

Evaluation of Solenoid Valve as Gaseous Injector for Single Cylinder SI engine



K. Vikram

Vikram780@gmail.com
Ph. No: 0 88809 67603

Student's Name	K. Vikram	AE (PT-2011)
Academic Supervisor(s)	H. K. Narahari	
Industrial Supervisor(s)	V. Padmanabhan, Robert Bosch India, Bangalore	

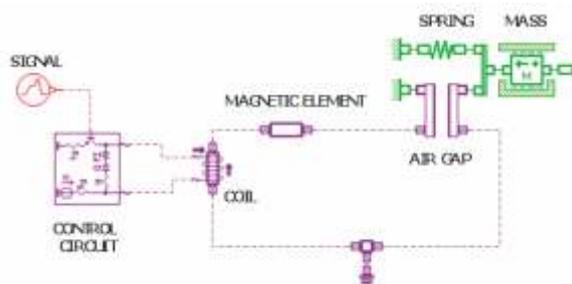
Keywords: Solenoid Valve, SI Engine, Gaseous Injector, Engine Performance, LPG

Abstract:

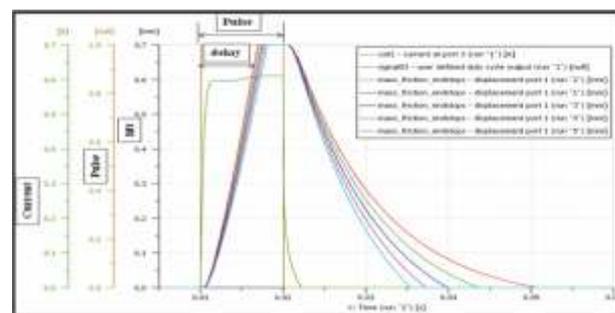
In gaseous PFI, standard gaseous fuel injector is implemented to meter the gaseous fuels in accordance with engine demand. Literature survey shows intense work focused on injector opening time along with repeatability of injected fuel. In liquid fuel, wall wetting phenomenon is concerned criteria and it defines the mounting of an injector to a defined spray angle. In the scenario of PFI engine powered by gaseous fuel, wall film effect is zero and provides an opportunity to identify the replacement for standard gaseous injector. In this study a solenoid valve designed for metering air is selected and was evaluated for controlling gaseous fuel in a PFI engine.

Solenoid valve is selected based on minimum and maximum fuel flow demand from engine. Flow and electrical characteristic of solenoid valve were measured for the input to simulation model. In AMESim electromechanical solenoid valve was modeled and validated with real measurement. Simulation was carried out with the model for different values of design parameter with focus to reduce on time delay. In addition, engine was mounted with the solenoid valve and was tested for steady state performance along with engine startability. Measurements were compared with standard gaseous injector and the behavior of solenoid valve in different operating scenario was evaluated.

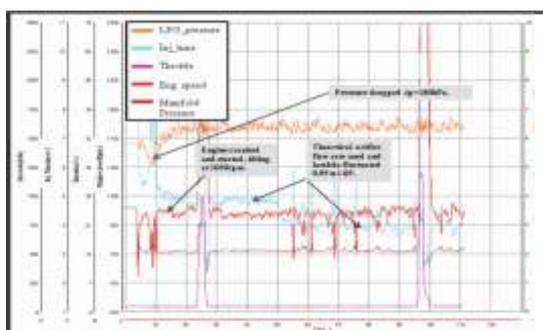
The study was concluded by using an orifice plate for proper metering of gaseous fuel to achieve engine idle stability. From simulation it was found that for different combination of number of turns and spring stiffness, on time delay of solenoid valve was not reduced to desired requirement. It was concluded to operate simultaneously a pair of solenoid valve fitted with properly designed orifice plate to meet the fuel demand from engine in all engine operating point.



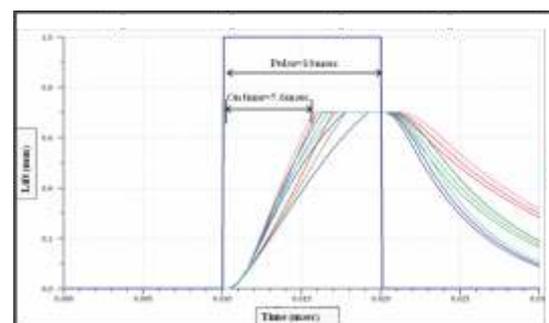
Solenoid valve model



On time delay



Engine start



Parametric study for on time delay