CHAPTER 10

SUMMARY AND CONCLUSIONS

10.1 BROAD FINDINGS OF THE PRESENT RESEARCH WORK – ITS INDUSTRIAL AND COMMERCIAL IMPORTANCE

Evaluation of comfort characteristics and using the estimation of ‘3T’ Values can help textile industry to produce value-added fabrics and these when stamped ‘3T Valued’ can fetch premium price in commercial or consumer market, in view of the phenomenal changes those can be brought in the Thermal Insulation Value, TIV and Moisture Transport, MT by chemical processing.

In this research study, a novel attempt of bleaching using the combination of SPB and H$_2$O$_2$ on mercerized cotton fabric at three different concentrations has been carried out. At the same time, the effect of 100% SPB bleaching on mercerized and un-mercerized cotton fabrics was evaluated. In the textile wet processing industry, the conventional H$_2$O$_2$ bleaching process has certain limitations such as, low tensile elongation and tensile resilience especially at higher concentrations, leading to drastic reduction in Total Hand Value, THV. To overcome the above, the combination of SPB & H$_2$O$_2$ and 100% SPB processes were tried and obtained successful results.

10.1.1 Effects of ‘Cool Finish’

Novel statistical models of 3T$_1$ & 3T$_2$ have been derived using tactile, thermal and moisture transport characteristics of the sixteen fabric samples. Based on the THV, 3T$_1$ & 3T$_2$ values, the statistical analysis showed that there is high correlation of test results, and the fabric samples were
ranked accordingly. A comprehensive evaluation of $3T_1$ & $3T_2$ highly reflects on tactile, thermal and moisture transport characteristics of finished fabrics. There was a need for measuring tensile modulus at 200 gf tensile load because, the extension obtained in the specimen at 500 gf load is quite high (7 to 8%). Hence, it is suggested that tensile characteristics below 5% extension corresponding to 200 gf tensile load can give a better picture about the tactile nature of the fabric sample.

10.1.2 Effects of Bleaching with Sodium Perborate (SPB)

The effluent characteristics of 100% SPB bleaching gave eco-friendly test results, with respect to BOD, COD, Suspended Solids (SS) and Chlorides. There was significant reduction in Total Dissolved Solids (TDS) in comparison with conventional hydrogen peroxide bleaching. It was also found that bleaching using 100% SPB has benefits in view of the enhancement of handle and comfort characteristics along with technical advantage of SPB.

10.1.3 Effects of ‘Lotus Finish’

The study of tensile characteristics tested on KES revealed that tensile resilience decreased with increase in ‘lotus finish’ concentration. There was increase in maximum elongation and thus decrease in tensile modulus for higher concentration of finish. The marginal decrease of the Total Hand Values (THV) was due to the factors such as, increase in shear rigidity (G), bending rigidity (B), geometric roughness (SMD) along with drop in Compressional Resilience (RC). However, the contribution to the marginal reduction in THV did not drastically alter the handle characteristics of the nano-lotus finished fabrics. The air-permeability and whiteness index (CIE) decreased with higher add on of nano-lotus finish.
Fabric finished with 25 gpl finish concentration exhibited all-round optimum performance with respect to the fabric properties, such as tensile modulus, thermal insulation value, moisture transport and air-permeability when compared with the control fabric. The Total Hand Value was equal for 15 gpl and 25 gpl finish concentrations.

25 gpl finish fabric sample scores the best ranking, as per 3TV, the newly derived expression for comprehensive evaluation of handle and comfort characteristics.

10.1.4 Effects of ‘Nano Lotus Finish’ and ‘Combined Cross linking ’

Fabrics exhibited all round multi functional characteristics compared to the conventional soil release finished fabrics.

10.2 SUGGESTIONS FOR FUTURE WORK

Researches have been done on handle characteristics of textiles, as well as comfort characteristics more in the former and less in the latter area of study. Interestingly, only a few are underway for comprehensive evaluation of these characteristics. To bring handle and comfort property on a common ground, modeling is necessary by choosing a few important properties. In this regard, Total Hand Value (THV) as determined by Kawabata Evaluation System (KES) is of immense help in representing handle characteristic of a woven fabric irrespective of the material used.

The impetus for future research in this subject area arises because of its practical and physical significance to fabric manufacturers, processors and last but not the least, the marketers and consumers.

Fabric samples of blends and finer cotton fabrics can be studied for 3T modeling, regression analysis and ANN modeling.