CHAPTER 7

CONCLUSION

7.1 INTRODUCTION

A systematic approach to production disturbance reduction and thus improvement of efficiency in a manufacturing system is necessary to a company in today’s competitive world. Previous research shows that, only 50-60 % of total production time is used for manufacturing and the rest of the time is wasted due to different production disturbances. Measurement of a manufacturing system is necessary in order to improve the performance. Measurement of data and key figures can give clues in the improvement work. The figures will give an indication, but the best is to measure as correctly as possible.

7.2 OEE IN CASTING PROCESS

The exact definition of OEE differs between applications and authors. It is necessary to develop an organization’s own classification frame work for the losses in the OEE calculation. In casting industry the metal is melted in the furnace, but after solidification, all the molten metal is not converted into product. It is found that, the currently applied
measurement technique to find the rejection rate in most of the plants is based on number or percentage rejects, which is a traditional measure. But, majority of the plants are simultaneously producing different products depending on the customer orders or market demand – the products were of different sizes. Therefore, this measure is inappropriate for these manufacturing environments.

The weight consideration, to find the rejection rate in term of kilogram, is more meaningful and suitable to get better performance review for the plant. Process like casting, yield plays an important role in assessing the overall performance of the firm. A case study has been carried out in a casting industry and REE is calculated with yield as one among the parameter. The result shows the real status of the equipments and the way for the management, where the resources can be deployed towards the improvement process.

7.3 OVERALL PROCESS EFFECTIVENESS

In any manufacturing process, more than one machine is involved. The machines may be arranged in many ways. But, in practice the performance level of individual machines are not identical. Each and every machine differs in their performance level, which results in bottleneck machine. This results in reducing the OEE of the individual machines as well as the OPE of the production process in the manufacturing plant. The OPE value obtained by the traditional method is not representing the real effectiveness of the process.
A new model is developed, in which, yield rate is included instead of quality rate in the OPE calculation.

\[ \text{OPE} = \text{Ap} \times \text{Pp} \times \text{Yp} \]

This model is validated in the tyre manufacturing industry. This model provides a method, to calculate the OPE of the manufacturing process. The MTBF and MTTR concepts are used for the calculation of availability. Performance rate of the process is calculated based on the machine having smallest processing time. The result shows, if a parallel machine is used in the bottleneck machine, the proposed method gives the OPE value more than the doubled the value of series configuration. So, the proposed method is sensitive with respect to the configuration of the manufacturing system.

### 7.4 OVERALL LINE EFFECTIVENESS

In traditional method, at the end of the process, the quality of the finished product is assessed. Ultimately the end result will show only, whether the product produced is good or bad. But it will not give any indication about the machine in which the defect occurs. Due to the non availability of this information, management can not take correct decision to improve the quality in the process. Poor quality rate in particular machine in the line will pull down the quality rate of the entire manufacturing line.

In the proposed OEE model, the Principal Component Analysis is used to convert multivariate quality characteristics measured in one
machine into univariate form. This method considers the bad products that occur at each stage of the line. So, at each stage of the production process, the quality rate is assessed, thereby, the machine producing lesser quality products can be easily identified and it will be much helpful for the improvement process. So, actual quality rate of the line can be obtained very accurately.

This model is more effective in analyzing Overall Line Effectiveness (OLE) using overall line availability, overall line performance and overall line quality, so that OLE provides real effectiveness of the line. So, the problems underlying improvements can be identified perfectly to improve productivity.

7.5 CONCLUSION

The OEE tool can be used in different manufacturing environment, with the suitable accurate measurement system. The OEE figure obtained using these methods shows the real effectiveness of the process or line. This exact figure will be helpful to the management in decision making, regarding the deployment of the resources to improve the performance level of the plant.

7.6 SCOPE FOR FURTHER RESEARCH

In this research, the analysis is explored to show the impact of measuring the performance of the process or manufacturing line by using OEE parameters accurately.
Analysis can be extended to find the impact of Buffer in the line balancing of the manufacturing line.

A mathematical model can be developed by including the effect of cost in the OEE model.

Further research can be extended to integrate process capability analysis with OEE measurement to enhance the quality at a lower cost.