# Chapter 4

# Discussion, Conclusion and Recommendation

## 4.1 Discussion

Throughout the period of this project, there were quite a number of difficulties encountered; some were major difficulties causing some slight delays to the project while some were just minor set backs. Firstly the Work Study methodology described in Chapter 2 does not include the method to compare between the present method and the current method when there are variations involved. For example, in this project, the lot size varies tremendously from a single container to one hundred over containers. Other variations include skills of the operator and the fluctuations in run rates from time to time.

An average time per unit was calculated for each activity in each observation and that value was then averaged again among the number of observations made. The overall average time per unit is finally used to estimate the time needed for a standard quantity to allow a fair comparison between the present method and proposed method. However, this method will require a reasonable number of observations in order to get a good estimation of the standard time, which takes into considerations all the variations mentioned above.

As with any changes, there were initially some resistances to the proposed change. For example, there was reluctance to do the work at the trolley versus sitting down at the QA station and the complaint that scanning the labels on sealed bags is more tedious than scanning empty bags. All of these concerns have to be addressed properly in order to gain the long-term co-operation of the QA specialists. The results of the study and the benefits of the proposed change should be shared and explained to every one especially the affected workers. Getting them involved in the data collection process helps in the acceptance of the new methods as the results are shared with them.

Benchmarking helps tremendously by identifying the best practices that can improve the current process quickly. The benchmark is even more effective when the operations being benchmarked are very similar like the case between the Hong Kong factory and Malaysia factory. However, benchmarking could be quite costly especially when travelling is involved.

By following the Work Study method, an in-depth understanding of the processes also helps in identifying other weaknesses of the processes and also other aspects not documented or understood earlier before the study. There were a number of activities performed by the operators that was not known to engineers but were critical to the processes. E.g. it was found that the operators have been performing a "start" and "end" in one single session on the CIM system after each process to save their time walking to the terminal twice. This made the data in the CIM system not reliable for process improvement as the process step seems to be completed within a few seconds only per the data in the CIM system. Thus a proposal was made to

perform an auto-start from one event to the next so that the operator only needs to end the lot after they completed the step.

## 4.2 Conclusion

From the results of the analysis presented in Chapter 3, it can be concluded that the Work Study method although a very old method, can still be effectively used to help improve productivity in the modern manufacturing environment. Even if full automation is involved, Work Study can still help identify inefficiencies within the equipment or process.

In this case, although the method is applied to a limited scope of the EOL processes i.e. only the QA processes, it has helped make a 23% reduction in average cycle time for those processes alone. The cause of the bottleneck was identified i.e. inefficient methods of operation. This project has identified one operation step, one delay step, and one inspection step to be totally eliminated. Bottlenecks at the QA OFI Gate have been reduced significantly, as there are less delay time with the new method and it is more efficient.

Benchmarking has helped tremendously in identifying quick alternatives to the opportunities identified in the Work Study. Overall, this project has achieved its objective to improve the productivity of the QA operations at the packing area. It has also helped in establishing a good understanding of Work Study Methods and there should not be much difficulty to expand this method to other processes that needs improvement.

By continuously improving every process step using this fast, simple and yet effective Work Study method, a factory's efficiency and productivity can be improved quickly and at a very low cost. This will definitely strengthen

its core competency in manufacturing excellence and thus able to help the company gains competitive edge by being more efficient and cost effective.

## 4.3 Recommendation for Future Work

Due to time constraint, this project only managed to explore the potential use of the Work Study methods in one of the many processes involved in the semiconductor manufacturing process. With this as a success story, the Work Study can be expanded to cover other processes including the assembly processes, test processes and end-of-line processes. The results of the study can then be used to define work standards that will help production planning in making better estimation.

The third alternative proposed in 3.4.2 should be explored next in order to provide a similar effective tool (TELXON) to the production operators and also relieving the QA specialists from 100% scanning to random audit. This will involve training the production operators on how to use the tool and establishing an effective audit system to ensure they use the tool in a disciplined manner. QA specialists may have to maintain the 100% scanning for a period of time to gage the effectiveness of production operators using the tool, before going to random audits. This will help in reducing the headcount and thus improve the QA productivity.

Other methodology like the study of workers movement was not explored in this study due to time constraint as it involves a major change in the form of a new layout. From the experience of this project, the workers movement is definitely a potential area for improvement. The layout should be studied in detail, as the current layout is not optimised for efficient flow of material.

Several possible solutions were also identified after going through the systematic questioning technique. These alternatives were not explored further in this project due to cost and time constraint. Some of these solutions are very promising as the ideal solution and should be explored further in future work. For example the idea of scanning all the bar codes in one single image scan of the whole label will help reduce the bar code scanning work by 75%. And this is a feasible method that requires time to program the vision system and cost to set-up the equipment.

Several good practices noted in the benchmarking should be further explored for feasibility of implementation. For example, the practice of strapping the trays immediately after the scanning process will help eliminate handling damage and efficient handling of the materials since they are well secured. In-line Visual Mechanical Gate is also another productivity option to consider once the quality level is up to a certain level.