

1 Weaving

The history of weaving dates back to ancient times, when human beings used woven fabrics to cover themselves. There are evidences that Egyptians made woven fabrics some 6000 years ago and silk became economically important in China 4000 years ago [1]. It is the most commonly used technique of fabric manufacturing. The woven fabrics have a huge number of application areas like apparel, home textiles, filters, geo textiles, composites, medical, packing, seatbelts, industrial products, protection, etc.

The woven fabrics are produced by interlacement of two set of yarns perpendicular to each other [2], i. e. warp and weft as shown in Fig. 1. The first set includes the threads running lengthwise in the fabric, while the second is represented by the threads placed in cross or width direction. The fabrics have varying structure, depending on the interlacement pattern of the yarns. This sequence of interlacements is termed as the weave design of the fabric. The properties of fabric are governed by its weave design as well as the fiber content used as the raw material.



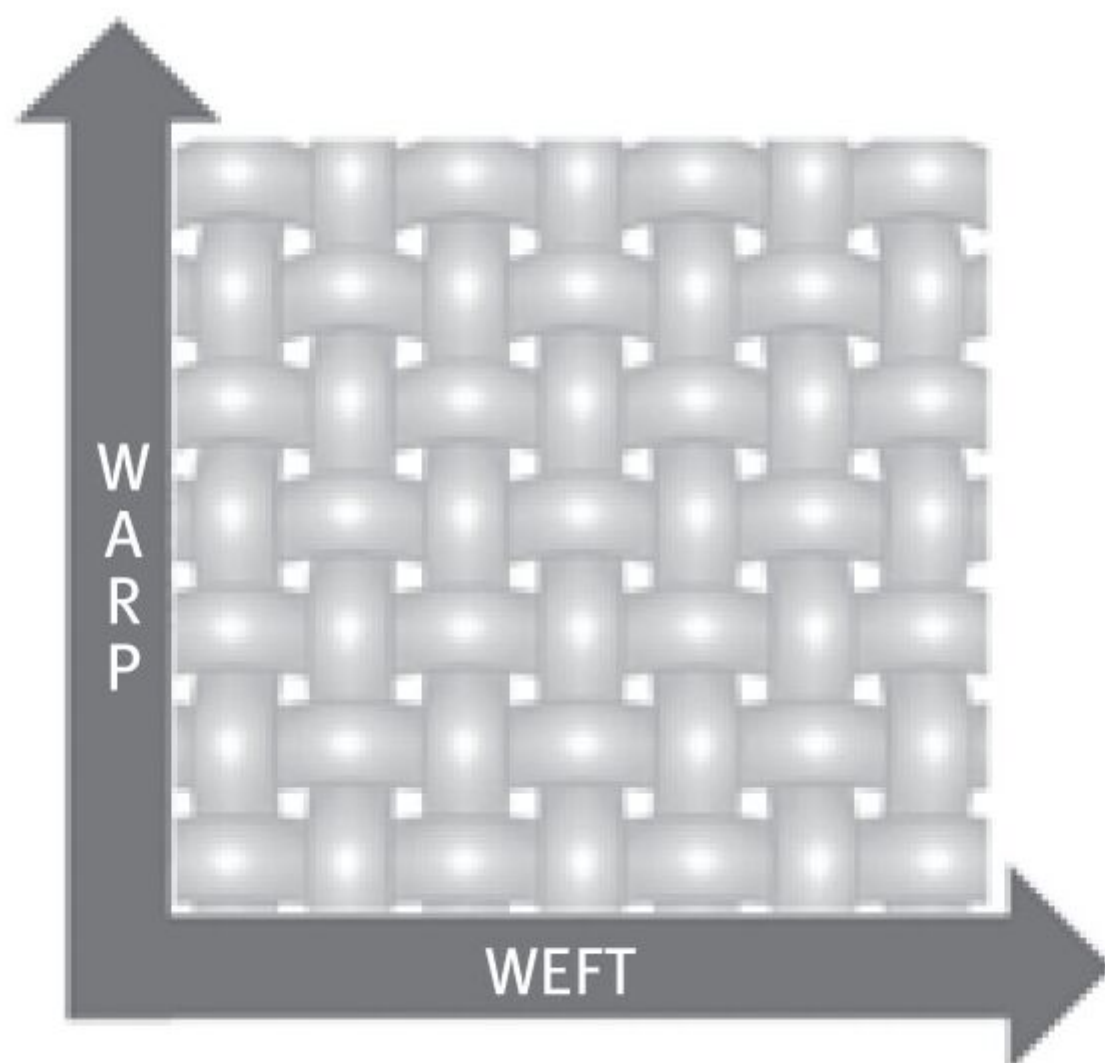


Figure 1

2 Warp Preparation Steps

A summary of the process steps from yarn to the final product, i. e. loom-state fabric is shown in [Fig. 2](#). Here the warp yarn is subjected to a number of processes, termed as warp preparation before conversion into fabric, while weft yarn does not require any specific preparation. The warp preparatory process consists of the following operations: winding, warping, sizing and drawing-in.

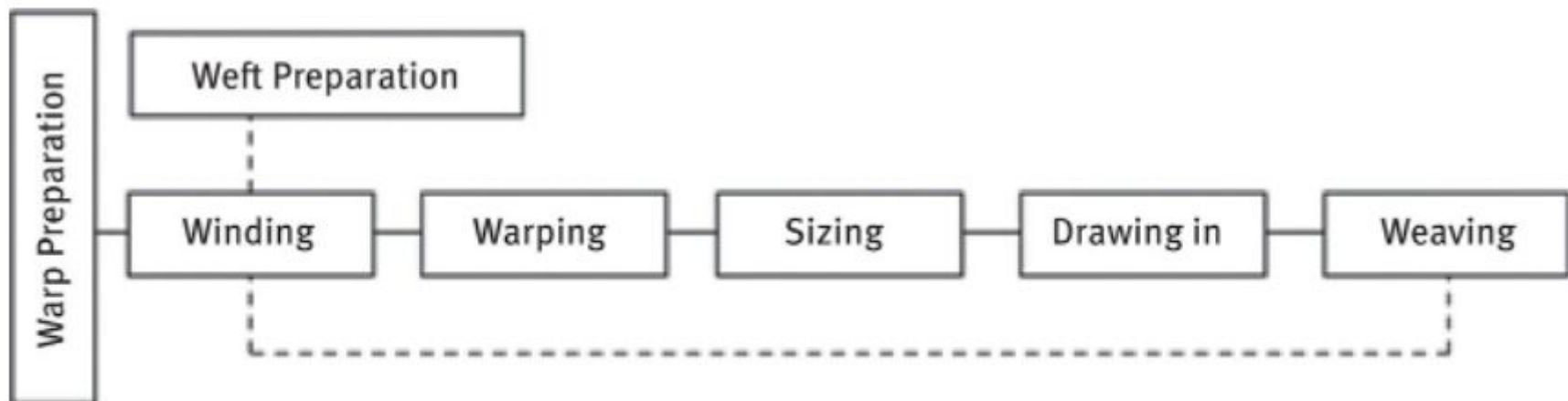


Fig. 2

Flow of the weaving process.

Yarns produced in spinning are used as input of the warp preparation. Winding helps to prepare the yarn for a package which requires shape and size. Weft yarn is then provided to loom, while warp yarns are processed to give a sheet of yarns on warp beam by the process called warping. A coating of size material is applied to the yarn in the subsequent process to impart strength and make the yarn smooth. This warp sheet is then drawn in from the droppers, heald frames and the reed. The actual fabric forming process is carried out at the loom, where this warp sheet and weft are interlaced to give woven fabric.

2.1 Winding

Winding is a process in which yarn from bobbins, which is the end product of ring spinning, are converted into suitable form of package. This transfer of yarn from one type of package to another package, more suitable for the subsequent process is also called winding. Main objectives of winding process are to increase the package size, clear yarn defects and produce a package suitable for subsequent process (size and shape).

The yarn packages are either parallel or tapered, with respect to shape, as shown in [Fig. 3](#). The parallel packages may also have flanges, while tapered packages are without flange [1].

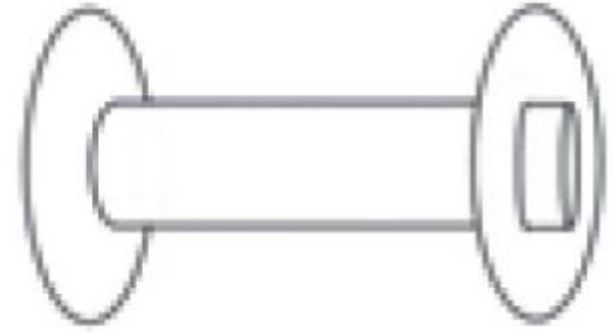


(a)

Fig. 3



(b)



(c)

Package types; (a) tapered, (b) parallel without flange and (c) flanged parallel.

The winding process involved unwinding yarn from one package and rewinding it on to another package. The yarn may be unwound in two ways, i. e. over end and side withdrawal as shown in [Fig. 4](#). Winding rate is the speed at which the yarn is wound on package surface, while to and fro movement of yarn when it is laid on to package is called traverse. In case of near parallel package, traverse is very slow, but in case of cross wound package traverse is quick. There is no traverse in case of parallel wound packages.