CHAPTER V

DISCUSSION

5.1. Result Analysis

These Discussions provide an analysis of MTALB Type II problem using simulation approach. In simulation approach, researcher uses Tecnomatix Plant Simulation by Siemens to facilitate this research. In order to implement MTALB using Plant Simulation software, researcher needs to collect certain data to support the model implementation in PT. Toyota Motor Manufacturing Indonesia which has implemented according to the case..

Firstly, the current situation is evaluated by modeling MTALB in the company. The data derived from the company that has already published. The standard time of each model is used and also the takt time is determinded from the company. The cycle time used in the current situation is determined by the company based on the available time during the work process and the amount of production in the planning period. Based on the current situation, 148 work elements consisting of 661 tasks assigned to 31 stations in 10 mated-stations. The time of work element and the cycle time those have already entered to each station shown in Table 4.2. Modeling the MTALB has been completed and correspond the real system.

The model has been built then it can be simulated by the software. The running by simulation model based on the real system can be seen in Figure 4.8. There are several station times that exceed the cycle time causing operator waiting time on the

assembly line is very high so that it can cause the bottleneck, the weighted line efficiency is still better but the weighted smoothness index is high. The program simulation results with a cycle time of 92 seconds is given in Figure 4.9 and Table 4.4. Mentioned that the weighted line efficiency is 98.4% and the weighted smoothness index is 60.5% with total waiting time 219 seconds (Innova) and 242.2 seconds (Fortuner). In the working time 7 hours 40 minutes, the result of simulation model from the mean life time is not sufficient so that the amount of product obtained is still far from the expected of throughput. The summary of model simulation results can be seen in Figure 4.10. It is mentioned that the throughput is 175 units consisting of 87 (Innova) and 88 (Fortuner). Throughput at each hour only produces 11 units.

In the assembly line balancing process, the researcher implemented MTALBP Type II which is to minimize cycle time with a given number of the workstation in order to reach the takt time. The programming language (SimTalk) provided in object "method" of the software is used as a line balancing method. The object is used as a programming tool to solve the problem of imbalance in the assembly line. Therefore the line balancing method, the task can be assigned into stations. The assignment process must be considered with the cycle time constraint, precedence constraint and assignment restrictions. In line balancing process between two models is done separately. The researcher found obstacle when doing the line balancing process. It is any station times that exceed a given cycle time. The researcher identified and found the stations in trouble. The solution to that problem is to reduce the station times that exceed the cycle time through move the work element in its station manually without breaking the constraints and restrictions. The result can be seen in Table 4.5.

In the proposed model, the results obtained by running the program in the object “method”. The waiting time in each station can be decreased so that the bottleneck can be minimized automatically. Weighted line efficiency still can be same then the weighted smoothness index can be decreased then automatically the workload also decreased. The program simulation result has given in Figure 4.17 and Table 4.6. It is mentioned that the weighted line efficiency is 98.40% and weighted smoothness index is 7.5 with the total waiting time is 24.15 seconds (Innova) and 62.2 seconds (Fortuner). In the working time 7 hours 40 minutes, the result of simulation model

from the mean life time is sufficient so that the amount of production can be reached from the expected of throughput. The summary of model simulation results can be seen in Figure 4.18. It is mentioned that the throughput is 278 units consisting of 100 (Innova) and 178 (Fortuner). Throughput at each hour only produces 23 and 13 units.

The comparison between current model and proposed model is provided. It can be seen in Table 4.7. Although the level of line efficiency in the current and proposed model are same, but the waiting time in this situation is high so that it causes an unbalance of the station workload which can be represented with the weighted smoothness index. The result has an impact on low production levels. In the proposed model, the cycle time can be minimized. After balanced, the station times have better cycle time so that the waiting time becomes decrease.