

An Investigation on the Spray Characteristics of DME with Variation of Nozzle Holes Diameter using the Common Rail Fuel Injection System

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Abstract

DME spray characteristics were investigated about varied ambient pressure and fuel injection pressure using the DME common rail fuel injection system when the nozzle holes diameter was varied. The common rail fuel injection system with DME cooling system was used since DME has properties of compressibility and vaporization in atmospheric temperature. The fuel injection quantity and spray characteristics were measured. The spray analysis parameters were spray shape, penetration length, and spray angle at each nozzle holes. Three types of injector were used, the nozzle holes diameter were 0.166 mm (Injector 1), 0.250 mm (Injector 2), and 0.250 mm with enlargement of orifice hole from 0.6 mm to 1.0 mm (Injector 3). The fuel injection pressure was varied by 5 MPa from 35 to 70 MPa when the ambient pressure was 2.5 and 5 MPa. When using Injector 3 compared with diesel injection quantity, the DME injection quantity was increased 1.69 ~ 2.02 times. Through this, it had the similar low heating value with diesel by Injector 1. In case of Injector 2 and 3, there were asymmetrical spray shapes at initial time. However as time goes by, the spray shape was symmetrical. Among three types of injectors, Injector 3 had the fastest development velocity of penetration length. In case of spray angle, Injector 2 and 3 got larger spray angle than Injector 1 and both injector had approximately same angle. Through these results, Injector 3 was optimized to solve the low heating value problem of DME.

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