Team (Mechanical)

- Keaton Dybdahl
- Matt Everton
- Brad Hogenson
- Andrew McIntyre
- Nicholas Roberts
- Matt Simkins (Faculty Advisor)
Sponsor

Wizard Manufacturing Inc.

Designing and building top of the line equipment for walnut and pecan hulling, drying, and processing.
Background
The Problem

- Current processes
  - Produces too much waste
  - Needs constant adjustment
  - Broken parts must be machined
Wizard Mfg. NEEDS wire cut to length and bent to a specific shape by a machine with easily replaceable parts.

Our GOAL was to design and build a machine, using easily replaceable parts, to cut wire to size from a spool, bend it into a specified configuration, and produce less waste than existing processes.
The Wire

Standard Brush Length

4.0

0.5

4.0

70° TYP

(Units are in inches)
Requirements

Must Do’s

- Reliability - Small downtime, very little re-adjustment
- Produce 40lbs/hr of wire ➢ Quantitative
- Reduce the amount of waste due to machine error
- Cut and bend wire to standard size

- Simple and mechanical
- Manual Adjustment – Type of wire
- Safe to operate
- Have way to bypass safety to troubleshoot ➢ Qualitative
- Simple to operate
- Must operate with available power supply
- Shearing edge and forming edge be off the shelf parts
- Overhead lighting
- Durable
Requirements

Should Do’s

X Produce 80 lbs/hr of wire ➢ Quantitative
X Be within the same footprint (floor size)

X Manual adjustment - lengths of wire ➢ Qualitative
✓ Acute bends on wire
✓ Be aesthetically pleasing
X Cost < $3500
Requirements

Would Be Nice

✔ Combine spool with machine
✗ Portability
✗ Machine packages wire

➤ Qualitative
Initial Design

- Spool
- Guiding
- Puller
- Flywheel
- Collection
- Electrical
Spool
Puller
Flywheel
Electrical
Design Changes Since Fall

- Frame Change
- Puller Chain Tension Design
- Flywheel Cutting/Bending Dyes Reinforced
- Collection System
- Control Panel Mounting
Final Design/Manufactured Product
Wizard Mfg. donated all raw material
Will pay for all but $3500 of the expenses
Testing

- 5 Test Runs
  - At Least 1 Hour Duration
  - Different Range of Speeds
  - Sorted and Weighed Good and Bad (Waste) Wire
Test Results: Reliability

- **Target:** < 10% downtime
- **Results:** ~ 8% downtime
Test Results: Wire Dimensions

☐ Target:  
- (A) $4 \pm 0.125$”
- (B) $0.5 \pm 0.125$”
- (C) $70 \pm 20^\circ$
Test Results: Wire Dimensions

Results:
(A) 3.964”
(B) 0.499”
(C) 57.8°
Test Results: Production Rate

- Target: 40 lbs/hour
- Result: 33 – 53 lbs / hour depending on speed
Test Results: Waste

- Target: \( \leq 0.5 \text{ lb of waste/ 40 lb of good wires} \)
- Result: 0.4 lb – 2.8 lb depending on speed
Project Success!

- Met all of our Must Do’s
- Met some of our Should Do’s
- Met a Would Be Nice

- It works and the sponsor likes it!
Future Recommendations

- Sifting through wire by hand is not fun.
- Having adjustability is nice, but it takes more time to setup.
- Figure out a more controlled method for cutting and bending the wire. They fling everywhere.
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- **Kaman Industries:**
  - Steve Campbell

- **Dept. MMEM Faculty**

- **FMS**
  - Forklift Operator
Questions?