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STUDY OF GINNING AND PRESSING MILLS

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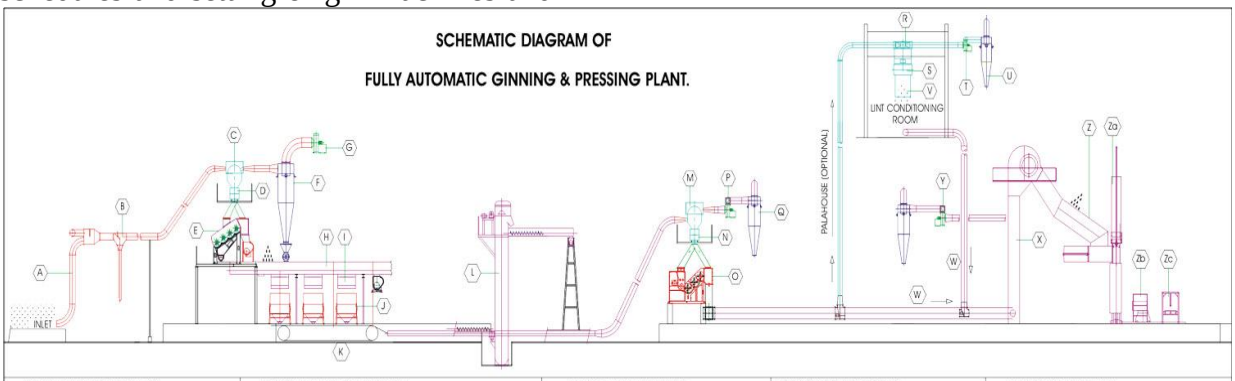
ABSTRACT

Ginning is the first mechanical process involved in processing cotton. Ginning machine separates cotton fibers from the seed bolls and dust particles. Cotton fibers pressed to Bales by using Hydraulic pressing machine. The development of different varieties, Fiber growth, Grading and Marketing. Storage of seed cotton, Handling of seed Cotton, Working principles of different Conveying systems. Importance, working principle and classification of pre & post cleaners. Study of Double roller gins with auto feeder & Ginning percentage, maintenance schedules and setting of gin machines and effect of gin settings on fiber parameters. Operation of lint condenser, Bale press, working of Hydraulic pressing machine, packing material, etc. Sampling for testing, Measurement of Length, Fineness, Maturity and Strength, Fiber Quality index and Moisture. Brief account of Fiber quality using HVI methods.

INTRODUCTION:

To Study the working of different mechanism of Marketing of cotton, Material handling equipments & structure, Pre & post cleaning, Ginning, Bale packing machinery, Fiber quality evaluation, and Future scope.



LINE DIAGRAM OF GININNG AND PRESSING PLANT

Ginning is the mechanical process for separating cotton into its constituents namely lint (Cotton Fibre) and Cotton Seed. The Seed Cotton that comes from the field has to be subjected to various treatments in the ginning factories depending upon its inherent characteristics such as trash contents, moisture contents, length of the fibre, variety of seed i.e. fuzzy or black, method of seed cotton transportation, storage practices, handling

practices inside the ginning factories and finally subjected to ginning process for separation of fibre and seed before packing into bales etc. Ideally the quality of the constituents i.e. cotton fibre and cotton seed before ginning and after ginning must be more or less same however it is seen that substantial damage is caused to quality parameters during processes in the ginning factories.

The selection of cotton for spinning is made on the basis of fibre quality and any damage in the same during the process of ginning reduces the value of the fibre and results in lowering down of value in total textile value chain.

THE SELECTION CRITERIA OF SEED COTTON: QUALITY is one of the most important aspects of producing a profitable cotton crop. The factors that determine cotton quality are:

Leaf grade: Leaf grade refers to the leaf or trash content in the cotton. Graded on a scale of 1 to 8, leaf grade is determined by human classers who compare a lint sample to Universal standards for the grades. A leaf grade of 8 is referred to as "below grade", and can result in large price discounts.

Fiber length: Fibre length is primarily determined by cotton variety, but growing conditions and fertility can affect length as well. Night time temperatures of 60-70ºF are optimum for fibber length development. Temperatures above or below this range result in shorter fibbers. Reduced length can also result from deficit or excess soil moisture levels.

Length uniformity: Length uniformity is the ratio between the mean length of fibber and the upper half mean length expressed as a percentage. Low uniformity values are a function of fibbers that are more easily broken.

Strength: Strength is measured by clamping and breaking the beard of fibbers with an 1/8-inch gage spacing between the clamp jaws. The strength reported is the force in grams required to break a bundle of fibbers one tex unit in size.

Micronaire : Micronaire (mike) is a measure of the fineness of the cotton fibber. Unlike fibber length, mike is determined more by environmental conditions than variety. Mike is developed after the full fibber length is obtained.

Trash: Trash is a measurement of trash present in the lint. The measurement is made by the HVI video trash meter which measures the percentage area and particle count of trash on the sample surface. This measurement provides an estimate of the total amount of trash in the bale.

Color: Colour is the measure of greyness and yellowness of the lint. Reported as a two-digit code as measured by the HVI, colour usually is not affected by variety.

Moisture: The Roller Gins can take up to 10-11%moisture but above that the drying process should be adopted before feeding the seed cotton to the ginning machines and the moisture contents should be brought down to below 10% before ginning.

MATERAIL HANDLING AND EQUIPMENT: Seed cotton can be safely stored in modules or trailers if its moisture content is kept at 12 percent less. Wet cotton or cotton containing the green plant material will heat during storage and quickly deteriorate. Cotton damaged in this manner produces low grades and poor quality seed. If the temperature exceeds 110F it should be ginned immediately.

Pre cleaning: Pre cleaning is done in different ways but in this plant Hot Box is used to clean the seed cotton. It runs with 5

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HP motor connected with the belt. The cotton is dried up and Seed cotton cleaners break up large wads and generally get the cotton open and in good conditions cleaning and drying.

HOT BOX

Conveying systems: After cleaning the seed cotton which is obtained from hot box it is sent to ginning machines by conveying systems. Conveying systems are of two types:

1. Belt conveyor system
2. Screw conveyor system

The main function of belt conveyor is to transport the seed cotton from hot box to cross screw conveyors. The cross screw conveyors have right and left hand screws to carry the seed cotton to the both sides of the gin houses.

BELT CONVEYING SYSTEM

CROSS SCREW CONVEYING SYSTEM

GINNING: Ginning is the first Mechanical process involved in processing cotton.Ginning machines separates cotton fibers from the seed bolls and dust particles. This works on principle operation of Mc- Garthy's gin.

WORKING OF DOUBLE ROLLER GINS: Double Roller is the improved version of McCarthy Single Roller Gins. In a double roller (DR) gin, two spirally grooved leather rollers, pressed against two stationary knives with the help of adjustable dead loads, are made to rotate in opposite directions at a definite speed.

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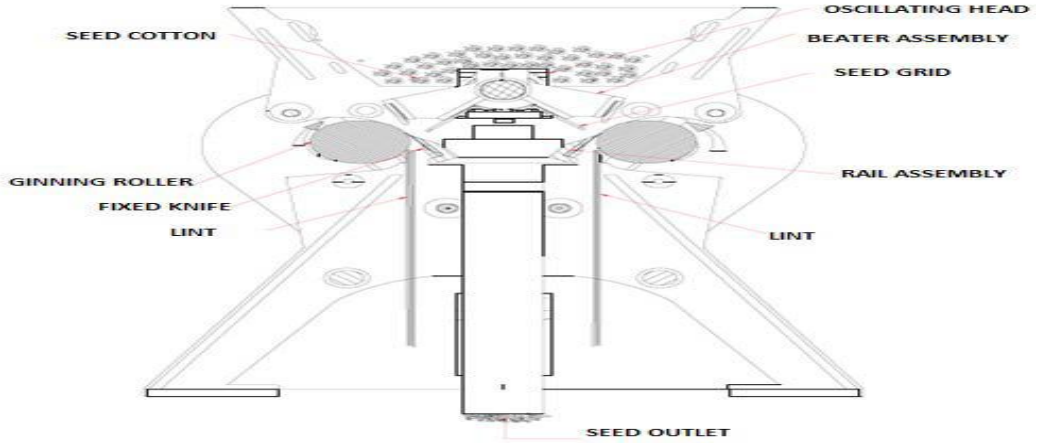
The three beater arms (two at end and one at the centre of beater shaft) are inserted in the beater shaft and two knives (moving knives) are then fixed to the beater arms with proper alignment. This assembly is known as beater assembly, which oscillates by means of a crank or eccentric shaft, close to the leather roller. When the seed cotton is feed to the machine in action, fibres adhere to the rough surface of the roller and are carried in between the fixed knife and the roller such that the fibres are partially gripped between them. The oscillating knives (moving knives) beat the seeds from top and separate the fibres, which are gripped from the seed end. This process is repeated.

A number of times till all spin-able fibres are separated from the seeds, which are carried forward on the roller and doffed out of the machine. The ginned seeds dropdown through the slots provided on seed grid, which is part and parcel of beater assembly, which also oscillates along with the moving knives.

This technology also retains maximum natural fibre parameters of the cotton similar to McCarthy Single Roller Gin but produces double or more quantity of fibre at same electrical power and processing cost hence most cost effective. Therefore maximum McCarthy Single Roller Gins have been replaced by this technology in case of handpicked cotton. In Double Roller Ginning Technology one can gin all types of cotton of the world by simple setting adjustments, hence this technology has rapidly replaced majority of McCarthy Single Roller Gins and has become most preferred technology for hand picked cotton where trash content are lower in the seed cotton.

THE MAIN COMPONENTS OF GIN MACHINE: Main frame machine, Pair of chrome feather rollers, A pair of fixed knives, Power transmission system, Rail assembly, Beater assembly.



LINE DIAGRAM OF DOUBLE ROLLER GIN MACHINE

GEAR BOX ALINGMENT: The alignment of the gear box is based on the Planetary gear trains assembly in which wear the sun gear is fixed and all the other gears are rotating around them.

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GEAR BOX ALINGMENT

The Gear box is filled up to 20% grease because due to the vibrations it may come out of the box. 500 grams is added weakly to gear box to maintain the level of grease in the box. If the grease is not maintained heat will be generated and gear may be disoriented. Power transmitting system consists of v-belt and chain sprocket .Gin rate and energy consumption depends up on Roller speed, beater oscillations moisture content

GINNING PERCENTAGE:

$$Ginning\% = \frac{WeightofL\ int*100}{WeightofSeedCotton}$$

$$G\% = \frac{34*100}{100}$$

$$G\% = 34$$

GIN PLANT

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POST CLEANING:

Lint cleaner is done in two stages
1. Air separator
2. Lint cleaner

After ginning next process is cleaning of lint. Lint cleaners are provided to clean the lint, to remove leaf trash and dust particles and it is sent to the Bale packing machinery.

Lint cleaner

BALE PACKING MACHINERY:

Ginning is the process of separation of fibber from cottonseed. Composite ginnery performs ginning and pressing operations to convert lint cotton into a bale. In modern day, capacity of ginning plant is such that the cotton bale handled by their press system gives rise to very large forces. Frame structure like all the other equipment has to be able to withstand these forces without damage. It is essential that the calculations for mechanical strength to check the suitability of top and bottom frame and their supports for hydraulic forces in cotton bale press at required level and duration in the system. Bale packaging is the final step in processing cotton at the gin.These bales weighed about 170 kg and were packaged respectively.

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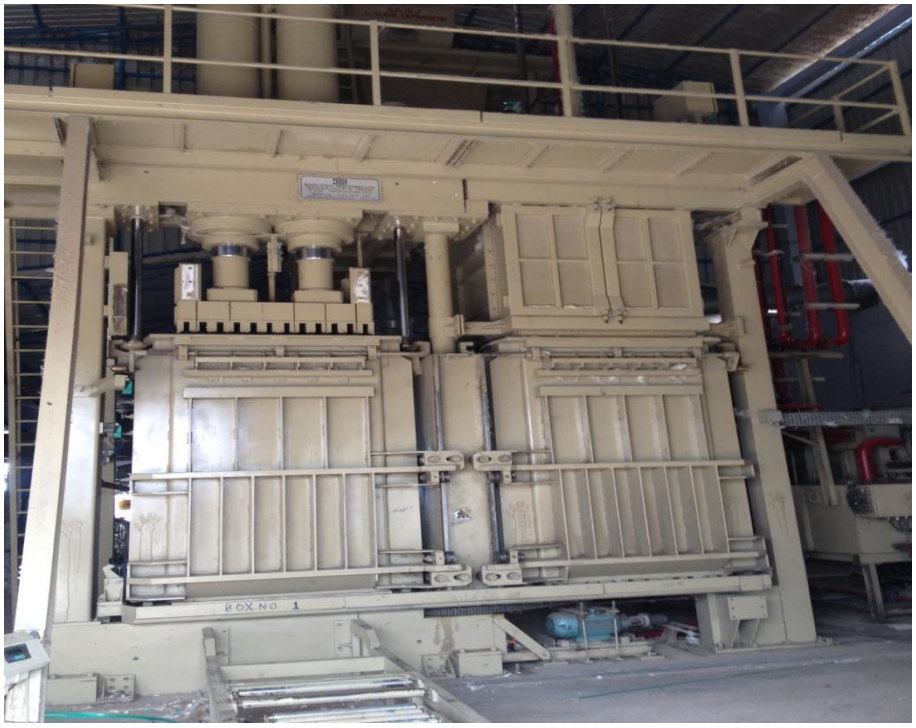

HYDRALLIC PRESS MACHINE

The packaging system consists of a battery condenser, lint slide, lint feeder, trampers, bale press, and bale tying mechanism. This system may be supplemented with systems for bale conveying, weighing, and wrapping. The bale press consists of a frame, one or more hydraulic rams, and a hydraulic power system.

Hydraulic pressure locks for the doors give positive locking. The unlocking operation opens all press door simultaneously, making the entire bale accessible for tying out and handling. Bale presses are described primarily by the density of the bale that they produce, such as low. Density (flat or modified flat) universal density gin or compress.

Hydraulic pressure locks for the doors give positive locking. The unlocking operation opens all press door simultaneously, making the entire bale accessible for tying out and handling.

Safety inter-locks are provided so that the tramper foot and ram platen remain locked clear of the revolving boxes until the boxes are securely locked in place. The baling box construction is unique and unconventional. Bale ties are applied through slots in the side walls, the ram backs off to tension the ties.

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LINT BOX

FIBER QUALITY EVALUATON: The technique used to check the quality of fiber is "HIGH VOLUME INSTRUMENT".High volume instrument systems are based on the fiber bundle strength testing. The bundle testing method is automated. The time for testing per sample is 0.3 minutes.

PRINCIPLES OF FIBER TESTING USING HVI:

SAMPLE PREPARATION: The Fibro Gram method is preferred while preparing the sample for fiber length estimation. Bale cotton which is brought from the industry is maintained at room temperature with the help air conditioners for

HVI INSTURUMENT

1-2 hours. This sample is divided into three parts each weighing 10 grams and it is processed for quality evaluation using HVI.

MEASURMENT OF DIFFERNET PARAMETERS: Length, Strength, Elongation, Micronaire, Color, Trash and moisture. These parameters are discussed in the selection of the seed cotton criteria.

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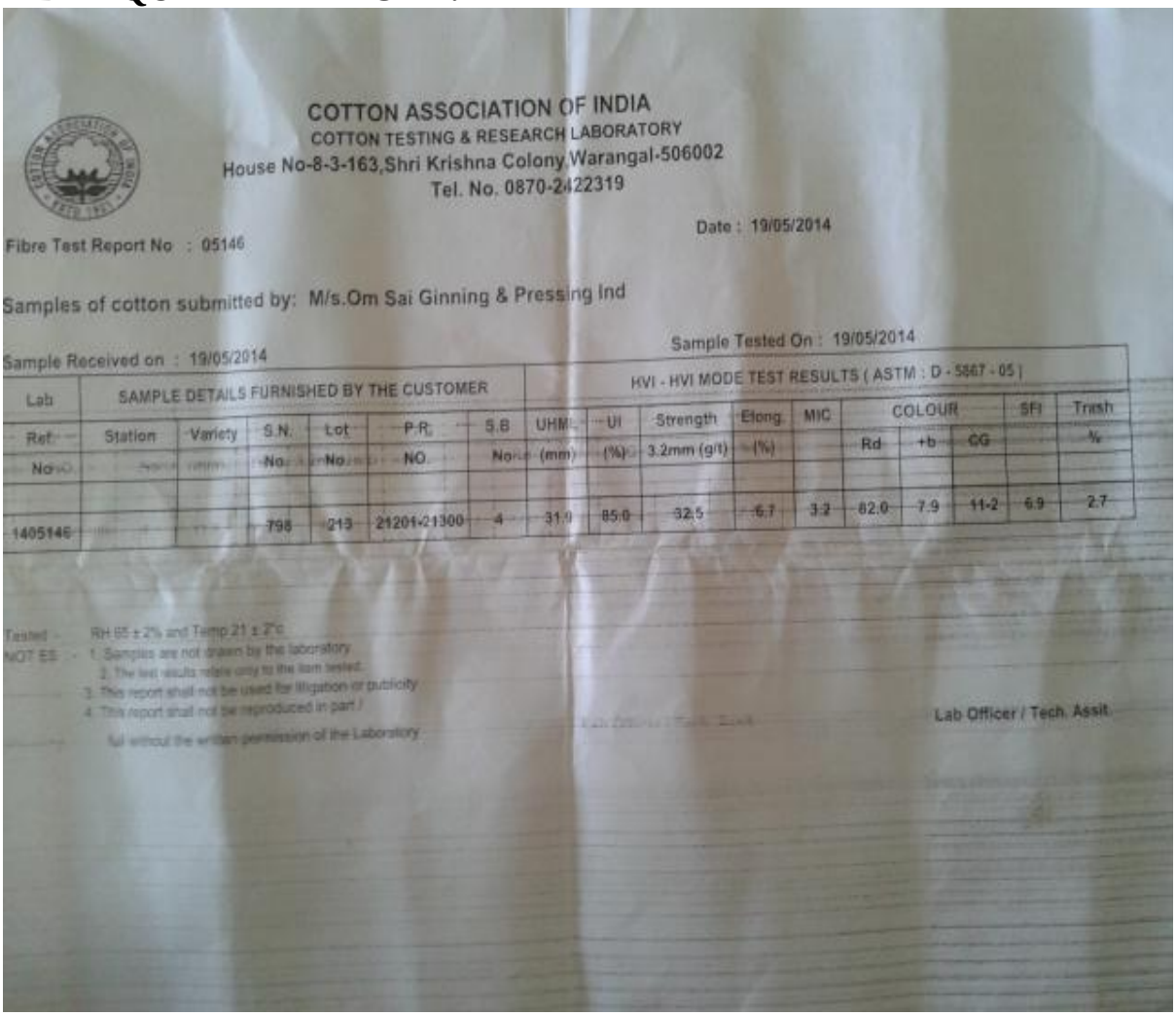
FIBRE QUALITY REPORT:



COTTON ASSOCIATION OF INDIA
COTTON TESTING & RESEARCH LABORATORY
House No-8-3-163,Shri Krishna Colony,Warangal-506002
Tel. No. 0870-2422319

Fibre Test Report No : 05146

Date : 19/05/2014

Samples of cotton submitted by: M/s.Om Sai Ginning & Pressing Ind

Sample Received on : 19/05/2014

Sample Tested On : 19/05/2014

Lab	SAMPLE DETAILS FURNISHED BY THE CUSTOMER						HVI - HVI MODE TEST RESULTS (ASTM : D - 5867 - 05)									
Ref. No	Station	Variety	S.N. No.	Lot No.	P.R. NO.	S.B No.	UHML (mm)	UI (%)	Strength 3.2mm (g/t)	Elong (%)	MIC	COLOUR Rd	+b	CG	SFI	Trash %
1405146			798	213	21201-21300	4	31.0	85.0	32.5	6.7	3.2	82.0	7.9	11-2	6.9	2.7

Tested - RH 65 ± 2% and Temp 21 ± 2°c
NOT ES - 1. Samples are not drawn by the laboratory
2. The test results relate only to the item tested.
3. This report shall not be used for litigation or publicity
4. This report shall not be reproduced in part / full without the written permission of the Laboratory

Lab Officer / Tech. Assit.

CONCLUSION:

The study reveals the technical, financial and environmental conditions of the ginning

Industry. The following conclusions can be drawn on the basis of findings of the

Study carried out:

1. The industry is actually an interface between the agricultural sector and industrial

Sector. Ginning is a seasonal industry, which operates for about 4-5 months a year.

2. The ginning industry does not appear to contribute to environmental pollutants

outside the plants in serious manner. Neither there is any stack emission except where

DG sets are used for auxiliary power supply

We have obtained the values as follows by the fibre quality evaluation:
UNIFORM LENGTH = 31.0
STRENGTH = 32.5mm
ENLONGATION = 6.7%
MICRONAIRE =3.2
Colour (yellowness) = 7.9

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FUTURE SCOPE:

To gin higher volume

To achieve lowest cost per unit of ginning and pressing.

To retain best natural fibre parameters.

To produce lowest trash contamination cotton.

To provide highest information to buyer to market their higher quality cotton.

To invest in aesthetics, information technology and improved machinery.

The complete value chain of seed cotton and cotton stalk should be utilized.