

CHAPTER 6

CONCLUSIONS

The aim of this thesis was to reduce the lost time during the manufacturing of galvanised steel poles at the case company, Chue Chin Hua. To do so it was necessary to identify the sources of the lost time and measure them so they could be ranked and overall equipment effectiveness was used for this task. The results provided a measurement for each stage detailing what percentage of the total shift time was 'lost'. It also showed that for each stage the major causes of time losses were different. Pareto analysis and cause and effect diagrams helped to focus firstly on what the biggest losses in each stage were and secondly on what were the root causes. Suggested solutions were formed and in some cases implemented for a test period so their effectiveness could be assessed. These results were compared with the original data. The targeted losses were all reduced by the implementation of the solutions. Therefore, the time losses at CCH have been reduced, where possible.

In the cutting stage the planned maintenance times were reduced by 65% or 12.4 minutes per day of operation. The average shift time per day of operation is only 95 minutes so the reduction of 12.4 minutes represents a significant reduction.

In the shearing stage the setup time was reduced by 43%, or 11 minutes per day of operation. The average shift time per day of operation is only 111 minutes so again the reduction of lost time is significant.

In the forming stage the minor stoppages were reduced by 39%, or 44 minutes per day of operation. The savings over a full month total over 19 hours which is a very large reduction. The saving allows overtime to be nearly eliminated. The implementation of SMED would produce further time loss reductions and would benefit other stages which suffer from work in progress starvation due to the length of time consumed by the die-change.

A limitation of this study is that no solutions have been found for the welding or galvanising stages. The welding stage has no machinery and is very labour-intensive. Therefore, the working practices of the employees must be investigated. The welding stage has a high level of efficiency with an OEE of 0.76. As part of the ISO 9001:2000 the galvanising stage has been the focus of much improvement efforts and therefore management did not provide access to implement any solutions.

Although this study was carried out in just one company, the results are should be important to many companies who are in a similar position. The solutions will not be suitable for all companies but the methodology and research procedure can be applied to other companies wishing to investigate and reduce the lost time in their organisations. By following the methodology other companies can identify the sources of lost time and thereby reduce their effects.

One limitation of this study was not including an analysis of the transportation losses between stages in particular when using overhead cranes. As it was explained previously, this was because the plant will be relocated in the near future and a new plant layout including the routing of cranes is already being investigated as part of another study.

OEE is normally used to calculate the efficiency of machinery usage. It was used in this study to measure the time losses and identify the causes. The effectiveness of using OEE to identify and measure losses is reduced in this investigation because of the lack of automation in nearly all the stages at CCH. The labour-intensive processes at CCH result in inconsistent manufacturing times which reduce the usefulness of OEE. It was also necessary to make various assumptions to facilitate the data collection process and the application of OEE in this case study. However, data accuracy is not the most important factor; correctly identifying the biggest sources of lost time is of utmost importance.

6.1 Recommendations and Future Research

1. As mentioned previously, it was not possible to implement all of the suggested solutions as part of this investigation. It is therefore recommended for the company to initiate the other solutions. The company should implement the proven solutions into the other stages where appropriate.
2. It is recommended that the company continue to monitor all processes using OEE or alternative measurement methods in order to pursue a policy of continuous improvement. OEE results from the previous day can be displayed in all departments to allow employees to monitor their own performance.
3. If possible, automated data collection machinery should be installed as this will improve the accuracy of the data, facilitating the generation of suitable solutions.
4. Various assumptions during this study to simplify data collection and also to allow the application of OEE to the labour-intensive processes. The research methodology can be further tailored to more accurately match the individual processes.
5. When the plant is relocated a new study can be performed to include the losses due to plant layout and overhead cranes as this was not investigated as part of this study.
6. Future research can investigate the improved usage and scheduling of overhead cranes during the setup/changeover process in order to reduce time losses.