To study how to improve the productivity of yarn and fabric production in a production mill

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Preface

This thesis is based upon the research conducted on Pakistan’s Spinning and weaving industry. We would like to thank all the people who helped us during writing this thesis. Specially, production managers of both companies helped us too much and we learnt a lot from their experience.

We would like to express our sincere gratitude to our examiner and supervisor Hakan Torstensson and Heikie Mattila. Without their support this cannot be possible.

Finally we would like to express our greatest thanks to our families who cope with us all those days in our research. Without their support, encouragement and patient this research would not have been possible.

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Abstract

Productivity in every sector is essential, Production areas like textile require more production, more profit with less cost. Everyone should play their own role in achieving better production rate in these working sectors.

There are many factors which can improve the productivity, but here we will focus on some specific areas. By working on these issues or factors, we can achieve our productivity goal. There are challenges for production managers and they need to take healthy measures for the enhancement in their production rates e.g. to find the best raw material available, to train its team and keep them updated to the latest technologies etc.

This thesis is comprised of different factors which can affect the productivity in textile field. Here we will discuss the textile sector of Pakistan. All the information and collection of data is taken out and is referenced to the textile industry of Pakistan.
Definations

**Nep:** A Nep is a small cluster of entangled or knotted fibers forming a compact ball which is not likely to be disentangled by drafting. Neps are found in most card slivers regardless of the fiber type. Paradoxically Neps usually are first formed during the carding process.

**Curly Fibers:** fibers which are folded on one another.

**Slub:** An unusually thick in the yarn

**Imperfection Index (Ipi):** Mean of thick places at 50%, thin places at -50 % and nep at 200 % is the IPI. For example if thin places are 384, thin are 23 and nep are 700 then, total IPI is 1107.

**Uniformity %:** U % means how much fibers are uniform or even in a yarn

**Bmr:** Balancing, Modernization and Replacement.

**Tuft:** Small pieces of cotton

**Fiber Fineness:** The fineness determines how many fibers are present in the cross-section of yarn of given thickness.
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1. Introduction

1.1 Background

For the last few years, productivity is the hot issue for each companies either it is textile or chemical or fertilizer, to raise the production per unit is discussed. If we see productivity is the ratio of output per unit of input. If we take the labour productivity as an example that means ratio of output per labour hour. Productivity measures in different ways like in a factory how many hours does it take to produce the product? Productivity depends on different things or factors like labour, machinery, capital, temperature, raw materials quality etc. so every factor has its own contribution.

In textile, productivity has great influence on yarn and fabric production. Optimizing the output in this sector is a big challenge; to achieve this goal the role of an individual person regarding the production department has a great importance.

Pakistan which is a good exporter of yarn and home textile, textile export has the value of 60 % of its total revenue. For such a sector which is in a huge volume, productivity issues or factors must be on top of its list and not be neglected. Working on these productivity factors textiles productions can be improved.

1.2 Purpose

The purpose of this project is to find the different factors which can influence the production of yarn and fabric. So, working on them we can improve or enhance the productivity but this is a big challenge to do this. Textile spinning and weaving is a big area of research. So the main aim of this project is to discover the factors which can improve the productivity of yarn and fabric production.

1.3 Limitations

This project only focuses on yarn and fabric production although there are many other sectors where research is to be carried out but our thesis here emphases on yarn and fabric production. Finishing, dyeing or printing can also be considered for research in textile sector.
1.4 Methodology

This research work is based on the spinning and weaving sector of Pakistan Textile Industry. The material and literature is taken from different sources like books, magazines, electronic journals and websites etc. Moreover, some data is taken from interviews conducted from managers of these sectors. Then, we analyzed which are the most important factors and took some experimental results. Further, this data is discussed in the form of report and made some suggestions and finally concluded the result.

2. Company Description

It is one of the most renowned textile mills in the textile industry of Azad Kashmir, Pakistan. It is situated 18 km from Mirpur on Bang Canal Road Mangla. This mill was established in 1976 by Azad Kashmir Government but later on his rights was undertaken by Mr.Ch.Saeed, chief executive Azad Group of Companies and former President of federation of Pakistan Chambers of Commerce and Industry (FPCCI).

In this mill Cotton is processed as Raw Material & wide range of counts are produced normally ranges from 10s to 52s carded. In ATM following yarns are manufactured

- 10s Carded yarn
- 30s Carded weft yarn
- 38s Carded weft yarn
- 40s Carded warp yarn
- 52s Carded weft yarn
In ATM, normally Pakistani cotton is processed for yarn manufacturing and all the yarn made is manufactured for local market. Now, let’s see how yarn is manufactured in this mill and which type of machine they are using for the different processes from Blow room to Auto cone?
3. Mixing

Mixing is the term used for the arrangement of various cotton varieties or b/w various grades of same variety to get a product having all the characteristics of different varieties of cotton. The objectives of mixing are given below:

- Financial reasons that’s why cheaper cotton and cotton waste is mixed with the upgraded cotton to get better results.
- For better processing performance of cotton fibers in carding and roving formation through control of nep level and variation.
- It also effects on the working efficiency of ring frame because better mixing results in the form of less variation in yarn count.
- Like in spinning it also effect the efficiency of machines used for weaving functions and operations because fine yarn results in the form of uniform fabric. It also has a contribution in dyeing and finishing processes.
- By using different combinations of fibers having different fiber properties fulfill the requirements of given end use for the spun yarn or the woven fabric.
- To improve physical properties of cotton i.e. tensile and tear strength, elasticity, abrasion and shrinkage resistance.¹

¹ http://www.textiletechnology.co.cc/spinning/COTTONMIXING.htm
4. Blow room

The name blow room indicates that

“Transfer of fibers from one machine to another machine by pneumatic means is used for supplying reduced air pressure near to the destination of fibers”

Blow room is the first department in the spinning process. Raw cotton contains a number of different impurities which we called as “Trash”. These types of impurities are present in cotton i.e. sand, soil, dust, whole seed, broken seed coats, undeveloped seeds and broken fragments. The extraction of dust and trash is reliant on the quantity of fiber individualization, which can be obtained from the processing of fibers. Most of the impurities are removed in this department while other ones are removed in next department. The production capacity of B.R department is 340 bags/ day. (Spin plan ATM, 2007).

Basic tasks of Blow room

- Opening
- Cleaning (40 – 70 %)
- Mixing or blending
- Micro dust removal (64%)
- Uniform feed to the carding machine
- Recycling the waste

For carrying out the above operations, different machines are installed in blow room deptt.²

² http://www.textiletechnology.co.cc/spinning/BLOWROOM.htm
4.1 Flow Chart of Machine in Blow Room

AUTOMATIC PLUCKER

AUTOBLENDER WITH CONDENSER

STEP CLEANER

UNICLEAN B11

MULTIMIXER

DUSTEX

PINBEATER WITH CONDENSER

RESERVE HOPPER FEEDER WITH CONDENSOR

SCUTCHER

Figure 3
4.1.1 Automatic Plucker

This machine is used in the first stage of blow room and the purpose of this machine is to pluck the cotton from the stack of cotton layers with the help of beater. Then, by means of condenser these fibers are delivered to the next machine for further processing via a delivery pipe. (Engineering Manual of Automatic Plucker FA 002(A 002-D), 2002)

Fig.4 Automatic bale opener

4.1.2 Condenser

This machine is used for opening and transferring the various cotton fibers with the aid of the suction and eliminates the trash and linters in the material. (Engineering Manual of Condenser A-21, 2002)

4.1.3 Auto Blender

From his name it is clear that this machine is used for blending of different cotton fibers. After stack mixing the material is fed to this machine. It consists of two types of lattices i.e. feed lattice and spiked lattice and one U-type spike beater as well. The material is fed from the feed lattice and then the spiked lattice takes this material to the beater for beating process which opens the material. Due to material opening cleaning also takes place. After beater again there is a spiked lattice, which takes the material and fed it to next machine. (C.Shrigley, 1973)
4.1.4 Step Cleaner

This machine consists of 6 inclined beaters as shown in the figure. The main purpose of this machine is opening and cleaning. First material is pneumatically fed to the first beater, which is at the lowest level. It beats the material against grid bars and finally sends it to the second beater and so on. The beaters speed gradually increases from first to the 6th beater so gradual opening of material takes place in this machine. When the material strikes on the grid bars it opens and waste is extracted through the grid bars whereas the material is transferred to the next beater. (Engineering Manual of Step cleaner A034, 1974)

4.1.5 Uniclean B11
**Working principle**

This machine is designed for intensive cleaning. The material is fed to the single opener and passed mechanically six times over the cleaning grid on special points. In this process the raw material is guided over the integrated dedusting filter where dust, fiber fragments and trash are stripped off mechanically. The subsequent process stages have to remove only a small proportion of the trash while it can removed up to 70% trash. (Engineering Manual of Uniclean B11, Rieter, Switzerland)

### 4.1.6 Multi Mixer

In this machine the process is done in different chambers to get the maximum mixing of the raw material. It is also used to form different blends of cotton and polyester or any other fibers.

![Figure 7 Multi mixer](image.png)

**Working Principle**

- The last chamber is filled firstly and then the rest of the chambers.
- When the chambers are full the delivery rolls are activated underneath each chamber and the material is transported to the conveyor by the opening roll or beater. The beater is moving at a nominal speed.
- When the chambers are empty they are again filled by the condenser.
- A small amount of tufts from the several chambers builds up on the blending conveyor.
After that the material is fed to the cleaner or opener. (Engineering Manual of Multimixer FA022-8, 2002)

4.1.7 *Micro Impurities Deduster (DX)*

Dedusting is another important process apart from the opening and cleaning of the raw material. A good dedusting result in higher efficiency rates, less yarn breakage in winding and knitting process.

This machine is suitable to deal with various grades of cotton and can remove part of any tiny waste, micro-dust as well as short fibers away from the opened fiber. (Engineering Manual of Micro Impurities Deduster, SFA 201, 2001)

4.1.8 *Pin Beater*

It is a fine cleaner and gives sever opening action to the material so a nip feeding is provided here. Material is fed to main beater, which consists of lot of pins which beats the material against the grid bars at very high speed so provides an intense opening action. As the material opens, the waste is extracted through grid bars. The intensity of cleaning depends upon the grid bars spacing and the gauge between pins and grid bars. Material is fed to the machine pneumatically through condenser and hopper. (Engineering Manual of Pin Beater, FA 106A, 2002)


4.1.9 Double Hopper Feeder

This m/c is inserted in front of the electrical distributor and behind the single beater Scutcher and lap m/c also in connection with the condenser. The raw cotton, destined for carding and combing system are to be processed in this m/c into cotton fleece and then fed into single beater Scutcher and lap m/c to produce laps.

4.1.10 Scutcher

Figure 9 Scutcher

It is the last machine of Blow room department. The function of this machine is to make end product in the form of lap for carding department. Lap must be wound by the winding rollers on a lap tube. In order to ensure a large take up capacity, the lap tube is pressed against the winding rollers. A lap weighing device connected with the lap apparatus detects deviation of lap weight from asset valve. (Engineering Manual of Scutcher, FA 141, 2001)
5 Carding

5.1 Introduction

The blow room process opens the compressed bales of cotton into small tufts and also removes 75% trash present in the cotton. Still the cotton has to be opened to individual fibre state and it must be free of impurities and trash etc. up to the maximum possible extent so, the fibre-to-fibre opening and complete removal of trash is carried out on the card machine. It is therefore rightly said that “Half Carded, Half Spun” and “Well Carded Well Spun” because it is the process of carding which plays a very important role in the spinning process and is called as the Heart of Spinning.\(^3\)

Following are the main tasks of the card machine: (WG. Byerley, W. Miller, GH Jolly, G.Battersby, F.Charnley, 1965)

- Opening of fibers to individual state.
- Elimination of impurities present in cotton that were not extracted in the previous cleaning departments.
- Disentangling of the neps
- Removal of the short fibers
- Fibre blending
- Fibre orientation
- Sliver formation

The production of card deptt is 263 bags/day. (Spin Plan ATM, 2007).

\(^3\) http://www.textiletechnology.co.cc/spinning/textilecard.htm
The process starts with the output of blow room department which is called Lap (1). The lap from blow room is unrolled and placed on the back of feed rollers (2), and then feed rollers transferred this material to taker in (3) which has wires like saw teeths. The function of taker in is to shift the lap against trash bars (4), which extracts trash particles from the cotton, and then passes these fibers into the cylinder (5). The body of cylinder consists of thousands of fine wires which grasps the fibers. The flats (6) are mounted on the upper side of cylinder having more fine wires, and they are moving in the opposite direction as compare to the cylinder. The short fibers are removed by the flats and long fibers remains on the cylinder which then transfers to doffer (7). On the top of doffer, doffer comb (8) is placed which vibrates against the doffer and take away the floating fibers from it. Now, fibers in the form of web, transfers through condenser rolls (9), where fibers are condensed and then moves into a can through a coiler head (10) in the form of sliver (James G. Bralla, 2007).
6 Draw Frame

![Image of Draw Frame](image)

Figure 11 Draw frame

6.1 Introduction

Draw Frame is a machine on which drawing is done. In this section sliver from card deptt, is again processed. For this purpose two types of passages are done to that sliver with the help of breaker and finisher drawings. The reason behind these two passages is to make sliver more uniform, even and parallel. It contributes less than 5 percent to the production cost of the yarn but its influence on the yarn quality is enormous. (W. Klein, 1987)

The production of drawing section is 254 bags/day. (Spin Plan ATM, 2007).

Tasks of the drawing frame (W. Klein 1987)

- Improving evenness
- Blending
- Parallelization
- Dust removal
Working principle

From the carding machine, cans (1) are fed to the drawing frame then, the sliver were taken out from the card cans. Each sliver is taken out and guided to the nip of back roller (3) with the help of spoons (2). Drafting is done with the help of difference of speed of rollers. After drafting, the material is in the form of ribbon. With the help of trumpet guide ribbon is accumulated and condensed to form a circular shaped sliver. Furthermore, this sliver is collected in the cans (4) for further processes (James G. Bralla, 2007).

7.0 Roving Frame or Simplex

7.1 Introduction

“Roving frame is known as necessary evil”. The problem is that this machine has many complications, creating faults which have no solution, increasing production costs, its finished product is sensitive while using in winding and unwinding operations. Then, why this machine is still in use?

It has two reasons:

1. As far as the structure of drawing sliver is concerned it is thick and hairy and creates fly during working. Draft needed to convert this thick sliver into a yarn is 300 to 500 so, it is
not possible for ring machines to make a yarn on this single drafting system that fulfill all the demands.

2. Presentation of feed material to the ring spinning department and draft can signify the worst conceivable mode of transportation. (Gilbert R. Merrill)

![Fig.13 Roving frame](image)

**Fig.13 Roving frame**

*Tasks of Roving Frame (Bernard P. Corbman, 1983)*

- Attenuation-drafting the sliver into roving.
- Twisting the drafted strand.
- Winding the twisted roving on a bobbin.

The production of this department is 219 bags / day. (Spin Plan ATM, 2007).

**8.0 Ring Frame**

**8.1 Introduction**

From the early ages of history, the production of yarn has been done by spindles. During the last centuries many spinning machines came out but no one has been able to replace the ring spinning machine.

*Advantages of ring spinning frame*

- We can make every count of yarn in this machine
The material obtained from this machine has optimum characteristics, especially if we talk about structure and strength.

- Very simple and easy to monitor
- Very modernized, less efforts required and accessible for everyone. (A.E.DE Barr, H.Catling, 1965)

In case of fine counts it is usually 200 bags/day while if course counts will be processed it reaches upto 400 bags. (Spin Plan ATM, 2007).

**Tasks of Ring Spinning Frame**

**Drafting**

The purpose of drafting is to get the desired thickness.

**Twisting**

The twist has its own importance for inserting the strength in the yarn because twist interlocks the fibers with one another.

**Package formation**

At the end the yarn is wound on small packages (ring bobbins) and stores it for further processes.\(^4\)

**Working principle**

\(^4\) [http://www.textiletechnology.co.cc/spinning/RINGFRAME.htm](http://www.textiletechnology.co.cc/spinning/RINGFRAME.htm)
The process starts from the output of simplex machine which is called “roving”. Roving is wound on roving bobbins (1). With the help of guides this roving is fed to the pair of drawing rollers (2) which draws this thick strand to its final desired count. The ring bobbin which is inserted into the spindle (3) is moving with the constant speed. The speed of first two pairs of drafting rollers is almost same but the final pair rollers speed is adjusted according to amount of yarn delivers so that it is twisted by the desired quantity as it is wound on the bobbin. The yarn is directed by the traveler (5); the traveler imparts twist to the yarn and is present on the ring (6) surface around the bobbin. Due to yarn insertion from traveller it drags and yarn winds on the bobbin with the same speed as the front rollers. (James G. Bralla Industrial Press © 2007).

The traveller’s rotational speed is less than the spindle speed by reason of the frictional force produced when it slides on the ring surface and one more factor is the air resistance due to the motion of yarn between the yarn guide and the traveller. (Lucia Pieri, Dec. 2002)

9.0 Winding

9.1 Introduction

The basic function of winding machine is the transfer of yarn from smaller packages (ring bobbins) to bigger package (cone), which is suitable for transport and for further processing. Suppose if we use bobbins from ring directly into weaving or knitting process, then we got following problems:
• The bobbins will be finished very quickly so more time will be wasted in bobbins replacement while changing the new with the old ones.
• While changing bobbins again and again it results in the form of many defects in the fabric.
• In Ring Section sometimes thin places occurs in yarn which causes yarn breakage in weaving department.

From all these points it is concluded that winding process has its own worth which is not denied in any case.\textsuperscript{5}

\textit{Tasks of Winding Process}

• Extraction of yarn faults
• Manufacturing of large yarn packages i.e. cones, cheese etc having a sufficient yarn length on it.
• To remove spinning faults e.g. thick and thin places.
• To improve the quality of yarn.
• During the winding process, waxes are also applied to the yarn to reduce the abrasion and friction resistance to make the yarn softer.\textsuperscript{5}

\textbf{9.1.1 Passage of Yarn in the Winding machine}

In a typical winding machine the yarn passes from the supply bobbin through a tensioning device, a slub remove, a tension bracket, over a package lever and finally on to take up package.

\textsuperscript{5} http://www.textiletechnology.co.cc/spinning/winding.htm
Most modern winding machines are equipped with the thread detectors which detect the presence of thread and if it is broken, it is automatically repaired by knotters or splicers. The bobbins are placed in a magazine and when a bobbin finishes out it can be automatically replaced by a full one.
The tensioners detect whether the yarn passing through them is of the required strength or not. If a yarn has a thin place, a bad piecing or soft ends it will not be able to tolerate the exerted tension and will break. The faulty region is then removed and yarn is knotted or pieced together by auto knotters or splicers. Slub is removed by slub removers, which are of various types. (Engineering Manual of Murata 21 C, 2003)

This is the last section of yarn manufacturing process, after this department yarn goes to the conditioning section for conditioning. After this it goes to the packing department. After packing it goes to the weaving mills for fabric manufacturing. The production of this department is 209 bags/ day. (Spin Plan ATM, 2007).

10.0 Factors Affecting Productivity in a Spinning Mill

10.1 Raw material

Raw material has an important impact on yarn quality and production. Let’s see how it affects on yarn production? There are many parameters through which we can easily assess the properties of cotton; first one is the fiber length which is the most important characteristic of cotton and is measured in terms of staple length, span length and effective length. If fibers have good staple length it results in the form of high production because less twist per inch is required to give enough strength. Second one is the short fibers percentage; higher percentage of short fibers will result in the form of production losses due to more end breakage and higher twist per inch. Third one is the fiber maturity, in case of immature fibers it results in the form of production loss because the yarn made from these types of fibers have poor strength and also it produces breakage in spinning department. Fourth one is the fiber strength which is the dominating feature of fiber. When fiber strength is higher it outcomes in the form of high production due to less twist multiplier. I think while choosing cotton we have to keep in mind all these factors otherwise it results in the form of great loss.

10.2 Labour

In all industries, the importance of labour cannot be denied. But in the textile sector specially in spinning mills labour plays a very crucial role because without their participation nothing could be done. For example if we take the example of the ring department in a spinning mill or you can say the production department, 400 workers are working in one shift and with their negligence it
results in the form of production loss. In the ring department we can calculate production in bags/day, so, with the workers carelessness it results in the form of loss of bags. In Pakistan working in mills exists in three shifts so, the question does arise why production is different in these three shifts if they have the same number of workers? Due to workers inattention the rate of production is different because in Azad Textile mill they face different types of problems every day so, to overcome these problems they have made a reward system in the form of cash prizes. By comparing the production of these three shifts. They decided which shift deserves for that prize. By adopting this system they can control this problem up to some extent. From our point of view we think that the proper way to improve productivity in textile mills is first to take those workers which are properly skilled secondly, with the passage of time arrange training sessions for their improvement and the most important thing is to increase their wages time after time. By adopting these things productivity can be improved.

10.3 Machinery

Machinery is the back bone of every industry. In the textile industry machine are working 24 hours so it is important that its efficiency would be excellent. Let’s look at the comparison between the old and new machine. In Azad Textile Mills we analyzed that, “why new machine are better than old machine?” In the simplex department they have erected 10 frames and in which one of them is the old one. If we compare the old machine with the new machine in production point of view then, it is clear that new machines are better than old ones. We got some experimental results, from the new frame with the speed of 725 rpm the production is 45 bags/day while with the old machine with the same speed production is 35 bags /days because many factors involved in it like sliver and roving breakages, machine adjustments and stoppages. If we compare these machines in energy point of view then old machine consumes more energy than the new ones. From the above discussion it is clear that the machine matters if we talk about productivity.

While analyzing in Ring Department, during working stoppages may occur due to the following reasons.

- Ends down
- Doffs
• Creeling
• Bobbin size

These factors affect the productivity to a great extent. If we control these stoppages then production can be increased and it also has an impact on yarn quality which is improved under the same conditions of cost and labour charges.

**Ends down**
The end down is due to the less strength of yarn and greater spindle speed. Adding to stops, no. of spindles per frame, lift of bobbin rail and cleanliness of the department also affects the production. More number of spindles on a frame increases its efficiency. Cleanliness means no fibrous mass is floating in atmosphere of ring otherwise ends down rate will be increased.

**Doffs**
Doffing means removal of full size package and replacing it with the empty one. During doffing, the machine is stopped and it is carried out by skilled workers. For coarse count like 7s, 10s etc, doff time is less and for finer count like 30s, 40s etc, time is more. For 20s it takes 90-110 min for complete doff. During doffing, it should be kept in mind that it should be carried out in the shortest possible time.

**Creeling**
The changing of the roving bobbin when it is empty and to replace it by a new full roving bobbin is called creeling. Creeling time should be as small as possible.

**Bobbin size**
The production can be increased by increasing the bobbin size because with a bigger bobbin less doff is required per shift. The Bobbin size depends on ring dia, but as we increase the ring dia, ends down rate also increases so it also has a limit. Usually 42 mm ring dia is available on which 40 mm dia bobbin can be prepared.

**10.4 Maintenance**
Proper maintenance of machine is necessary otherwise it results in the form of many problems like sudden shut downs and big production loss. In ATM maintenance is done on daily basis to overcome the problems which they are facing every day. Usually in ATM one machine is opened
in every department for maintenance. Proper maintenance results in the form of efficient working of machine and good outputs. For example by proper maintenance and by proper preparation of roving it results in the form of minimizing the end breakage rate.

10.5 Energy issue

Energy is the basic requirement of any industry but now a days in Pakistan it’s a big issue right now that’s why the textile industry is suffering from many problems. Now take a look and discuss what kind of problems they are facing and how they create hurdles for productivity? Pakistan industry is mainly running on these two resources i.e. gas and electricity. But due to shortage of these necessities many textile units are shutting down. Sometimes due to sudden failures machine parts are being destructed. The second and most important problem that arises is that the products are not being prepared in time for delivery which causes customer and production loss as the products are not being produced on time. For instance if one spinning mill has a production of 300 bags/ day due to shut down of 2 hours, its production is going to decrease by 275bags/day.

11.0 Interview of Company 1(Azad Textile Mills)

The purpose of interview is to collect knowledge regarding productivity and how they are working for the betterment of productivity and what type of steps should be taken for increasing the productivity?

Q.1. What do you think about productivity and how can we improve productivity in any company?

Imran: Productivity plays a very important role in the growth of any company, the more productive the company is the more it will profit and it has a positive impact on quality as well.

It can be improved by different variables.

1. Raw material:
   Better raw material results in the form of better yield age and high production rate.

2. Machine:
   Good quality machine results in the form of increase productivity.

3. Man power skills:
   If labours are properly skilled then productivity can be improved.
Q.2. What do you think is the most important factor by which you can reduce your cost and increase your productivity?

Imran: I think the most important factor is the raw material. From good quality raw material we can get maximum output with minimum rejection. If our rejection is less then yield age will be improved which outcomes in the form of less reprocessing of raw material. Through this cost will be reduced. For example on 83% yield age the profit/month is 30 lacs, if it is increased up to 84% then profit/month goes to 40 lacs.

Q.3. How would you evaluate the productivity of each department?

Imran: The evaluation of every department is taken from the daily production reports. Reports are generated after the completion of one shift. Every shift is responsible for its own report and these are made on a daily basis. In report, machine efficiency and production in yards (piy) is written. After that the manager will compare efficiency with Piy to get the productivity of each department.

Q.4. You are still working on shuttle and shuttle less yarns, why don’t you move towards fancy yarns because now a days the trend is different?

Imran: Well we worked on shuttle less yarns but the problem is that we are not capable to make fancy yarns because our raw material and machine are not of that type. Actually we are not working on product innovation but in future we will work on this segment as well.

Q.5. What type of changes would you like to make the process more productive?

Imran: First, I would like to enhance the quality of raw materials because good raw materials results in the form of good quality yarn and production improvement. Secondly, by installing latest machine the process can be more productive and one thing more workers and managers training also plays a very crucial role for increasing the production. I think it is impossible for us that without improving these areas; we can’t make our process more productive.
Q.6. How can you compare your company with the other big market players, and where do you see your company standing now?

Imran: For comparison, I divided it into three types.

1. Machine comparison:
   Our 80% machines are the same as good set up companies like Nishat and Crescent Textile Mills but we are lacking in Air conditioning and Filter plants.

2. Production comparison:
   We are not lacking in this area because our OPS (ounces per spindle) are the same as compared to other big market players.

3. Product Comparison:
   In this segment we are far back from our competitors. Actually, we are not working on product innovation, not processing variety of counts and we don’t have back process limit for this purpose. So, we have to work out more in this area.

Q.7. How do you manage your company’s supply chain, as it is complex?

Imran: Our supply chain is complex and not cost effective because we are far away from the market. The reason behind this is that our government has announced that the mills which are opened in these areas don’t pay any tax in the starting 10 years. It is helpful for us to overcome our other expenses. We are buying cotton bales from Local suppliers of Sindh and Punjab. By using our own transportation system we deliver this yarn to our suppliers. We have sent our major parts of yarn to one of our suppliers from Multan and the remaining yarn is sent to Faisalabad and Gujranwala market for selling. As far as spare parts are concerned we are also purchasing it from different suppliers of Karachi, Lahore and Faisalabad.

Q.8. What is your company’s future plans, and what ideas do you have in mind to improve your company?

Imran: In future we have planned to open a new unit consisting of all Rieter machine because we move towards product innovation. For making high quality fancy yarn we will import cotton type Pima and Giza from America and Egypt because these are considered as one of the best cottons. Then, we will work out on implementing BMR completely, change air conditioning and
filter plants. To make workers capable, organize training sessions for them. Moreover, we have plans to work for workers benefits to stop the turnover.

**Q.9. Where do you think Productivity and quality interrelates with each other?**

Imran: Obviously, these two things have a deep relation with each other. Better is productivity better is your quality. For measuring yarn’s quality these parameters i.e. Imperfection index and Uniformity percentage is very important. Less IPI and less U % results in the form of good quality yarn.

**Q.10. What is the role of financial policies in production process?**

Imran: A financial policy plays a very crucial role in any company. The finance department should always make policies where in time decisions are taken otherwise it results in the form of great loss. For example if you want to order any machine and you have sent a request to financial department for finance approval and you want that machine in time but finance department don’t take any action against your request and at that time you have bulk of yarn orders .But due to their long time policies your request is going to be pending which results in the form of production loss and these type of problems are normally seen when your staff is incompetent.

**Q.11. How marketing strategy plays its role regarding production?**

Imran: Marketing strategy is like how you introduce your product in a market? If its presentation is good and it can satisfy the customer completely then obviously, its demand is going to be increasing which results in the form of high production.

**12.0 Production Analysis**

Here is the production analysis of Ring department by doing some changes how we can improve productivity. For this purpose we changed the raw material staple length, by using raw material having different staple length and took some experimental results which are given below.

**Twist Calculations**

Couple twist gears ZB/ZA = 88/32

Twist exchange gear ZC = 31, 32, 33,34,35,36,37,38,39
\[ T = (D_3+S) Z_2 x ZB x Z7 x 1000/ (D_4+S) Z1 x ZA x ZC x 27 \times \Pi \]
\[ = (250 + 0.8) \times 96 x ZB x 32 x 1000/ (20.2+0.8) x 28 x ZA x ZC x 27 \times \Pi \ (T/m) \]
\[ = 15455 \times ZB/ (ZA x ZC) \]
\[ = 15455 \times 88/ (32 \times 36) \]
\[ = 1180.59 \ (T/m) \]

\[ TPI = 29.98 \ (Twist/inch) \]

\[ TPI = TM \times (ct)^{1/2} \]

\[ TM = 29.98 / 6.33 \]

\[ TM = 4.7 \]

**Production Calculations**

- Spindle speed = 19500
- Yarn ct = 40
- If \( TM = 4.7 \)
- Efficiency = \( \eta = 94 \% \) (breakage factor)

Front roller delivery = spindle rpm / TPI

\[ = 19502 / 29.98 \]

\[ = 650.50 \text{ inches/min} \]

\[ OPS \ (ounces/spindle) = FRD \times 60 \times 8 \times 16 \times 94 / 36 \times 840 \times 40 \times 100 \]

\[ = 650.50 \times 60 \times 8 \times 16 \times 94 / 36 \times 840 \times 40 \times 100 \]

\[ OPS= 3.88 \]

Production = OPS x 1/16 x 408

\[ P = 3.88 \times 1/16 \times 408 \]

34
\[ P = 98.94 \text{ lbs. / frame /shift} \]

- If \( ZC = 37 \), then \( T = 29.17 \text{ (Twist/inch)} \)

**Production Calculations**

\[ TM = 4.60 \]

Spindle speed = 19500

Yarn ct = 40

Efficiency = \( \eta = 96\% \) (breakage factor)

Front roller delivery = spindle rpm / TPI

\[ = \frac{19500}{29.17} \]

\[ = 668.56 \text{ inches/min} \]

\[ OPS \text{ (ounces/spindle)} = \frac{FRD \times 60 \times 8 \times 16 \times 94 \times 36 \times 840 \times 40 \times 100}{\text{OPS}} \]

\[ = \frac{668.56 \times 60 \times 8 \times 16 \times 96 \times 36 \times 840 \times 40 \times 100}{\text{OPS}} \]

\[ \text{OPS} = 4.07 \]

Production = OPS \times 1/16 \times 408

\[ = 4.07 \times 408 \times 16 \]

\[ P = 103.91 \text{ lbs. / frame /shift} \]

From the above analysis it is clearly revealed that by using same raw material having same price but difference in its staple length, results would be different. Like in first case we used the raw material which has an Avg. staple length of 28mm. From this our calculated TPI is 29.98 and TM is 4.7 for 40 single yarn count, which results in the form of 98.94 lbs. / frame /shift production. Then, we examined the fibers having an Avg. staple length of 34 mm. In this case our calculated TPI is less which is 29.17 and TM is 4.6 for the same count of 40s because when staple length increases twist per inch decrease and at the same time production is increased i.e. 103.91 lbs. /frame / shift for fibers having good staple length. Greater the staple length of cotton
fibers better will be the machine efficiency due to reduction in breakage. We examined that in case of 28 mm fibers breakage is more as compared to 34 mm fibers.

12.1 Cost analysis

The price of 40s yarn is 160 Rs/lb and from the above results its production from one frame is 98.94 lbs / shift, it means its cost would be 15,830.4 Rs. After changing its staple length its cost increases up to 16,624 Rs which shows its increase in Production rate. During the experiment it was also analyzed that less the Twist per inch (TPI), high will be the production and cost.

13.0 Fabric Production

Fabric production or weaving means the making of fabric by yarn, which is made by the interlacement of warp and weft yarn on the loom. These yarns are vertically interlaced. There are different processes involved for making the fabric like warping, sizing, weaving and folding. These processes are dependent on each other. Warp beams are transferred to the sizing process where these beams are sized by different chemicals to give strength to yarn and then, these sized beams are attached in looms for making the fabric. After this, fabric is sent to the folding department where fabric is folded and inspected to check the faults. Faulty fabric is separated from the A, B grade fabric.

Following are the processes through which the fabric is produced step by step.

13.1 Warping process

The objective of warping process is to make the weavers beam for the weaving machine because it is impossible that to place the hundred of cones in front of weaving loom to provide the warp threads.

Types of warping processes

Direct warping

When several beams with same beam length are prepared then direct warping is used. In this process the proper winding takes place, the available threads from the creel are wound on the beam. After this all available beams are unwound on the weavers beam.
Fig. 22 Source: ACIMIT weaving reference book (Direct Warping)

Sectional warping

In this system several sections are wound in the sequence which parallel to each other on a drum. This type of warping is cost effective for short and striped warp and fancy pattern. Here the warping speed is about 800 m/min while the beaming speed is about 300m/min.

Fig 23 Sectional warping

13.2 Sizing

Strong, smooth and elastic yarn is the requirement of weaving process. To achieve these properties a polymeric film or coating is applied on the warp yarn

Following are the objective of sizing process

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6 Source http://www.karlmayer.cn/internet/images/OOM_maschine_freigestellt.JPG
- Strengthen the yarn
- Make yarn surface smoother
- To reduce the yarn hairiness

The goal of the sizing process is to reduce the warp breakage during weaving. Warp breakage is either caused by low strength yarn or through high tension.

**Fig 24 Sizing Source: ACIMIT weaving reference book**

The important ingredients which are used in the sizing recipe are Adhesives, lubricants, additives, water like PVA, CMC, Starch etc

Following are the parameters which controlled in the size box:

- Level of size solution
- Temperature
- Size liquor concentration
- Squeeze roller pressure
- Yarn speed

### 13.3 Drawing In

This process consists of threading through each drop wire, healed wire and reed dent depending on style and size of machine. This operation is carried out manually and now a day’s automatic drawing machines are available.
13.4 Tying In or Knotting

When the fabric is mass produced and weaver beam is about to finish then, new weaver beam is placed on the loom having same ends, each end is tied to its corresponding end of loom. This process is carried out through knotting machine.
13.5 Weaving Process

Weaving is the interlacement of warp and weft yarn. The machine which is used for this process is called loom; both yarns are interlaced at right angle, warp yarn is working in vertical direction while weft yarn is inserting in horizontal direction.

![Fabric weave](http://en.wikipedia.org/wiki/File:Kette_und_Schuß.jpg)

Fig 27 Fabric weave

Many types of looms are available for fabric production and are being used in different companies.

14.0 Loom

Different types of looms are used in KTM. The details of these machines are given below:

14.1 Projectile loom

In this loom filling of yarn is done through the small metal device just like a bullet in appearance with a clamp to grip the yarn from one end then, this metal device propelled into the shed. This loom is considered as a high productivity level, having 450 rpm and reliable operational functions.

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14.2 Air Jet loom

In Air Jet loom the weft insertion is done through air pressure. This machine has the highest weft insertion performance and it is considered as the most productive in case of all type of fabrics from light to medium weight fabric.

The weaving width normally ranges from 190 to 400 cm and has the capacity of 8 different colors fed at a time. Although, it requires high energy consumption to prepare compressed air and this consumption increase with the increase of loom width and running speed.
14.3 Water Jet loom

Only few companies produced this type of machines, normally used for light to medium weight fabrics, in water repellent materials and mainly utilize for multi filament synthetic yarns. Water Jet loom are extensively used in East Asia while on other countries it have limited importance. They are categorized as high insertion rate with low energy consumption.

Weft yarn fed from the cone through pressurized water, from the water pump the weft yarn is inserted to the shed at high speed

Fig 30 Water jet loom Source: ACIMIT weaving reference book

14.4 Rapier loom

Rapier loom is the most flexible machine in the market; its application covers a wide variety of different fabric styles. Rpm of this machine is about 600-700. During working reed, healed frames and slay has low vibration. The weft yarn is inserted through clamp containing the weft passed through the shed and then comes back to its initial position; this is the example of single
rapier machine.

Fig. 31 Rapier loom Source: ACIMIT weaving reference book

15.0 Weaving Mechanism

The mechanism of any loom can be classified as described below.

- Primary motions
- Secondary motions
- Auxiliary motions

The primary motions contain the shedding, picking and beat up motions.

*Shedding* means the open of warp sheet into two layers to make the way for the passage of shuttle containing the filling yarn.

The *Picking motion* varies from loom to loom e.g. in air jet weft picking is done through pressurized air.

*Beat up* is the process of pushing the last inserted weft yarn to shed fell into cloth by another device called reed.

Secondary motions consist of let off, take up and auxiliary motions.

In take up motion, as the fabric is weaved the first task is to remove it from the weaving area, to achieve this take up motion is used. Take up motion support to wind the cloth on the cloth roller. The fabric removes the cloth at rate that controls the filling density pick/inch.
In let off motion, warp yarn from the warp beams are released, as warp is woven into the fabric it
remains constant throughout the whole weaving process.

Auxiliary motion consists of warp stop motion, warp protector and weft stop motion. Warp stop
motion is used when warp yarn breaks then loom will stop automatically with the help of
sensors. Warp protector is used for several warp thread breakages in the happening of shuttle
getting trapped in the middle of warp sheet. Weft stop motion is used when weft yarn breaks then
through sensor loom stops automatically. (Fabric structure and design by N.Gokarneshan).

16.0 Folding and Inspection

16.1 Faults

Following are the faults normally inspected during folding.

- Miss pick: This is caused when weft stop motion does not work
- Miss end: These faults occurs when warp stop motion does not work
- Double pick: When the faulty pick is not removed and worker restarts the machine then
  this happen.
- Half pick: When the pick is broken and not removed by the worker and machine is
  started.
- Reed marks: If the dent of the reed is not properly aligned then reed will leave mark
during beating up.
- Sizing spot: These are the brown spots which cannot be removed
- Loose selvedges: These are caused due to tension variation.

There is a proper folding department who is responsible for folding and inspection. The fabric
from the loom directly brings in this department. The fabric overlapped on rollers then it is
checked properly and divided into 3 classes. Inspection process consist of points system:

A grade: defects points from 72 yards - so on

B grade: defects points from 36 -72 yards

Cut piece: defects points from 1-9 yards
17.0 Company Description

Kohinoor Textile Mill was established in 21st December, 1987 and is located eight kilometers from Manga Raiwind Road, District Kasur. In this mill Greige cloth is processed from cotton, blended and synthetic yarns. In the start of this project 48 Sulzer Ruti shuttle less looms are installed for production but in 1990, Japanese made 96 Tsudakoma air jet looms were installed and then in 1998 a new shed is established comprising of 60 Picanol Omni 340 cm machines. Furthermore, old Sulzer Ruti looms were replaced by modern 48 Picanol Omni plus 380 cm looms. With the passage of time, company makes its system more automatic and preferred to use latest machines. The company has the production capability of 30 million square meters annually.

Following data describe machinery information which is now using in the company.

17.1 Weaving section

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<th>Capacity</th>
<th>Specification</th>
<th>No.of machine</th>
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Table 1

17.2 Inspection and Folding

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<td>75&quot; - 110&quot; - 130 Cloth Inspection Machines</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Nazer Industries</td>
<td>75&quot; - 150&quot; - 86&quot; - 110&quot;</td>
<td>15</td>
</tr>
<tr>
<td><strong>Baling Press</strong></td>
<td>MM Heavy Engineering</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Folding knotting</strong></td>
<td>Taj Engineering</td>
<td>75&quot; - 125&quot; Folding Machines</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 2

### 17.3 Warping

<table>
<thead>
<tr>
<th>Make</th>
<th>Capacity</th>
<th>Specification</th>
<th>No of Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auto coner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Murata Mach Mini 7R2</td>
<td>10 Drum / 6 TO 80 Yarn Count (Ne)</td>
<td>Murata Cone Winder Machine</td>
<td>1</td>
</tr>
<tr>
<td>Savio</td>
<td>60 spindles</td>
<td>Savio Automatic Cone Winder Machine</td>
<td>1</td>
</tr>
<tr>
<td>Benninger ZELL ZCR-1800</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Warping</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZB 24 TKD (Bentronice-3800)</td>
<td>Dia 1016 MM</td>
<td>Warping Machines</td>
<td>2</td>
</tr>
<tr>
<td>Benninger</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3

### 17.4 Sizing

<table>
<thead>
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<th>Capacity</th>
<th>Specification</th>
<th>No of machine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sizing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZB 24 TKD</td>
<td>Dia 1016 MM</td>
<td>Sizing machine</td>
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</tr>
<tr>
<td>TKD - TKD</td>
<td>CT 4/4/4 UB</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4

### 17.5 Quality Management system

- ISO 9001-2000
  - Certified by Lloyds Register Quality Assurance UK

### 17.6 Environmental System

- ISO 14001
  - Implementation Work in Progress
18.0 Factors Affecting Productivity in a Weaving Mill

The factors involved in this company are similar to that of the previous company but there is difference in its manufacturing process and machine set up.

18.1 Machinery

Productivity is greatly influenced by the machinery efficiency, if the machine has the latest model then definitely the productivity will be high, multiphase and air jet loom has the highest weft insertion rate. If the machines have proper maintenance then, the breakage of weft yarn will be low. Breakage is the important factor to optimize the productivity, less breakage of weft yarn is the guarantee of more productivity ratio. In this competitive market many types of looms are available in the market but those looms are preferred whose yield is high and has best production results.

18.2 Labour

Skilled labour and their capacity is also an important factor. Labour personal involvement sometimes dependent on company’s production. If the labours are well trained and aware of machine operations then production rate will be high. Labours carelessness or ignorance during production process affected the production efficiency. When machine stops due to breakage or any other reason than delay of restarting the machine has an impact on production. Sometimes it happens due to negligence of workers because they don’t start the machine at the right time. Furthermore, more labour on one machine cannot give the guarantee of high productivity while on the other side competent labour can give the better results.

18.3 Temperature

In weaving shed, temperature (humidification factor) has great impact on the production. In weaving process, the yarn faces different tensions and friction forces. So, temperature in this environment should be maintained. If the temperature is exceeded than the standard temp, then breakage will be increased and production efficiency will be decreased and as a result whole production will be disturbed. So, to overcome this situation temperature issue should be in your mind. This will provide the best operating conditions for machine operators.
18.4 Raw material

This is observed that raw material quality has the key importance in production process, like from where you are buying yarn and who is your supplier? If your raw material is of high quality then the chances of breakage and error would be minimum. There will be cost factor issue in this regard because for high quality raw material you have to pay more but on the other hand this will compensate in the form of high production.

18.5 Energy issue

In weaving, energy is used in terms of machines operations, for air conditioning, compressors and other production areas etc. Two types of energy sources are used in a weaving mill like electrical and thermal energy. For machine operations, air conditioning and for illumination electrical energy is used but for sizing thermal energy is used. If you have old model loom then your energy consumption will be more as compare to the latest machinery. So, latest machinery can save the energy consumption and definitely improve the production rate.

Following figure describe the average consumption of energy in a chosen mill.

Source: Fibres & Textiles in Eastern Europe 2010, Vol. 18, No. 2 (79)

18.6 Maintenance

The main purpose of maintenance is to minimize the operating cost and to improve the quality and reduces the chances of stoppage of machine. In a weaving mill, work is being done in three
shifts. Normally maintenance department is responsible for checking the machinery working condition. Due to proper maintenance, production quantity will be improved and manufacturing cost will be decreased.

19.0 Interview of Company 2 (Kohinoor Textile Mills)

Q1. How do you analyse productivity and how you differentiate production with productivity?

Ans. In our point of view especially in weaving, if your total production is about 30,000 meter/day. Then, 10000 meter will be the productivity of each shift, through this way you can understand the difference between production and productivity. If your productivity is high then it means that your company is moving towards the right direction, this will increase the profit margin but for this you must think about bringing in the latest machinery, skilled labour, quality standards and raw material quality etc.

Q2. What is the parameters to calculate the productivity?

Ans. As we have three shifts, after each shift the production in charge note shows how much fabric is being produced. If one shift produces less fabric as compared to the other two, one then asks the reason why it is less.

Q3. Is there any utilization of wastage that produces in each process?

Ans. In warping we have some left over cones, so they are taken into auto cone where they are unwound and wounded on to other cones. Sometimes the owners of the local power looms purchase yarn bags so warping waste in this way utilize. In weaving waste like cut pieces in folding that is also sent to the local lower market where it is easily purchased.

Q4. How do you control your supply chain?

Ans. We have a proper purchase department who is responsible for each purchasing, we send them our requirements with quality standards and time when it should be with us. Then that is their responsibility how they handle this situation. We are interlinked with each department; information is shared on rapid conditions.
Q5. What is your strength?

Ans. We believe on our labour skills and their devotion towards this company. They are working hard and complete their tasks with full responsibility. In machine prospective we are following the latest trends so our technology is our strength as well.

Q6. Who is your buyers?

Ans. In our buyers list you can find the big market players like Nike, Diesel, Armani and Gucci etc. We also have many local buyers.

Q7. How you relate Quality with Productivity?

Ans. Both terms have their own importance, if we go by the quality of the product then the product should be errorless and it should be fully accepted by the buyers, if your quality is good then it means that the productivity will be at a good position. Both terms if they are at their best then the company will be in profit.

Q8. Do you follow CSR rules in your company?

Ans. Yes, we are strictly implementing on CSR rules.

Q9. Has your company made any plans to expand this present production capacity?

Ans. Yes, last time the board of directors meeting was held they discussed this issue that we have a good market share right now, so this production capacity should be expanded and improved.

20.0 Discussion

From the above production analysis it is clear that by minimal changes in raw material results will be different. From the above experiment it is easily analyzed that minimum change in raw material can affect our production and cost. While choosing raw material cost should not be compromised. If you use low quality raw material then your end product (yarn) cannot be sold out in a good price. Sometimes mill owners think that by using low graded cotton we can get more profit, but we think they have wrong perception. We got results from this experiment showing that how minimum changes in a raw material can affect production and cost.
There are many other issues to discuss related to the spinning and weaving industry which results in the form of productivity loss. From our point of view the most important factor is the quality of raw material. If raw material is of good quality then end product will be good which results in the form of high productivity. For example in many mills they have good machine set up but they are using cheap cotton using cheap yarn for fabric manufacturing. As a result their quality is going to decrease.

The other important thing is having skilled worker. It is also a core issue to relate productivity with profit. Some managers think that if you decrease your labour magnitude then the profit will be increased because they are thinking that we can save money from their salaries. We think less or more labour is not guaranteed success factor for profitability. If workers are properly trained and skilled then probability of profitability will automatically increase.

In Pakistan, there are many issues related to child labour; in many firms’ children of under working age are working illegally. The solution of these problems is that the Government should apply a proper check and balance system that should be observed. The industry should follow these rules and take proper actions to solve the problems caused due to under age illegal workers.

Information technology is spread all over the world and use of IT tools in an industry is mandatory to survive in this competitive global market. So, in every company IT systems should be installed. The implementation of IT systems in an industry will generate great benefits, as each department will be connected to other departments and in this way production or general manager can get regular updates regarding machine status or efficiency that whether it’s working properly in the required manner or not and production level can be enhanced by following this method.

Pakistan textile industry is facing many problems due to Pakistan’s economic setbacks in last 8 years. Energy issue is one of the biggest issues which textile sector is facing. Large number of firms was closed due to the energy crisis, as machines couldn’t run to get the desired production. It is the need of the time that government should come up with plans to rescue Pakistan’s biggest industry such as construction of dams, use of sun light and wind as a source of energy.
21.0 Conclusion

The research project showed that there are many factors by which we can improve productivity, but our emphasis was on one of the most important factor which yielded very important results. We focused on raw material staple length and machine efficiency. By using the same raw material with good staple length, we achieved better results in the form of high production and high profit. The other benefit is that due to increase in staple length, Short fibers percentage also decreases and results in the form of less TPI and less yarn breakage. Breakage is one of the big factors due to which efficiency of department is disturbed. Productivity increases with a variation in a raw material staple length and machine efficiency is directly dependent on the staple length of a raw material.

In the production of yarn and fabric we should keep many things in mind which can control and enhance the productivity parameters. Productivity can be enhanced by restructuring the each process or using fully automated machine. While producing yarn and fabric, quality of raw material or other parameters have their own importance. On the other hand, we should realize that without participation of each individual nothing can be done. So, companies should make the policies which are favorable and helpful to both managers and workers.

Skilled labour, automated machinery, raw material quality and energy issues have an impact on production of yarn or fabric. If any company has a grip in these issues then, that company can survive in this competitive market in a better way.

With the growth of production, the company earns more profit and can create more vacant positions for the new jobs to increase or install new machinery. For this they need more investment or capital and new labour will help in increasing the productivity.

High profit or high investment in every business is the first preference, but in the textile sector the high profit with customer satisfaction is the key issue. Customers should be satisfied by the textile sector in order to retain a long term relationship with them. Customer’s trust must be kept on top priority by each and every company.
22.0 Reference

2. Cotton Drawing and Roving- Gilbert R. Merrill
17. http://www.textiletechnology.co.cc/spinning/COTTONMIXING.htm