MODERN CONTROL DESIGN FOR A

VARIABLE DISPLACEMENT HYDRAULIC PUMP

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ABSTRACT

In this work modern control methods are used to design and analyze control methods for a variable-displacement hydraulic pump. More accurate uncertainty descriptions are derived by using a structured uncertainty model as opposed to an unstructured uncertainty model. The system studied includes one variable-displacement swash-plate hydraulic pump with a constant engine speed model. The input to the system is the current actuating the control valve position, while the system output is the discharge pressure of the pump. The established PID controller design lacked robustness, encouraging design of a two degrees-of-freedom control scheme. Frequency domain tests show robustness improvement over the classical PID control scheme. Time domain results show similar performance from both the PID controlled system and the two degrees-of-freedom controlled system. Time domain tests also show improved robustness to parametric variation from the modern control method, while system responses to large disturbances are similar among both the classical and modern control schemes.