# Cotton Gin Stand


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## WeARE Research Area

The area of concentration that this research puts emphasis on is automating a ginning system for small seed cotton samples. This will make a one step process easy for the client to do. The next area of focus is getting some properties about the process of the cotton flowing through the machine. Such as temperature, RPM of the shaft, moisture, among others. These variables can be obtained using sensors that are attached to the gin stand. The last part was designing a device that can weigh and transport the cotton seed that exited the machine.

## Motivation or Background

Cotton breeders generally use small gin stands to gin seed cotton samples during the process of developing new cotton lines. Samples are ginned to obtain data on lint and seed production as well as to generate a fiber sample for quality analysis. A single breeder may process several thousand samples each year, so efficiency in the ginning process is very important. A new ginning system for cotton breeders is being developed by USDA ARS in Lubbock, TX. A goal of this development project is to automate the ginning process for breeders. This particular ginning system was made to handle seed cotton samples weighing about three pounds. Full automation means that when the seed cotton is placed it the container in the beginning it will pass through the seed cotton cleaner then it will directly go into the gin stand and from there the seed will exit the shoot and the lint will continue to the lint cleaner then exit on the other side of the machine. A secondary process that needs to be automated for this system is the weighing of seed cotton before ginning, and seed and lint after ginning. Additional information about system operating parameters (shaft speeds, shaft torque, cotton moisture, etc.) will also be analyzed.

## Objectives

1. Design a mechanism to automatically weigh cotton seed and discharge it into a conveying line for disposal
2. Design a data acquisition system for the ginning system to measure and record cotton seed and lint weights, shaft speeds, shaft torque, cotton moisture, and other system operating parameters

## Methodology

Most of the design was based on the dimensions of the saw and ribs, and since the saw and ribs have not been chosen; the main focus of our research was the DAQ System with the sensors, and the cotton seed weight mechanism. Different types of sensors must be used to give more information on the efficiency of the motor and properties of the cotton seed and lint. To obtain accurate data the sensor must also be placed where it can read the information properly.

## Results

There is a variety of sensors that can complete the desired duty but they were chosen upon three main qualities **cost, compatibility with the DAQ System, and the accuracy of the sensor**. The location on where the sensor is placed is also essential to get back prevalent data. With accurate data, cotton breeders can more efficiently process cotton and aid them in choosing the highest yielding, highest quality, and easiest ginning varieties.

## Skills and Experience

A broad knowledge of measurements and instrumentation was needed to complete the design of the DAQ System. Since there are many types of the same sensor plenty of research was done to ensure that each sensor could complete the task it was assigned. For the design of the components I had to be fluent in SolidWorks.

## What I Learned

I learned that the space between the saw and the ribs is very important, if the gap is too big the cotton seed might not be properly separated from the lint, and if the space is too small it might cause the saw to hit the rib and cause a spark that can start a fire. Also that the moisture of the cotton is crucial, if the cotton is too moist, it will not be cleaned properly, and if its too dry, a fire can start if cotton is under too much friction.

## Future Plans

The future plans for the Gin Stand is the design of the whole structure that will be based on the specific saw and ribs that will be chosen. This process will most likely take over two years.

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## References


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