CHAPTER 8

CONCLUSION

8.1 INTRODUCTION

In the manufacturing environment, several strategies are adopted to achieve continuous quality improvement and productivity enhancement while manufacturing products and components. One of such strategies is failure prevention. A few techniques and tools are adopted by the engineers to attain failure prevention. Among them, FMEA technique has found wide adoption. Though the principles behind FMEA are facilitating the organizations to attain failure prevention, the actual implementation in real time situation suffers from certain hurdles. Two of such hurdles have been overcome by pursuing the doctoral work reported in this thesis. The first hurdle is the failure to consider uncertain situations while applying FMEA technique. This hurdle is resolved by infusing fuzzy elements in the FEAROM model that has been developed during this doctoral work. The fuzzy subset is incorporated in the formula used to calculate RPC and CFM of FEAROM model.

The second hurdle is that, FMEA is a general model and hence the effectiveness of implementing it in different companies varies. This hurdle has been overcome in this doctoral work by developing the FEAROM model which is designed exclusively to choose the best mould design which will facilitate the continuous quality improvement and productivity enhancement in the case of producing castings in foundries. An interesting observation of this doctoral work is that, the ranking of mould designs was varying while
applying traditional FMEA and FEAROM. After designing, the practicality of FEAROM model was investigated in three foundries. After checking the validity of the FEAROM model by applying MFTOPSIS method hybrid with AHP, the doctoral work was concluded. The concluding aspects of this doctoral work are narrated in the subsequent sections of this chapter.

8.2 CONTRIBUTIONS

As mentioned in the several parts of this thesis, the primary contribution of this doctoral work is the FEAROM model. This contribution is accompanied by means of the procedure which is required to implement FEAROM model. As mentioned earlier, the application of FEAROM model has been found to possess potential to facilitate the engineers and managers for selecting the best mould design in foundries. The selection of the best mould design will support engineers and managers working in foundries to achieve continuous quality improvement and productivity enhancement in the case of producing castings in the foundries.

The secondary contribution of this doctoral work is MFTOPSIS method hybrid with AHP. Using this approach, the validity of the results obtained by applying FEAROM is checked. This provision is required to check validity that enhances the confidence of engineers and managers to work in foundries to rely upon the results obtained by applying FEAROM. A positive feature of MFTOPSIS method hybrid with AHP is the consideration of multi criteria in making decisions. Thus, FEAROM model was scientifically and practically examined for its accuracy and effectiveness.

8.3 LIMITATIONS OF THE DOCTORAL WORK

While implementing FERAOM in the three foundries, FMEA team could not be formed due to high turnover of employees. Hence, the knowledge gained by the managers only could be adopted while applying
FEAROM in the three foundries. Because of this condition, it is likelihood that knowledge gained by the foundrymen is not accommodated while studying the practicality of FEAROM.

Another limitation of this doctoral work is that, the practicality of FEAROM was examined only in three foundries. This limitation occurred due to paucity of time in implementing FEAROM. This limitation is overcome by carrying out the validation of FEAROM model by applying MFTOPSIS method hybrid with AHP.

8.4 SUGGESTIONS FOR FUTURE WORK

Although the practical validity of FEAROM has been established while carrying out this doctoral work by applying MFTOPSIS method hybrid with AHP, its effectiveness can be further checked by forming FMEA team consisting of managers and employees in foundries and gathering data, information and knowledge. These data, information and knowledge may be fed into FEAROM model and its effectiveness in choosing best mould design that will aid in achieving continuous quality improvement and productivity enhancement in the case of producing castings in foundries can be examined.

In future, researches involving foundries producing castings using specific methods and new methods may be involved to check the practicality of FEAROM model. This kind of researches may examine the differences in the effectiveness of applying FEAROM in foundries in different methods like centrifugal castings, squeeze casting and die casting.

8.5 CONCLUDING REMARKS

Currently in the traditional foundries, mould designs are examined by applying trial and error based approach. According to this approach, a mould design is made on receiving the drawing of the component whose casting is to
be produced. This mould design is applied in the foundry practice. The castings produced using this mould design are examined. Based on the results of this examination, the mould design currently used is refined and modified to produce a new mould design. The new mould design thus obtained is subjected to again examination. This cycle continues till optimality in the mould design is achieved. This approach consumes longer time and high cost towards obtaining a mould design that will aid to achieve continuous quality improvement and productivity enhancement in the production of castings in foundries. This deficiency is overcome by carrying out the doctoral work reported in this thesis which has resulted in the contribution of FEAROM model.

FEAROM model is incorporated with fuzzy subset that enables the consideration of uncertainty while quantifying the indices namely S, O and D. Besides a procedure for validating the FEAROM model was developed. This procedure has been incorporated with the MFTOPSIS method hybrid with AHP. This MFTOPSIS method hybrid with AHP contributed in this doctoral work facilitate to check the validity of the FEAROM model. Thus, the decision making under multi-criteria situations has been made possible by making use of FEAROM model for choosing the best mould design of the casting by consuming least time and cost. The validation of FEAROM by using Modified Fuzzy Technique for Order Preference by Similarity to Ideal Solution (MFTOPSIS) method incorporated with Analytic Hierarchy Process (AHP) method confirms the usefulness of FEAROM in choosing the optimal mould designs in foundries. At this juncture, the thesis is concluded by stating that, FEAROM model will facilitate the foundry engineers and managers to choose the best mould design that will aid in achieving continuous quality improvement and productivity enhancement in the case of producing castings in foundries.