Rotating Test Stand for Accelerated Wear on Seed Opener Tips

Ashley Balzer, Jayden Morris, Jesse Stringer, Noah Sampson (Group 3)
Supervisor: Dr. Adisorn Aroonwilas (ISE)

Abstract

This project involves the re-design of a small-scale test stand used to evaluate wear patterns on different seed opener tip geometries. In order to achieve consistent testing conditions, the test stand was designed to provide control over speed, soil consistency, compaction, and moisture levels. Final project deliverables include a CAD model, engineering drawings, and a standard operating procedure.

Current Soil Bin

Project Significance

- Consistent Data for Continuous Improvement
- Provide Guidance for Dutch's Future Product Design and Development
- Quantitative Marketing Data
- Safer and More Ergonomic Test Procedure

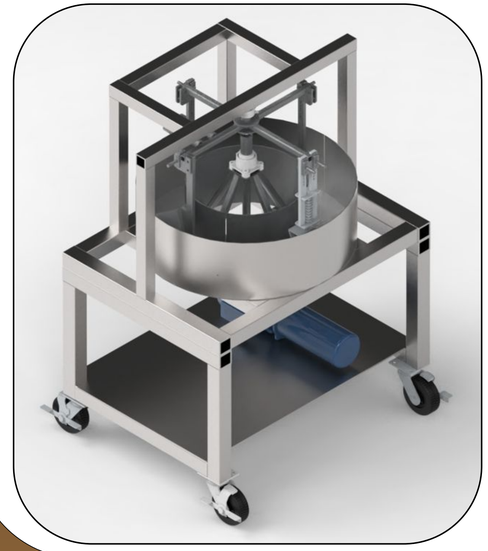
Project Goals & Objectives

- Constant Speed
- Automate Tillage and Compaction
- Consistent Soil Moisture Measurements
- Compact Footprint of 3' x 4'
- Decrease Testing Procedure Complexity
- Decrease Testing and Preparation Time
- Standardized and Streamlined Test Procedure

Methods & Process

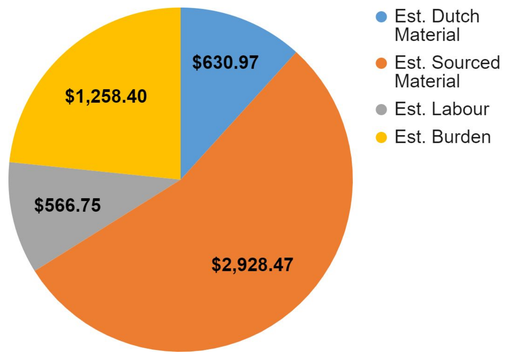
- Soil Bin Shape Redesign
- Top Carousel and Arm Attachment Designs
- Power Transmission Selection and Sizing
- Hydraulic Motor Housing Schematics
- Shaft Component Design
- Structural Frame Design
- Safety Cage Design
- SolidEdge 3D Modelling
- ANSYS Finite Element Analysis
- Ergonomic Assessments
- Electronic Safety Controls
- Economic Analysis

Redesigned Soil Bin

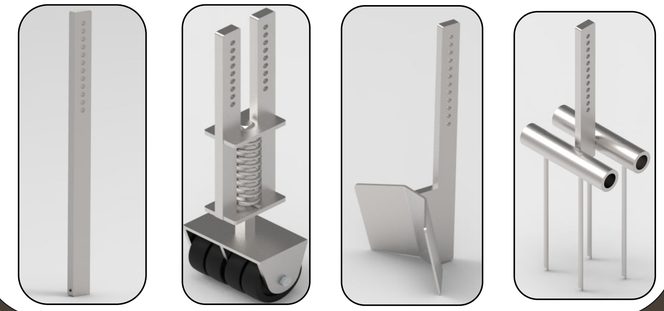


Cost Breakdown

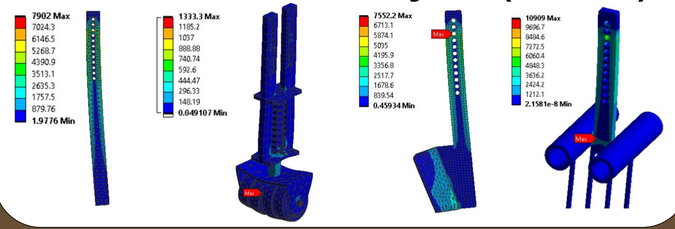
- Capital Cost: **$5385**
- Operational Cost Savings:
  - **$1071/year**
  - Manpower & Electricity
- Payback Period: **7 Years**



Attachment Arms



Finite Element Analysis (Stress)



Conclusions

Soil Bin Objectives	New Bin	Old Bin
Constant Speed	✓	✗
Consistent Compaction	✓	✗
Consistent Tillage	✓	✗
Low Operator Involvement	✓	✗
Consistent Moisture Measurements	✓	✗
Adjustable Depth	✓	✗

Acknowledgments

Academic Contacts
- Dr. Adisorn Aroonwilas (U of R)
- Demi Turnbull (Dutch Industries)
- Chris Yung (U of R)
- Robert Jones (U of R)

Industry Contacts
- Wil-Tech
- Motion Canada
- Boston Gear
- Applied Process