Josh received his B.S. in Mechanical Engineering from Brigham Young University, Provo, UT in 2006. Then in 2008 he received his M.S. in Mechanical Engineering from Purdue University. His master's thesis was "Design and Simulation of an Energy Saving Displacement- Controlled Actuation System for a Hydraulic Excavator." Following the completion of his master's degree he joined the Department of Agricultural and Biological Engineering where he continued his research with an emphasis on fluid power systems.

Agricultural & Biological ENGINEERING

Dissertation Defense

Speaker: Josh Zimmerman

Title: Toward Optimal Multi-actuator Displacement Controlled Mobile Hydraulic Systems

Major Professor(s): Monika Ivantysynova

Date: Wednesday, March 21, 2012

Time: 11:45 AM

Location: Maha Lab – 1500 Kepner Dr.

Abstract:

Displacement controlled (DC) actuation is an efficient actuator technology which allows energy recovery and offers many advantages for mobile hydraulic machine systems. Previous researchers have studied possible applications for this technology and studied control laws to optimize its performance, but have not focused on improving the system performance at the design stage. In this work novel architectures are presented which overcome barriers seen by basic DC actuators in some applications. Additionally the effect of variations in actuator sizing parameters on system productivity and efficiency are considered. Finally a promising new hybrid design having energy storage is presented and an optimal design study is performed for a sample system.

Application:

This work has direct application to mobile machines such as excavators and wheel loaders which have multiple actuators. Displacement control technology has been shown to offer up to 40% fuel savings on excavator systems. Through novel designs presented in this work it was shown that potential fuel savings of greater than 50% are possible. The discoveries from this body of work will offer insight for designers who wish to get the most out of DC hydraulic systems.