CHAPTER 7

CONCLUSION AND SCOPE FOR FUTURE WORK

Energy conservation, wherever possible, has become essential due to various factors. Energy conservation in industrial compressed air systems has been taken for the present research work. In general, the compressed air requirements (load) can be classified into three categories, constant or near constant load, varying load at a specific pattern and randomly varying load. Energy conservation can be achieved by lowering the minimum pressure settings, reducing the pressure bandwidth, by changing the storage tank size and other factors.

Arriving optimum values for each parameter which will result in minimum overall energy consumption under the given load conditions is the task taken in this research work. An iterative algorithm has been developed when the load of the compressed air system is almost constant. A dynamic control algorithm and a dynamic controller have been developed when the load is not constant but, varies in a known pattern. A fuzzy logic based approach has been attempted when the load pattern in uncertain or random.

These approaches have been applied to various industrial compressed air systems. The results are presented and discussed. In addition, a totally new management based approach, a combination of Target Costing and Reengineering has been applied for a textile yarn manufacturing industry. The major conclusions arrived out of these four studies are presented here.
7.1 CONCLUSION

An iterative algorithm developed for almost constant load has been tested. Data from a medium scale engineering industry having two compressors each of 11.36 SCMM and, almost constant compressed air consumption of 15.51 SCMM has been used for simulation.

i. Under existing conditions, an energy conservation possibility of 6.34% has been observed by reducing the minimum pressure setting and pressure bandwidth reduction.

ii. The algorithm can be used for arriving optimum storage tank size which can keep the number of “ON-OFF” or “Load-Unload” cycles per hour within limits.

For dynamically varying loads, however at certain particular patterns (not in random), a dynamic controller along with dynamic control algorithm is developed. This methodology has been simulated in the same industrial conditions. The dynamic controller could able to provide additional savings of 0.75% to 2.25% for various receiver or storage tank sizes.

The fuzzy logic based approach has been developed for the uncertain or randomly varying loads. A textile industry having a 0.925 SCMM compressor has been used for simulation. The compressed air consumption varies at random over a range of 0.42 to 0.84 SCMM over the time. The fuzzy based approach is able to provide optimum parameter settings under varying operating conditions. For specific case under simulation, with optimum parameters, the possible energy savings are 7.18% when compared to the original settings with which the industry is functioning at present.
The target costing and reengineering approach has been applied to a textile industry manufacturing yarn. The industry has four compressors (0.833 SCMM, 0.833 SCMM, 1.535 SCMM and 2.152 SCMM). The average compressed air consumption is about 1.6 SCMM. By applying the target costing and reengineering combined approach developed, upto 70% reduction in energy cost has been achieved when compared to the existing practice.

In an overall sense, sizable energy conservation opportunities exist in compressed air systems which can provide 3 to 70% savings in energy cost of compressed air.

### 7.2 SCOPE FOR FUTURE WORK

The present study can be extended in the following directions.

i. In the present study only major parameters like compressor pressure settings, pressure bandwidth and receiver size are considered. The effect of intercoolers, after coolers, compressed air drying systems, distribution elements etc., can be included and studied.

ii. As industries do not permit to do the physical modifications and test various concepts, most of the concepts are proved by means of simulation. All these concepts may be tested under real industrial environment.