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WeARE Research Area

Research in a mechanical delinter is being conducted to steer away from toxic chemicals used to delint the cotton. The study focuses on the development of a mechanical delinter that can replace the use of such chemicals.

Motivation or Background

When the cotton plant is processed through a gin it separates the long cotton fibers from the cotton seed. The cotton seed is separated and processed further to remove the short fiber that are difficult to remove known as linters. As of today, the industry standard for removing the lint from the seed is through a chemical process. The chemical process includes the use of harsh chemicals such as sulfuric acid and hydrochloric acid. These chemicals are dangerous to humans and to the environment. Acid delinting also reduces the shelf life of the cotton seed that is used specifically for planting of cotton. The purpose of this research is to **develop a machine that will replace the use of such chemicals.**

Objectives

- Design a mechanical delinter to be compared with current designs
- Validate effectiveness through the implementation of a test protocol that can be used in both designs.

Methodology

The new design that was developed is shown in Figure 1 which has a stationary brush and a rotating brush. This design was compared to an existing design shown in Figure 2 which had 2 rotating brushes. A test protocol was developed to compare the two designs. Metrics include the following: germination rate, percent of lint remaining, mass balance (intake versus output.)

Results

The results show that there is not statistical difference when performing a t test with the given data. The data being presented in Figure 3 is the mass balance after the seed was processed. However, several observations were made as the delinter was operating. One of the observations noted was that the lint is extracted with less resistance with the stationary brush compared to the dual rotating configuration. The dual rotating brush configuration had a tendency to clog the lint extractor making it difficult for the lint to be removed.



Fig. 1
Stationary Brush Design



Fig. 2
Rotating Brush Design

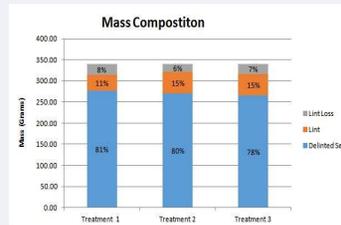


Fig. 3
Mass composition



Fig. 4
Delinted seed and lint

Skills and Experience

The use of AutoCAD Inventor® required by this internship has given me the ability to expand my knowledge of CAD software. Another skill set that was acquired was the processing of DXF files to be used in a water jet to make manufacturing of the parts more efficiently. I also have a better understanding of how a part goes from a computer drawing to a physical tangible object.

What I Learned

The development of machines requires the work of a lot of people. The communication between team leader, engineer and machinist must be excellent to ensure that the project gets done in a timely fashion. Furthermore, the design is only one aspect of an engineer's responsibilities. Engineers should also validate each design.

Future Plans

Due to time constraints, only the mass balance was accomplished. Other tests include the germination rate of the seed and the amount of lint still attached to the cotton seed.

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