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Problem Statement and Background:

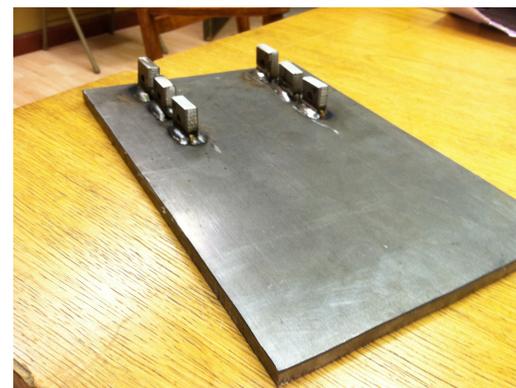
John Deere approached the ABE department with a project that would help to solve problems with testing straw in the field. John Deere currently tests straw to determine optimal settings of their rotor combine in different crop conditions. They want to be able to maximize the intake capacity of straw without compromising the quality of it. The current testing methods performed in the field are done by hand and allow too many differences between each test to produce consistent results. John Deere wants a portable product with a similar sample size that will produce reliable results from test to test.



Current testing method used by John Deere

Constraints / Requirements:

- **Portable testing device:** Device will be used in the field being harvested
- **Simple, repeatable motion:** Test must provide accurate and similar results
- **Adaptable to conditions:** Device will be subjected to dust, dirt, and weather conditions. Must be able to test various types and sizes of straw



Base with tabs for distance adjustment

Final Budget

Materials	Cost
1/4" thick Steel Plate (12"x12")	\$ 17.32
1/2" diameter Steel Shaft (15" length)	\$ 11.06
1/8" thick Steel Plate (24"x24")	\$ 38.60
2- Aluminum mounted Bronze Bearing	\$ 22.22
1/4" Adjustable Clevis Pins (1 pkg.)	\$ 4.23
Cotter Pin Keys (1 pkg.)	\$ 12.99
Flat Belt	\$ 3.16
Spray Paint	\$ 4.99
Total Cost	\$ 114.57

Operating Instructions:

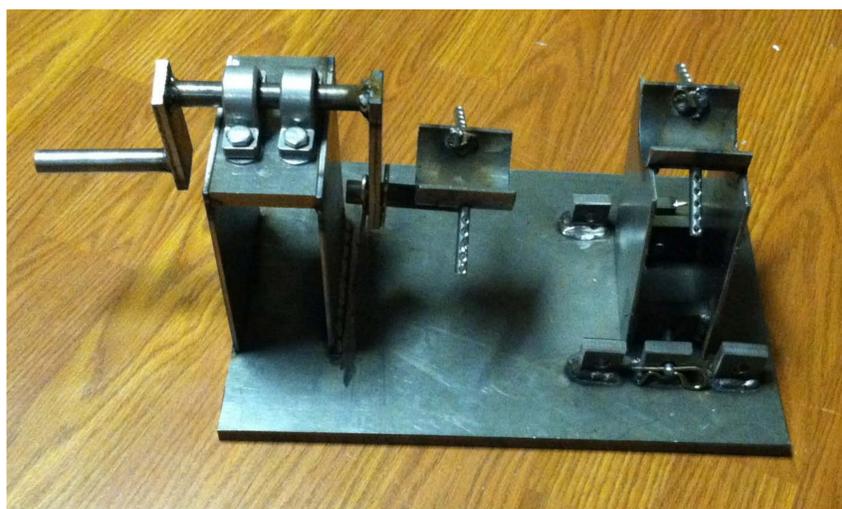
The two clamping devices (pipe) are filled with the sample of straw until full. The strap is then tightened down to securely hold the sample in place while the test is being done. After the sample of straw is secured the tester can begin to crank the rotating end using the handle. The operator should be able to turn the sample without problem and should count the number of turns before the straw begins to break. When the straw breaks the operator should record the number of turns the device made. The straps can then be released and the straw removed to be prepared to start another test.

Alternative Solutions:

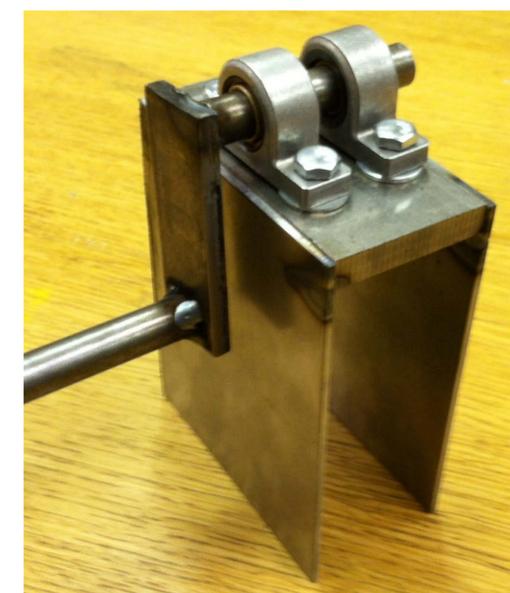
- Powering the rotating mechanism
- Self- powered clamps
- Change testing from rotational to tensile strength
- Allow adjustments to be made by a slide instead of tabs

Key Components:

- Sample holding-** Halved 2" diameter pipe with strap for tightening
- Cranking mechanism-** Two Aluminum-mounted bronze bearings, Three pieces of 1/2" diameter steel rod
- Distance between clamps-** Three different settings at 10", 8", and 6"
- Angle offset-** Two different placements for clamp on rotating end



New testing device built



Cranking mechanism with handle

Sponsor: John Deere -Brian Herringshaw, Matt Wold

Course Instructors: Dr. Bernie Engel, Dr. Bob Stwalley

Technical Advisor: Dennis Buckmaster

Special thanks:
Scott Brand