Chapter II

Supply Chain Management in Textile Industry

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Chapter – II

Supply Chain Management in Textile Industry

Textile industry has a various range and a variety of products and has numerous usages. Textile does not only satisfy the basic human needs of clothing but used in various industry for production process or in the product itself. Broadly the end user of textiles may be divided into

- Apparel clothes
- House hold textiles
- Furnishing fabrics
- Industrial textiles

The whole industry can be divided into the following sections:

a. Cotton, silk and manmade fibres
b. Wool
g. Hosiery
c. Carpets
h. Lace
d. Linen  
i. Warp-knitting  

e. Jute  
j. Bleaching, dyeing, finishing & printing  

f. Felt  
k. Laundering  

Here for the purpose of this study the researcher has considered cotton, silk and manmade fibers section only. Any organisation dealing in silk, cotton or manmade fibers will be engaged into one or more than one operation listed below:

- Spinning
- Processing
- Weaving
- Garment Manufacturing

Any organisation engaged into spinning, processing and weaving is called as composite mill.

2.1 Spinning

The process of converting raw material (natural or manmade) into yarn is called as spinning operation. This study is limited to cotton & viscose mixed spinning. Cotton is grown in the field and the kapas is plucked during harvest. The fibers are attached to the seeds. These kapas
contains lot of impurity. In order to remove the impurity the cotton has to pass through an operation called as ginning. During this operation care is taken that no impurity exists there and neither the fibre nor the seed is broken. In early days the ginning operation was carried out by foot roller gin or charkha. With the development of the textile industry new process like the Knife Roller Gin, Macarthy Gin, Saw Gin are in practice. After the ginning operation the cotton is in loose open form and transporting it in the very form is very expensive. Therefore cotton is compressed into cubical form called bales. In different countries the average weight and size of the cotton bales vary. The Indian cotton bale has average weight of 180 kgs. The dimensions are 120 cm length, 60 cm in width and 45 cm in height. They are having a density of about .8g/cm. They are covered with jute clothes and 4 to 6 metal bends are used. The quality of cotton is judged in terms of grade and staples. The Indian cotton is graded as:

- * Super choice
- * Super fine
- * Fully good
- * Fully good fair
- * Choice
- * Fine
- * Good
The staple length are 25 mm, 32 mm, 35 mm. Longer the staple better will be fineness and feel.

The hard-pressed cotton is to be opened and this is done at the blow room. The blow room line is made up of opening, cleaning and lap making machines where cotton or any other fibre is changed in form from the hard-pressed bales to soft sheets called laps. The functions of blow room machineries are:

- Opening
- Cleaning
- Blending
- Lap formation

In the opening process the hard-pressed bale is reduced to the smallest possible size. In the cleaning fresh and foreign matter is removed to the possible amount without damaging the fibre. The fibre is blended “mixed” thoroughly to get a uniform yarn quality. In the last stage of blow room operation even, uniform and compact laps are formed.

The laps as the outcome of blow room is brought to the carding section where the carding machine performs the following functions:
➢ It loosens the fibers from the fibre tufts and to individualise them

➢ It extracts sand, leaf etc. left in the cotton by the blow room machinery.

➢ It converts the lap into a round strand of loose soft cotton known as sliver

The fibers in the card sliver are hooked and lie in all possible directions. The weight per unit length of the card sliver varies considerably along its length. In order to obtain a good quality yarn it is essential that this high variation should be reduced and is made to lie parallel to one another. The process termed drawing achieves these two objectives:

➢ Improves the uniformity of sliver fed.

➢ It makes the fibers parallel to each other and to the axis of the sliver.

The carded and the drawn material is further attenuated on the speed frame and ring frames. The quality of yarn spun by using this sequence of processing does not reach a very high level. This is because of presence of short fibers and the inappropriate configuration of the fibers
in the drawn sliver do not permit the drafting at the speed and ring frames to be effective. The process of combing is introduced for reducing the short fibre content in the material and for improving the fibre configuration. Consequently, combed give a more even and stronger yarn, which contains less, naps as well. Combing is an optional process in the series of steps needed to convert fibre into yarns. The actual process of combing consists of teasing out shorter fibers from a thin sheet of fibers by a series of fine steel needles.

The drafted material called roving is weak and needs some strength to withstand the strain while it is wound into a package and later when it is wounded at the next stage. Twist is given to the rove at speed frame again. It is given a suitable form for spinning.

This all is done at the speed frame. The first machine used is the slubbing frame, where the draw frame sliver is fed from the cans. The material is drafted out, twisted to give it some strength and wound to a bobbin. The bobbin is next fed to the intermediate frame roving and Jack roving frames respectively.
Ring Frame is the last stage of spinning. The roving is used to convert the yarn of the required count by drafting it to the appropriate level. The drafted out roving is then twisted on ring and traveler arrangement. The twisted yarn is then wound on bobbins and cones.

The yarn made up at the ring frame may be made ready directly for weaving, for doubled yarn manufacture, sale or dyeing. For weaving the yarn is made into warp or weft. For both the doubling process and wefting is done.

2.2 Weaving

Weaving is the convenient way of describing the series of process, which collectively converts yarn into loom-state fabric. Textile fabric are most commonly woven or knitted but they may also be produced by non-woven process, tufting, braiding, felting, lace making or net making. Weaving is the oldest of the textile process and the majority of textile fabrics are still produced by this process. Fig. No. 2.1 shows process of converting yarn to fabric.¹
Fig. No. 2.1 - Process of Converting Yarn to Fabric.

The process to be used for the preparation of yarns depends mainly on the type of fabric to be produced and also on the equipment and other facilities available in the mill.
Winding

The winding process is the division between the group of processes described as ‘spinning’ and those described as ‘weaving’. In an independent yarn mill it is associated with spinning and deliveries to the weavers on the appropriate package most appropriate for end usages. In a yarn mill, which is an integral part of a vertical textile unit, winding is the first process of weaving preparation. The main objectives of winding are:

- Removal of objectionable faults from yarn
- Putting the yarn in a long continuous length into a bigger package

The yarn from supply package taken through a guide is passed under some tensioning device to break at weak places and then it is passed through a slit to maintain thickness. The yarn is then wound on to a package.

Warping

It is the next basic process of making fabric. The objective of warping is to convert a predetermined number of single end packages, such as cones or cheese into a sheet of yarn of specified length and width. The
individual ends in the warp are uniformly spaced across its full width. The warp yarns comprise of the systems of yarns required to produce a woven fabric and also for warp knitting.

**Sizing**

The purpose of sizing is to apply a protective coating to the yarn to enable it to withstand the complex stress to which it is subjected in the weaving machine at the same time maintaining its strength & elasticity. For this the warp yarns are impregnated with size. The size binds the fibers on the surface of the yarns, thereby making the yarn comparatively strong, round and smooth and prevent entanglement of protruding fibers with each other. In order that the strength of fibers in the yarn be fully utilized, the fibers are prevented from slippage by the binding action of size. The sized warp is dried by the following method:

- Conduction of heat to the yarn from steam heated cylinders
- Free and forced convection of hot air over or through the warp sheet
- Radiation of heat to the warp from infrared radiators.
Drawing in Process

After sizing the weavers beam has to undergo the drawing-in-process. The drawing-in-process consists of passing the warp ends from the weavers beam through the heald eyes in case of tappet or dobbey weaving or through the harness cords in case of jacquard weaving in a predetermined order as determining by the cloth design. The drawing-in-process can be carried out either manually or mechanically.

Weaving

Weaving is the final stage in the fabric production. Automatic and non-automatic looms are used in the weaving process. In the loom the insertions of successive picks or wefts in successive warp sheds of different formation, followed by beating up action, produce the desired fabric according to a prearranged scheme of interweaving or interlacement. The repeating pattern of interlacing is called weave.

2.3 Garment Manufacturing

The process next to weaving is garment manufacturing. The various process involved in garment manufacturing are:

-Cutting
-Sewing
-Fusing
-Pressing

Cutting

The first stage to the manufacturing of garments is the cutting of materials into the necessary pattern shapes. The cutting process is carried out in the cutting room. Here the spread fabric is cut into garments. This operation is very decisive, because once the fabric had been cut, very little can be done to rectify serious mistake. Cutting production starts with the receipt of inspected raw materials, production orders and graded patterns and finishes. The total process has four stages. Fig. No. 2.2 shows various process in the Cutting Room.
Fig. No. 2.2 - Process in Cutting Room

Planning

The operation consists of planning the layout of the pattern components so as to ensure the most economical use of materials.

Spreading

This is the preparatory operation for cutting and consists of laying plies of cloth one on top of the other in a pre-determined direction and relationship between the right and wrong sides. The composition of each spread i.e. the number of plies of each colour is obtained from the cut order plan.
Cutting

The fabric parts are separated as the ripples of the pattern pieces in the marker plan. The ease with which accuracy is achieved depends on the method of cutting employed and in same case on the marker planning and marker making. The various tools used in cutting are:

- Hand shear
- Straight Knife
- Round Knife
- Band Knife
- Natchers
- Drills and thread markers
- Computer controlled cutting knives
- Die cutting
- Laser cutting
- Plasma cutting
- Water Jet cutting
- Ultra Sonic cutting
Preparation for Sewing

This group of operation are concerned with preparing the cut components for sewing. It includes the following:

➢ Position marking
➢ Shade marking
➢ Bundle preparation
➢ Bundle tickets

Sewing

Sewing is the dominant process in garment manufacturing. Its objective is to achieve both strength and flexibility. The process involves joining together of components of garments. Various different categories of sewing machines are in use. Every category of sewing machine produces a specific type of stitch formation depending on the number of needles, loppers and threads which combine to construct the stitch where a sequence of stitches unite two or more pieces of material is called as seam. The construction of seam is the main job of sewing. The choice of seam type is determined by aesthetic standards, strength, durability, control in wear, and convenience in assembly in relation to the
machinery available and cost. The good appearance in a seam normally means smooth fabric joins with no missed or uneven stitches and no damage to the material being sewn. The question of economy of seaming in production arises because many seams can be constructed in a variety of ways. Many of the newer machines and stitch types enable shortcuts to be taken in the joining and neatening of seams but the appearance and performance of the seams vary with the different methods. A balance must be achieved when planning garment production between the demands of the end use of the garment, its price and the machinery available for construction.

Components and Trims

At this stage various components other than fabric are essential to the garment, which act as trimming or fastening of some kind. The total number of items available for use in garments in addition to main fabric is extremely large. However, a brief summary of the most important components is:

- Labels and motets
- Lining
Interlocking
Wadding
Lace, braid and elastic
Look and loop testing
Seam binding and tape
Shoulder parts
Eyelets and laces
Zip fasteners
Buttons
Tack buttons, snap fasteners and rivets

The logic behind the selection and the sequence is to look first at those components which are purely textile, for which construction methods are akin to those for the rest of the garment and then to consider some of the items made from non textile materials for which special, non-sewing machinery may be required.
2.4 Alternative Methods for Joining of Materials

There are various situations where sewing of parts of the garment does not serve the purpose or is very difficult to attain the desired level of output. In such situation fusing is the alternative method for joining the material is used.

Fusing

In fusing the interlining is bonded to the outer fabric by means of a thermoplastic resin. The fusible interlining consists of a base cloth, which may be similar to that used for a sew-in-interlining, and which carries on its surface a thermoplastic adhesive resin. It is laid flat with the resin side into the garment part and heated with pressure. The resin gets attached with the fabric.

Pressing

Pressing of the garment is done in order to give shape and finish. It increases the attractiveness of the garment. It serves the following purposes:
- Smoothes away unwanted creases and crush marks
- Makes creases where design of the garment requires
- Moulds the garment
- Prepare garment for further sewing
- Refinish the fabric

The process of pressing can be divided into two groups:

- **Under Pressing** - This is pressing when the garment is being manufactured
- **Tap Pressing** - This is final pressing when the garment is completely assembled

The various means of pressing are head, moisture and pressure. Equally important is the use of vacuum, which sucks ambient air through the garment as it lies on the buck or pressing table.

The fabric system employed in the garment factories is progressive bundle system.
The garments are gradually assembled as they move through successive sub-assembly and main assembly operations in bundle form.

2.5 Textile Industry in India

Textile industry in India is one of the largest and oldest industries. This sector has made significant contribution to the economy of the country. It covers a wide range of economic activity starting from growing of raw material to the production of fabric and garments. If we talk in the terms of employment, it is the single largest organised industry employing nearly 10 lacs. of workers. In 2000-2001 it had contributed 14% to industrial production and 27% to the country's export earning. The textile industry has been witnessing growth in the last years 1996 to 2003. The spindlage capacity in 1996 was 31.75 million which increased to 38.33 million in 2003. India has 1509 spinning mills, 276 composite mills and 209 exclusive mills. It has been seen that the number of spinning mills decreased from 1665 in 2000-01 to 1509 in 2002-03 whereas composite mills decreased from 285 in 2000-01 to 271 in 2000-03. As on 31.3.2001, 383 (262 spinning & 121 composite mills) with installed capacity of 8.96 million spindles, 46012 rotors and 69000 looms
reported closed. The textile industry in India is passing through a very rough phase. There has been instability in the raw material cost. The textile industry has been using some chemicals which are non acceptable in the international market. If we see the manufacturing cost we find that Indian textiles are less cost competitive as compared to the major competitors like China, South Korea & Brazil. This less cost competitiveness can prevent Indian textile industries to enter the global quota free market. The major causes that contribute to a higher cost of production are:

- High raw material cost.
- Higher outgo on power
- Lack of economies of scale.

Production competitiveness for some of the textile product can be seen from Table No. 2.1.
<table>
<thead>
<tr>
<th>Item</th>
<th>India</th>
<th>Brazil</th>
<th>China</th>
<th>S.Korea</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textured yarn*</td>
<td>2.06</td>
<td>1.90</td>
<td>1.40</td>
<td>1.68</td>
<td>2.13</td>
</tr>
<tr>
<td>O-E yarn*</td>
<td>2.17</td>
<td>2.31</td>
<td>2.51</td>
<td>2.35</td>
<td>2.30</td>
</tr>
<tr>
<td>Ring-yarn*</td>
<td>2.45</td>
<td>2.61</td>
<td>2.76</td>
<td>2.68</td>
<td>2.86</td>
</tr>
<tr>
<td>Weaving Ring O-E yarn**</td>
<td>0.24</td>
<td>0.20</td>
<td>0.22</td>
<td>0.29</td>
<td>0.34</td>
</tr>
<tr>
<td>Woven ring-yarn fabric**</td>
<td>0.663</td>
<td>0.652</td>
<td>0.691</td>
<td>0.754</td>
<td>0.844</td>
</tr>
<tr>
<td>Woven O-E yarn fabric**</td>
<td>0.614</td>
<td>0.600</td>
<td>0.647</td>
<td>0.696</td>
<td>0.746</td>
</tr>
<tr>
<td>Ring yarn knitting**</td>
<td>0.12</td>
<td>0.14</td>
<td>0.08</td>
<td>0.12</td>
<td>0.19</td>
</tr>
<tr>
<td>O-E Yarn knitting**</td>
<td>0.06</td>
<td>0.07</td>
<td>0.04</td>
<td>0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>Textured yarn weaving**</td>
<td>0.39</td>
<td>0.37</td>
<td>0.37</td>
<td>0.39</td>
<td>0.71</td>
</tr>
<tr>
<td>Woven textured fabric**</td>
<td>0.591</td>
<td>0.548</td>
<td>0.506</td>
<td>0.551</td>
<td>0.920</td>
</tr>
<tr>
<td>Textured yarn knitting**</td>
<td>0.05</td>
<td>0.06</td>
<td>0.04</td>
<td>0.05</td>
<td>0.08</td>
</tr>
<tr>
<td>Knitted textured yarn fabric**</td>
<td>0.205</td>
<td>0.201</td>
<td>0.139</td>
<td>0.177</td>
<td>0.242</td>
</tr>
</tbody>
</table>

* total yarn cost (in $ per kg of yarn)

** total fabric cost (in $ per yard of fabric)

Table. No. 2.1 - Textile Production Competitiveness of Countries
Mr. Bagar Iftikhat Naga, Senior Consultant with KSA Technapak said “Many of the organised Indian textile players have production cost comparable to their Chinese counterparts. Much of the Indian textile industry is, however, disaggregated and hence the overall costs competitiveness of the industry comes down in comparison to the much more organised industries in China and other countries”. The Government tax structure for corporates is also comparatively high. This also adds to less cost competitiveness. India has an advantage in labour cost area over other countries, therefore the textile industry can perform well in the garment-manufacturing sector. The Indian textile manufacturers have been concentrating on niche market and hence the productivity here is much lower. The items in which India does have clear cost competitiveness over China and Brazil are production of O-E yarn, ring yarn and knitted ring yarn fabric. The Supply Chain Management needs to be developed along with improving market arrangements internationally. The textile industry in Indian needs to be more organised and adapt the management and technical strategies to compete in domestic as well as international market.
The quota free world will give India an opportunity to capture export market. Indian Textile Industry must strengthen itself to capture this potential. Fig. No. 2.3 shows the deficiencies and initiatives, which must be taken to strengthen this industry.¹⁰

<table>
<thead>
<tr>
<th>Sector</th>
<th>Deficiency</th>
<th>Key Initiative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre</td>
<td>➢ Inferior cotton with high impurities</td>
<td>➢ Technology mission on cotton to improve productivity, quality</td>
</tr>
<tr>
<td></td>
<td>➢ High duty rates for synthetics, making it uncompetitive</td>
<td>➢ Rationalising duty structure to synthetic fibre competitive</td>
</tr>
<tr>
<td>Spinning</td>
<td>➢ Catering to lower value added product</td>
<td>➢ Abolishing excess spindleage</td>
</tr>
<tr>
<td></td>
<td>➢ Obsolete technology</td>
<td>➢ Technology upgradation</td>
</tr>
<tr>
<td>Loom/ Knit /independent process plant / Mill</td>
<td>➢ Low technology absorption</td>
<td>➢ Encourage setting up of large integrated textile complexes</td>
</tr>
<tr>
<td></td>
<td>➢ Fiscal exemption leading to evasion</td>
<td>➢ Modernizations of power loom</td>
</tr>
<tr>
<td></td>
<td>➢ Excess capacity</td>
<td>➢ Clustering of activities</td>
</tr>
<tr>
<td>Garment</td>
<td>➢ Fragmented sector, low technology absorption</td>
<td>➢ Allowing FDI in apparel sector</td>
</tr>
<tr>
<td></td>
<td>➢ outdated labour policy</td>
<td>➢ De-reserving from SSI sector</td>
</tr>
<tr>
<td></td>
<td>➢ Various protectionist policies</td>
<td>➢ Investment in state of the art facilities, setting up of apparel park</td>
</tr>
</tbody>
</table>

Fig. No. 2.3 - Key Deficiencies and Initiatives
2.6 The Textile Supply Chain

The Reserve Bank of India said in its annual report 2003-04. “The dismantling of Multi Fibre Agreement imports quotas offers the textile sector significant opportunities to capitalise on the expansion of overseas markets. India has a potential to be a major beneficiary of the phasing out of the Multi-Fibre Agreement (MFA) but the textile industry needs to develop skills and upgrade technology to take advantage of the opportunities”. The free trade environment in textiles could expose vulnerabilities in the Industry’s excessively fragmented structure, traditional approach, vertical integration, inferior technology with low mechanism.

In such circumstances the textile industry need to pay more attention towards latest management strategies. One of them is the supply chain management area. The competitive forces have compelled the textile companies to pay more attention towards their supply chain. The Indian Textile and Clothing industry have one of the longest and most complex supply chain in the world, with as many as 15 intermediaries between the farmer and the final consume.
Fig. No. 2.4 shows a typical textile supply chain, which consists of all the organisational entities those are involved in delivery of goods to the end consumer. The fibre supplier, the yarn manufacturer, the fabric manufacturer, garment manufacturer, retailer/distributor can be interconnected with each other. Across each of these organisations the functions like procurement, production, inventory management,
distribution, marketing and planning are also integrated in the supply chain.

The flow of supply at different stages in the supply chain may be different and may not be uniform. The total time taken by the chain starting from fabric supplier to delivery of goods to the consumer either fabric to garments may range from 90 days to 100 days.

Depending upon the demand of the product the textile supply chain may be divided into three categories namely:

- **Push Supply Chain**
- **Pull Supply Chain**

**Push-pull Supply Chain (Syncronised)**

Long back the textile industry practiced vertical organisation orientation and activities were oriented toward optimization manufacturing by mass production. In those cases organisation practiced push supply chain approach. Still some of the organisations are practicing push supply chain approach. To name one of them is Arvind Mills Ltd. Later
References


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