

Nattawee Srisattayakul 2012: Effect of Pressure and Timings of Diesel Injection on Combustion Processes in a Diesel Dual Fuel Engine under Low Load Operations. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Assistant Professor Tanet Aroonsrisopon, Ph.D. 117 pages.

Diesel Dual Fuel (DDF) is an alternative operating mode for conventional diesel engines. In a DDF engine, natural gas is supplied to generate a premixed charge before entering the combustion chamber. During late compression stroke, a pilot diesel injection is directly supplied into the cylinder to initiate combustion.

The current study investigated the effects of diesel injection parameters, engine speeds and charge temperature on DDF combustion and emission characteristics in a common-rail direct injection, single-cylinder, four-stroke research engine. The natural gas was supplied at 9.5 mg/cycle. The diesel fuel injection timings were varied under injection pressures from 200 to 500 bar. The diesel injection duration was tuned to obtain the injected diesel mass of 3.25 mg/cycle. This corresponded to 70% energy ratio of natural gas to the total fuel energy supplied to the engine for all engine conditions.

Our data indicated that diesel injection timing, diesel injection pressure and engine speed have potential to control mixing time of diesel and mixture in cylinder. Moreover, using high intake charge temperature has potential to reduce HC emissions. However, the higher charge temperature resulted in increase of NO_x emissions and the rate of pressure rise. The injection parameters should be tuned to achieve modest combustion rates and lowest HC emissions possibles.

Student's signature

Thesis Advisor's signature