"Effect of loom settings on the quality of grey fabric"

Submitted To:
Textile Committee

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We are also thankful to the management of **Kohinoor Mills Ltd** for supporting our project. We also want to appreciate the efforts of **Mr. Waqas Ahmad** and **Mr. Anwar** for his guidance and cooperation regarding our project of loom settings.

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Chapter 1

Introduction

1.1 Introduction:

Clothing is one of the three basic needs of human kind, the other two being food and shelter. Therefore, fabric formation in general and weaving in particular are probably as old as human history. One of the first necessities of early human was a piece of cloth to cover their body for decency and to protect themselves from the adverse effects of the environment.

Weaving is the mixture of science and art. Despite all the technological advances, weaving is still not a positively controlled process. That is, it is hardly possible to control the individual fiber which is the smallest meaningful building block in a woven structure. This fact makes weaving an interesting technology.

1.2 Objectives:

Textile industry world over has experienced highly significant and irreversible changes in recent years. These changes have been both on the demand as well as on the supply side. Market demand has altered e.g. in terms of product types segmentation and particularly in over all volume terms whilst the supply side has countered with a concentration and rapid expansion of the industry is new textile producing countries as well as adaptations of the many new technologies and cost effective equipments.

We all know that sizing is the heart of weaving process, but finally grey fabric is obtained on the loom. Regarding the project of air-jet loom settings, our purpose is to analyze various settings including mechanical and pneumatic settings through which we can understand how the quality of the grey fabric is ensured through these settings. The quality of unfinished fabric depends on the condition of the loom. There may be several other factors which affect directly or indirectly the quality but loom settings should be perfect in order to satisfy the needs and demand of the customer. Customer requires the product irrespective of the whole process, that's why we have selected that project.

1.3 Mill Profile:

The mill under observation is "Kohinoor Mills Ltd." Having the following profile:

Company Name:	Kohinoor Mills Limited.
Address:	8 Km Manga Raiwand Road, Distt Kasur Lahore Pakistan
Products:	Cotton fabrics and cotton blended with other materials
Certificates:	ISO 9001 & 14000, SA 8000 SGS System Certification
Established:	1989

1.4 Weaving Process:

Weaving is defined as the method or process of interlacing two yarns, so they cross each other at right angle to produce a woven fabric. It's a mechanical process carried out on loom. The ends of warp yarn run in length wise direction and pick yarn run from side to side.

1.5. Warping:

The purpose of warping is to assemble the long length of yarn produced in winding on a beam. The required member of single thread, package are placed in a creel from which they are wound on to a warper beam. A group of warper is run to form a weaver beam. Warping has two types, direct and indirect. In direct warping the yarn are withdrawn from single- end yarn packages on the creel and directly wound on the beam. Direct warping full beam is prepared in one go.

Indirect warping also called sectional warping or pattern warping or drum warping. In indirect warping first yarn is wind on drum then wind on beam or warp yarn wound on beam in sections.

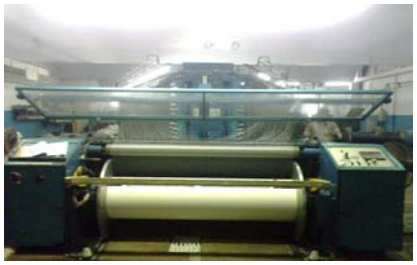

Fig 1.1 Head stock

Fig 1.2 Creel

1.6 Sizing:

The purpose of sizing is to apply a protective coating to the yarn to enable it to withstand the complex stresses to the weaving machine, mean while maintaining its strength and elasticity. Sizing has also two types direct sizing and indirect sizing. In direct sizing technique one beam is used to size the yarns. In indirect sizing multiple beam are used for sizing to get required ends according to design of fabric. The sections of sizing machines are creel, size box, drying cylinders and head stock.

Fig 1.3 Creel

Fig 1.4 Drying cylinders

Fig 1.5 Head stock

1.7 Drawing in:

Drawing-in is the entering of yarns from a new warp into the weaving elements of a weaving machine, namely drop wires, heddles and reed, when starting up a new warp ends to the depleted warp is done when new pattern is not required.

Fig 1.6 Drawing in

1.8 Weaving:

Weaving process is being completed on either shuttle or shuttle less loom in which the basic motions are same except the weft insertion system. Advancements came with the increasing insertion systems. Air jet technology provides more speed and production and top quality of woven fabrics to the weaver. Primary and secondary motions are described as under:

1.8.1. Shedding:

Shedding is separating the warp ends into two or more layers to form shed.

1.8.2. Picking:

Picking is the passing of weft thread through shed.

1.8.3. Beating up:

Beating-up is pushing the newly inserted weft, known as pick into already woven fabric with the help of reed. Secondary motions are given under.

1.8.4. Let-off:

Also called warp control i.e. to deliver the warp sheet at required rate and tension.

1.8.5. Take up:

Also known as cloth control i.e. this motion withdraw fabric from the weaving area at constant rate and wound on cloth roll with the help of two press rollers.

1.9 Fabric inspection and folding:

After weaving process the fabric is transferred to the inspection hall .In inspection hall the inspectors inspect the fabric and remove the defects from fabric. The Four-Point System has gained widest acceptance in the textile trades because it is the most lenient, simple and easy to understand cloth grading system.

Fig 1.7 Inspection frame

Fig 1.8 Folding machine

Fig 1.9 Inspection frame

1.10 Mill overview:

Kohinoor weaving mills ltd is situated 8 km Raiwand Manga road, Raiwand. Mill has four warping machines (3 direct, 1 sectional warping) of Benninger-Zell, 2 sizing machine with 24 and 40 warper beam creel capacity 2 size boxes each with Double-dip ,Double-nip and pre wetting. Mill has a weaving shed of 270 looms including 228 cams, 26 dobby and 16 jacquard. They are placed in four sheds. All the looms are air jet of Picanol Omni Plus, Tsudaoma and Toyota. The inspection hall of the mill comprises of 22 inspection frames.

1.10.1 Introduction Kohinoor:

The Kohinoor Maple Leaf Group was born from the trifurcation of the Saigol group of companies and is a reputable and leading manufacturer of textiles and cement. KMLG comprises of Kohinoor Textile Mills limited (KTML) and Maple Leaf Cement factory limited (MLCF). Both companies are incorporated in Pakistan and are listed on three stock exchanges of the country.

1.10.2 Kohinoor Textile Mills Limited:

KTML was established in 1953 at Rawalpindi and is one of the oldest companies of Pakistan with over 50 years experience in textile manufacturing. It was initially set up as a spinning and weaving project with 25,000 spindles and 600 looms. However, after decades of aggressive expansion and modernization KTML has emerged into a fully vertically integrated home textiles company with state of the art capabilities for spinning, weaving, dyeing, printing and stitching. The company has a diverse customer base with sales in both the local and export markets. The main international markets include Asia, Europe, USA and Australia.

Chapter 2

Air-Jet Loom Settings

2.1 Project Objectives:

Our primary objectives of capstone project are:

- To study the mechanical and pneumatic settings of air jet loom.
- To analyze the effect of loom settings on the quality of grey fabric.
- How the efficiency and productivity can be increased.
- Comparison between the different qualities on the basis of loom settings.
- Weaving faults or mechanical faults regarding Air-jet loom settings.
- Settings of basic weaves e.g. plain, twill and satin/sateen.
- Main focus on higher performance, immediate fabric quality and full modularity.

2.2 Project Outcomes:

After the completion of capstone project, we will be able to:

- Understand the settings of the loom for the particular quality.
- How settings are arranged for different qualities.
- Relation between settings and production.
- Factors effecting the overall efficiency and productivity of weaving technology.
- How the quality of grey fabric is achieved through loom settings.

2.3 Definition of air jet loom:

A loom using a jet of air to carry the yarn through the shed is called air jet loom.

2.3.1 Working of air-jet loom:

Air jet weaving is a type of weaving in which the filling yarn is inserted into the warp shed with compressed air. Figure 2.1 shows a schematic of air-jet weaving utilizing a multiple nozzle system and profiled reed which is the most common configuration in the market. Yarn is drawn from a filling supply package by the filling feeder and each pick is measured for the filling insertion by means of a stopper. Upon release of the filling yarn by the stopper, the weft is fed into the reed tunnel via tandem and main nozzles. The tandem and main nozzle combination provides the initial acceleration, where the relay nozzles provide the high air velocity across the weave shed. Profiled reed provides guidance for the air and separates the weft yarn from the warp. A cutter is used to cut the yarn when the insertion is completed. Figure 2.2 shows a modern air-jet weaving machine.

Air-jet weft insertion is the simplest way of inserting the filling yarn which probably explains why air-jet weaving machines are one of the most popular machines in the market today. The major components of the insertion system are the main and relay nozzles, ABS break system which are relatively simple in design. The insertion medium mass to be accelerated is very small, relative to the shuttle, rapier or projectile machines, which allows high running speeds. Unlike rapier or projectile insertion systems, there are not many mechanically moving parts to control and insert the weft yarn.

The advantages of the air-jet weaving machines are:

- High productivity
- Low initial outlay
- High weft insertion rates
- Simple operation and less hazards because of few moving parts
- Reduced space requirements
- Low noise and vibration levels
- Low spare parts requirements
- Reliability and minimum maintenance

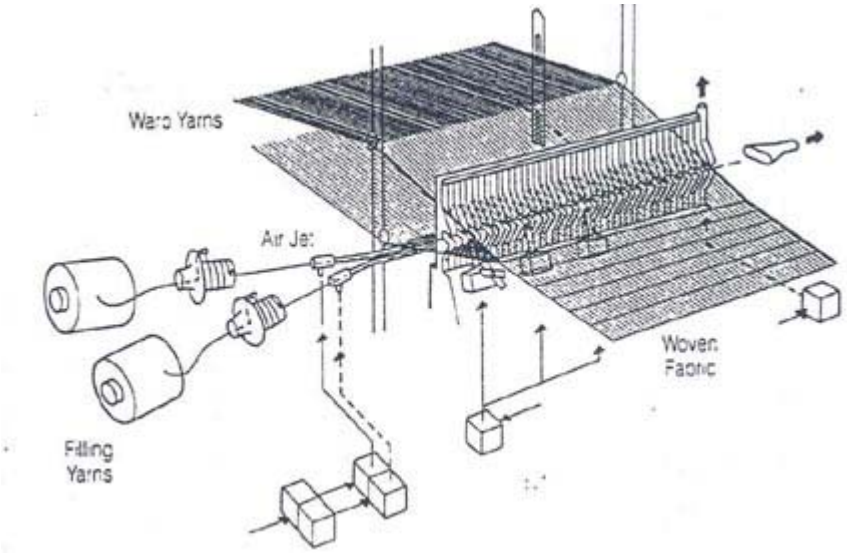

Fig 2.1 Schematic diagram of air jet loom

Fig 2.2 Modern air-jet weaving machine

2.4 Picanol Introduces "OMNI plus 800" Air-Jet Loom:

Picanol has introduced its latest air-jet loom, the "OMNI plus 800". This entirely new machine is conceived to become the new standard for profitable air-jet weaving. In developing the "OMNI plus 800", Picanol designers focused on three basic criteria for meeting this promise: namely, higher performance, immediate fabric quality and full modularity.

All components are optimized for as yet unheard-of industrial speeds, minimum maintenance and maximum profitability. In addition, the "OMNI plus 800" is full of functions that make it easy to achieve the very best fabric quality.
The "OMNI plus 800" is an entirely new, fully modular concept, enabling the machine to be modified or converted quickly and easily so as to take advantage of new market opportunities. With the "OMNI plus 800", weavers have an investment that will keep its value, even in the long term.

2.4.1 Higher Performance by Optimization of Insertion Parameters:

The entire concept of the machine is new: the "OMNI plus 800" is a future-oriented platform with components designed for maximum operating speeds and highest productivity.

By making the insertion cone shorter and more slender, the load on the weft yarn has been reduced, thus permitting higher speeds. At the same time, an entirely new 16-hole relay nozzle has been developed. In combination with the new relay nozzle valves with short reaction time, this enables the "OMNI plus 800" to weave more with less air.

Higher Performance with Ultra-Short Drive Train & Balanced, Robust Construction.

The frame of the "OMNI plus 800" and all moving parts are perfectly balanced and robustly built to permit even higher machine speeds. The harness frames, joints and members too have been optimized in numerous respects for high-speed weaving. The new hybrid harnesses are made of aluminum with carbon fiber reinforcement. The short drive train of the "Sumo" motor guarantees vibration-free operation. The speed of the motor is controlled electronically, without a frequency converter, thus reducing power consumption and permitting greater flexibility. The "Opt speed" function makes it possible to program the speed pattern according to yarn quality, number of harnesses and pattern, so that a higher overall speed can be maintained: the maximum speed is no longer determined by the weakest yarn or the most complex part of the pattern.

2.4.2 Higher Performance Thanks to Minimal Downtime:

The "OMNI plus 800" has many unique features for minimizing nonproductive time. The automatic pick finder system, QSC (Quick Style Change) system, fast frame connections, quick fastenings for warp beam and cloth roll, rapid width reductions on both left and right side, microprocessors for setting the shed and selvedge crossing time: these all increase the amount of time available for producing fabric at high speeds.

The QSC system enables a style change to be carried out by a single person in less than 30 minutes. The style change is performed by replacing the entire rear part of the split frame, with the warp beam, backrest and support, warp stop motion, harnesses and reed. All the settings involved in preparing the article on the warp side are done before the style change, outside the weave room.

The Picanol QSC system offers huge advantages: downtime on the loom is much shorter, fewer personnel are needed in the weave room, and there is far greater flexibility for weaving different articles.

2.4.3 Highest Fabric Quality Immediately, Thanks to Quick & Easy Settings:

The mechanical components combined with the advanced electronics of the "OMNI plus 800" are largely responsible for the higher fabric quality. Whereas in the past weavers used to forego some of the finer settings necessary for higher quality, because they were too time-consuming and labor-intensive, these can now be carried out quickly and easily.

Thanks to electronic controls, adjusting the machine settings for higher fabric quality is now an easy matter, and can even be done while the machine is running. In addition to the many diagnosis screens, the terminal screen gives the weaver access to a whole series of preprogrammed values for shed formation, insertion, pick density and warp tension. For example, the crossing time can be set automatically, and the machine speed can be adjusted or programmed for optimum fabric quality, with immediately visible results. The Ethernet connection enables the machine to be integrated into the corporate network, opening the door to Internet applications.

2.4.4 Full Modularity, for a Bolt-on Future:

Never before has any weaving machine had such a modular design. In the new "OMNI plus 800" concept, the machine itself is a basic platform designed to receive all sorts of future extensions and adaptations. This modularity safeguards the weaver's investment for the future: no other loom is so easy to adapt so as to take advantage of new market opportunities.

For example, the air preparation for the fixed and movable main nozzle is modular in design, making it a simple matter to extend the number of filling channels.

The basic machine structure for the cam, dobby and jacquard versions is identical, making it possible to change the shed formation system at some time in the future. For example, it is possible to change from cam to dobby, and vice versa. Also transformation towards jacquard does not pose any problem.

The superstructure mountings are similarly identical, making it possible to decide at some time in the future to add e.g. a fancy beam or jacquarette.