

Executive Summary

The development of a bee's wings collection system at the Purdue ACRE facility was a task that was posed as a capstone project to help the farm manage the collection of particles that are typically a problem during corn harvest, more specifically, the drying operation of the corn. After analyzing the constraints and criteria listed by the sponsor our team developed a series of options for the project design based on our research. A decision matrix was then created to choose a design that fit our project description. Our team then developed the ideal design in real life to work with the sponsors operation and to develop an option for the agriculture industry.

Characteristics & Limits

Constraints	Criteria
• Budget \$1000	• Cost
• Easy to work on	• Connection Time
• Work with current dryer	• Unloading Time
• Completed by May 2024	• Water Tightness
• Compiled of readily available parts	

Codes & Standards

- OSHA Standard 1910.272(A) Grain Handling facilities
- OSHA Standard 1910.272(E).(1).(I). Dust Accumulation
- OSHA Standard 1910.272(j)(2) Grain Dust

Project Deliverables

- Operational prototype
- Parts list

Sponsor Information

The sponsor for this project was Dr. Rachel Stevens through the Purdue Agronomy Center for Research and Education (ACRE).



Initial Setup/Background



Figure 1 Initial Containment System

The original system at ACRE for containment was comprised of a stationary pipe that slid through a hole in the back of a silage wagon. The silage wagon was fitted with a tarp which covered the front opening. This system lacked in effectiveness and often led to plugging and overflowing.

Design & Development

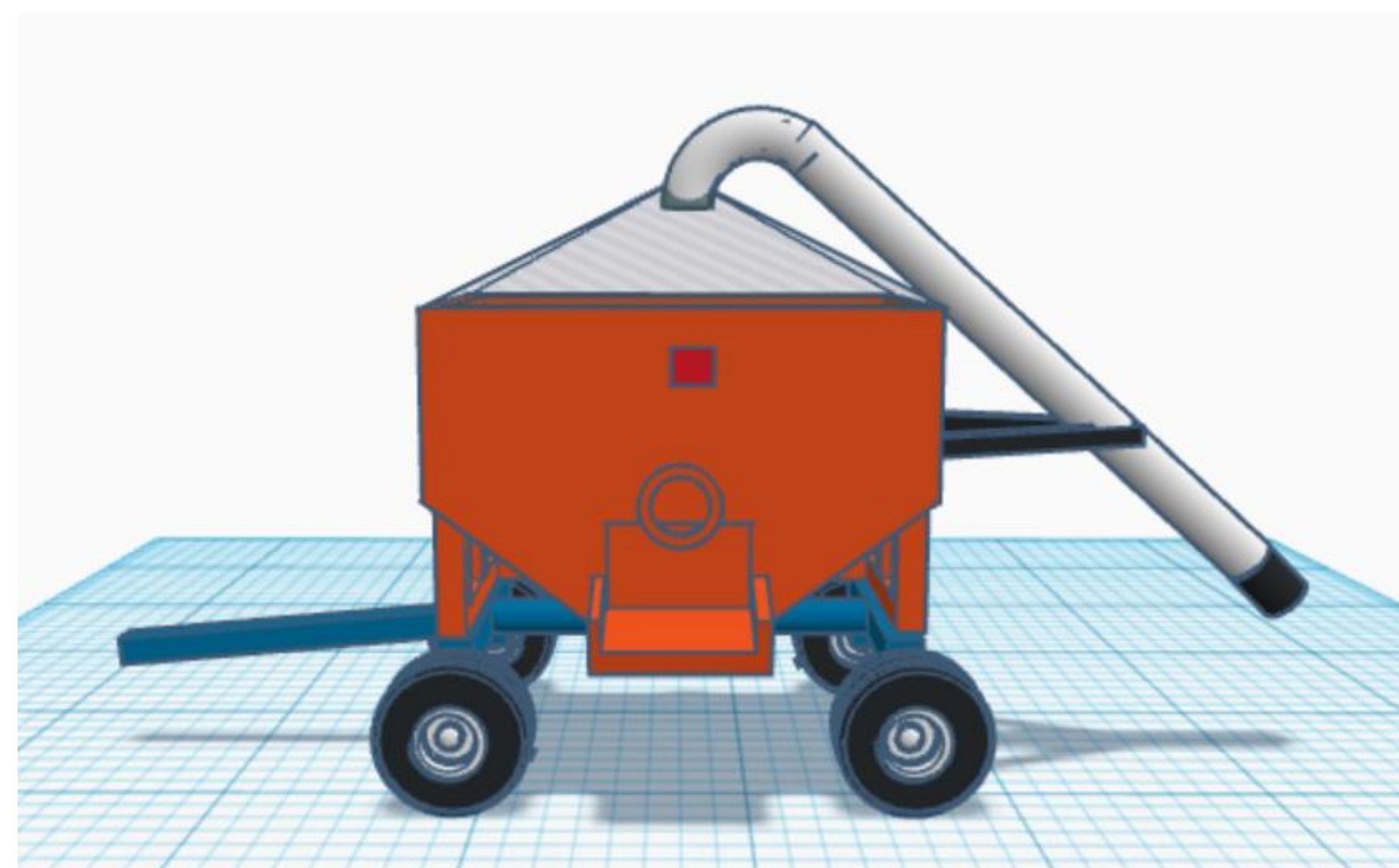


Figure 2 3D Drawing

For the 3D model of the project, TinkerCad was utilized to bring the design idea from a paper drawing into a more accurate piece. The 3D model highlighted several of the key goals for the final design such as a top with easy viewing, a quick connect fitting on the fill pipe, and an infrared sensor.

Design Prototype/Solution



Figure 3 Construction

This is a picture of the roof during the construction process. There are two vents in the top and 2 sheets of Lexan so it can be easily seen into from the ground.

There were 4 prototypes that we had drawn out, but after consideration we decided to go with this option. It was made of:

- Wagon
- 2x4 Boards
- PVC Pipe
- Spray Foam
- Black Plastic Sheeting
- Lexan
- 2 Vents
- Caulk
- Screws

Value Proposition

The Purdue Agronomy Center for Research and Education will see the value for this project during the harvest season. The team truly believes this system will assist in a decline in clean-up efforts and allow for the dryer system to run more efficiently. Therefore, ACRE well will become more efficient as a whole operation due to time saved with the new system attached to there grain facility setup.

Final Design



Figure 4 Final Design

The final design utilized the same top built in the prototyping phase with several additions. sealant was added along with spray foam in the corners in order to make it as air tight as possible. A flexible fill pipe was put in place with an easily connectable fitting. The infrared sensor was also added later due to an original shipping delay.

Project Impact

This prototype offers that ability for facilities within the agriculture industry to contain and collect bee's wings coming out of the dryer. The team's goal was to offer ACRE a solution that can grow with there operation while working with there current setup and be applicable to other operations in the industry.

Conclusion

Our team is greatly appreciative for the opportunity to develop a solution for the problem surrounding the bee's wings collection system. The steps that were taken to get the final design has set the foundation for future projects in our individual careers. We would like to once again thank our sponsor for gifting us a chance to have an impact on their operation.