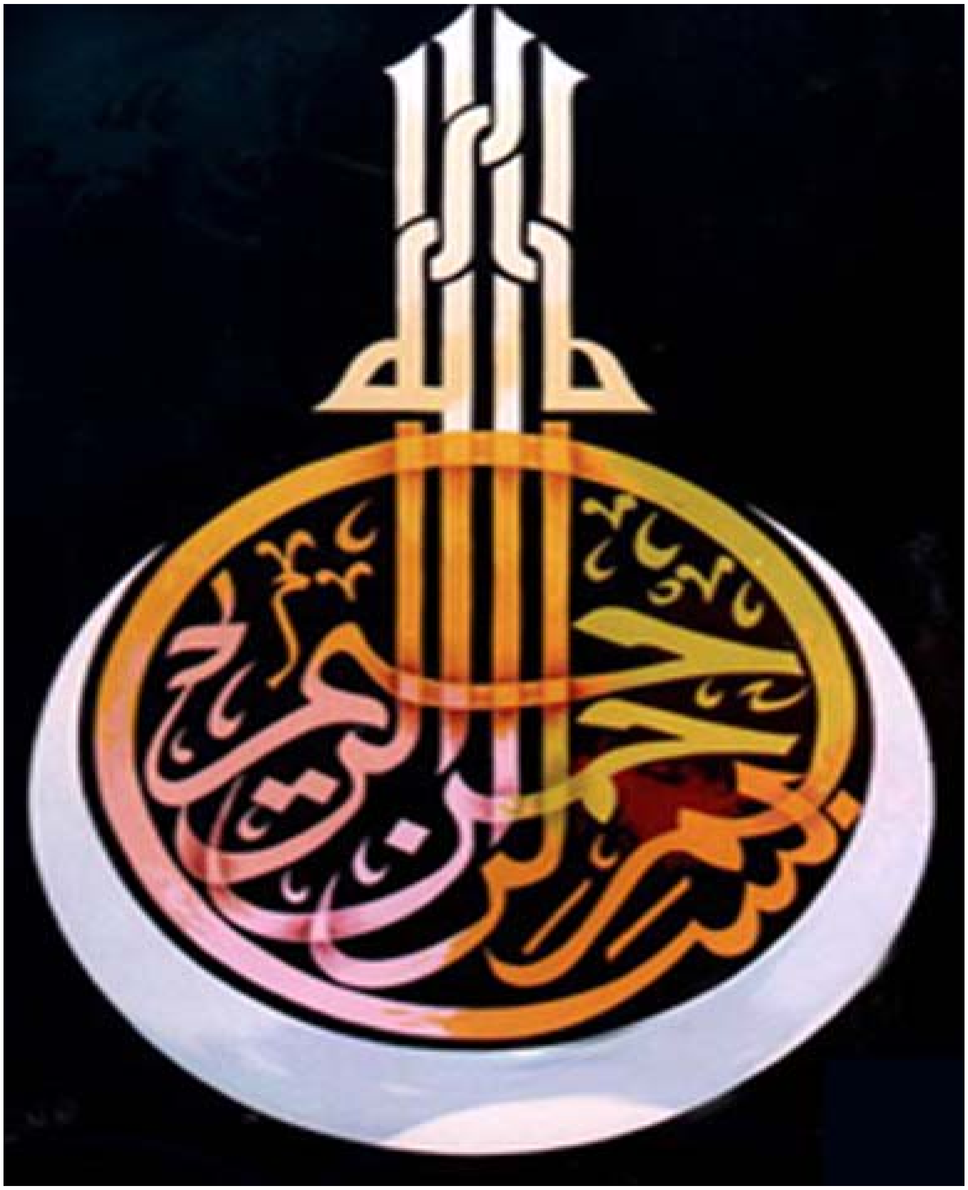

In the name of ALLAH, The COMPASSIONATE,

The MERCIFUL

Technical Factors Affecting the Quality on the Projectile Weaving With Open End and Ring Spun Yarn

By

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Contents

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The purpose of this study is to investigate the effect of Open End and Ring spun yarn (carded and combed) in weft on fabric properties. Different test were processed to get the best quality and production by varying the cotton and PC in filling. Three types of weave fabrics i.e. plain weave, satin weave (4/1) and twill (3/1) weave fabric samples were manufactured by different variables to perform Tensile Strength, Abrasion Resistance, Pilling and GSM. This study was carried out on projectile weaving machine inspite of air jet weaving machine because the yarn untwisted parameter is found in the weft insertion at air jet weaving machine. The yarn untwisting also varies from filling to receiving unit which may affect the results of any test. As the OE yarns have already loosely wrapped sheath as compared to ring-spun combed and carded yarns. The 100% carded cotton ring spun yarn, 100% combed cotton ring spun yarn and OE yarn were inserted as a weft to evaluate the entire variable. Similarly for further studies and research PC (50:50) carded ring spun yarn, PC combed ring spun yarn and PC Open-end yarn were used in weft insertion. In this research study tensile strength, pilling, GSM, crimp percentage and abrasion properties of woven fabrics made from 100% cotton and PC (50:50) carded and combed ring spun yarn were investigated. And same properties were also investigated from woven fabrics made from 100% cotton and PC (50:50) carded and combed OE yarn. It is concluded that there was found significant and non-significant effect of ring (carded and combed) and open-end yarns mostly due to similar twist and count when made up into different fabric for all the fabric characteristics. For this reason, all the phases of this study were specifically carried out under common working conditions.

Chapter 1

INTRODUCTION

Weaving is the method of forming fabric by interlacing of two sets of yarns or threads. The threads which run lengthways are called the warp and the threads which run across from side to side are the weft or filling. The basic theme of the weaving remained unchanged for centuries. Today it is running on the same pattern, passing threads over and under from one side angle to another. Only the change was seen in weft insertion techniques. On the basis of these techniques weaving technology is classified into different phases. Weaving is often completed on high speed looms in which shuttle looms remained the best for fabrication. Four major types of loom are projectile, air jet, water jet and rapier loom (Talukdar, *et al*., 1998).

Mechanical motion in the textile industry covers a wide range of applications. In order to interlace warp and weft threads to produce fabric on any type of weaving following operations are necessary:

- Separate the warp threads by Shedding.
- Passing the weft threads by picking process
- Pushing the newly inserted length of weft into already woven fabric by beating up new pick.

With the new development in modern machinery such as high speed loom the input and output package has been increased. For the long term production it is essential to have a warp beam with continuous yarn length (Shaw and Radford, 1991).

Projectile weaving machines use a projectile equipped with a gripper to insert the filling yarn across the machine. The unique principle of projectile filling insertion allows the insertion of practically any yarn such as cotton, wool, and polypropylene ribbon into the cloth being produced (Sekercioglu, 2010).

In order to reduce the breakage rate of the warp yams and achieve a higher quality end product as well as increase the efficiency of the weaving machine, the warp is sized to reach a certain degree of strength and smoothness. With sizing, the fibers in the yarn are fixed in the position they occupy before sizing, and the yarn should maintain, not lose, its existing elasticity, as it is essential for proper shed formation. In addition to sizing, it is necessary to set proper warp tension on the loom to achieve high quality weaving. A properly set warp tension is one that enables a clear shed, proper weft density, and acceptable woven fabric appearance (Kovacevic *et al*., 2000).

One of the most important changes made to weaving machines, is has been the invention of shuttleless looms. Different weft insertion systems for weaving machines have been introduced by different companies. However, only some of them have been commercialized. One successful systems of weft insertion is projectiles (missiles), which are so very similar to shuttles, but since they contain no weft yarn pirn, they need require a lower amount of energy compared with shuttle looms. The projectile used in this system was a permanent magnet, which may lose its magnetic properties and performance after it is used for a while. This may be the main reason why this method was not used as a commercial system the weft insertion. In this work, we describe the designed and built construction of a weft insertion system in which the force required to shoot the projectile is provided by an electromagnetic force. However, the projectile used in our system is the same projectile used in Sulzer-Ruti looms. The system introduced here is significantly cheaper and simpler than the similar existing mechanisms (Mirjalili, 2005).

In the weft insertion process on an air jet loom, the weft yarn is withdrawn from the weft accumulator and accelerated by the main nozzle into the shed, where it is carried forward by a number of relay nozzles arranged in several groups. These groups are activated sequentially as the yarn is moving forward. Once the yarn reaches full insertion, the stopper pin on the weft accumulator closes. As a consequence, the yarn is stopped from a high speed, which generates a high tension and causes the yarn to jump back. If the tension due to the stopping of the yarn gets too high, weft breakage and thus machine stops can occur. In order to avoid this, a brake can slow down the yarn before the actual stopper pin closes. If the yarn jumps back too much, fabric faults can occur. In order to avoid this, the yarn is usually stretched by the relay nozzles and other devices at the end of the insertion (Meulemeester *et al.*, 2000).

Nowadays, air-jet weaving machines may be a better weaving machine for all kinds of yarns without any problem at higher speeds compared to the projectile and rapier systems. That the reason air jet looms a very good alternative to other weft insertion systems. But it also has some major drawback: to generation of compressed air it required high power consumption. Therefore, intensive efforts have been made by researchers and air-jet loom makers to overcome this problem and achieve a dramatic reduction in air consumption without any decrease in loom performance and fabric quality. The air flow in the filling insertion process and investigated the effects of air and yarn characteristics (Goktepe and Bozkan, 2008).

When a new technology is introduced, the downstream processes were nearly always affected. Accordingly, the implications of OE spinning must be examined by all departments of textile. OE spun yarn differs in its structure but also have some familiar properties to ring spun yarn. The possibilities of weaving OE yarn on Sulzer machine was examined, investigating also affect of OE yarn on end breakage rate on high performance machinery were the reports in technical press quoting 20 to 30% lower breaking strength as compared to ring spun yarn. For years Sulzer machines have been successfully weaving cotton yarn at weft insertion rate up to 760 m/min, but rates up to 940 m/min were used for the test. The test yielded guidelines for the weavability of OE yarns in high warp and weft density fabrics as well as plain weaves with square setting (Nick, 1974).

The OE yarn is normally 10-30% weaker than ring yarn which can be attributed to the limited migration and the existence of many fibers in the outer layers which do not take a fair proportion of the load. The OE yarn has higher elongation at break than ring yarn (which is desirable in- further processing of the yarn). The OE yarn is normally some 15% bulkier and it is also less hairy. Due to the formation of the yarn under low tension and due to the shallow migration, OE yarns have less internal stress and this is an important factor in the wet finishing of fabrics as will be discussed later. OE yarns are normally more regular than ring yarns which tend to reflects in the fabrics produced. The difference in structure between OE and ring' yarns make it necessary to use high levels of twist for the OE yarn to obtain adequate strength. This and the surface nature of yarns are reasons why the fabrics made from OE yarns have a harsh feel (Mohamed and Lord, 1973).

For open end yarn the advised tension values are lower, because OE yarn is more sensitive to stretch on the sizing machine. In our opinion the tension values for OE yarn should be at least 20% lower than those for ring spun yarn (the pressing tension under the loom beam by means of the pressing roller should be the same as for ring spun yarn).

The basic Principles of Sulzer Shuttleless Weaving is to be examined under the following four heads:

• Picking, or weft insertion system,
• Beating-up,
• Selvedge formation, and
• Weaving with one, two, three or four colours.

In the Sulzer weaving machine, the weft yarn is introduced into the cloth by means of gripper. A tuck-in selvedge is for med by drawing the cut weft end back into the open shed by means of tucking needles. The pick is then beaten up. The sley is not moved through cranks, but is then positively rocked about its centre through a saddle carrying two follower bowls, each bearing against the surface of matched cams. The Sulzer Shuttleless weaving machine differs from the automatic shuttle loom in two respects, namely, (a) the method of weft insertion, and (b) the method of moving the reed and projectile track. Other motions including take-up and led-off are almost similar to known mechanisms (Sudarshan *et al*., 2011).

Slightly lower is the effect of the constructional properties of a fabric, such as the weave, warp and weft thread density. There are also other factors which have an indirect influence on final values, such as the conditions in which weaving takes place: temperature, humidity, and yarn tension during the weaving process etc (Gabrijelcic *et al*., 2008).

The design feature is also an important unit for the construction of the fabric the three main conditions are compulsory for the designing, drafting and lifting.

1. To construct the draft and plan from a given design.
2. To construct the design from given draft and lifting plan.
3. To construct the draft from a given design and lifting plan.

The efficiency losses arising from loom stoppages in looms are generally of two types such as those requiring the weaver’s attention and those not requiring weaver’s attention. The former category includes causes like warp breaks, weft breaks and interference. Losses due to warp and weft breaks are in proportion to the frequencies. The interference loss is depend upon the loom assignment to weavers, frequency of warp and weft breaks, average distance required to be walked per stoppage and other miscellaneous jobs performed by a weaver. Losses due to stoppages not requiring weaver’s attention arise from loom repairs, cleaning and oiling, beam gaiting and others. Efficiency loss on account of beam change varies according to its frequency, while other losses depend upon the organizational setup, frequency of breakdowns, types of looms, sorts woven and level of maintenance (Sudarshan *et al*., 2011).