

**APPLYING AND ANALYZING ROBUST
MODERN CONTROL ON UNCERTAIN
HYDRAULIC SYSTEMS**

Brian Bax

Dr. Roger Fales, Dissertation Supervisor

ABSTRACT

In this work modern robust control systems are designed and compared to standard techniques for a hydraulic implement system. The system includes an independent metering valve (IMV) and a variable displacement pump. The IMV is a powerful and versatile valve assembly. The IMV's inherent complexity makes classic control methods difficult to design. Parameter variations and unmodeled dynamics can cause sluggish performance and instability in some cases. By applying modern control, robustness can be improved relative to classical and single-input/single-output (SISO) control design techniques. Techniques such as H_∞ control have been proven effective in many multiple-input/multiple-output (MIMO) applications. Linear analysis shows improvement in robustness characteristics of the IMV system over a conventional PID control scheme. Nonlinear simulations show favorable system response and similarly positive robustness traits for the modern control designs.