To reduce the unnecesarry movement of forklift by reducing the distance travel and reduce excessive oil usage.
2) To reduce the time taken to load and unload the racks which will led to reduce in lead time.

1. 5 SCOPE OF WORK

1) Improve the material handling system in Hirotako Acoustics Sdn.Bhd Logistic Department.
2) Reduce unneccessary transferring movement by shortening the distance travel of forklift.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

In most of the industry the material handling system exist and play an important role to load and unload material. Forklift is the most used material handling tool in most industries. In this literature review the importance of the forklift and then how to reduce the cost caused by the forklift such as oil usage, the time taken to load and unload, also the distance the forklift travel were discussed.

2.1 THE IMPORTANCE OF THE MATERIAL HANDLING SYSTEM

In manufacturing industries, material handling system play the major role starting from receiving raw materials, then being transferred to the production line, move from a machine to machine, processing from department to department and then moved to final assembly section. In a simple manner to say wherever there is a movement of material, work in progress or finished product, the material handling system is involved.

The importance of the material handling system is to save time and increase the productivity rate, besides reduction in inventory and work in progress. When transferring the material from department to department while processing it time can be saved while reducing the inventory/storage area of material [1].

2.2 THE IMPORTANCE OF FORKLIFT

No matter what industry, all come across the situation whilst working hard, completing many straining tasks throughout the day, hit a point how to make the job easier. Work routines were looked out and try and spot flaws in the efficiency of the current way workers do things. The improvements in the way workers work studied.

Then the most efficient way possible to improve the material handling system found. But this is not always where the problem lies; found that one element into making a job easier is by the worker having the right equipment [2]. Not having the right equipment should never be a problem; machinery increases the efficiency of business and can save money. Take lifting & transporting for example how many times workers have had to go back and forth moving to trades goods or waste and think about how much time and therefore money could have been saved by using a forklift truck. All industries and businesses can benefit from more efficient methods of lifting and transporting and below are just a few examples of how a forklift can help business.

2.3 HANDLING FORKLIFT

There is no doubt a forklift truck is a brilliant piece of equipment. They can move in and out of tight spaces, take up little space, cheap to run and have great strength for serious lifting work. But the operation of a forklift is not a simple matter. For example, a forklift can overturn from unexpected angles and its operation follows strict rules and regulations [5]. Only a trained and qualified person should operate a forklift.

If there is a mechanical or other operational fault, the machine must not be operated until repaired. Only a qualified person can carry out a proper inspection before the forklift is put to work. Failure to operate a properly maintained forklift can result in serious damage, injury or even death. A forklift can leak fluids which may cause slippage. A qualified person will place mats under a forklift and know how to inspect for any leaks. The forks when raised may drop unexpectedly and only a qualified operator will know to have people

well clear when the machine is in operation [3]. A forklift can tip over if the weight being lifted is not correctly balanced and only a qualified driver will know how much to lift and how to place the load correctly.

2.4 REDUCE THE COST BY REDUCING THE DISTANCE TRAVELLED

The distance the forklift travel is directly proportional to the money. The more the forklift travel the more the fuel consumed hence its slightly increase the budget for fuel. For example, let say a forklift consuming 2 liter of fuel while travelling 1 km and the price for 1 liter fuel is RM 2.75. The total distance a forklift travels per day is about 10 km with unnecessary movements which will cause about 20 liters and RM 27.50 per day.

When the unnecessary movement is reduced, which led to reduce in distance travels by forklift, the cost of fuel can be reduced slightly. For example let say the unnecessary motion is about travelling for 2 km, and then we can reduce the about 4 liter and RM 5.50 per day. This means we can save up to RM 5.50 per day times 20 working days which will result in saving RM 110.00 per month. The shorter the distance forklift travels the more money we can save.

2.5 SHORTEN THE LEAD TIME BY REDUCING FORKLIFT TRAVELLING TIME

By reducing the forklift travelling time the lead time can be reduced. There are many benefits by reducing forklift travelling time which will cost a time reduction in lead time. The benefits are as in Table 2.1:

Table 2.1: Lead Time of delivery

Reducing the Lead Time In a Process or a Series of Processes In Your Company will have the Following Benefits:			This Benefit Will Contribute To:					
#	Benefit Description	Explanation	Increased Sales	Improved Quality	Reduced Operating Costs	Increased Capacity and Throughput	Reduced Invested Assets	Improves Employee Satisfaction
1	Reduces customer order lead-time	The shorter your processing LT, the quicker you can deliver products and services to your customer.	x					
2	Improves on time delivery	The shorter your LT, the less that can change and go wrong (including customer changes).	x		x			x
3	Generates emergency sales	Customers are poor planners, the supplier with the shortest LT will often get the sale.	x					
4	Increases customer satisfaction	Short LTs solve many customer problems (shortages, inventory levels, etc.)	x					x
5	Reduces the amount of inventory that the customer has to carry.	The customers raw material inventory is proportional to the suppliers LT.	x	x				
6	Reduces impact of customer changes to orders, or cancellation of orders	The probability of a customer changing the design or due date, after work has started on the order, is proportional to the LT of the order	x	x	x	x		x
7	Increases flexibility	Short LTs give you the flexibility to change schedules and priorities quickly	x			x		
8	Justifies premium pricing	Companies can often justify a higher price if they have the shortest LTs. An alternate approach is offering a shorter LT than your standard for a premium	x					

2.6 ALTERNATIVE FORKLIFT

Forklifts can be powered by batteries or fuel such as propane, diesel, or gas. But the electric forklifts have a few advantages when compared to the other types. Some of these advantages include emissions, lifespan, noise, and maintenance.

2.6.1 Emissions

One of the first advantages of electric forklifts is emissions. Unlike other types, these forklifts generate no emissions. This is a great benefit if use the forklift indoors. Although propane-fuelled forklifts can operate inside, the area will need very good ventilation [10]. Those that are powered by diesel or gas can't be used indoors at all.

2.6.2 Fuel

Another advantage of electric forklifts is the fuel. These forklifts are much cheaper to operate than other types of forklifts. There is also no need to store fuel like used

propane-powered forklifts [10]. The fact that doesn't need an area to store fuel will free up more space in warehouse. Besides being cheaper to operate, they will also last much longer.

2.6.3 Lifespan

Their lifespan is also an advantage of electric forklifts. They have fewer moving parts than forklifts powered by other means. This means that electric forklifts will last longer than the other types. Also, they will have a longer lifespan because they are usually used in cleaner environment than other types [10]. In addition to their longer lifespan, these forklifts are easier to maintain.

2.6.4 Maintenance

Another advantage of electric forklifts is the amount of maintenance required. As mentioned earlier, these forklifts have few moving parts. This means that electric forklifts require less overall maintenance. Also, forklifts powered by internal combustion need to have their engines regularly maintained [10].

2.6.5 Noise

One of the final advantages of electric forklifts is the noise of the engine. Electric forklifts are powered by a battery. Therefore, they will produce lower levels of noise. This is a great benefit to use them indoors.

These are some of the advantages of electric forklifts when compared to the other types. Unlike forklifts powered by internal combustion, the electric designs can safely be used indoors because they produce no emissions. Electric forklifts also last longer than other varieties.

CHAPTER 3

METHODOLOGY

3.0 INTRODUCTION

This chapter introduces the experimental procedure utilized to improve the material handling system in logistic department of Hirotako Acoustic Sdn.Bhd, step by step process that done during this project. This project was done to reduce the time taken to load and unload parts by forklift and also reduce the lead time by reducing the distance travel and also time taken by forklift. During the experiment, three different types of experiment used in order to observe the difference in the material handling system. With the reduction in time taken and travelling distance, it might influence which will give different performance to the material handling system. The flow chart in Figure 3.1 shows the overall flow of project in step by step process.

3.1 FLOWCHART

The flow chart of the project is in Figure 3.1.

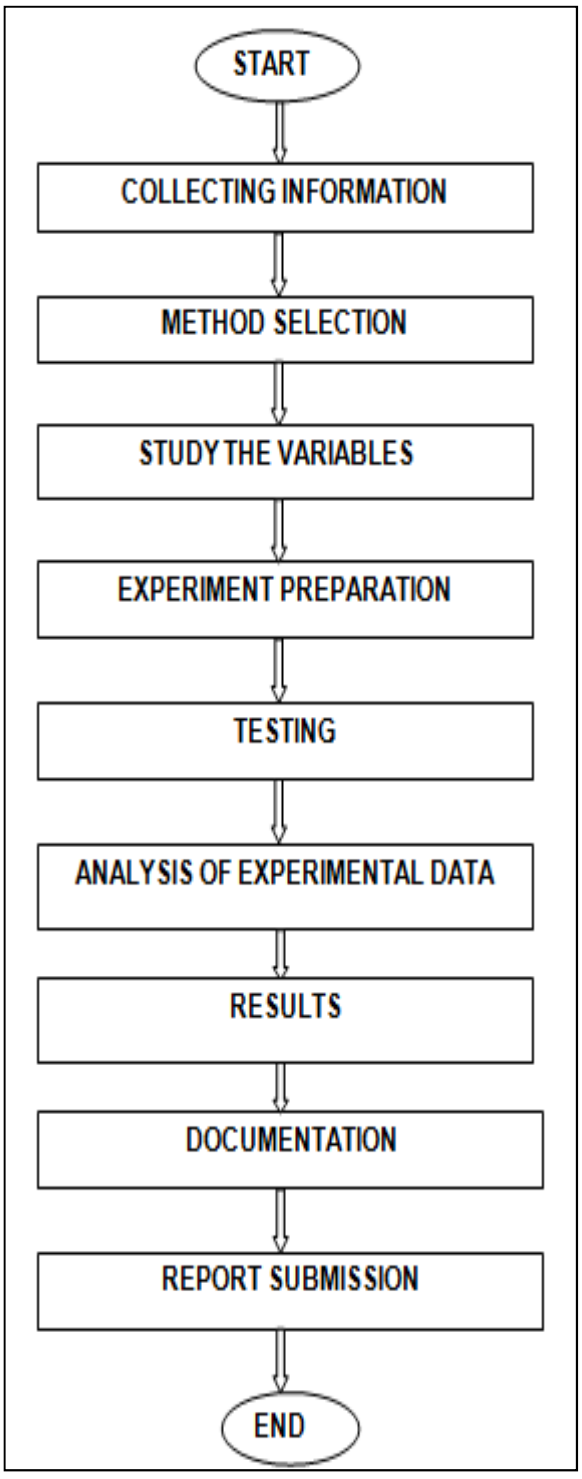

Figure 3.1**:** Process flow chart of study

3.1.1 Collecting Information

Firstly, the information about the material handling tool that been used in the logistic department was identified which is forklift. Then the research about the material handling system and forklift searched through journals. The information needed was gathered by literally through logistic department's manager to precede the next step.

3. 1.2 Method Selection

The method to precede the experiment was the time study for the forklift with having different variables. The variables selected were time taken and distance travelled by forklift. The method chosen was to survey the current handling system. Then different variables tried where shorten the time taken and reduce the distance travels by the forklift.

3.1.3 Study The Variables

Before studies the variable the flow of forklift was identified.

1) Storage area to loading bay: The forklift moves to storage area before transfer parts. Then the forklift transfers four racks with parts. The forklift moves to loading bay and storage area until transfer all four racks.
2) Loading bay to the lorry: The forklift moves toward the lorry to unload empty racks
3) Lorry to loading bay: The forklift unloads four empty racks to loading bay. The forklift moves to loading bay from lorry until transfer all four empty racks.
4) Empty rack to Rack with parts: The forklift move to rack with parts from empty rack
5) Loading bay to the lorry: The forklift load four racks with parts into lorry. The forklift moves from loading bay to the lorry until load all four racks.
6) Lorry to loading bay: The forklift move towards empty racks in loading bay

7) Loading bay to empty rack storage area: The forklift transfer four empty racks to empty rack storage area. The forklift moves from loading bay to empty rack storage area until transfer all four empty racks.
8) Empty rack storage area to forklift parking area: The forklift return to the parking area.

The flow of forklift was messy and there are a lot of unnecessary movements during the forklift transfer the racks with parts to the loading bay and transferring the empty racks to the loading bay. These steps are unnecessary since its wasting time and cause the forklift to travel more distance.

The distance from storage area to loading bay is 6m. The distance from loading bay to lorry is 2.5m. The distance between the rack with parts and empty racks placed in loading bay is 5m. The distance from loading bay to the empty rack storage area is 10m. The distance of the forklift parking area from the empty rack storage area is 15m.

The total distance travels by the forklift = Storage area to loading bay + loading bay to lorry + lorry to loading bay+ empty rack to rack with part +loading bay to lorry + lorry to loading bay + loading bay to empty rack storage area + empty rack storage area to forklift parking area.

Total distance travels by forklift = 2m + (6m x 7) + 3.5m + (2.5m x 7) + 5m + (2.5m x 7) +3.5m + (10m x 7) + 15m

Total distance travels by forklift = 2m + 42m + 3.5m + 17.5m + 5m + 17.5m + 3.5m +70m+ 15m

Total distance travels by forklift = 176m

Since it's involving too many unnecessary movements, where the forklift transfer racks to loading bay and then move to lorry to transfer empty rack to loading bay, I came

up with two solutions to eliminate the unnecessary motion with a new forklift flow. As first solution the forklift parking area shifted near to the lorry and the unnecessary movements, which involving the transferring racks to delivery bay eliminated. Second solution was similar to the first solution, but with a shorter distance of the empty rack storage area from the lorry.

The new forklift flow for experiment two:

1) Forklift parking area to the lorry: The forklift move towards the lorry to unload empty racks
2) Lorry to the empty rack storage area: The forklift unloads four empty racks and transfer to the empty rack storage area. The forklift moves to empty rack storage area from the lorry until transfer all four empty racks.
3) Empty rack storage area to storage area: The forklift moves to the storage area.
4) Storage area to the lorry: The forklift transfers the four racks with parts to the lorry. The forklift moves to the lorry from the storage area until load all four racks with parts.
5) Lorry to the forklift parking area: The forklift moves to the parking area.

The distance of the new forklift parking area is 2m from the lorry. The distance between the lorry and the empty rack storage area is 12m since the delivery bay is eliminated. The distance between empty rack storage area and the storage area is 13m. The distance between storage area and the lorry is 8m.

The total distance for new forklift flow= 2m + (12m x 7) + 13m + (8m x 7) + 2m

The total distance for new forklift flow= 144m

When eliminate the unnecessary movements the new distance become lesser and shorten the distance for forklift to travel.

For the third experiment the same new flow had been used but with shorter distance of empty rack storage area. The distance between the lorry and the empty rack storage area were reduced to 5m. The distance between empty rack storage area and the storage area is 8m.

The total distance for experiment 3= 2m + (5m x 7) + 8m + (8m x 7) + 2m

The total distance for experiment 3= 103m

The distance travel for experiment three become lesser after reduce the distance between empty rack storage area and the lorry.

3.1.4 Experiment Preparation

A video recorder used to record the loading and unloading racks activity of forklift for all experiments. The maximum speed of forklift was set up to 10 km/h for all experiments. The time measurement sheet was used to enter the data of all experiments. For the first experiment, the old forklift flow was followed. For the second and third experiment the new forklift flow was used. But for the third experiment the distance of empty rack storage area from the lorry was reduced to 5m.