

Department of Agricultural and Biosystems Engineering (ABE)

TSM 416 Technology Capstone Project

# Hagie Warehouse Consolidation

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**Client:** Hagie Manufacturing, 721 Central Ave W, Clarion, IA 50525

[https://www.hagie.com/hagie\\_home.aspx](https://www.hagie.com/hagie_home.aspx)

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## 1 PROBLEM STATEMENT

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### Problem Statement

- Hagie Manufacturing is a small manufacturer of agricultural sprayers that recently partnered with John Deere. They have a manufacturing and storage facility in central Iowa.
- Hagie Manufacturing is having difficulty using their current organization system of parts and how to pick them to meet their increased goal of building more (33%) sprayers a day.
- This is creating a problem for the company because parts are in multiple locations which makes it difficult to quickly get parts to where they are needed in a correct rotating habit efficiently.
- This project will immediately affect the workers of warehouse one and five on how they go about their work, and later affect the rest of the factory because they will have their parts faster, in a more organized manner.

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- Our solution could be applied to other clients by showing them tools such as flow planner to help create a more efficient and lean warehouse system. We aren't developing any new product, but the systems and methods of creating efficiency can be applied in many places.

### Business Case Statement

- **What?** Hagie wants to increase its production. Part of the plan to increase production is to make changes to their current warehouse layouts and inventory systems.
- **How?** By combining their service parts warehouse and production parts warehouse. Efficiency for picking parts should improve and a substantial amount of floor would become available.
- **When/where?** Our sponsors want to consolidate their two warehouses, and also move inventory that is stored outside into one of the warehouses. Our suggestions will contribute to Hagie's plan for consolidation.
- **Why?** The current warehouse system and layout need to be improved in order to increase production.
- **Who?** The people affected by the changes that we propose will be: Hagie Manufacturing Employees, John Deere, and Hagie's Customers

## 2 GOAL STATEMENT

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The root cause of the warehouse problems is an inefficient parts tracking system. With no easy way to track where parts are coming and going, it is hard to determine the most efficient storage layout. This is unfortunately outside the scope of our project. Success will be measured by an overall increase in sprayer production once the layout has been fully implemented. Their goal is to increase production of sprayers by 33 %. Since we will not be around to see the results and because many other improvements could affect that overall goal, we will be measuring our own success by creating the most efficient warehouse layout through Flowplanner, as well as fulfilling other deliverables such as ladder alternatives, boom shelving options, and inventory tracking system options.

The way we will collect data on our layouts is to track a portion of parts and collect to from locations. Once we have that we will input that data into flow planner with our CAD layout of the two warehouses. From there we will use flow planner to minimize travel distance for the highest used parts and try to limit high congestion.

- **Main Objective(s) and Specific Objectives**
  - **The main objective is to:** condense the inventory into one warehouse, while also creating a more efficient warehouse layout and helping reach the overall company goal
  - **Specific objectives include:**
    - Creating shelving options for booms
    - Giving alternatives to ladders within the warehouse
    - Inventory tracking options
    - Multiple CAD layout options, with outside storage solutions
- **Rationale**

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- When the warehouse consolidation project is done Hagie will see an increase of warehouse space by at least 10% and will be one step closer to reaching the goal.

### 3 PROJECT PLAN/OUTLINE

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#### Methods/Approach

- **Reference Material**
  - Resources that we used are as follows: Hagie Parts list for Services Parts warehouse and Production Parts warehouse from 2017 and 2018, Warehouse Layout Files, Parts Movement Data, thoughts and concerns of employees.
- **Data collection:**
  - We gathered data by analyzing the high priority and high use parts from the parts lists. Gathered opinions and thoughts from employees in both warehouses.
- **Skills:**
  - The skills needed: data analysis tools, AutoCAD Skills, people skills
- **Solutions:** Our proposed solution is stemmed from the inventory systems that are in place at many manufacturing companies.
  - The layouts that we developed are based on the frequency of used parts we found in the provided parts lists
  - Safety was set as a priority, then space saved, then time/money saved
  - Minimal ladder use, a greater area opened up, shorter distances from A to B
  - Total improvement is to build X sprayers a day, implementing our design will take steps in the right direction to accomplish this.
  - Our proposed solution falls in the scope and fulfills the criteria.
  - Expectations are to create base layouts for the client that they can further build on, so expectations will be fulfilled.
- **Organization:** We communicated with our sponsors about once a week, sometimes contact would occur bi-weekly
  - Many of the tasks that our team accomplished were chosen democratically. A task would be given to the person that thought they could do it best.
  - The order of milestones for our project was as follows: Taking Measurements, Finding Ladder Alternatives, Collecting Thoughts from Employees, Analyzing Inventory Data, Planning Boom Storage, Layouts and FlowPlanner, and Delivery of Findings
  - Our project had several setbacks that caused a lot of wasted time. These setbacks were mostly caused by trouble accessing Hagie files. At the beginning of the project we were supposed to use the John Deere Research Park, but this did not work. Our sponsor was very amenable with our problems and we eventually found a solution after several attempts.

## 4 RESULTS

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### Results/Deliverables

- CAD layouts, ladder alternatives, boom storage design, other suggestions
- After resetting our scope, our project completed the tasks we laid out
- Inventory cleanse, parts tracking system, combine warehouses into warehouse 5

### Company Follow up steps

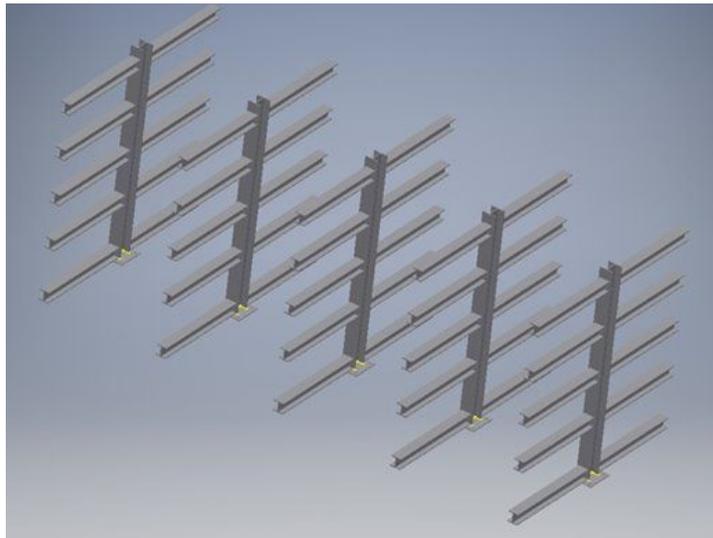
- Training and certification for warehouse members in the use of personal lifts
- Implementing the warehouse design and part tracking system
- Building the boom storage shelf

## 5 BROADER OPPORTUNITY STATEMENT

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- With minimal experience in warehouses and by seeing a sprayer, our report is straight forward.
- Our project addresses needs and provides solutions to Big Challenges in ways such as potentially providing jobs, improving workplace safety, improving energy efficiency and worker health.
- Key points in our project can be applied to any warehouse over a vast majority of fields
- Increased sales of sprayers could affect the broader opportunity
- One way John Deere combats problems such as boom storage is that they build them on demand, so they don't have stock booms laying around.
- A large portion of our project was to eliminate ladders to increase safety, which is always worth the cost; the rest of our project it will be a large upfront cost, but it will pay back in the long run.

## 6 GRAPHICAL ABSTRACT



Boom Storage Solution CAD Design

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## 7 REFERENCES

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