

**Senior Design Job Ticket**

**This is a project in Multidisciplinary Engineering (MDE) and the Krenicki Arts and Engineering Institute**

**Sponsoring Company:** The Hickories, 136 Lounsbury Road, Ridgefield, CT 06877

**Project Title:** Design of an adaptable small seed thresher

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**Project Focus:** Design, concept development, concept prototyping

**Senior Design Project Report:** Thresher unit for seeds of varying sizes

**Project Description**

This senior design project aims to address engineering and design challenges associated with creating an efficient, easy-to-clean, easy-to-operate, and portable seed thresher for different seed sizes, for a small farm.

**Engineering Challenge**

Design of an ecotypic native seed thresher, that will allow the farmer to separate seed from stalks and husks. The owner of the farm operates a small-scale seed company that aggregates the seed from 12 (more) urban and suburban farmers around the Northeast. The seed company works with over 40 different species and each one has its own seed cleaning needs.

All seed must be cleaned before they can be tested and packed for commercial production. Currently there are two challenges. First, seed needs "debearding," the removal of the papas (or wings) that are attached to the seed. Second, seed needs to be threshed, which is separating the seed from the sticks and stems on which it grows.

After the threshing, the farmer will run the seeds through a new operation which will involve seed-cleaning screens, and a winnowing machine to separate seed from chaff.

Ecotypic native seed is generally substantially smaller than most agricultural seed. The chains that hang off the central rod in this thresher will not be adequate to fully separate the seed from the plant material. In addition, some of the ecotypic seed shatters easily and would be damaged with these chains.

The farmer is eager to figure out how to use the basic design of this machine. The current process uses a bicycle-powered drum thresher with a central spoke, and

paddles/chains/bristles to thresh. Currently, this part of the process is done by hand, a process that is time consuming. The farmer is concerned about the dust that the current system generates, which makes the seed cleaning room very dusty and hard to breathe into. A dust remediation will be greatly appreciated.

## **Design Challenge**

The design challenge involves creating a thresher that is portable and that is easy to set up and put away, following human factors principles to ensure user-friendliness. The mechanical components will be protected and will be placed for easy maintenance.

To achieve this, the thresher will operate with an electrical motor that is fully integrated in the design. A plus will be to design a system that produces little noise. The unit will be easy to carry and adjust for different seed sizes and will make it easy the process of bagging the cleaned-up seeds. Handles and wheels will be added for quick repositioning and moving. This unit will be designed so that it can be easily repaired with easy-to-find materials in a local hardware store.

The design must also consider the integration of all components and moving parts into a cohesive, safe, portable and efficient unit. Ensuring the system's durability and reliability under various operating conditions is paramount.

## **Deliverables**

To successfully complete this project, the following deliverables will be required:

- **Project Plan and Timeline:** A detailed plan outlining the project phases, tasks, and milestones.
- **Initial Prototypes:** Physical prototypes of the key components, including overall size, portability, and efficiency in the mechanical movements of different parts.
- **CAD Models:** Computer-aided design (CAD) models of the entire system, illustrating the integration of all components.
- **Adjustability Studies:** Studies and simulations demonstrating the system's ability to change the settings to fit different seed sizes, while keeping overall function.
- **Control System Design:** A fully functional system that makes the process of changing settings in an easy format, including changing blades, rotors, or air filters.
- **Implementation Plan:** A step-by-step guide for setting up, portability, and repairing the system while ensuring ease of use.
- **Testing and Validation:** Testing and validation of the system under various environmental conditions to ensure reliability and performance.
- **Final Report and Presentation:** A comprehensive report and presentation summarizing the project, design process, findings, and recommendations.

## **Conclusion**

This senior design project presents a unique opportunity for students to address real-world engineering and design challenges. By creating an efficient thresher that can

adapt to different seed sizes, students will gain valuable experience in areas such as control mechanisms, repairability, and human-centered design.

The successful completion of this project will not only contribute to the field of agricultural engineering but also provide practical solutions for enhancing seed production and sustainability.

Is there a specific software package required for the projects? Y \_\_\_ N X

Which package (name/version) \_\_\_\_\_

U.S. Citizen/Person (green card) Required? Y \_\_\_ N X

Will Export Controlled data be used in project (EAR/ITAR) Y \_\_\_ N X

NDA/IP Agreements required? Y X N \_\_\_

Other Considerations: