

Recent Trend in Cotton Ginning

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ABSTRACT

Genetically developed B.T. Cotton increase the productivity of the cotton in last decade. Most of the farmer in our country and the world are producing B.T. Cotton and supplying to the Cotton Ginnery. As the production increases the conventional methods of Ginnery [1] are replaced by automatic Ginnery. This research paper discusses conventional ginnery using pre-cleaner for removing the contaminants like trash, stem, leaves, immature locks etc. which is not being used by Ginners. Present scenario reveals that most of the handling operations are replaced by mechanized conveying, which may probably clean the cotton in various stages of transportation of cotton. The drawbacks in system are that the crop producer or farmer is not fetching the reasonable price from the ginners. If farmer installed pre cleaner at storage place either in village or at farm can fetch better price. Further this papers also discusses the details of recent trend and economic feasibility of cotton pre-cleaner in details.

Keyword

B.T. Cotton, pre-cleaner, ginnery, trash

1. INTRODUCTION

Cotton is a natural fiber harvested from the cotton plant. Cotton is one of the oldest fibers under human cultivation, with traces of cotton over 7,000 years old recovered from archaeological sites. Cotton is also one of the most used natural fibers in existence today, with consumers from all classes and nations wearing and using cotton in a variety of applications. Thousands of acres globally are devoted to the production of cotton, whether it be new world cotton, with longer, smoother fibers, or the shorter and coarser old world varieties.

Cotton grown on short seasonal plant. More than 75 countries grow cotton on a commercial basis. The largest producers are the U.S.A., China and Uzbekistan, then comes India and Pakistan. Cotton is also grown in Egypt, Mexico, Colombia, Brazil, Syria and Guatemala. Cotton, one of the most important commercial crops in India, is grown mainly in nine states, namely, Punjab, Haryana, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka and Tamilnadu.

Bacillus Thuringiensis or Bt is a used by farmers to control Lepidopteran insects because of a toxin it produces. Through genetic engineering, scientists [2] have introduced the gene responsible for making the toxin into a range of crops, including cotton. BT expresses the qualities of the insecticidal gene throughout the growing cycle of the plant. Cotton crop naturally occurring soil bacterium are very susceptible to pest attacks and use up more than 10 per cent of the world's pesticides and over 25 per cent of insecticides.

In India, while cotton is grown on 5 per cent of the total crop area, it uses up 55 per cent of all pesticides. Intensified chemical use has led to a dramatic rise in pest infestation as, over time, they have become resistant to insecticides. Increasing chemical costs and falling cotton prices have pushed thousands of cotton farmers in India, where the majority of the 17 million cotton cultivating families subsist on less than two hectares, into a vortex of debt. Unable to face the consequences of crop failures and mounting debts, thousands of farmers across the country ended their lives in the last five years

2. COTTON QUALITY

Quality of cotton that is available for commercial use depends on a wide variety of factors. These physical attributes are affected by every production step, including variety, environment, harvesting procedures, and the ginning process. In order to maintain uniform cotton quality the United States Department of Agriculture- Agricultural Marketing Service (USDA-AMS), has established standardized procedures for measuring these physical attributes. These attributes are used to assign class grades to cotton for its commercial use. These class grades enable the AMS to determine a uniform price for cotton in the market place as a trading commodity. Classification of cotton is based on fiber length, length uniformity, fiber strength, color, and trash [2]. The presence of trash and its subsequent removal during the ginning process affects some fiber properties, trash grade, and color grade [3]. The presence of trash in ginned lint also impacts the spinning and textile manufacturing industries. As such, trash extraction is a vitally important aspect in the production of quality cotton.

2.1 Trash in Cotton

In India, the cotton is normally hand picked. The seed cotton contains some amount of immature bolls, sticks, bracts, and other vegetable matter. The non-lint material can consist of bark, stick, leaf, pepper trash, grass, hulls, seed coat fragments, and motes left behind in the lint. As the name suggests, bark is the outer covering of sticks and is rather stringy in appearance and not easy to separate from the fibrous lint material. Pepper trash refers to small broken or crushed pieces of leaf, hulls are the outer coverings of the cotton boll. Immature cottonseeds are referred to as motes. Even when cotton is harvested carefully under ideal field conditions, pieces of leaf and other trash are picked along with the seed cotton. Once cotton is passed through the requisite number of seed cotton cleaning and extraction machinery, the gin stand separates the fiber from the seeds, and the lint is then cleaned before being baled. In spite of advances in cleaning and ginning equipment, trash objects are left in the ginned cotton.

3. PRESENT MODE OF GINNERY

The cotton industry is a multi-billion dollar enterprise worldwide. The revenues generated, by the various sectors of the cotton industry in the developed country exceeds 120 billion dollars annually. With liberalization of trade and increasing competition from overseas markets, the cotton industry is keeping abreast with technological advances to produce quality cotton and stay competitive in the free market system. With increasing demand for quality products in the consumer market, the cotton industry is trying to modernize the ginning process. In order to achieve such a goal, industry is exploring new technologies to further enhance the productivity of modern gins and to produce quality cotton.

The ginneries are many in numbers, but their efficiency is poor. Dispersed over 9 cotton-growing states in the country, there are over 3000 Ginning units, of which over 2000 perform only ginning where as about 700 composite units perform both ginning as well as pressing. Barring saw ginning units, numbering over 700, installed in northern states and scores of modern roller ginning units in other cotton growing states, the ginning industry in the country can be said to be still backward.

3.1 Present Mode of Production Activity At Ginnery

The analysis of existing ginnery is carried out through video film, prepared with objective to know existing method of processing of cotton at ginnery. A flow diagram and flow process chart is prepared for the analysis also postural analysis and cycle time for each operation is recorded. The detail analysis is discussed as under.

The machinery used in a typical ginning industry having Ginning and Pressing units in Maharashtra are-

- i) Raw Cotton Pneumatic Conveying System.
- ii) Pre Cleaner.
- iii) Ginning machines.
- iv) Belt Conveyor system.
- v) Lint Cleaner.
- vi) Press machine.
- vii) Seed Conveying System.

3.2 Raw Cotton Pneumatic Conveying System.

Without changing/Disturbing fiber attributes we convey raw cotton from one place to another pneumatically. For Raw cotton conveying there are different systems such as, conveying of R.C. from heap to pre-cleaner or up to Gin House & Droppings is done automatically with the help of pneumatically operate dropper boxes the dropper box is again an indigenous design & having no wiping roll as (See Figure 1).

This system can also be called the suction command system which will take away the pain of the ginner to find very dependable persons for feeding the raw cotton to the pre cleaner evenly as required from the heaps of the raw cotton. The system consists of independent suction lines. This suction command system can be designed to meet your individual needs from one to many lines.



Fig 1: Pneumatic Conveying System

3.3 Pre-Cleaner.

Pre cleaner (see Figure 2) is the main integral part of the technology which provides optimum capacity, very high and best quality and in the end huge profits. Even if the pre cleaner is working in connection with other systems or it is working alone the pre cleaner can be found working good in any arrangements.



Fig 2: Pre-Cleaner

3.4 Ginning Machine

In India, roller gins are most commonly used in ginnery. The principal purpose of ginning is to separate cotton fibers from seeds. In a roller gin, a spirally grooved leather roller pressed against a fixed knife is made to rotate at a definite speed. A moving blade, known as the beater or "moving knife" oscillates by means of crank or eccentric shaft, close to the leather roller. Seed cotton, when fed to the machine, fibers adhere to the rough surface of the roller. Then it is carried in between the fixed knife and the roller such that the fibers are partially gripped between them. The oscillating knife beats the seeds and separates the fibers, which are gripped from the seed end. This process is repeated a number of times and due to the "Push and Pull" the fibers are separated from the seed, carried forward on the roller and dropped out of the machine. The ginned seeds drop down to the reserve box. In these machines, the ginning efficiency primarily depends upon the surface speed of the roller and the number of effective working strokes of the moving knife. The output of roller gin is around 45 kg, per hour (see in Figure 3)



Fig 3: Ginning arrangement.

3.5 Belt Conveyor

The belt conveyor is made out of wooden strips fixed on the endless rubber strip, which carried the lint towards the press box.

3.6 Lint Cleaner

Lint cleaner is also called as post ginning. It reduces trash contents and removing seed coats & leafy matters and protects fiber quality. Lint cleaner can contribute much to the preservation of grade. Saw type lint cleaners are most commonly used now a day.

3.7 Press Machine

Press machine, generally used in a ginnery, is single box type. In ginnery a set of presses- a half press and full press is used. Half press is installed at the ground level (see in Figure 4). The normal size of the box is 124 x 48 cm. Full press is installed about 550 cm away from the half press and both are connected by I beam. This beam is provided with rail on which pincer moves for transporting bale from half press machine to full press machine. Three rams each of 18,75 cm diameter and two rams each of 17 cm diameter are provided for compressing bale at half press and full press stage respectively. The number of grooves in the platens is 9, 10, and 12 and depending on the number of grooves, the press is called as 9, 10 or 12 gala press machine. All the presses are hydraulically operated. Electric motor of 100 hp is used to operate the 12 pumps. Opened lint in loose form is fed into the press box of half press and bale of 127 x 51 x 55 cm size is prepared. Further compression reduces its height to 37.5-46 cm to achieve bale density up to 0.58 to 0.64 g/cm³.



Fig 4: Lint Pressing Machine.

3.8 Seed Conveying System.

Seed conveying system has screw conveyor. The screw conveyor collect seed form individual double roller to one end of Gin House & thereafter can carry up to platform of seed.

4. DRAWBACKS OF GINNING AUTOMATION

The Present scenario reveals that most of the handling operations are replaced by mechanized conveying, which may probably clean the cotton in various stages of transportation of cotton. The drawbacks in system are that the ginner stops the functioning of the pre-cleaner [3] due to increase in wastage in the form of trash. The crop producer or farmer is not fetching the reasonable price from the ginner although they produced good quality cotton. The transportation of cotton field to ginner added lot of foreign materials and affect quality of cotton. The ginner cannot, as yet, solve the problem of sticky cotton, [4] control of white flies and aphids. When grass and bark are problems, it is need to provide good pre-cleaning of seed cotton before ginning [8].

5. APPROACHES FOR DEVELOPMENT

The gin's customer is the cotton grower, the one who pays in one way or another to have the cotton ginned. It is the ginner's responsibility to maximize the revenue from every module of cotton. This does not simply mean maximizing the value of a bale, or the price per pound for the fiber, or even the grade. Instead, it means maximizing the return to the grower. As ginner, it needs to know how to operate the gin so as to optimize [5] its performance for the growers and for their customers, the mills. In general, the less drying and cleaning, the better for all concerned provided, of course, that meet the grower's objectives. If farmer installed pre cleaner at storage place either in village or at farm can fetch better quality of cotton. The ginner may skip the pre-cleaning process [9]. If small size ginner installed at village level, the farmers will save transportation cost, improve quality of cotton and spinner get good quality cotton for process.

6. ECONOMICS OF APPROPRIATE TECHNOLOGY

Cleaning involves the removal of both moisture and trash, but it also means the loss of some marketable fiber [6]. The general rule is that cleaning to a better leaf grade than is normal for ginner area, or than is required by ginner's customer (the grower), usually results in loss of profit to the grower because the premiums for the extra cleaning do not compensate for the loss of marketable weight (gin turnout) in the form of lint-cleaner waste or motes [10].

Unneeded cleaning has other disadvantages. It reduces staple length and it causes the creation of short fiber and neps, which are especially detrimental in the spinning process. A gin's reputation among mill buyers is often related to the amount of short fiber and neps that are believed to be in that gin's cotton, causing buyers to speak of over-ginned cotton.

Appropriate technology, which is sustainable to cotton growers and they can maximize their profit by selling directly to the spinner [7].

7. CONCLUSION

The use of a field cleaner in the harvesting stage was also found to be optimal with some variation based on the desired yarn quality.

A lack of reliable information about the effect of field cleaning on economic returns and quality characteristics of cotton lint has limited the adoption rate for field cleaning.

Maximizing the return to the grower/farmer, the Ginner knows the optimized operation of the ginning.

Development of mini cotton ginnery is essential for solving the problems. Energy consumption by gin machinery is reduced. Quality of lint cotton is improved that is reduction in contamination because of reduction in multiple handling and transportation cost. Processing cost is reduced.

8. REFERENCES

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