



CHAPTER 5

CONCLUSION AND RECOMMENDATION

Having designed the different plant layouts, the performance of each plant layout, including existing layout, has been measured in order to evaluate which plant layout gives the best efficiency to produce the work. The result from running the simulation program is discussed in the following.

5.1 Reduction of production time

After designing the new layouts, the performance of each layout will be evaluated by using the simulation program. Simulation helps on evaluating the production time; it shows all the detail of how long each the work in process takes production time in each department. It shows the idle time of the work in process, which is the time of the work in process waiting for the operation. The utilization and idle time of the crane in the system is also evaluated. All the data evaluated from the simulation program is shown in the Appendix.

5.1.1 Overall time of production

This data show how long the batch of 80 pontoons is finished. Product layout design gives the shorter time to finish the work, which is 14.5 days, which is 27.36% of the existing plant layout. The reason that product layout design gives the best result because of it has better material flow compared to existing plant layout and process layout which still have the back and forth motion of material flow.

5.1.2 Average flow time

This data shows how long each pontoon is in the production line. It shows that existing plant layout gives the longest flow time, 9.03 days, for the one particular pontoon in the system and process layout design gives the shortest time. Because of having the limitation space of 4 pontoons in each department, the existing plant has a low number of works in process in the system, which made the capacity of the plant to be low. This means that work in process of existing plant within the system, at particular time, is less than the work in process being constructed within process layout and product layout design. The other reason that the process layout has the shortest average flow time is because having the better material flow more departments are added into the system in order to smooth out the flow of the production. The product layout design gives the shortest average flow time, which is 5.26 days that is 58.25% of the existing layout.

5.1.3 Cycle time

Cycle time is the gap of time between each pontoon that comes out of the system. The data show that all three new designs give the improvement of reducing the cycle time compared to the existing plant, though all three designs give quite a same length of time, which the shortest cycle time is 3.04 hours from the product layout, and reduce to 20.78% compared to the cycle time of existing plant layout, 14.63 hours.

5.1.4 Overall idle time

Over all idle time is the time that work in process waiting for the operation and the time that work in process wait to transfer to the next operation. The data from the

table 4.10 is calculated by the number of observation found in the production multiply by the average idle time of each observation (according to the appendix). The data show that existing layout gives the highest average idle time, because the capacity of the existing plant is very limited. That is why the idle time is most found in existing plant. The product design layout gives the best shortest average idle time, which is 51 minutes per observations even though it shows the highest number of the idle observations, 2960 times of the idle time occurred. However the product layout gives the best performance in reducing of the idle time within the production.

5.1.5 Crane utilization

Crane usage has been measured in order to evaluate how much the crane has been used in production. All three cranes are calculated and shown the utilization in one category. By looking at the table 4.10, existing plant has used crane 12.85% of total production time, process layout plant 25.87%, modified process layout 33.47% and product layout 48.02%. Existing plant gives the least utilization because of the idle time of the crane that waiting for another activities to finish. The product layout has the highest percentage of crane utilization, because of the flow of the product is better and the crane doesn't have to wait for more idle time. Even though the product layout has the highest utilization, this doesn't mean that the cranes are used more than other layout design, because of having the shortest production time then the cranes usage is reduced consecutively.

5.1.6 Labour cost

The labour cost has been measured in order to evaluate how much the company needs to pay for the labour cost in order to product 80 pontoons. The product layout design gives the least labour cost, mostly due to the shorter product time, however having the most number of workers. The labour cost has been reduced 53% from the existing plant. This saves a lot of expenditure to the company.

5.2 Increase the working space

In the existing plant layout where the space of each department is 6 * 12 meters and it can store 4 pieces of work in process. By increasing the space to 9 * 25 meters in process layout plant and product layout plant, this increase the capacity of working area from 4 pieces to 8 pieces of work in process.

Also the storage area has been increased to overcome the limitation of the storage area which is the problem occurred in the existing plant. This helps to smooth out the material flow and at the storage of the finished product is also increased this increase the capability to keep the finished product before transfer to the customer.

5.3 Improve flow of material

In the existing layout and process layout where the flow of material is quite complicated, there are many back and forth motion between welding department and painting department. This makes the difficulty to the workers to work effectively. By rearrange and adding department in product layout, it makes the flow of material run more simple direction.

Sand blasting area is another area that has been concerned. In the process layout and product layout, sandblasting room is moved closer to cutting area in order to reduce the material transfer and reduce the material handling usage.

5.4 Improper work place reduced

In the existing layout and process layout where the welding department and painting department is located close to each other. This may cause the accident of some chemical reaction between spark and wet paint. By concerning the safety of the work place, in product layout welding department and painting are located apart from each other in order to avoid the possible accident. Also in the painting the proper room will be constructed in order to avoid the spreading of dust or small particle caused from the painting. Having painting room might also avoid the possible breach of legal regulations.

5.5 Suggestions for Further Study

Having done all the improvement, even the result of improvement the plant layout of the factory is successful which obviously show that the product layout design give the best performance by looking at the production time, production cost, material handling utilization. Another main reason is the size of product which is not quite suitable to the process design layout or the job-shop layout, the difficulty of transferring the product within the plant will occur if using the process design layout. Using the product layout design will eliminate the problem of transferring. Moreover, having the

bigger size of factory, the company can diversify the product range into the bigger size of product, which has the same characteristic of work flow.

Those are the reasons that the product design will be chosen to be the best layout in this research. However, all of this work need to take period of time which can cause the opportunity lost for the company. Also the cost to improve the layout can be high even though the cranes are brought from the existing layout, but for example the factory structure, roof, crane structure need to be rebuilt. Moreover, the support from executive team is very important to push the project to be successful, without the full support from the executive team the project might not be finish. Another aspect is the worker commitment, the worker morale is also important to make the production to be effective; having the very good plant will be useless if the workers are not working with the full ability. All the people in organization need to understand the change of the new environment and the possible problems that can occur in the new plant layout. The availability of the worker is also one major point that company needs to be focus on, shortage of worker resource will directly effect to the product capability. Shortage of the worker resource will also effect to the utilisation of the welding equipment. Fortunately, from the past many years, the company has a good relationship with many group of worker, so the availability of the worker is not quite a big problem to the company. All of these aspects need to be concerned in order to make the entire project to be fully successful.