CHAPTER 9

CONCLUSION

9.1 INTRODUCTION

In export-oriented units, productivity improvement is an important area in decision making. Customer satisfaction is the primary concern and hence critical decisions are to be taken on productivity. Manufacturing organizations on the way to gain the competitive position in the global market pay more attention to the implementation of productivity engineering principles. Increasing complexity and magnitude of manufacturing operations have necessitated the need to implement efficient and effective productivity improvement techniques. One important challenge in productivity engineering is the integration and coordination of all activities in the manufacturing. In particular, an important issue is optimizing the manufacturing process to minimize the product cost as a whole.

The present day consumers are highly quality and cost conscious and the market is consumer-driven. The present day consumer demands quality products at very competitive prices (Inman et al., 2011). During the recent years, only the manufacturing industries which have been able to increase productivity have emerged as winners in the competitive market. In order to keep pace with the demand, the manufacturing industries are striving to produce quality products at the most competitive price. Even though efforts are being taken to improve the productivity, the literature survey conducted during the beginning of the doctoral work being reported in this thesis has
revealed that manufacturing industries have failed to use the productivity engineering techniques for exercising productivity improvement. In order to bridge this research and practice gap, during the doctoral work reported in this thesis, the practicality of productivity engineering was investigated to validate its application in the export-oriented units. The hallmark of the doctoral work reported in this thesis was the conduct of the implementation of productivity improvement techniques in sharp tools, western valley corporation and stark motors. After reporting the investigations and productivity improvements carried out in the doctoral work in the previous chapters of this thesis, the contributions and limitations of this doctoral work are presented in this chapter. The avenues for pursuing further research in this direction have also been earmarked in this chapter.

9.2 CONTRIBUTIONS

The contributions of the doctoral work reported in this thesis are highlighted below:

- The literature was surveyed in the domains of productivity analysis, productivity measurement and monitoring, optimization and productivity improvement. The results of this literature survey indicated that productivity engineering can be employed in export-oriented units for achieving continuous productivity improvement.

- Through the conduct of literature survey, the knowledge required to exercise productivity improvement in the export-oriented units was gathered. This knowledge was utilized to adopt productivity engineering techniques for exercising productivity improvement in the manufacturing industries.
During this doctoral work, distinct implementation methods were evolved. These methods were useful for the manufacturers for implementing productivity engineering techniques in the manufacturing industries for exercising productivity improvement.

Implementation was done in three export-oriented units in the manufacturing of textile spindles, doffer and carding cylinder machining and coil winding of turbo motors. The experience of these implementations indicated that productivity engineering principles can be successfully employed in more manufacturing organizations similar to the elaboration done in this doctoral work. The experience also revealed various steps like analysis, trials and optimization of manufacturing process needed for the productivity improvement.

On the whole, the doctoral work reported in this thesis has contributed to three export-oriented units by implementing productivity engineering principles and techniques for the productivity improvement of their products during manufacturing.

9.3 LIMITATIONS

Although the swaging process for the manufacture of textile spindles could be implemented, a limitation of frequent die changing and of non-availability of such indigenous machines limited the manufacturing of the textile spindles to certain range of spindles only.
In the case of doffer and carding cylinder machining, product quantity demand and difference in the machining time of different machines posed a limitation for its complete implementation.

The major hurdle faced in the allocation of winding coil in turbo motors for reducing the scrap during cutting could not be reduced further since the material is imported and the industry has no control in the material weight of the strip being imported.

Despite the above limitations, it is inferred that productivity engineering principles can be employed to achieve productivity improvement and thereby enhance the profit of the products manufactured.

9.4 CONCLUSION

As the globalization of economy is rapidly taking place, there is a stiff competition among various export-oriented units to conquer the global market for their products. Quantity of the product to be exported and the prices of the products are two major factors that determine the share of each player in the global market. The increased complexity of manufacturing and magnitude of business operations among global manufacturers due to greater variability suggests that a new approach is required. Pressures and trends impacting a manufacturer’s ability to effectively manage at global level are increasing. Traditional methods are still necessary but not sufficient to manage the growing multi-dimensional complexity and fast implementation among the various players as briefly indicated by the literature review.
Of late, the manufacturing companies have been exerting concerted efforts to reduce the price of their products. Even striving hard in this direction, they have not been very successful towards reaching their goal of improving productivity and reducing cost of production. Under these circumstances, the literature survey conducted during the beginning phase of the doctoral work reported in this thesis has revealed, that export-oriented units have not been tapping the benefits of applying productivity engineering techniques for exercising continuous productivity improvement. This literature review and subsequent implementations have also revealed that productivity engineering is a very powerful tool. Detailed analysis made to find out the most suited technique for each product and their implementations indicated that productivity engineering is practically implementable in the export-oriented units. The cooperation of the employees and the management support would be the key for successfully implementing the productivity engineering in the export-oriented units to achieve productivity improvement.

In conclusion, it can be stated that the experience of conducting the implementation trials at sharp tools, western valley corporation and stark motors have indicated that productivity engineering techniques are practically implementable in export-oriented units. It is also established that the implementation of productivity engineering will aid to improve the manufacturing process quality and also enhance the productivity of the export-oriented units by bringing in gains to maintain competitive benefit in the global market.

9.5 SCOPE FOR FUTURE WORK

As mentioned earlier in the section of this thesis, on the whole, through the implementation carried out during the doctoral work reported in this thesis the practical compatibility of productivity engineering has been revealed.
Future researchers can further improve the swaging process setup to have more number of stages in the same machine to handle different manufacturing operations and also for different types of spindles or products.

Researchers may also conduct further trials on doffer and carding cylinder machining to improve the machining time by other tooling methods and machine lay-outs with different OR methods.

In the case of turbo motor coil winding, scope for further research is available to indigenously develop a different material in place of imported one and also to maintain coil lengths during spooling instead of weight basis.

Combined effects of profitability and price-recovery can be analyzed for future research to link the work to profitability. Inflation is also an issue. Yet export-oriented products operate in environments where inflation changes over time. Such is the case in the Indian manufacturing environment. Further investigations can be taken up in future research.

Investment, capital/labor ratio, capacity utilization, government regulations, age of plant and equipment, energy costs, workforce mix, work ethics, workers’ fear about loss of jobs, unions’ influence and management are some of the factors which affect productivity as mentioned by Sumanth (1994). These aspects can be considered for future research.

These research results may be used to refine and improve the productivity for the organizations enabling them an effective building block for continuous improvement.