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Grain Drying Test Stand

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Grain Drying Test Stand

Problem Statement

- Dr. Dirk Maier is a post-harvest engineering professor at Iowa State University and wants to expand the grain processing program.
- A continuous-flow grain dryer for labs and research is needed.
- The dryer is to be designed, built, and configured all from scratch by the capstone team, implementing the designs and specifications Dr. Maier requires.
- Our dryer will be finished by the next technology capstone team and be used by classes to come.
- This project’s broader scope and initial capstone stages were developed from two previous capstone projects, referenced below.

Disciplines
Bioresource and Agricultural Engineering | Industrial Technology

Authors
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Grain Drying Test Stand

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*course instructors and corresponding authors.

Client: ABE, Prof. Dirk Maier

1 PROBLEM STATEMENT

Problem Statement

- Dr. Dirk Maier is a post-harvest engineering professor at Iowa State University and wants to expand the grain processing program.
- A continuous-flow grain dryer for labs and research is needed.
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Business Case Statement –

The ISU post-harvest program needs a grain dryer to be researched and studied

2 GOAL STATEMENT
• **Main Objective(s) and Specific Objectives**
  o The main objective is to: design and build a research grain dryer
  o Functioning grain dryer
    ▪ Dries wet grain
    ▪ Continuous flow
  o 3 Separate Columns
    ▪ Implement a design from a major manufacturer into each column
    ▪ GSI, Mega, Sukup, QED
  o Transportable
    ▪ Can be loaded onto a trailer by forks
    ▪ Short enough to fit under Ames overpasses

• **Rationale**
  o Our client will be able to dry over 100 bushels of wet grain per hour
  o Temperature, moisture, and airflow sensors
  o Our client will be able to control the functionality of the dryer

• **Project Scope**
  o Building the grain dryer
  o Purchasing a used grain dryer was considered, but decided against

### 3 PROJECT PLAN/OUTLINE

#### A. Methods/Approach
  o Reference Material(s)
    ▪ Company websites were researched, Dr. Maier’s paper, other grain research, emailed and contacted companies.
  o **Data collection:**
    ▪ The data we collected was used to give our project dimensions, fan and burner sizes, and a real grasp on the project size.
  o **Skills:**
    ▪ Understand the grain drying process
    ▪ Metal manufacturing
  o **Solutions:** Team meetings
    ▪ CAD drawing
    ▪ Calculations
    ▪ Material list
  o **Organization:** Emailed weekly, meet bi-weekly
    ▪ Could meet only when Maier was on campus
    ▪ Multiple team work hours at BCRF
B. Timeline

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<th>Milestone Performance</th>
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4 RESULTS

Results/Deliverables
- Dryer is built. All major components are in place. Project is ready to be handed-over to the legacy team.

5 BROADER OPPORTUNITY STATEMENT

A. The average student will be attracted to a large metal structure with moving components and a lot of buttons and dials.
B. Our project provides a solution to a hands-on approach for upcoming students in the Iowa State University grain handling labs and further research into safe grain storage practices.
C. Farmers across the Midwest could improve their grain storage.
D. The grain handling industry and academics.
E. Iowa State University is thinking about a new focus program in grain drying.
F. This project showcases all drying methods across the industry to use the collected data together and improve grain drying industry-wide.
G. Companies are willing to work and spend money with us for this project.
6 \textbf{GRAPHICAL ABSTRACT}

\begin{figure}[h]
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\includegraphics[width=\textwidth]{image.png}
\caption{Graphical Abstract Image}
\end{figure}

\section{REFERENCES}


Department of Agricultural and Biosystems Engineering (abe@iastate.edu) aims to be a premier team serving society through engineering and technology for agriculture, industry and living systems. ABE welcomes opportunities to discover and improve new technologies for all stakeholders.