College of Engineering Department of Mechanical & Industrial Engineering

college of Engineering School of Electrical Engineering & Computer Science

To Predict ► To Design ► To Perform

ME, ECE Capstone Design Programs

Team 29: Harvest Cleaning Simulator

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Background: The CH570 Sugar Cane Harvester utilizes a chamber and an extractor fan to separate trash from product. Due to the inconvenience of field testing and the inaccuracy of computer modeling, John Deere is in need of an indoor simulator that can be ran in a controlled environment to collect

experimental cleaning data. There is currently no other simulator like this used in industry.

Objectives

- Design and build a scaled simulator of CH570 cleaning chamber that operates within the same concepts with variable settings.
- $2^{\text{Create a reusable sugar cane and leaves}}_{\text{replicate.}}$
- Run lab tests in the simulator to find **3** relationships between variables within the chamber system and the cane loss vs

cleanliness.





Description	Success Criteria	Test Results		
Ensure Power Draw is as expected	P<1300W	Max: 370 W		
Verify fan operates within correlated simulation speeds	400 to 1800 RPM	Operates up to 2600rpm		
Harvest enters chamber at varying rates	Up to 7 lbs/s	Verified and Recorded		
Verify the belt moves at correlated speeds	Up to 15 ft/s	Verified up to 17fts		
Actuator moves at consistent speed as weight is added	12 sec for each weight, 0- 100 lbs	Verified		
Determine time to reset between simulations	Reset takes less than 2 hrs with 2 people	Verified under 1 hour		
Determine rotations need to mix thoroughly	Cane=74%, green= 10%, brown=26%	5 rotation per 25lbs material		
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September	Oct	tober	November		December	January	February	March	April	May
Determining Variables		Fan mount	Cor	Conveyor Design Hopper	Selecting Parts	Parts from John Deere	Chamber	Cutting Wood & Paper Electrical Testing	Correlations Move to JD	
Traveling To John Deere to see Harvester Functional Decomp		Cleaning Chamber Similitude	Treadmill Selection - Structural Analysis	3D Models	Final Prototype	Parts from other vendors	Treadmill Stand Hopper Stand	Mechanical Testing Painting	Writing Manufacturing & Operation Guide	Final Report
House of Quality	Model Size Concept Generation	Materials Selection	Engineering Analysis	Fan Power	Safety Enclosure	Ordering/Receiving	Manufacturing	Validation	Final Presentation	Graduate

Sponsors: John Deere

Advisers: Dr. Ingmar Schoegl