CHAPTER 12

SUMMARY AND CONCLUSIONS

The overall contribution of this thesis is the development of a personal computer based torsional rigidity analyser. The experimental techniques developed along with the analyser was utilized in carrying out studies on novel techniques developed in producing yarn of better torsional stability which also formed an important contribution of this thesis along with other studies. A list of the major contribution of each part is summarized below.

12.1 SUMMARY

1) The design, development and fabrication of a personal computer based torsional rigidity analyser based on digital technology was the major objective of this research, and this was successfully executed. The equipment developed was unique in that it combined two techniques into one equipment namely the torsion pendulum technique and the torsion balance technique. The measurement of breaking twist angle could also be accomplished.

The computerisation involved in the torsion pendulum mode utilized a photo electric sensor in conjunction with the timer chip of the personal computer in order to determine the time period of the torsion pendulum made by using the textile fibre. The time period thus determined was then used by the software developed to calculate the torsional rigidity of the textile fibre. Different textile fibres were tested including lyocell fibre which is becoming popular now.

The computerisation involved in the torsion balance mode utilized two stepper motors, a standard torsion wire attached in series
with the textile yarn whose properties are to be determined, an equilibrium pointer and two inductance proximity sensors. When the bottom motor twisted the specimen under test, the shift of the equilibrium pointer was sensed and this made the software developed step the top motor back to bring the pointer to the original position. The number of steps moved by the top motor gave the torque developed.

Suitable software was developed to give torque-twist curve, hysteresis curve and torque-untwist curves.

The equipment as designed, is the only one of its kind with so many features, excellent accuracy, repeatability and reliability.

The important characteristic of the above Torsional rigidity analyser developed is that this equipment uses digital signals when compared to the analog signals used by other microprocessor based analysers and the above characteristic makes it more reliable.

2) A novel method of measuring residual torque characteristics of cotton yarn using polyester monofilament was devised.

3) A novel technique of insitu steaming of ring spun yarns was put forth. A pilot plant was made and the insitu steamed yarns produced were compared with the control samples for their residual torque characteristics. The reduction in the residual torque characteristic was an interesting finding which was reported. Technology has abridged several machine capabilities into one in the past 50 years. There were days when between the sliver and the yarn there used to be four speed frames. Today one speed frame can do the job of four. Sliver to ring spinning directly is also a reality. In future, similarly it is hoped that insitu steaming will be an alternative to the combination of ring frame spinning and the subsequent autoclave steam setting of cotton yarns.

4) A novel technique of insitu gassing of ring spun yarns was put forth. A pilot scale plant was designed to carry out gassing on the ring frame
itself. Insitu gassing resulted in decreasing the torsional property of the yarn. It also reduced hairiness.

5) A contribution in the form of a study of the torsional property and breaking twist angle of the relatively new fibre, Lyocell was made.

6) A survey of residual torque characteristics of yarns used in Tirupur was carried out. It is believed that in the years to come, this and similar work will lead to the creation of new standards in the measurement and presence of residual torque in cotton yarns.

12.2 SCOPE FOR FUTURE WORK

Though all the objectives of this approved research work has been executed, there are several new and interesting ideas which have cropped up which though were beyond the scope of the present research, still demands and projects opportunities for further research. The instrument developed and the ideas of insitu steaming and singeing give rise to several new ideas for future work.

1) A survey of the residual torque characteristics of cotton yarns of various counts.

2) A study of the effect of different spinning parameters and different types of cotton on the residual torque values.

3) A study on the residual torque characteristics of sewing threads.

4) A study of the residual torque values of different cord and braids.

5) Further studies on insitu steaming and its comparison with conventional steam setting.

6) Further studies on insitu gassing and its comparison with conventional gassing.
7) Studies on the possibility of converting the pilot scale plants of insitu steaming and insitu singeing into a full scale plant.

8) Studies on the effect of temperature on the torque-twist relationship of synthetic fibres and yarns.

9) A study of the residual torque of cotton crepe yarns and its effect in producing the crepe effect of fabrics.

10) A study of the twist blockade of the yarns with different torsional rigidities, and surging in draw textured yarns utilizing the torsional rigidity analyser is warranted.

11) The effect of temperature and humidity on the torsional rigidity of the yarns utilizing the analyser particularly for polyester and cotton is also required.

12) Use of this apparatus for on-line monitoring of yarns during processing can also be explored.

13) Torsional rigidity of yarns and residual torque should be incorporated as one of the inputs for prediction of spirality of plain weft knitted fabrics in artificial neural networks.

14) A study of the torque of engineering materials such as composites, metallic fibres, plastics and other non ferrous materials. Also the effect of additives, resins, fillers and lubricants on the torsional properties of textile materials can be studied with the equipment developed.