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Hysteresis and dither in a metering poppet valve

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The objective of the following thesis is to reduce the hysteresis of a hydraulic flow control valve through the use of dither. A hydraulic valve system, used in controlling the valve and collecting and converting the appropriate data into a usable format, is first constructed. The Linear Variable Displacement Transducer (LVDT), used in measuring the movement of the internal poppet valve, is then calibrated to find the relationship between the movement of the core (i.e. the movement of the poppet valve) and the voltage output of the LVDT sensor. Testing can then be undertaken to find which combination of the dither wave amplitude and frequency will most significantly reduce the magnitude of hysteresis without causing large unwanted vibrations in the system. The magnitude of the vibrations, which can be expressed as a function of inlet pressure oscillations, is related to the amplitude and frequency of the dither wave. It is found that a dither wave with amplitude of 0.1 Amps and a frequency of 100 Hz will result in approximately 57 percent reduction of hysteresis with an increase in vibrations only 2 to 2.5 times greater than those seen when the valve is subjected to no dither.