



Investigator: David Yuill

Position Title: Assistant Professor

Department: Durham School of Architectural Engineering & Construction

Email: dyuill@unl.edu

Phone: (402) 554-4176

Webpage: <https://engineering.unl.edu/durhamschool/faculty/david-yuill/>

Heat Pump Grain Storage System Development and Demonstration

Abstract.

In this project, an interdisciplinary team will investigate the advantages of a heat pump grain storage system with advanced control capabilities. Grain processing generally requires moisture removal, which uses a significant amount of energy. Heat pumps provide the potential for significantly reducing this energy input, by: (a) removing moisture more efficiently than current drying methods; or (b) chilling the grain to store it safely until ambient conditions are appropriate for drying. Chilled grain systems currently exist, but recent advances in heat pump technology make a chilling or drying system much more feasible. One factor limiting adoption is that farmers typically are slow to adopt new farming technologies. To overcome this hesitancy requires practical demonstrations and solid research to present to the research community, extension staff, and manufacturers.

There is a great deal of associated research work to be done, so this project will provide a proof of concept to facilitate seeking funding for further research. The research will provide better understanding of the relationships between moisture content, storage time, and spoilage modes for chilled grain. It also includes development of heat pump systems and controls that are optimized for this application. Finally, preliminary research has shown grain quality advantages associated with heat pump storage systems. This needs further exploration and quantification. The team of thermal science, food science, and agricultural extension specialists is well constructed to develop a successful approach to energy efficient and effective grain storage, which can provide substantial benefits for farmers, consumers, utilities, and the environment. They will do this by developing models, then a demonstration prototype of a heat pump grain storage system. A test and demonstration will be on a grain bin at UNL's research farm.