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## External Nutrient Storage Cover Design

Client: Smithfield Hog Production, Algona, IA

### Problem Statement

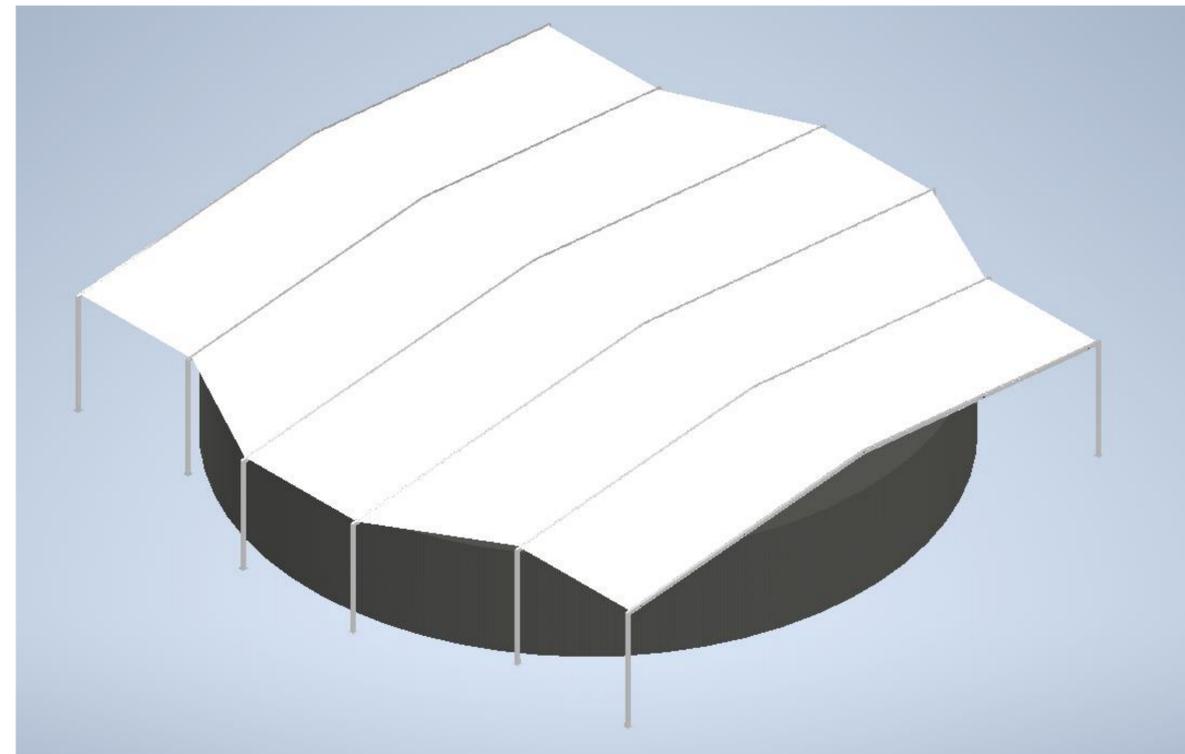
- Most outdoor manure storage structures currently have no cover to keep rainwater out
- Rainwater in the storage structures increases the cost to pump manure out of the tanks
- Rainwater also dilutes the nutrient content of the manure

### Objectives

- Design a cover that will successfully keep rain water out of the tank
- Design the cover so it is easily installed and removed
- Design cover to be structurally sound and withstand the elements

### Constraints

- Materials used must be resistant to corrosion
- The structure must withstand common weather events in Iowa
- Tarps must be easy to install and remove
- Proposed cover must allow access to the tank in at least two locations
- Must have a reasonable ROI



### Structure Design

- The above image is our designed cover structure
- The framing is constructed of aluminum
- The structure has external posts so no part of it is resting on the manure tank itself, this allows us to avoid compromising the integrity of the structure
- The tarps are split into six sections and are run through a tongue and groove system which allow for easy installation and removal in the spring and fall
- There is a rise of 6 feet which allows the structure to shed rain water
- The tarps will be removed during the winter months in order to avoid having to hold the snow load

### Scope

- Develop a feasible nutrient storage cover that can be utilized by swine producers to stop rain water from entering the tank

### Methods/Approach

- Define constraints of the project
- On-site visit and analysis of a Slurrystore
- Understand all areas affecting a usable cover such as price, functionality, and durability
- Utilize Auto-Inventor to create renderings of proposed cover design
- Present final proposed cover and findings

### Major Deliverables

- Inventor files of proposed cover design
- Final Report with recommendations on how to proceed
- Final Report with cost savings findings, structural analysis, and pricing of proposed structure

### Recommendations

- Next years' capstone team could start to develop a prototype
- They will also find first party manufacturers of materials to reduce cost of production
- An in depth look into cost savings will need to be completed to see whether a cover is actually feasible