

An experimental result of exhaust emission concentration relative to various injection timing of CNG fuelled direct injection engine

ABSTRACT

This paper presents an experimental result of exhaust emission concentration at various injection timing for high compression engine fuelled with compressed natural gas engine which implements a direct injection technology called CNGDI engine. The engine implements central injection method, where the injector has been located within a certain degree of spark plug location. The experimental test was carried out using computer-controlled eddy-current dynamometer which measures the CNGDI engine performance. The Horiba analyzer uses infra-red for CO, CO₂, HC and flame ionization for THC for emission measurement. Various injection timings were varied to investigate their effect of all exhaust emission species. The emission concentration level was recorded with respects to engine speed, fuel injection angle and ignition timing. The injection angle was varied in between 2500 crank angle to 3600 crank angle. Indicated power and torque of CNGDI engine were also monitored during the course. A closed loop wide band lambda sensor has been attached at the exhaust manifold to indicate the oxygen level during the exercise. The results indicate that late injection timing tends to reduce the emission level especially HC but too late of injection timing would result in increasing the emission level such as NO_x and CO₂. Thus, a range of limitation of injection timing is identified to obtain good agreement between the engine performance and engine emission.

Keyword: CNGDI engine; Compressed natural gas; Exhaust emission of CNGDI engine and direct injection; High compression engine; Injection timing