CHAPTER VII

CONCLUSIONS AND SCOPE FOR FUTURE WORK
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5.1 Conclusions

In the present work extensive study was made on sheath-core yarns and fabrics. The major findings were as follows:

1. The sheath-core yarn’s strength was observed more than 100% cotton yarn strength by introducing more than 15% nylon/polyester filaments at the core. The strength was increased proportionately with the percentage of synthetic filaments at the core.

   In the case of air-jet yarns introduction of synthetic filament up to 25% at the core did not improve the CSP and single yarn strength as compared to 100% cotton yarn strength.

2. Introducing synthetic filament beyond 25% at the core increased the breaking elongation percentage of sheath-core ring yarn by approximately 6% as compared to 100% cotton yarn but when core percentage was increased and reached to 40% the elongation of the sheath-core yarn was increased to four to five times more with polyester sheath-core yarn and five to six times more with nylon sheath-core yarn as compared to 100% cotton yarn. There was no difference of elongation being observed between air-jet and ring sheath-core yarns.

3. Energy to break of sheath-core yarns were observed significantly high when polyester core percentage was 25% and above. The energy to break of polyester sheath-core yarn was 10 to 16 times more than that of 100% cotton
yarn and with nylon it was 9.5 to 15 times more than that of 100% cotton yarn. No difference of energy to break being observed between nylon and polyester sheath-core yarns. With air-jet yarns same trend was observed like ring sheath-core yarns and the energy to break was improved and observed 6-8 times higher than that of 100% cotton yarn when 40% synthetic yarn was introduced at the core.

4. As regard yarn evenness and initial modulus no trend being observed with sheath-core yarns prepared on ring frame/air-jet systems.

5. With the increase of synthetic filament percentage at the core no trend of total imperfection values were observed on sheath-core yarns but air-jet sheath-core yarns were showing less imperfection values than that of ring sheath-core yarns.

6. It was observed that cotton could completely cover the core part of the yarn in both the systems of spinning up to 25% synthetic filaments at the core.

7. In case of all ring sheath-core yarn fabrics it was observed that percentage increase of filament at the core beyond 15% increased the warp strength significantly. Ring-spun sheath-core yarn fabrics were 20-26% stronger than air-jet sheath-core yarn fabrics irrespective of denier and type of filaments at the core.(crimp/drawn).

8. All the ring sheath-core yarn fabrics were having higher tearing strength than that of 100% ring-spun cotton yarn fabric. It was observed that as the percent of filament was increased at the core, tearing strength of ring-spun fabrics were increased proportionately and significantly. No differences in tearing strengths being observed between ring-spun sheath-core yarn fabrics and the air-jet sheath-core yarn fabrics though the air-jet yarns were weaker than ring-spun sheath-core yarns. Hence using weaker air-jet sheath-core yarn in weaving same fabric properties can be achieved as that of ring spun fabrics.

9 Up to 25% synthetic filament at the core of sheath-core yarn the fabric elongation % did not show any appreciable differences with 100% cotton fabric. But when filaments were 40% at the core appreciable increase of elongation percentage was observed (5-5.4% with nylon and 4-4.5 % with polyester).
Sheath-core yarn fabrics with nylon at the core showed higher elongation to the tune of 1% than the fabrics made with polyester sheath-core yarn.

10. In the case of ring-spun sheath-core yarns it was observed that yarns with higher percentage of synthetic filaments at the core were having higher abrasion resistance. Loss of weight due to abrasion was lower with ring-spun yarn fabrics as compared to air-jet yarn fabrics.

11. When filaments at the core was increased from 15% to 40% at the core of ring sheath-core yarn the air permeability was decreased to 30% with polyester filament and 40% with nylon filament as compared to 100% cotton fabric. Air-jet sheath-core yarn fabrics showed 10% lower air permeability than that of 100% cotton fabric. Ring sheath-core yarn fabrics were 10-20% more permeable than air-jet sheath-core yarn fabrics.

It was observed that nylon sheath-core yarn fabrics were 10% less permeable than polyester sheath-core yarn fabrics in both the spinning systems i.e. in ring and air-jet systems.

12. It was also observed that crease recovery values of air-jet sheath-core yarn fabrics were far higher than that of ring-spun sheath-core yarn fabrics when polyester/nylon filaments were more than 15% at the core.

13. Absorbency was reduced with increase of filament percentage at the core. Nylon sheath-core yarn fabrics absorbed 8 to 16 % more water than the polyester sheath-core yarn fabrics in both the spinning systems.

It was also observed that absorbency percentage of air-jet core yarn fabrics was more than the ring core yarn fabrics to 20 %. This was because of low compactness of yarn by the wrapper fibres present on the air-jet sheath-core yarn than the strong helical bonding of fibres of ring sheath-core yarn.

14. It was observed that as % of polyester/nylon filaments were increased at the core of yarn the total hand value of the fabrics were also increased for both the spinning systems.

When the Numeri values of polyester and nylon sheath-core yarns were analysed and compared with 100% cotton ring spun yarn it was observed that
cotton was having highest MIU(Coefficient of friction) value and low SMD(Geometrical roughness) value. When filaments were increased it was observed that fabrics were reducing their MIU values and increased the SMD values.

Air-jet sheath-core yarn fabrics showed higher Total Hand Values than that of the ring sheath-core yarn fabrics. This was because of higher Fukurami value(fullness of fabric) along with higher Koshi .(firmness of cloth) value with higher Numeri(roughness) value of the air-jet sheath-core yarn fabrics over the ring sheath-core yarn fabrics.

Denier of polyester/nylon filaments ranges from 44 to 70 at the core was showing comparable total hand value with 100% cotton woven fabric where 70den sheath-core yarn fabric showed best total hand value prepared from both the ring and air-jet systems.

15. It was observed that single yarn strength established a strong correlation with fabric tensile strength and tearing strength where correlation values were more than 0.8. Uniformity ratio of yarn strongly influenced tensile strength and the tearing strength of the fabrics. Energy to break of yarn and fabric established a correlation of higher side to the tune of 0.75. Yarn elongation and fabric elongation established a medium correlation to the tune of 0.6. More over an equation was available where feeding of yarn property could predict the fabric property in limited sections of yarn and fabric properties.

5.2 Scope for future study

1. High performance fabrics can be made using high tenacity synthetic fibres at the core of sheath-core yarn and their performance can be compared with 100% cotton yarn as well as intimate blended yarn.

2. Different finishes can be applied on sheath-core yarn/fabric and fabric properties can be studied and compared with 100% cotton or intimate blends of cotton/synthetic fibre fabrics.