CHAPTER 9

CONCLUSION

9.1 CONCLUSION

In the present work, new aluminium alloy – aluminium oxide / silicon carbide composites of different compositions have been developed using a new combination of vortex method and pressure die casting technique. The properties of the aluminium alloy are improved by hard ceramic particulate reinforcement of Al₂O₃ and SiC.

The pin-on-disc tests have revealed that the wear increases with normal load and sliding velocity. The wear for the plain LM24 aluminium alloy is higher than the aluminium alloy - aluminium oxide composites which is higher than that of the aluminium alloy - silicon carbide composites. The wear decreases with the increase of particle reinforcement. The coefficient of friction of the plain LM24 aluminium alloy is higher than the aluminium alloy - aluminium oxide composites and which is higher than that of the aluminium alloy - silicon carbide composites. The coefficient of friction decreases with the normal load, sliding speed and with the increase of particle reinforcement. The wear and coefficient of friction of the entire specimens are lower and the newly developed aluminium alloy - aluminium oxide / silicon carbide composites are very much suitable for engineering applications.

The drilling tests have revealed that the surface roughness decreases with the speed and increases with the feed. The surface roughness values of the drilled hole surfaces of the plain LM24 aluminium alloy are lower than that of the aluminium alloy - aluminium oxide composite, which in turn is lower than that of the aluminium alloy - silicon carbide composite. The surface roughness
increases with the increase of particle reinforcement. The surfaces of the entire drilled hole are of a high quality surface finish. The drill tool wears increases with the speed and the feed. The drill wear of HSS tool on drilling of the plain LM24 aluminium alloy is lower than the aluminium alloy - aluminium oxide composite, which in turn is lower than that of the aluminium alloy - silicon carbide composite.

The milling tests have showed that the surface finish improves with increasing speed and decreasing feed. The surface roughness values of the milled surface of the plain LM24 aluminium alloy are lower than that of the aluminium alloy - aluminium oxide composite, which in turn is lower than the aluminium alloy - silicon carbide composite. The surface roughness increases with increase of particle reinforcement. The surface roughness of the entire specimens is excellent and comparable to that of a finish machining processes such as grinding or lapping, thus eliminating the costly finishing operations. The end mill tool wears increases with the speed and feed. The end mill wear on milling of the plain LM24 aluminium alloy is lower than the aluminium alloy - aluminium oxide composite, which in turn is lower than the aluminium alloy - silicon carbide composite.

The EDM studies on aluminium alloy - aluminium oxide and aluminium alloy - silicon carbide composite show that the material removal rate and the surface roughness are greatly influenced by the current and particle reinforcement. The material removal rate increases with an increase in current and decreases with particle reinforcement. The material removal rate of the aluminium alloy - aluminium oxide composite is lower than the aluminium alloy - silicon carbide composite, which is lower than that of the plain LM24 aluminium alloy. The surface roughness of the aluminium alloy - aluminium oxide composite is lower than that of the aluminium alloy - silicon carbide composite, which is lower than that of the plain LM24 aluminium alloy. The
aluminium alloy - aluminium oxide / silicon carbide composite can be machined by electrical discharge machining.

In summary, new aluminium alloy – aluminium oxide / silicon carbide composites are developed using a new combination of vortex method and pressure die casting technique with improved properties. These new metal matrix composites can be used for many engineering applications, especially in the automobile and aerospace industries. The Tribological studies, Drilling Studies, Milling Studies and Electric Discharge Machining studies reveal that the newly developed aluminium alloy - aluminium oxide / silicon carbide composites do have enhanced performance characteristics to process easily for further engineering applications.

9.2 FUTURE WORK

- Different aluminium based die casting alloys can be used as matrix material.
- Different particle sizes of ceramic particles can be used for reinforcement.
- Different stir casting and die casting process parameters can be applied.