



CHAPTER 6

CONCLUSION AND SUGGESTION

The objective of this research is to study, analyse and improve the plant layout of the case study factory - a plastic utensil processing line - in order to reduce production lead time, cost and transportation. To achieve the expected result, this research will be based on the knowledge of industrial engineering and engineering management such as plant layout, work study and work measurement.

The research scheduling starts from studying and analysing the current plant layout of milk bottle processing line and operation, identifying the real cause of problem, surveying and studying the relevant literature, defining the way in improving the layout and comparing layout before and after improvement.

After studying the current plant layout by using data from plant layout, flow diagram, process chart, from-to chart, string diagram and activity relationship chart, the problems may be summarized as follows:

1. The material flow of this plant is not effective in many areas.

They are a lot of non value added activities such as transportation of work in process and finishes good that are 54.54 % of overall activities. Moreover, the route of material flow was chaotic and repetitive. Since management and location of each department was not appropriate and work in process and finished goods spread everywhere through out the factory. Besides, it is clear that some departments involving a lot of interaction were placed very far apart. For example, blow molding processing line and UV room that have high frequency of transportation but are placed very far apart. This leads to loss of workforce and time in transportation among departments.

2. Improper warehouse of work in process and finished good

The storage of work in process and finished goods inventory was not well manage. Because in the existing arrangement the products are placed anywhere without regard to distance and convenience of transportation. Moreover, with poor plant layout will effect to the quality of product. Without a system is more close , cleaner, and with poor material handling and poor warehouse management, the quality of goods will be reduced. Moreover, not having a good management of work in process warehouse will affect the quality of goods. According to the technical requirement, the plastic bottles must be left for one day before entering the silk screening process. However, some bottles was brought to be silk screened earlier because the worker did not know which bags of bottles were of the right age. Consequently, the closest one is usually brought to be silk-screened first. As a result, the milk plastic bottles are often distorted and the customers often complain about this problem. Apart from the pre mature silk screening of milk bottle, the older batches of work in process were left or forgotten in places around the factory, resulting in a loss to the factory. Not only was there a loss of opportunity in sale of the products, but the product quality will also be reduced because contamination. The contaminated bottles will need be cleaned before silk screening, meaning the loss in material and labour cost.

3. Improper workplace of the silk screening room

From observing the workplace of the silk screening room and oven room, it can be seen that these two workstations have a wall separating them even though these two stations have a high frequency of material flow. So, in each of the material transfer, the worker must open the door of the oven room to bring out the screened after the first colour screening and go to open the door of the silk screening room to bring the bottles into the room. In situation it can be seen that there is a high chance of dust, insect and dirt with the wind blowing into the room when the door is opened almost all day and all night, even though this area is a control area that should be as clean as possible. So, there is a chance that the dirt will be in the milk bottles. The above will effect

customer satisfaction and reputation of the company in business dealing and future partnership.

4. Improper workplace of painting a milk bottle size 830 cc.

From painting a 830 cc. milk bottle that it started from framing a milk bottle surface with fire in UV room and then it will be brought to the screen room for painting, we can see that they will lost time in delivery bottle between workstation. After studying, the cause of problem came from can not set up the UV silk screen bottle to paint the bottle, perfectly, so the bottle must be brought to the screen room to paint it.

After we know problems that occur in the current plant layout and cause of it, we will find solution of improvement all of these problems by designing a better plant layout in order to eliminate all of those problems. The solution will be design follow the problem observation as seen in all above by design new warehouse and workplace that they benefit to both transportation and quality of product.

After Implementation there are many benefit as following;

1. Unnecessary Activity Eliminated

From the improvement in the warehouse are of both work in process and finished goods, we can eliminate unnecessary workforce that is employed in material transportation. This results in savings of labour cost and delivery time. As seen in Table 5.2., the transportation time reduces from 0.3649 sec/bottle to 0.152 sec/bottle or by 58.47%.

2. Improve warehouse system and management

From the existing plant layout, the storage of both work in process and finished goods was not effective and the inventories were hard to be tracked and their quality hard to be control. In the new plant layout, the same kind of product will be kept in the same area, which make it easy to control and monitor. Moreover, the warehouse system was designed to be closer so that

the risk of contamination can be reduced, resulting in increased quality of the product.

3. Increase Reputation of the company.

Implementing a new plant layout can increase reputation of the company by creating clean and close system workplace environment. Having a clean workplace environment improves the quality of the product. That improvement also meets the customer requirement. This can be seen from the fact that after implementing the new plant layout, customers did not complain about the same problem again. So, the reputation of the company increases as a result in dealing business together in the future.

4. Productivity Increased

From the effective warehouse system, we will reduce the risk of contaminate of the product that occurs from leaving the WIP for a long time. On the other hand, if the WIP is produced before the time it takes for the structure to set, it will lead to distortion of the silk-screened bottle. The new plant layout can improve the quality of product by making all the materials to be more visible. So, the risk of using improper bottle will be reduced.

5. Cost of Production Reduced

From the effective plant layout, the labour, equipment and material used in the factory will be reduced. The transportation cost will also be reduced. By a good plant layout, distance of delivery among each workstation is shorter. So, man and equipment used in the delivery is reduced. The labour cost was reduced from 2220.04 baht/day to 1,496.80 baht/day or by 32.58%. Moreover, the cost of cleaning forgotten bottle was eliminated. The amount used to be spend in cleaning cost was 1015 baht per month and lost opportunity in the sales of the product was 264,762 baht per month. So, the company can save on these spending 265,777 baht per month. This means the decrease in production cost.

Suggestion

Even the result of improvement the plant layout of the case factory was successful, but improving the plant layout from the existing factory can not change overall, fully, because of a limit the existing structure that supports to reallocation department. If we consider in flow of material, the design of plant layout should be locate each department priority to the flow of material and relationship of each department. As seen in this factory, we should place work in process warehouse between UV room and silk screen room for convenience of loading and building a close system workplace environment. Besides this, we will switch the mold warehouse and silk screen room with the existing UV room area. This area will be design a warehouse of finished good that it close to oven room. So, we will see that the milk bottle will be load pass the loading hole from the work in process warehouse to silk screen room and finally to finished good warehouse. This design will enable transportation flow in one way without return of material handling route. Moreover, this design will provide a clean workplace environment by establishing close system workplace environment that reduce dirt from the outside. Furthermore keeping the same kind of good in the same place will be easy to monitor, control and management warehouse. But this design is not suitable for the existing plant layout because it will lead to many problems in implementation. Firstly, moving a mold warehouse replace an existing UV room, floor of that room has to resistance heavy weight of many molds in the warehouse. So, the floor will be rebuild that all equipment and product will be moved out of the room for structuring, that effect directly to a stop of processing line. Secondly, building new UV room also requires strong floor to maintain the weight of two silk screen machines, and it needs to having a clean room, that they have to build new painted wall & floor, ceramic floor and ceiling. That all restructuring is nearly building new plant. Even this design have a huge benefit, it is not proper in the short time for stopping every activity to build a new plant layout and spending a lot of investment on it. Furthermore, this company has a plan of building new plant in the next year. So, they require improving plant layout for a short period and do not change so much in the structure of existing layout. On the other hand, this idea is suitable for implement in the design plant layout because the engineer can design the structure of the factory support to weight and activity according to the design of plant layout. All of this idea will be represented in the following plant layout and flow diagram in the next page.

Plant Layout

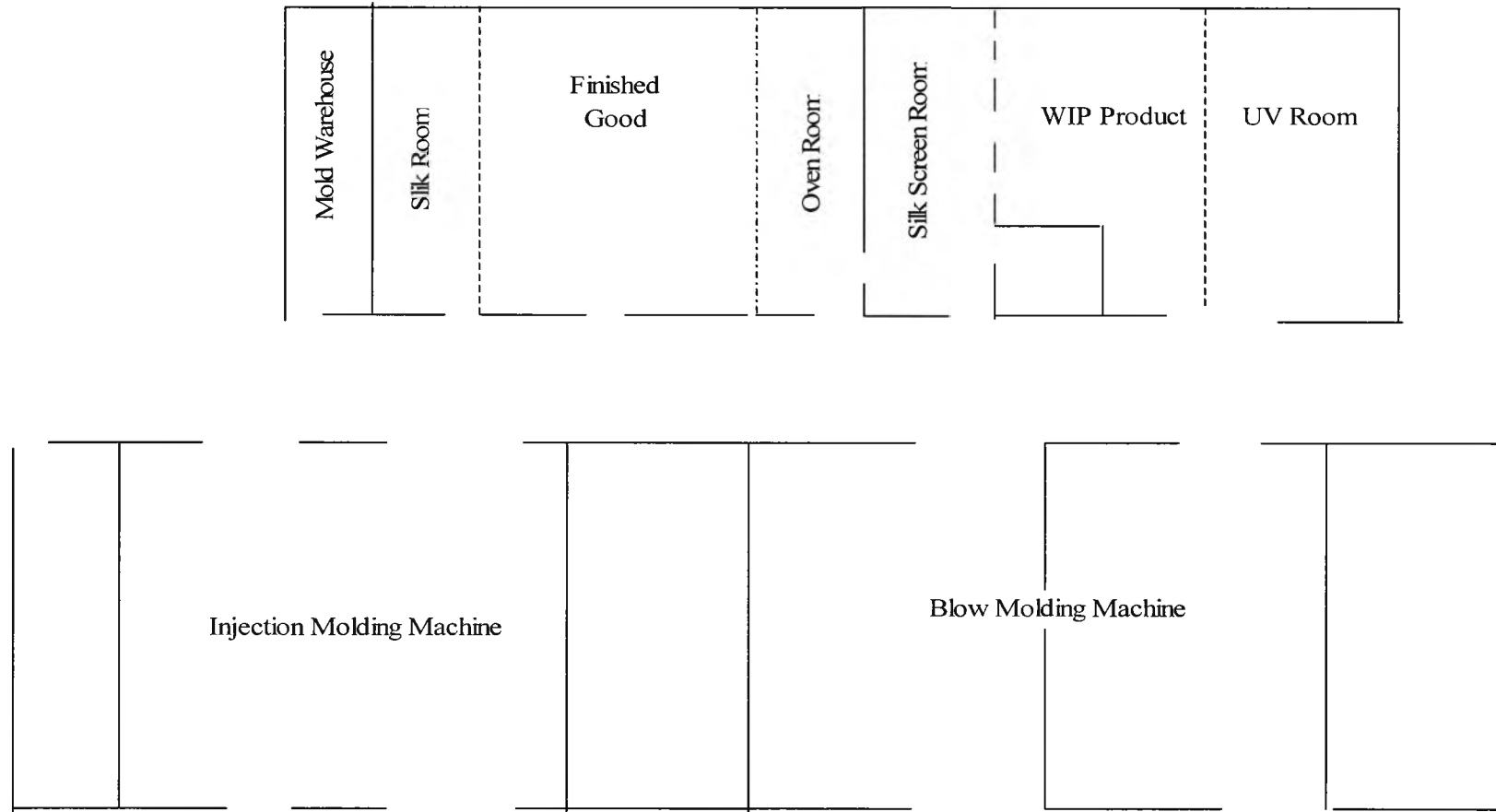


Figure 6.1. The Plant layout for a New Plant

Flow Diagram

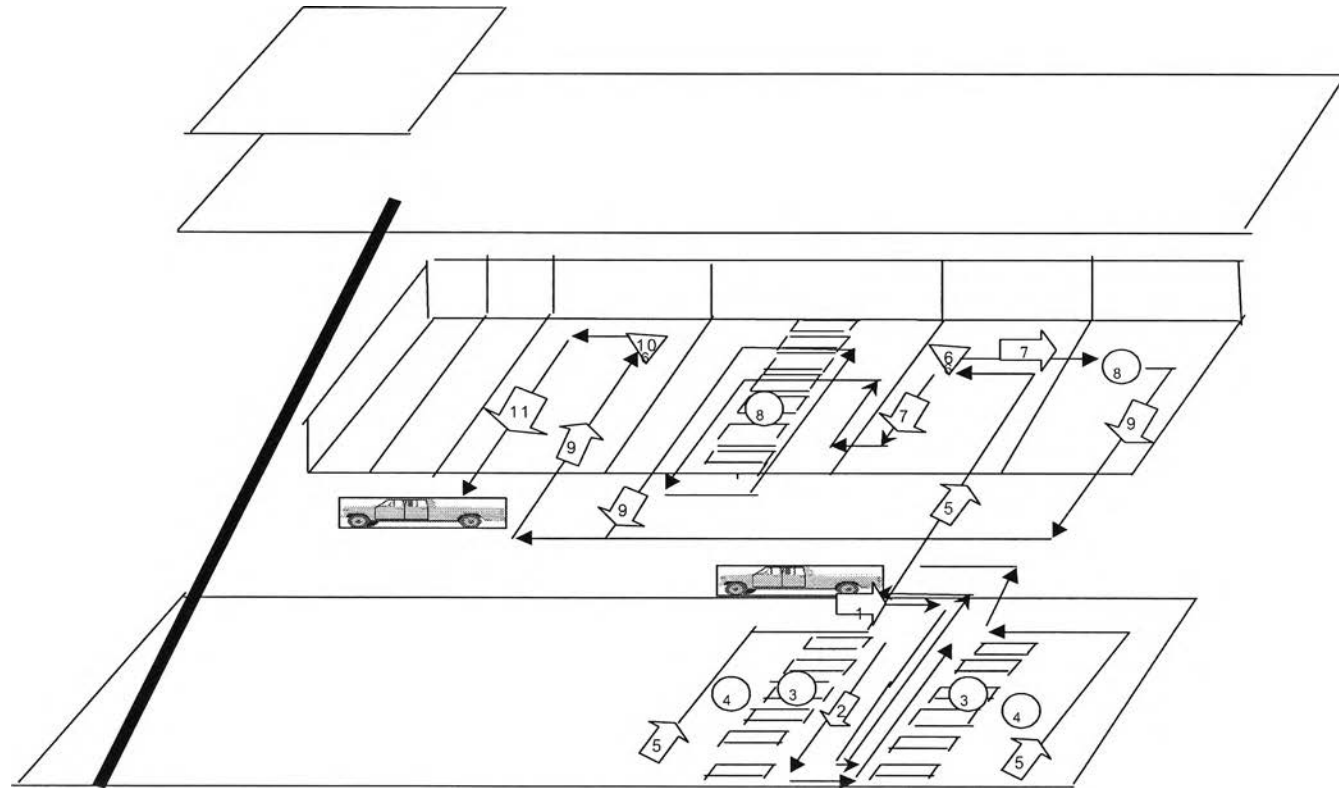


Figure 6.2. The Flow Diagram for a New Plant

Table 6.1. Comparing Table of the Process Chart Results among Before Improvement and the Suggested Plant Layout

Process Chart

Description	Before Improvement	The Suggested Plant Layout
	Distance (m/bottle)	Distance (m/bottle)
1. Bring the plastic granule bags into the processing line	0.023	0.023
2. A worker pours a bag of plastic granule into the machine	0.004	0.004
3. Cycle time of blowing Milk bottle	0	0.000
4. A operator cut and dress a bottle and put it in a bag	0	0.000
5. Bring a bag of screened bottle to a storage place	0.0111	0.009
6. Leave a bottle for setting of plastic structure for one day	0	0.000
7. Bring a bag of bottle from a storage place to silk screen room	0.121	0.016
8. Paninting Color on a bottle	0.178	0.099
9. Bring boxes of screened bottle from a silk screen room to storage place	0.014	0.001
10. Stock the finished product for one week	0	0.000
11. Bring boxes of screened bottle from storage places to a truck	0.013	0.002
Total	0.363	0.155
	Improve (%)	57.44

