A Study of Supply Chain Management Practices: A Case of Cotton Industry

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Abstract—*The objective of this paper is to present a case study of cotton industry of north India and elaborate the problems faced by cotton industries in today's scenario. The paper reflects the concept of supply chain management. This concept came in to existence in 1980 and being followed by the developed and developing countries. Prior to evolution of supply chain management, logistic and operational management techniques were in practice. Supply chain management is the integration of various companies like production, inventory, transportation, location etc. performing the jobs with a particular type of product and providing the customers right product well in time. Wall-Mart and Toyota are using this technique with responsiveness and efficiency. Japanese companies have been forerunners to implement Supply Chain Management by quality check procedures directly into the manufacturing and assembly process. In India, the concept of supply chain is not being followed as well as the people are not so much aware about this technique; to understand the importance and benefits of this concept, cotton factory of north India has been chosen for case study and shortcomings have been noticed. Problems have been identified through Ishikawa diagram. Increase in production and quality of products along with higher profit earnings were the results obtained through successful implementation of supply chain management concept.*

Keywords: -Supply Chain Management, SCM Team, Ishikawa Diagram.

I. Introduction

In Today's scenario supply chain management assumes a significant importance and needs serious research attention, as companies are challenged with finding ways to meet ever-rising customer expectations at a manageable cost. To do so, Industries must carry out a research to find which parts of their supply chain process are important and how much impact do they have individually and cumulatively. The concept of supply chain management was first coined by an American industry consultant in 1980. Prior to 1980, businesses used terms such as "Logistics" and "Operations Management" instead of supply chain management. The term "Supply Chain Management" arose in the late 1980s and came into widespread use in the 1990s. Logistics and operation management was concerned with a single organization whereas supply chain management is the integration of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served. Previously only manufacturers were the drivers of the supply chain managing the speed and pace at which products were manufactured and distributed. Today, customers are calling for the fast delivery of products, and manufacturers are scrambling to meet customer demands for options/styles/ features, quick order fulfillment, and fast delivery. A company's supply chain is an integral part of its approach to the markets it serves. The supply chain needs to respond to market requirements and do so in a way that supports the company's business strategy. The business strategy a company employs starts with the needs of the customers that the company serves or will serve. Depending on the needs of its customers, a company's supply chain must deliver the appropriate mix of responsiveness and efficiency. A company whose supply chain allows it to more efficiently meets the needs of its customers, will gain market share at the expense of other companies in that market and also will be more profitable. There are three steps to use in aligning your supply chain with your business strategy. The first step is to understand the markets that your company serves. The second step is to define the strengths or core competencies of your company and the role the company can or could play in serving its markets. The last step is to develop the needed supply chain capabilities to support the roles your company has chosen. There Supply Chain Management could be implemented to all firms (manufacturing firms, retailers, services, etc.) and public organizations that satisfy the following criteria:

- Minimum Number of employees: 20 (at least 4 in management positions).
- Strong management commitment to new ways of working and innovation.

II. Literature Review

A. Supply Chain Management Definitions

SCM has been explained by various researchers. It is not surprising that there has been much debate as to a specific SCM definition based on the recent development of the supply chain literature. Mentzer et al. (2001) have defined SCM as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the Supply chain as a whole. Christopher (1998) stated that the supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer. Cavinato (1992) defined that supply chain concept consists of actively managed channels of procurement and distribution. It is the group of firms that add value along product flow from original raw materials to final customer. Keeping in view all the definitions of various researchers we can say that Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served.

Table 1 shows definitions of supply chain management which closely resemble with each other's but the purpose of every definition is pointing out ultimate aim of earning maximum profit by providing value added products that result in customer satisfaction, providing a platform to the organization to make it stand for a long time in the market and create a goodwill among the customers.

Table 1 Various Definitions of Supply Chain Management

Sr. No.	Researchers	Year	Definition
1	Burt et al.	2003	SCM is a chain that includes all internal functions plus external suppliers involved in the identification and fulfillment of needs for materials, equipment, and services in an optimized fashion. The supply system plays a key role in helping the firm satisfy its role in the supply chain.
2	Chopra and Meindl	2001	"A supply chain consists of all stages involved, directly or indirectly fulfilling a customer request".
3	Ganeshan andHarrison	1995	"A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these Materials intermediate and finished products and the distribution of these finished products customers."
4	Handfield & Nichols	1999	"A supply chain encompasses all activities associated with the flow and transformation of goods from the raw material stage, through to the end user, as well as the associated information flows".
5	Novak & Simco	1991	"The supply chain management covers the flow of goods from supplier through manufacturer and distributor to the end-user"
6	Ross	1998	Supply chain management is a continuously evolving management philosophy that seeks to unify the collective productive competencies and recourses of the business functions found both within the enterprise and outside the firm's allied business partners located along intersecting supply channels into a highly competitive, customer-enriching supply system focused on developing innovative solutions and synchronizing the flow of the marketplace products, services, and information to create unique, individualized sources of customer value.
7	Lee & Corey	1995	"The integration activities taking place among a network of facilities that procure Raw material, transform them into intermediate goods and then final products, & deliver Products to customers through a distribution system"
8	Towil, Naim, and Wikner	1992	"The supply chain is a system, the constituent parts of which include material suppliers, production facilities, distribution services, customers linked together via the feed forward flow of materials and the feedback flow information"

B. The Literature, Theoretical and Practical aspects of SCM

There is a vast amount of literature related to the supply chain management. This chapter reviews literature related supply chain management. The objectives of review are:

- To study the various aspects of supply chain management.
- To study literature related to supply chain management in Cotton firms.
- To identify the effect of supply chain management in Indian cotton industries.

Literature has been reviewed through Indian and International journals, books, conference paper etc. The literature collected is conceptual articles. Surveys, reviewed articles and case studies.

- *B.S. Sahay and Jayanthi Ranjan (2008)* while doing work on Real time business intelligence in supply chain analytics have stated that during the last ten years, the approach to business management across the entire globe has deeply changed. The firms have understood the importance of enforcing achievement of the goals defined by their strategy through metrics-driven management. In the twenty-first century, organizations are evolving into new forms based on knowledge and networks in response to an environment characterized by indistinct organizational boundaries and fast-paced change. They identify new and complex changes that are emerging which will force enterprises to operate in entirely new ways. Organizations are experiencing environmental changes characterized by indistinct organizational boundaries and fast-paced change. As a result firms need appropriate decision support infrastructures in order to face these challenges.

- *R. K. Gupta and Pravin Chandra (1998)* have explained the concept and benefits of supply chain management with the example of fall of East European Socialist-Bloc and opening up of the Asian markets; the trade barriers began falling during the 1980's and continued throughout the 1990's. This development leads to organizations having a supply chain, that criss-crossed the whole globe. The proliferation of trade agreements has thus changed the global business scenarios. The Integrated supply chain management is now not only a problem of integrated logistics (as a process) but also demands that the supply chain management must look into the ramifications of these arrangements on the cost of transportation (including tariffs or duties) of products within a trade zone and outside it, besides, developing logistics strategies. The field has thus developed in the last few years for bridging the gap between demand and supply vis-à-vis efficiency and cost trade-offs. The supply chain management now not only

involves the "management of logistic function", as was done in the past (to achieve internal efficiency of operations) but, includes the management and co-ordination of activities, upstream and downstream linkage(s) in the supply chain. Organizations can gain substantial supply chain related benefits through the use of internet by getting right information well right in time.

- *Shabab Firouzi and Amin Nezarat (2012*) while giving Intelligent approach for Negotiating between chains in supply chain management Systems has stated that a supply chain is a complex and network of facilities and distribution channels which are responsible for providing and distributing materials throughout the chains. Materials can be raw materials, semi-finished product or final product. Primary and upstream chains in supply chain need raw materials and downstream chains send final product to consumer. Supply chain management applications in production industries and their supply chains consist of very complex techniques. Since there are also many other industries and chains in a supply chain of production industries, material distribution and supply management is one of the basic problems of these industries. Up to now, they have tried to increase speed in transfer chains messages using new technologies like internet and provide relationship between chains in the least time as possible. In current supply chain management methods, one central management is often used, that is, one of the chains which is nearer to chain center is recognized as manager of chains and tries to communicate with other chains using supply chain management systems. Supply chain management tries to solve one of the problems and discussions in production and operation management. Many published contexts mentioned to high supply chain potential in cooperation process between chains and tried to use this potential in providing combination of whole supply chain.

- *Kavita Joshi Rai (2010)* in her one of the case study of IKEA, which looks for good quality of raw cotton; states that managing the supply chain is a social and environmental responsibility and also a challenge for many companies that produce and sell products made of cotton. Their raw cotton and semi-finished products are sourced from multiple suppliers, and are mixed at various stages of supply chain. The flow of products changes from year to year depending upon price and crop fluctuations. Then there is always a problem for the companies to ensure whether their products would be produced in a responsible way or not. While finding the solution for this problem she outlined that creating linkages is harder than convincing farmers. The IKEA team that initiated the project thought that creating capacity – i.e., convincing farmers to switch to sustainable farming methods would be a big challenge. In fact, this has proved relatively easy. Farmers can see a direct impact on their profitability when they start using the new techniques. They are quick to learn from their neighbors' success. The number of farmers registering with the initiative has doubled or trebled in the second year in all the IKEA projects. It is more of a challenge to create linkages along the value chain – ensuring that ginners buy cotton from registered farmers, avoid mixing it with conventional cotton, and offer it for sale to spinners, who in turn process it separately from regular cotton. Motivating ginners to participate in this supply chain has been a weak link, since ginners do not gain a price advantage from moving towards better cotton. Some ways to persuade ginners to become involved are:

1. Clarifying to the ginners that they will not need to pay a premium to the farmer. They can buy cotton from registered farmers at the regular market price, which depends on the grade and quality of the yield. Ginners do not have to change their procurement methods, since in most cases the same farmers who sold them conventional cotton are now supplying them the more sustainably grown version.
2. Segregating batches and avoiding contamination among them during ginning and pressing are inherent in the ginning process for different qualities of seed cotton. So, processing better cotton does not necessarily add to the ginner's costs.
3. Establishing link between ginners and yarn suppliers who are part of the IKEA supply chain will ensure timely pickup of the cotton bales. This in turn minimizes the warehousing and financial cost of maintaining stock. Ginners are also free to sell the cotton from IKEA projects as conventional bales if demand is low.

- *Sumanta Bandyopadhyay (2013)* in his study indicates the problems faced by fresh banana industries in the India and provides solutions by suggesting the value addition in the supply chain. Author states that India with rich biodiversity of banana is the largest producer with a 23% share or 10.4 million tons of the world production of 48.9 million tones. But, India is absent in the world trade which is estimated at 14 million tons worth $4.7 billion a year. The contribution of banana to GDP of agriculture in India is 2.8%. The growing potential of fresh and processed banana in the domestic and world markets has presented the banana a golden opportunity. And to en-cash upon this opportunity, the banana growing states have to concentrate upon the procurement, infrastructure setting, production and marketing of the fruit. Export of Indian bananas has so far been affected by lack of market awareness, poor post-harvest management and inadequacy of supply chain management including higher air cargo tariffs compared to ocean freight rates. Quality control is another area where domestic suppliers and exporters face problems regarding freshness, safety and shelf life of the produce. Food safety and quality aspects in trade became important since fresh food is more prone to certain microbiological contaminations such as bacterial, fungal. In order to guarantee reliable supply, retailers search for sustainable partnerships with producers that reduce such information and screening costs and reinforce mutual trust amongst chain agents. So the concept of supply chain management and value addition has been taken into consideration. The nature of the supply chain management is changing at a very fast pace to meet the requirements of the customer. Today, the focus of the customer is to get safe quality product, which is fresh and is also competitive in price. Therefore, challenges are manifold and to achieve this daunting task, all the chain partners need to work very closely. Application of information system to make a network, to link farmers, village level aggregator and retail organization is a big

challenge. It involves cost for training, application of information management etc. This can fulfill traceability of the product, which is very much essential. Information costs are controlled through integrated supplier-buyer networks. Producers are encouraged to start quality controls at the farm level and thus become locked in the supply network through specific investments. To achieve global standard in the value chain of banana, different retail organizations in India are giving stress on backward and forward integration, with special importance to adding sufficient value at each step. Integrated value chain management aims to set specifications and standards according to the maximum residue standards of the Codex Alimentarious by proper coordination and monitoring from the farm level. At farm level, farmers can be trained to follow "good agricultural practices" (GAP) at other levels of the chain to make a strong quality system, which can easily attract domestic as well as foreign customers. Addition of value by each chain partner reduces unnecessary wastage and keeps the product quality as demanded by the customer. Vertical integration is being adopted, which is full ownership of the different stages of production, procurement, processing and distribution throughout the supply chain. Another important aspect is the technological innovation in agricultural production, processing, storage and delivery systems.

- *Hakan Adanacioglu and F. Akin Olgun (2011)* while making a more concrete evaluation of the cotton ginning industry: Aegean region of Turkey, felt that it is necessary to determine the structural characteristics of the factories, costs and profitability, the level of technical efficiency, and the potential for improvement in the industry. Study made by authors showed that unit production costs of ginning factories are high and that they have low operating profits. In particular, it was found that ginning factories do not operate efficiently with regard to the labor force employed and the amount of capital invested. So the capacity of ginning industries is low and also the level of technology used is below the optimum. There is no government support for the ginning industries and also lack of education is there. Authors have provided the solutions for all the above mentioned problems arising in ginning industries of Turkey. In order to solve the problem of idle capacity in Turkey's cotton ginneries, author finds that it is necessarily most importantly to improve the situation of cotton producers. Here it is important first to revive the sector by reducing production costs by increasing the input support given to cotton producers, and by increasing the premium paid to support producers. The managers or owners of cotton ginneries interviewed in the course of their study felt that these measures to help producers would increase cotton production, which would in turn bring about a revival in the ginning sector. As explained above, variations in the costs of cotton production directly affect the ginning industry. Initiatives to reduce costs would then help the industry. In this regard, a transition to mechanical harvesting in countries, where it is largely carried out by hand picking is of great importance. The reason for this is that the cost of mechanical harvesting is less than that of harvesting by hand. To solve the problem of old technology, the necessary steps must be taken for the ginneries to move to the saw gin type of cotton ginning system. Studies made by authors have shown that the use of saw type cotton ginning machinery reduces the cost of ginning. The option of subsidizing the ginning industries must be a major step by the government. Education is also important to economic and technical efficiency in the ginning industry in Turkey. In this regard, continuing education on new ginning technology and improved practices is contemplated for managers (ginnery owners) and workers in the cotton ginning industry.

III. Problem Formulation

From the literature survey it is evident that all industries whether manufacturing, service or any other are facing problems like wastage, increase in production cost, poor quality of raw material, increased inventory carrying cost, increased cost of distribution system and delay in providing customer or end user the right product with good quality etc. While describing the problems literature also provides solution adopted by industries to solve the above problems.
The study would be designed on the same pattern to access the necessities and possibilities of implementation of supply chain management to improve and enhance above mentioned factors and these improved factors would provide a competitive edge to the industry among all the others competitors.
For present work, a Cotton Ginning & Pressing Factory from Haryana (India) has been selected. The industry is facing the problem of low productivity and low quality of cotton which continuously affects the morale of management and incentives of staff in a negative manner.
Now while implementing the supply chain management in an industry the study would be based on:

1. Identification of various stages in Cotton industry from procurement of raw materials to providing product to customer or end user.
2. Formation of SCM Team.
3. Detection of factors affecting the drivers of supply chain management.
4. Identification of main causes of poor quality of raw material, increased cost of raw material, transportation, inventory and distribution system with the help of brain storming session using techniques and models of supply chain drivers.
5. Recommendation of methods and means for reducing the overall cost.

IV. Methodology

Methodology adopted for the effective utilization of supply chain management concept has been shown in figure 1 and explained step by step. In the first step, SCM team is formed in the cotton factory. Top management commitment and support is necessary for this formation. The steering committee is formed in the factory in which SCM team is formed in the factory by taking self as a facilitator. After steering committee has been formed, the group leader and the deputy group leader are selected from the committee of the factory. After the selection of group workers are invited to join this group as members of SCM team.

In the next step, brain storming session will be conducted to find out the views of the group members about the problems they had faced during working season. In this

each and every member will be free to talk about the problems in the factory which affect the productivity.

Ishikawa diagram based on the views given by the supply chain management members will be prepared .Based on Ishikawa diagram, the main causes of problem shall be identified and discussion will be there with the group members.

On the basis of problems identified, solutions shall be found out by having discussion with group members and best possible solution will be recommended to solve that main problem.

Recommended solution will be implemented in the factory and the results would be found out by comparing present and previous production.

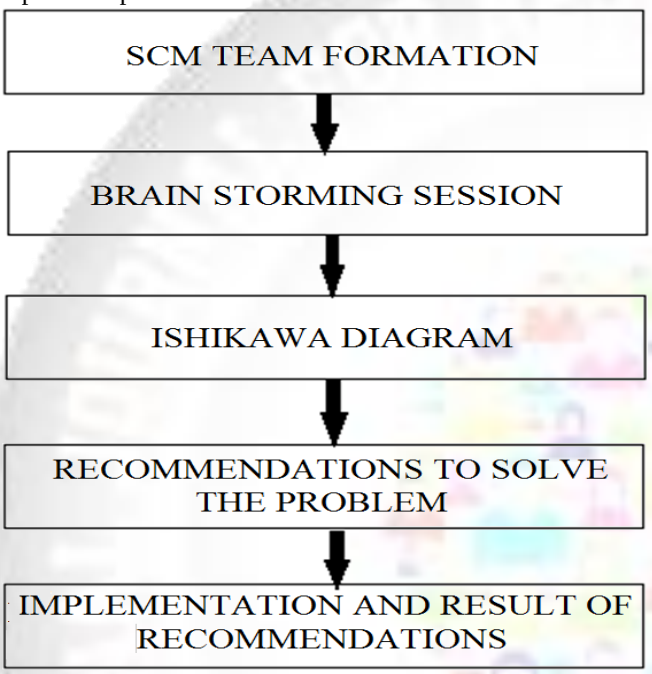

Fig. 1: Plan for Research Work

I. Methodology Procedures Followed

In the first step, SCM team is formed in the factory. This team was formed for whole of the factory taking self as a facilitator. After this team was formed, the group leader and deputy leader were selected from the senior employees of the factory. After the selection of group leader, workers were invited to join supply chain management application to work as a SCM team member. Then brain storming session was conducted to find out the views of SCM team members about the problems they had faced in session time. In the brain storming session each member was free to talk about the problems which affect the production and quality.

In the first meeting, the concept of supply chain management was explained to both management persons and workers. The benefits of supply chain management were explained in detail during the first meeting. It was explained to workers how supply chain management technique develops mutual understanding between them, improve their knowledge and improve the communication resulting in self-respect of the workers.

In the second meeting, the brainstorming session was conducted and possible causes were discussed. In this session SCM team members were ready to talk on the problems they had faced in their season work. Personals from all the level suggested the possible causes form the problems already mentioned. All the causes discussed by SCM team members were recorded and these are:

1) *Causes related to men:*
   - Lack of motivation
   - Lack of knowledge
   - Inadequate training
   - Worker carelessness
   - Unskilled workers
2) *Causes related to machines:*
   - Low capacity of production
   - Manually operated machines
   - Poor quality of finished cotton
   - Wastage of raw materials
3) *Causes related to materials:*
   - Poor quality of raw material
   - Low yield of production due to cheap raw material
   - Wastage of raw cotton during cleaning process
   - Shortage noted in finished cotton
4) *Causes related to maintenance:*
   - Not proper maintenance
5) *Causes related to transport:*
   - Higher transportation charges

In the third meeting, facilitator with the help of group leader constructed the Ishikawa diagram and discussed all the points very deeply. Figure 2 shows the Ishikawa diagram from which recommendations have been made for improvement in the following three categories:

(i) Management causes
(ii) Technical causes
(iii) Other causes

Ishikawa diagram has been drawn taking into consideration the causes related to poor quality of finished material as well as low productivity output. These causes are also responsible for the low profit and wastage of materials from initial stage of raw material processing to final stage of finished products.

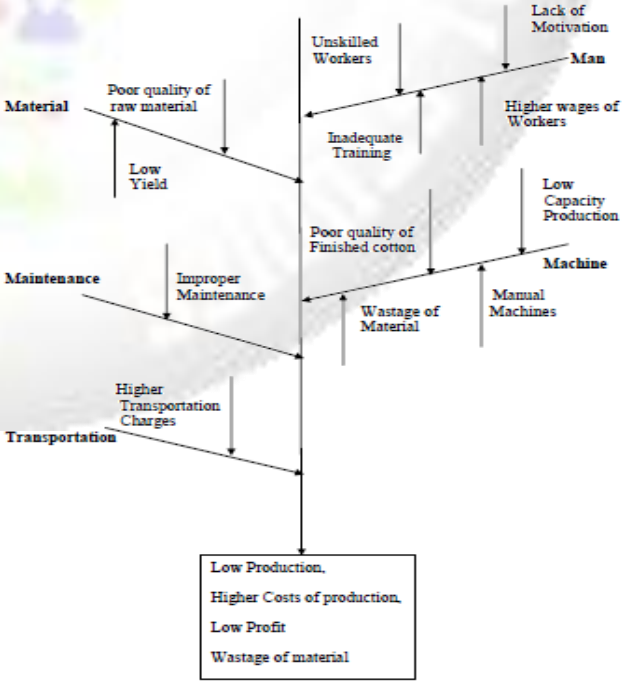

Fig. 2: Ishikawa Diagram

II. Data Analysis and Recommendations made

Data collected from the cotton factory showed that all the machines are manually operated machines with a production rate of 80 bales for 10 hours shift of a day. Each bale has a weight of 160 kilograms after it has been pressed and ready for dispatch. The raw cotton material is purchased from the markets nearby the factory location. The raw cotton is purchased from nearby markets of factory location and it has been observed that the quality of raw cotton is not as per the requirement and yield is low causing material wastage and shortage during ginning and pressing. Ginning and pressing unit runs for 4 or 5 months in a year. For rest of the time only refinery unit can be run for minor production of oil and oil cake as per the market requirement. Table 2 shows the expenses related to manufacturing in concerned cotton factory.

Table 2: Expenses Related To Manufatcuring

Types of Expenses	Rate in Percentage
Market Fees	1.40%
Commission to agent	2.50%
Transportation	0.55%
Ginning & Pressing Charges	3.50%
Office Expenses	0.50%

Based on the data collected and manufacturing expenses, following are the recommendations by SCM Team for management causes, technical causes and other causes:

i. Recommendations made for Management causes:

The management is required to look into the following matter as suggested by SCM team:

- Management can provide some incentives like promotion, increase in salary leaves etc. to motivate the workers so that they shall think positively for growth of the industry and take necessary steps to increase the production of factory. This can help to improve understanding between employees and high level management and help employees to get job satisfaction & develop themselves.
- Proper supervisory staff should be appointed so that good supervision on the workers can be done to avoid the negligence of tasks by the workers.
- Skilled workers should be recruited by the management so that the knowledge of these workers can be utilized in increasing production rate. As well as good quality products can be produced by these workers well in time as per the requirement of the customers.
- Automated machines of new technology should be installed to increase the production rate and to lower down the wastage of materials as the manually operated machines are not capable for higher production rate as well as wastage of material is there. These new machines require less maintenance and have high efficiency. Good quality products can be produced with the help of these new machines resulting in higher profits and satisfaction to the users of the factory products.
- The management should provide training to their workers and workshops etc. to enhance their knowledge and skills. Every year two or three persons can be sent to gain the knowledge of new emerging technology so that the same can be introduced in the factory at lower costs to increase production and quality of the products.
- The management should take care of the safety devices in the factory because in the lack of safety devices workers will not be able to perform their tasks fearlessly.

ii. Recommendations made for technical causes:

Following are the recommendations made for machines and materials under technical causes:

- The cotton factory is using manually operated machines from the establishment of the factory. The production rate of these machines is 80 bales per day with a shift of working time of 10 hours. Each bale weighs 160 kilograms. Also the shortage of material is 3% of the total input material. It has been suggested that if the automatic ginning machines are used for the processing of raw cotton, then production rate can be increased from 30 to 40% and the shortage of material can be reduced up to 0.5 % of the total input material. Pressing machines press the finished cotton in the form of bales and it take 5 hour's time duration for pressing of 80 bales of finished cotton. It has been suggested that if automatic hydraulic pressing machines are used then this time duration would be of merely 3 hours for these 80 bails. If the provision of automatic machines of ginning and pressing could be there, then approximately 110-120 bales produced by ginning machines can be pressed within 4 hours. It saves a lot of time and reduces the total expenses of ginning and pressing by 0.5%.
- Raw cotton is purchased from the nearby markets of factory location. The quality of cotton is not as per the requirement needed for the end products. So it was suggested that raw cotton could be purchased from the areas of Punjab which are in nearby the location of factory because the production of cotton in the fields of Punjab is of good quality and the suppliers can provide raw materials well in time. Although the cost of purchasing will increase by 0.8% of total purchasing cost (including cleaning charges) and transportation charges will also increase by 0.2% of total transportation charges yet the yield would increase by 1% and the selling price would increase by 1% of the total selling cost. In this way purchasing cost can be compensated for the selling price and additional benefit of 1% yield and good quality raw material can be achieved resulting in customer satisfaction and high selling revenues.

iii. Recommendation made for other causes:

Following recommendations has been suggested for others causes in the cotton factory:

- This factory hires the means of transportation like trucks etc. randomly without adopting any method of contracts and biding. This results in higher transportation charges. It has been suggested that by adopting the method of contracts and biding, transportation costs can be lowered down by 0.05% of total transportation charges.
- The maintenance of machines should be done well on time. Routine and preventive maintenance can prevent the machines from breakdown and help to increase the productivity and improve the quality of product.
- Raw cotton purchased should again be cleaned in the factory after purchasing of it. Although the seller of raw cotton provides the clean cotton yet some impurities can

be there and these can be eliminated by again cleaning the raw cotton in the factory.

III. Implementation of supply chain management

Most of the suggestions and recommendations provided by SCM team has taken into consideration and followed with the permission of higher authorities of the factory. Following are the recommendations and suggestions implemented in the factory under the concept of supply chain management.

i. Implementation made for management related recommendations:

- Supervisory staff has been appointed for supervision on the workers so that negligence of tasks by the workers can be avoided.
- Skilled workers have been recruited by the management.
- Training has been provided to the workers to enhance their knowledge and skills.
- Workers are being rewarded in terms of increase in salary and promotion etc.
- Fire distinguisher and other safety devices have been provided in the factory. The suggestions of Lightening, good working environment and allowances for workers have been taken in to considerations so that they can work effectively without any fear of health and fatigue.

ii. Implementation made for technology related recommendations:

- Manually operated Ginning machines have been replaced by the new automatic machines of new technology.
- Hydraulic Pressing machine has been installed so that time utilization in pressing the finished cotton can be minimized as well as the labor can be utilized in some other works which was initially utilized in pressing the finished cotton.
- Good quality of raw material is now being purchased from the markets of Punjab which is in nearby reach of the factory location.

iii. Implementation made for other recommendations:

- Contracts have been given to the transportation companies who provide their services at lower possible rates with fast deliveries of raw materials.
- Preventive and Routine maintenance is being done to avoid the breakdown of machines.
- Cleaning of raw cotton is done even after purchasing the clean cotton form the suppliers. Cleaning of cotton prior to sending to ginning machine reduces the possibility of wastage of material.

V. RESULTS OBTAINED

Following are the results obtained after the successful implementation of supply chain management concept:

a. Results in terms of expenses reduction

- Transportation cost has reduced by 0.05 % of total transportation charges.
- Ginning and pressing expenses have lowered down by 0.5% of total processing expenses of production.
- Although the cost of good quality raw material has increased a little bit by 0.8% of purchasing cost, yet finished cotton yield of 1% has increased and extra amount of purchasing cost can be compensated against the extra selling price of 1% of total selling cost for the good quality finished products.

b. Results in terms of increased productivity

- Production of 110 bales per day with a shift of 10 hours working time is now in existence while it was 80 bales per day prior to the implementation of supply chain management concept. Also the automatic hydraulic pressing machine takes only 4 hours to press these 110 bales of finished cotton.
- There has been found a possible increase of 35% in production as compared to the production of last years.

c. Results in terms of wastage reduction

- Shortage of material has reduced by 1% in the processing of raw material to finished products.
- As the raw material of good quality is now being purchased, yield of finished cotton has increased by 1 % of total production.

d. Results in terms reduction in arrival time of raw material

- Delay in arrival of raw material has been reduced by purchasing the raw material from the new suppliers of Punjab markets.
- New Transport Company is unloading the raw material in the factory well in tine without causing any delay in supply of raw material.

e. Results in terms of increased quality of finished cotton

- There has been found a considerable increase in the quality of finished cotton as the selling price per bail has increased maximizing the revenues earned.

VI. CONCLUSION

Today the cotton industries are facing the problems of low production and poor quality of finished products. Management and employees are not aware of the basic reasons that cause the low production and poor quality of their factory products. But they are interested to gain higher production, good quality and at the same time the higher profit margins. There is lack of knowledge and awareness about the new technology in cotton factories. The production and quality can be improved by applying supply chain management concept which can be analyzed with the help of cause and effect diagrams. The present study shows:

1. Supply chain management concept can increase the productivity and profitability of the factory.
2. Raw material of good quality can be purchased from the new suppliers by following the drivers of supply chain management.
3. Transportation costs can be lowered down by hiring transport companies on contracts basis.
4. Ginning and pressing expenses can be lowered down by replacing new automatic machines in place of old machines which have low efficiency of production.
5. Reduction in arrival of time raw material is possible with the concept of supply chain management.
6. Supply chain management builds a good relationship between the suppliers and producers, between the

producers and distributors & between the distributors and customers or end users.

7. Employees of the organization feel free to share ideas and contribute a lot in achieving higher production and good quality of products.
8. Quality and yield of finished products can be increased causing a reduction in the wastage or shortage of the materials.
9. Cost of implementing the concept of supply chain management concept can be covered within short period of time duration.

VII. FUTURE SCOPE

In the present study, Supply chain management has been applied to cotton factory to improve the production and quality of the product. The same concept can be applied in the fields of automobiles, power plants, chemical industries, aeronautical and pharmaceuticals etc. to improve the production and quality and also to solve the problems faced by the workers in daily routine. This concept of supply chain management is also useful for the cost benefit analysis in Indian industries. It is expected that this concept will be useful for Indian industries in future. The cost benefit analysis of SCM can be analyzed in future.

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