Automatic Cotton Cleaner & Mixer

V. Naren[1] V. Gokul[2] C. S. Sundar Ganesh[3]
[1,2]UG Scholar [3]Assistant Professor
[1,2,3]Department of Robotics & Automation Engineering
[1,2,3]PSG College of Technology, Coimbatore, Tamil Nadu, India

Abstract— With the rise in field of Textile industries, cost and labor are becoming worrying factors. The blow room section, which is an important part of textile industries, requires lot of labors and time. The main objective of this project is to develop an automated system in the blow room section. Though there are higher end machines for the whole setup, building a cost efficient system mainly for small scale textile and spinning industries is also the secondary objective of this project. This project mainly focus on the cleaning and mixing process involved in the blow room section. The final solution will be to reduce the labors, for salary and also for the safety, in small scale sectors.

Key words: Cotton Bale, Blow Room Section, Fabrics, Pnuematics

I. INTRODUCTION

The textile industry in India traditionally, after agriculture, is the only industry that has generated huge employment for both skilled and unskilled labor in textiles. The textile industry continues to be the second-largest employment generating sector in India. It offers direct employment to over 45 million in the country. The Indian textile industry's current revenue is around US$ 108 billion which is forecasted to increase up to US$ 223 billion by 2021 [1]. India is the second largest exporter of textiles and also has the second largest textile infrastructure after china. India is the second largest producer of fiber and 60% of the Indian textile industries are cotton based. There has been increase in India share of global textile trading to 7% in five years.

Traditionally textile industries produced goods manually without any machines. The introduction to machines in 20th century lead to increase in production and increase in variety of products. As India is rich in fiber like cotton, the export of textile goods increase rapidly. In present world, fashion important part among humans, it is necessary for industries to produce quality products and also at low cost. This is where automation into picture. Automatic systems are very efficient compare to manual work, industries are gradually shifting to machine that automate the process and reduce the labor work. This project is an automatic setup implemented in blow room section of the textile industry.

II. LITERATURE SURVEY

Automation in textile industry by Dr. Nitin S. Choubey and Manish Agrawal [1]. Automation can be implemented in various process like Spinning, Weaving, Garmenting, Dying. Automation brings in quality improves the productivity in garment industry. Productivity increase because of automation has resulted in reduction in the overall manpower in textile industry. Research and development is being done in textile machinery to achieve further automation and enhancements.

Current scenario of Indian textile machinery market and future prospects by Suvin Advisors Pvt. Ltd [4]. Per capita consumption of all man-made textile fibers are showing increasing trend in past few years. Per Capita consumption of polyester expected has takeover cotton by 2015. India has the lowest Per Capita spent on garment (US$ 37) which is only 3% of the highest one viz. Australia (US$1131).

Countries	Market Size in n. USD 2013	Market Size in n. USD 2025	CAGR %
Europe	355	440	2
USA	230	285	2
China	165	540	10
Japan	110	150	2
Brazil	60	100	5
India	46	200	12
Russia	45	105	8
Canada	30	50	4
Australia	25	45	5
RoW	80	195	8
Total	1146	2210	5

Source: World Statistics

Technical development in cotton manufacturing since in 1860 by Melvin T. Copeland [2]. This paper explains about the blow room process from opening of a cotton bale to converting and finishing. The bale is loosened up in bale breaker and it passes to the opener where it is loosened up. Then it goes to the pickers, where fibers are separated and the dirt shaken out. The cotton issues in the form of lap ready for the part.

The blow room installation as a sequence of machines, Rieter, [online] [3]. The assembly of blow room line depends on the type of raw material, the characteristics of the raw material, waste content, dirt content, material throughput, the number of different origins of the material in a given blend. Rieter machines are mostly installed in large scale industries and is also higher cost. The blow room process can be done using lines of Rieter machines.

III. COTTON BALE

A cotton bale is a stock of raw, unprocessed cotton containing dirt and wastes. A standard bale of cotton contains 480 pounds of lint. Cotton is priced on its length, strength, uniformity, color and few other metrics at present the price could range anywhere from 60 cents to $1.50 per pound (INR 40.52 to 101.3). A bale weighs about 500 pounds. Ginning is the process, which separates cotton fiber from cotton seed. Lint cotton separate from cotton seed is pressed in form of full pressed bales with standard weight of 170 kgs.

Source : India Business directory – IndiaMART

IV. BLOW ROOM SECTION

Blow room is one of the most important part of textile spinning sector. It consists of number of machines which are used in succession to open and clean the cotton fiber according to the required amount of degree. In blow room section, 40-70% trash is removed. In this section compressed bales are opened, cleaned and mixing or blending for making uniform lap of definite length. The range of blow room cleaning efficiency is 60-65%. Blow room is first section of spinning line for producing cotton yarn. There are four main operations in a blow room.
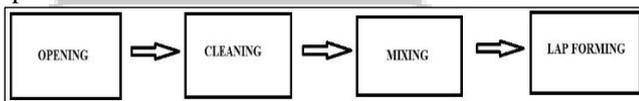

Source : TextileChapter – Blogspot

The compressed bale of cotton is open for making cotton tuft in a small size. Then in cleaning process the dust, dirt, broken leaves, broken seeds, stalks and other foreign materials are removed from cotton. Mixing process is performed for producing high quality yarn and thus reducing the production cost for different grade of fibers. Then the cleaned fibers are made into sheet form of specific width and uniform length which is termed as lap. The laps are rolled into cylindrical shape around a lap pin. Then they are fed into carding machine for subsequent processing.

V. PROJECT AND IMPLEMENTATION

The Rieter machines have a full setup for all lines of blow room section. Our project is to automate the cleaning and mixing process of the blow room section. The overall setup and cost is compared to be small and low respectively and best fit for medium and small scale industries. The work of a labor is mostly used in cleaning and mixing process, so automating is will be cost efficient and also for the safety of labor. Safety concern with dust allergy, toxic wastes, small insects and animals.
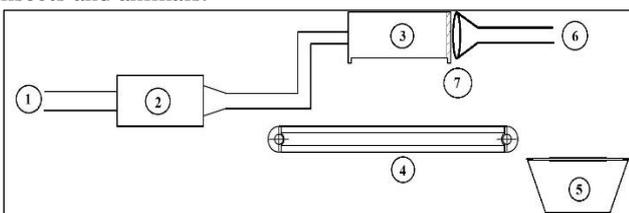
Source: SolidWorks Model

1) Opened cotton from bale
2) Isolated chamber or box to receive the cotton
3) Rotating roller drum
4) Conveyor belt
5) Collecting sack or Basket
6) Vacuum suction pump
7) Filter or Holes

The opened cotton from bale flow through the pipe line to the isolated chamber. The different grades of cotton from many pipelines are collected in the chamber. Vacuum suction pump is connected at one end of the roller drum and is maintained at a particular pressure depending on the grade of cotton. The roller drum is open at the bottom for the cotton to fall on the conveyor. The holes in the roller drum are smaller than the cotton mix and are used to remove the dirt through suction. A filter of required type can also be used instead of holes at the opening of suction pump. So the cotton from the chamber is sucked to the rotating roller drum, at this time the dust particles pass through the roller drum to the suction pump through holes or filter. The roller drum will also keep rotating until the different grades of cotton entering into the roller drum are mixed and loosened. The dust removal will be much higher compared with manual cleaning or using machines. Finally loosened, cleaned and mixed cotton fall on the conveyor and are received in sacks on bucket for carding process.

VI. CONCLUSION

Though the initial implementation will be challenging and also not economical, maintenance and labor cost can be decreased and efficiency, quality of the goods can be increased when it is implemented full pledge for medium and small scale industries that fully depend on labor. This automatic cotton cleaner and mixer is of low cost compared to high scale machines. Different grades of cotton, polyester can also be employed in this system, this idea first popup from a medium scale industry who were using labors for cleaning and mixing the cotton. The labors where paid high salary and also faced many health issues. There may be many alternate ideas, but this system can be implemented in all textile industries that are facing shortage of labors.

REFERENCES

[1] "Automation Textile Industry" by Dr. Nitin S. Choubey and Manish Agarwal, Computer science and IT department, NMIMS Shirpur, India.
[2] "Technical Development in Cotton Manufacturing" since 1860 b Melvin T. Copeland, Oxford University Press.
[3] "Blow Room installation as a sequence of machines", Rikipedia, Rieter.
[4] Knowledge Paper on "Current Scenario of Indian Textile Machinery Market and Future Prospects" by Suvin Advisors Pvt. Ltd