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Simulation of an Injection System using Solenoid Gas Injector Combined with an Electric Pressure Regulator

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A simulation study is conducted on an injection system using compressed natural gas (CNG). The injection system includes a solenoid gas injector and an electric pressure regulator. The purpose of this study is to evaluate the dynamic response characteristics of both solenoid gas injector and electric regulator when they are combined in the injection system. Mathematical models are established to describe the operation of solenoid gas injector and electric pressure regulator. Besides, a control model is also built to examine the response as well as control output pressure of the electric pressure regulator. These models are solved in Matlab-Simulink. Effects of design parameters such as spring stiffness and plunger mass on the dynamic response characteristics of the solenoid injector and electric pressure regulator are investigated. The simulation results show that the dynamic response of the solenoid injector and electric pressure regulator can be improved if their spring stiffness and plunger mass are suitably chosen. In addition, the electric pressure regulator can be successfully controlled to maintain a stable output pressure providing to the solenoid injector.

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