

Chapter 5

Conclusions

5 Conclusions

5.1 Major Outcomes

The concept of having one system of warping for all kinds of yarn, especially for apparel sector, has been always looked for. In the research work presented here an attempt has been made to find the solution to the problem. Designing a new mechanism requires lot of time and huge resources. So normally newer mechanical concepts are developed by machinery manufacturers. There were many time spans of total despair and exhilarations. After a lot of deliberations, design could be developed by which warping concept can be changed. Following are the major conclusions of the work.

- (i) Most of the published work discuss about the process of warping, function of various parts, process parameters etc. There are few patents, filed in last two decades, which describe how an alternative can be worked out.
- (ii) The current work presents a possibility to design a suitable system for warping beam by which one may warp patterned threads on a direct warping machine. This can replace the need for having two different warping systems. Only direct warping machine can carry out warping for both types of yarn – monocolored and patterned.
- (iii) A manual model with simple raw material was prepared which served as the starting point for the whole thought process.
- (iv) Three different design solutions have been offered. The first solution failed to provide required solution. Remaining two are capable of providing the solution as stated above.
- (v) The structure of the whole beam, used for warping, has been redesigned so as to have provision for adjustment of the section width. The barrel of the beam is divided in to two parts – outer barrel and inner barrel. Inner barrel fits inside the outer barrel.

- (vi) The whole width of the beam is further divided in to various segments so that the requirements of different section widths can be made available. As first and the last sections will contain selvedge threads, both are to be adjusted separately. This has been enabled by having flanges on both sides of beam rotatable. For remaining threads the section width will be same for a given set up of creel. This is achieved by having newly designed separator plates.
- (vii) The newly designed beam is provided with section width adjustment for separator plates for most of the situations one comes across for apparel fabrics. The section width for all plates should be set at the same value preferably by a simple method. This has been carried out by providing two different solutions in the present work.
- (viii) In the first successful attempt, the beam has provision to adjust the section widths in segments of fixed length for a given situation. Currently a width of 150 mm is used in the work but the same can be kept otherwise too. Again there is no limit to which one can extend the number of segments because each successive segment has an incremental value of section width adjustment. Detailed calculations have been generated to utilize the design for a given set of warp. Two actual examples have been used in the work to prove the point.
- (ix) In the second successful attempt, the beam has a provision to adjust the section width with the help of a continuously increasing value of the pitch of the inner barrel. This will enable any section width adjustment without changing much of the set up. Again detailed calculations have been generated to take care of various situations.
- (x) All three designs were made using standard mechanical CAD software NX offered by Siemens PLM company. While designing with CAD software, actual dimensions are used as far as possible to get the idea about the workability. Also 3D CAD design is generated to fine tune the whole exercise. Again motion simulation tool of the

software is tried to check the model in detail for virtual mode running.

- (xi) A prototype or 3D printed version of the second successful design is also generated. This model is a scale down version of the actual warping beam. This is due to the limitations imposed by the capacity of the 3D printer facility. Still the 3D printed version very ably demonstrates the concept in real life way and provides some degree of confidence before actual manufacturing of the full beam is to be taken up.

5.2 Scope for Future Work

- (i) The current work has been done using CAD models and a prototype. The beam can be manufactured and can be run on the existing warping machine.
- (ii) The attempt which failed can be further explored to see any possibility of making a working design from the same.
- (iii) The proposed design can be extended for different dimensions on very low and very high sides to check feasibility.