

# Design of Delinter Machine Grate for High Removal Lint

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**Abstract-**The objective of this project is to design of the delinter machine grate for increasing productivity, quality of lint, minimizing friction between grates and saw blanks, uniform shape and length of grate. To achieve these objectives by new design of delinter machine grate and analyze the new design of grate by mechanical software's. New design of grate is help to outcome in uniform in shape and length of grate, quality of lint will increase. During Design parameter such as radius, length of grates is optimized. A cottonseed delinting machine mechanically delints the cottonseed by a rotating brush system. There are 200 saw blanks, 201 grates are used in delinter machine. The burning of linter due to friction between saw blanks and grates. By using new design of grate the friction between saw blank and grate will be minimize and quality of lint will increase.

**Keywords-**Delinter machine, grates design, saw blanks, lint, cotton seeds, motes.

## I. INTRODUCTION

Delinter machine is part of cottonseed processing plant. Delinter machine removes lint from cotton seeds as shown in fig.1. A cotton seed delinting machine mechanically delints the cotton seed by a rotating brush system. There are two processes used for delinting cottonseed, firstly is mechanically and second acid delinting process. Mechanically delinted is the most common form of delinted seed available in the feed trade. Delinted seed retains about 1-2% residual linters which usually appear on the surface of the seeds. Acid delinting process used to removes all linters. This process is used for the production of planting seed. At various times through the year, quantities of culled, or leftover planting seed, become available to the feed trade. Such types of planting

seeds may be hazards caution stress of soul kind of chemical.



Fig.1 Delinter machine

Grate:-

Grate plays very important role in delinting machine as shown in fig.2. During delinting process the cotton gets stuck to brush roll. The brush roll is rotating in clockwise direction, while the saw blank is rotating in opposite direction of brush roll.



Fig.2 grate

Grates are help to maintain gap between two saw blanks. During delinting process cotton seed trap between gap of saw blanks and grates. With the help of the nozzle, linter is suck to the lint cleaner machine and the black seeds are fall down in underground conveyor and are passed to next process. I.e. Seed cleaning process. Delinted linter is used in currency paper. Lint play very important role in day today life.

## II. LITERATURE REVIEW

Review reflects considerable amount of researches has been reported in the field of delinter machine.

Prof. R. B. Salwe et al [1] developed cost effective for automation for delinting machine and study low cost systems, for the operation on seeds of cotton is used to separate lint from cottonseeds. At low price automation system for removal of lint from cottonseed is to be model designed and developed. The machine component consists of material SS drum with stirrer in which cottonseeds having lint is combine with concentric sulphuric acid. So lint will get burn. This lint free cottonseed treated with lime water to due to which acidic nature neutralize. After cleaning water this cottonseeds are used for agriculture purpose.

Thomas c. wedegaertner et al [2] studied Systems and methods for removing material, e.g., linters, from seeds, e.g., cottonseeds ginned are supplied. Machine and process involve motion the seeds in a rotatable drum having brushes of longitudinal. We produce centrifugal force by the seeds against an inner side of the drum is connected with an insert brush. In this way, work is done that eject the material from the outer side of the seeds. The material is ejected with help of pressure and the processed seeds are removed. System may include a brush insert that is easily removed from the rotatable drum.

Ugwuet al [3] worked on optimization and performance evolution of cotton seed delinting machine. The machine was converted by recommended various pulleys with dia, as 120mm, 200mm and 250mm, which produced rotor speeds of 650rpm, 600rpm, and 550rpm subsequently. The rotor speeds were then used to test the designed machine and its efficiency were evaluated. Pulley and belt were used for transmitting power from the electric motor to the shaft of the cotton seed delinting machine. The new delinting machine is worked on a 2hp electric motor. The performance test was carried out using three distinct feed rates with three distinct speeds which include 650rpm, 600rpm and 550rpm, using 5g, 6g and 7g weight of feeding rates of the wool considering seeds. Each one was replicated five times. The results showed that the machine works efficient at 7g feed rate, which was 79.93% and the speed does not influence the efficiency. The

mathematical study [ANOVA] for outcome of rotor speed and feed rate on the capacity and execution of the check machine at 5% expectation level was computed. The result of the analysis confirms that feed rate was compelling process parameter that affects machine efficiency.

M. K. Sharma [4] studied on new trends in cotton ginning and cotton seed processing. The optimum utilization of all ingredients of cotton i.e. fiber, cotton seed, cotton stalk has become then compulsory for sustain in the competitive field of cotton growing processing. A way that manpower component is decrease to the smallest for complete cotton value processing chain has become necessity due to scarcity of manpower and cost of electricity increase in different countries. The continual work is being made to address these problems by the scientific community and manufacturers. Various new equipment's / systems have been introduced in the recent year in the journey of modification / progress of various operations in the cotton ginning and cotton seed processing.

Thomas c. wedegaertner et al [5] developed Systems and methods for removing linters from ginned cottonseeds are provided. The systems and methods involve motion the cotton seeds in a rotating drum having a plurality of longitudinal brushes. Centrifugal force is created by the rotation of the drum and the plurality of longitudinal brushes urge the cottonseeds compare to inner side of the drum that is connected with a flexible abrasive member. In this way, work is performed that extract linters from the cotton seeds. Linters are removed using reduced pressure and the processed seeds are removed.

Louis T. Kincer et al [6] studied the delinter machine and developed new mechanical cotton seed delinting machine. Cotton seed delinting machine mechanically delints the cottonseed by a rotating brush system. The period of time for the delinting operation is operated with help of door operating system. The machine also gives for the return of the lint after separation from the cottonseed. The movement and travel of path the cottonseeds during the delinting process is controlled to ensure a high degree of efficiency in the removal of the lint.

Edward John O'Brien et al [7] worked to find out the improvements in machines employed for removing the lint from cotton seeds by introducing to the art the use of a sand blast in a seed containing chamber.

### III. NEED OF INVESTIGATION

The current design of the grates doesn't provide the highest capacity lint removal; Quality of lint along with problem of burning of lint. Detailed analysis of the grate is also required to determine the losses.

Following problems occurs in delinter machine:-

- Low lint recovery
- Motes in output of delinter machine
- Friction between grates and saw blanks.
- Chances of Burning of lint.
- Low Quality of lint.
- White seeds in output of delinter machine.
- Output of delinter machine decreases.
- Shape and length of grates are not in uniform length.

#### 1. Grates:-

Following fig. shows that, grates are not in uniform shape and length.



Fig.3 Different Shapes of Grates

Due to not in uniform grates shape and length, which result in seeds falling directly to the conveyor. The design of grate should change for high capacity lint removal. Higher output and excellent quality of lint is desired.

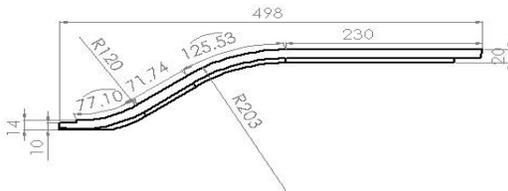


Fig.4 Current design of grate

Trail No	INPUT(Kg/Hr)	Radius(mm)	Delinted seeds Kg/Hr	Motes(Kg/Hr.)	Lint(Kg/Hr.)
Trail No.1	3990.00	120.00	3762.57	152.00	59.84
Trail No.2	3800.00	120.00	3534.00	144.40	68.40
Trail No3	3500.00	120.00	3251.50	122.50	66.50
Trail No.1	3650.00	120.00	3420.05	131.40	69.35
Trail No.1	3750.00	120.00	3525.00	131.25	75.00

Table.1 Result of current design of grate

Table.1 shows that, Result of current design of grate. Above result taken by trail of current design of grate in delinting machine. New design of grate result will take by experiment. Fig. 5 shows that, current design of grate. With the current grate we got above result.

Lint recover- 1.8%

Motes in output- 3.68%

Delinted seeds- 93%

New design of grate is required for high lint recovery and delinted seeds, low motes. New design of grate, which will help to increase the productivity and many more advantages.

#### 2. Burning of lint:-



Fig.5 Burning Lint

There are many chances of burning lint due to friction between saw blanks and grates. Quality of lint and output of delinter machine decreases due to burning of lint. Sufficient gap between grate and saw blank is required.

### IV. OBJECTIVES

- To modify design of grate.
- To minimize friction between grate and saw cylinder for avoiding burning of lint.
- To increase quality of lint.
- To minimize white seeds in output of delinter machine.
- To obtain best solution for implementation.

### V. METHODOLOGY

While the problem is being inspected on different fronts, this dissertation work would focus on the new

design grate, which will help to increase lint recovery and reduce motes in output, minimize the friction between saw blank and grate, the chances of burning of lint. The above objectives may be achieved by new design of grate. Design of experiments is one of the many problem-solver tools that can be used for various investigations such as finding the significant items in a process, the effect of each item on the outcome, the variance in the process, troubleshooting the machine issues, parameters, and modeling the processes. Many industries use this tool to stay competitive worldwide by designing robust brands as well as improving quality and reliability of brands. By using strategically designed and numerically performed trails, it is possible to study the effect of several variables at one time, and to study inter-relationships and interactions. Proposes a strategy to apply the design of experiments to study and develop the performance of a process. Also, the formulation and solution to a multi-objective optimization problem have been presented. Practically recommended solution will increase lint recovery, delinted seeds, quality of lint and reduce motes in output. Following design of grate will achieve above objectives.

New Design of grates:-

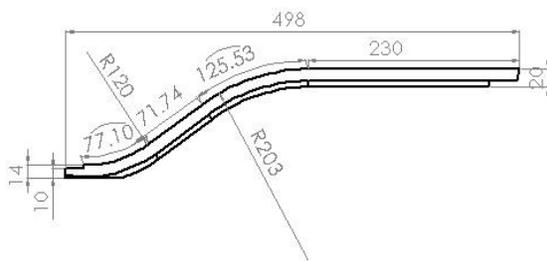


Fig.6 Design of grate no. 1

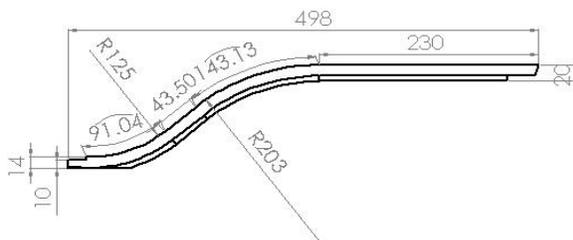


Fig.7 Design of grate no. 2

Higher lint recovery, quality of lint and low motes in output can be achieved by new design of grate. Because during delinting process perfect slop and shap of grate is required. Lint recovery up to 2%,

motes up to 3%, delinted seeds up to 94% can achieve by new design of grate by design of experimental. It will help for increasing capacity tons per day.

## VI. SUMMARY

Partially recommended solution will be achieved. Lint recovery up to 2%, Motes in output upto 3%, Delinted seeds up to 94 Quality of lint will increase Further study will help in improving the highest lint removal capacity of delinter machine. Motes percentage in output of delinter machine will reduce. Quality of lint will increase.

## VII. REFERENCES

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