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Abstract:

Electronic Fuel Control (EFC) valve regulates fuel flow to the injector fuel supply line in the Cummins Pressure Time (PT) fuel system. The EFC system controls the fuel flow by means of a variable orifice that is electrically actuated. The supplier of the EFC valves inspects all parts before they are sent out. Their inspection test results provide a characteristic curve which shows the relationship between pressure and current provided to the EFC valve. This curve documents the steady state characteristics of the valve but does not adequately capture its dynamic response. A dynamic test procedure is developed in order to evaluate the performance of the EFC valves. The test itself helps to understand the effects that proposed design changes will have on the stability of the overall engine system. A by product of this test is the ability to evaluate returned EFC valves that have experienced stability issues. The test determines whether an EFC valve is faulted or

not before it goes out to prime time use. The characteristics of a good valve and bad valve can be observed after the dynamic test. In this thesis, a mathematical model has been combined with experimental research to investigate and understand the behavior of the characteristics of different types of EFC valves. The model takes into account the dynamics of the electrical and mechanical portions of the EFC valves. System Identification has been addressed to determine the transfer functions of the different types of EFC valves that were experimented. Methods have been used both in frequency domain as well as time domain. Also, based on the characteristic patterns exhibited by the EFC valves, fuzzy logic has been implemented for the use of pattern classification.

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