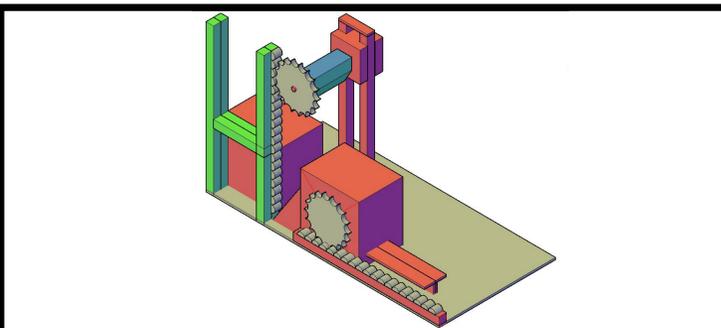


Straw Strength Testing Unit

Keith Fischer (ASM), Paul Gentry (ASM), Yun Lou (ENRE)

Problem Statement:

In the past, testing toughness of straw has mainly been breaking stalks by hand and giving a personal judgment. John Deere issued a challenge to create a machine that can give a numerical value to the toughness of straw and design a portable straw breakage testing unit to use in the field. Straw toughness is an important parameter in determining the straw quality produced by the combine.

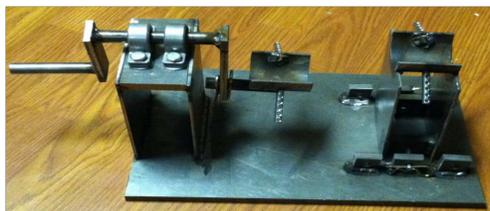


Sustainability & Benefits:

With the creation of an economical machine to give a numerical value to the toughness of straw, harvesters in European markets may be adjusted to minimize breakage. As a result, a higher quality product can be created with less loss from both the machine and baler. Higher yields of straw per given area results in less land needed to meet a specific demand. In the future of agriculture, maximizing yields and efficiency will play a key role in meeting demand while exploiting less land.

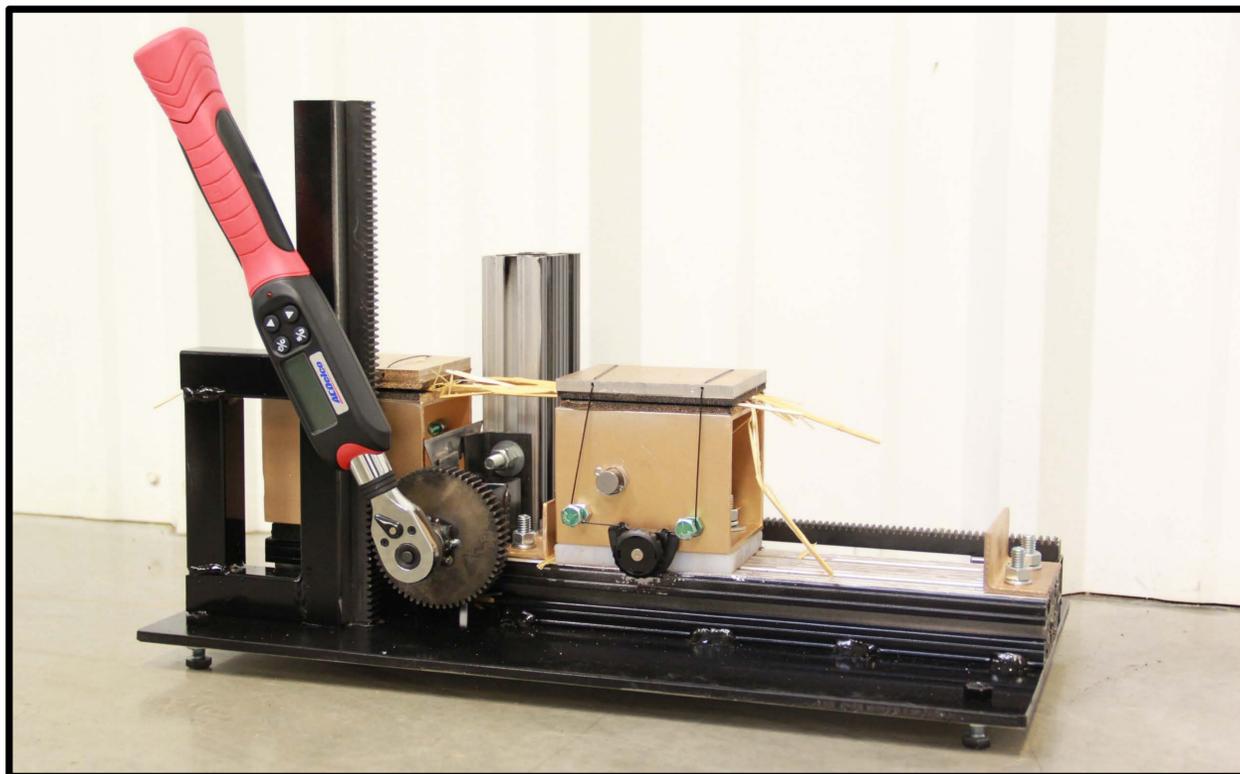
Past Solution:

While a strong attempt, last year's product was replaced with a new design in an attempt for greater accuracy.



Solution:

Initially, the team was presented with a design from last year. After review of the machine, the team decided to move forward with a completely new design while keeping the solution simple and portable. In order to produce a measureable amount of force, a torque wrench was utilized to measure peak force at the breaking point. By using a gear and rack system for applying forces on the straw, the machine puts virtually no strain on the torque wrench during the measuring process. In order to hold the straw tightly without crushing, a BOA lacing system was used to clamp the straw between two rubber-like mats. Straw can be tested to determine either the tensile strength, by applying horizontal force, or shear strength, by applying force perpendicular to the strands.



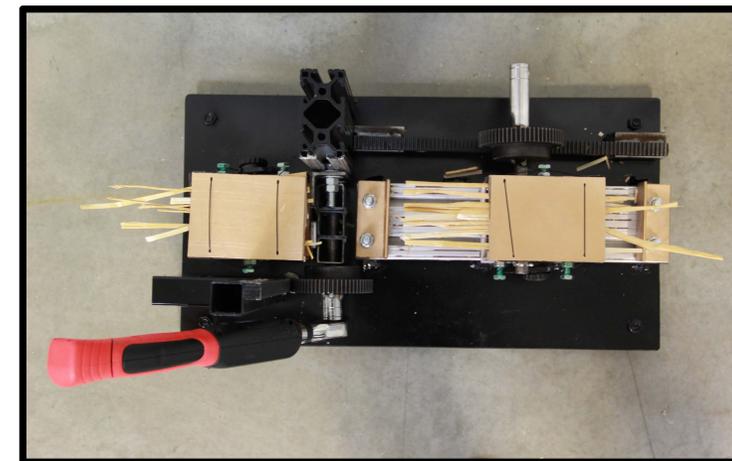
Criteria & Constraints:

- Numerical value given to toughness
- Portability
- Easy to use
- Moderate to low cost
- Have value for both John Deere and farmers
- Marketable final product

Societal & Global Impact:

The main focus on this product is not for North America, but for overseas use, where straw is more valued as a product. Its uses include:

- Home Insulation
- Fuel Source
- Clothing
- Erosion Protection



Economic Analysis:

John Deere gave the project a budget of \$500. By utilizing a design that minimized electrical products, the project was completed under budget by approximately 30%.

Straw Toughness Machine	Price (\$)
Aluminum Base Plate	20.00
Aluminum Square Tubing	15.00
1" Steel Square Tubing	7.97
5/16" Steel Round Stock	4.97
2 Steel Spur Gears	74.90
2 Ft Long Steel Rack	45.82
Boa Lacing	8.50
AC Delco 3/8" Digital Torque Wrench	104.39
3/8" Polyethylene Sheet	17.24
Misc. Nuts, Bolts, Washers	20.00
Razor Blade	2.97
Mouse pad	Donation
Total Cost of Production	321.76

Future Recommendations:

- Testing different moisture levels
- Testing different amounts of straw strands per test
- Testing different types of straw (Wheat vs. Rye)
- Correlate with Instron Machine

Company Sponsor:



JOHN DEERE

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