CHAPTER 6

CONCLUSION

6.1 CONCLUSION

In the present work, the newly tailored four types of AA6061-Boron Carbide metal matrix composite are developed through stir casting technique by varying the weight percentage of Boron Carbide as 0%, 5%, 10% and 15%.

- XRD results showed the presence of $B_4C_p$ in AA6061 matrix. From the Optical Microscopy test, it is ensured the distribution of Boron Carbide particle in the aluminium matrix. From the Scanning Electron Microscope (SEM) analysis, it is observed that the distribution of reinforcement of aluminium matrix is uniform throughout the composite.

- Density of Aluminium Boron Carbide Composites are found to decrease gradually due to the addition of Boron Carbide particle in the AA6061 matrix.

- Macro hardness of Aluminium Boron Carbide Composite is found to gradually increase due to the addition of $B_4C_p$ particle to AA6061.

- In cold upsetting deformation for both the aspect ratio 1 and 0.5, the true axial stress, true hoop stress and hydrostatic stress values gradually increased due to the presence of Boron Carbide particle in the composite. The maximum stress values were obtained in
15% of Boron Carbide particle and minimum stress values were obtained in 0% of Boron Carbide particle in the composite.

- In the overall observation of three types of composite (AA6061-5% B₄Cₚ, AA6061-10% B₄Cₚ and AA6061-15% B₄Cₚ) during Electric Discharge machining process, the current and pulse on time influenced more on material removal rate and pulse off time did not influence in a significant way on the material removal rate in all types of Aluminium Boron Carbide Composites. Tool wear rate influenced significantly due to an increment in current. The tool wear rate remained constant on increment of pulse on time and pulse off time. In the overall observation, the minimum surface roughness value is obtained at a minimum current and pulse on time value in all the types of Aluminium Boron Carbide composites.

- The percentage of error between the predicted value of response factors and the experimental value of response factors obtained through confirmation experiments is within 5% in all the three types of Aluminium Boron Carbide Composites.

- The results of ANOVA and the validation experiments confirm that the developed mathematical models for material removal rate, tool wear rate and surface roughness excellently fit and predicted values of these response factors are close to the experimental values with 99% confidence interval.

- When comparing two optimization techniques, Genetic algorithm yields the better optimum value for material removal rate, tool wear rate and surface roughness than the Desirability Function Approach.
• The mathematical models developed may be helpful to the manufacturers while selecting the machining parameters during machining the three Aluminium Boron Carbide Composites (AA6061-5% B₄C₉, AA6061-10% B₄C₉, AA6061-15% B₄C₉) to achieve a specified value of material removal rate, tool wear rate and surface roughness.

6.1 SCOPE FOR FUTURE WORK

• The experimental machining parameter analysis for AA6061 would be done in future.

• The present study investigates only the effect of current, pulse on time and pulse off time on material removal rate, tool wear rate and surface roughness. In future, additional machining parameters such as fluid pressure and voltage may be included in the machining process.

• Two optimization techniques such as desirability function approach and genetic algorithm were used to obtain optimum machining parameters. In future, other optimization techniques such as Particle Swarm Optimization, Ant colony Algorithms may be used for optimization process.