CHAPTER 6

CONCLUSIONS AND SCOPE FOR FUTURE WORK

6.1 CONCLUSION FROM EXPERIMENTAL STUDIES

A centrifugal atomizer based evaporative cooling system with necessary instrumentation has been fitted to an industrial shed and the performance has been studied by varying various parameters. The experiments are carried out on 18 days spread over the month. From the experiments (Chapter 4), the following conclusions are obtained.

(i) The proposed centrifugal atomizer based evaporative cooling system is capable of cooling larger air volumes in hot tropical Indian climates, and are best suited for providing cooling to large industrial sheds.

(ii) The system is found to reduce the interior temperature by 4°C to 12°C when compared to the outside ambience. Higher cooling is observed when the outside ambient temperatures are higher and outside relative humidity (RH) are lower.

(iii) Among circular, triangular and rectangular breaker strips, rectangular strips are found to offer better performance.

(iv) Increase in spinning disc diameter is found to increase the system performance. When the disc diameter is increased from 280 mm to 330 mm, the evaporation efficiency is found to increase from 30.89 % to 75.67 %.
(v) Higher disc speed is found to increase the system performance. When the disc speed is increased from 1000 rpm to 3000 rpm, the evaporation efficiency is found to increase from 56.79 % to 79.92 %.

(vi) With the increase in evaporation chamber length, the system performance increases. When the chamber length is increased from 1.219 m to 1.828 m, the evaporation efficiency is found to increase from 35.34 % to 63.53 %.

(vii) Increase in air flow rate increases the performance to a level and then drops. The optimum air flow rate obtained for the present system is 0.5749 kg/s.

(viii) Increase in supply water flow rate increases the performance to a level and then drops. The optimum supply water flow rate obtained for the present system is 0.0080 kg/s.

6.2 CONCLUSIONS FROM OPTIMIZATION STUDY

Using Taguchi method, the optimum parameter settings that provide larger difference between the outside air DBT and room air average DBT are studied. Then using ANOVA, the influence of each parameter on system performance is analyzed. From the study (Chapter 5), the major conclusions arrived are as follows.

(i) Among the parameters, disc speed, air flow rate and water flow rate are found to influence the system performance by 33.30 %, 21.44 % and 19.10 % respectively.

(ii) The other parameters, viz., breaker strip geometry, disc diameter, breaker strip orientation and chamber length are found to have lesser influences (<5 %).
(iii) When compared to the original system (Experiment -1), the optimized system is found to provide 32% higher performance.

6.3 SCOPE FOR FUTURE WORK

The current study focuses on implementation of centrifugal type evaporative air cooler for a room size of $3 \times 10$ m. Such system with much larger spaces can be tested. Large industrial sheds may demand more than one such cooler. Optimum locations can be analyzed in such cases.