

Effects of hot exhaust gas recirculation (EGR) on the emission and performance of a single-cylinder diesel engine

ABSTRACT

With the increment in global demand for energy, there is a need to reduce vehicle emission, which is among the major causes of air pollution around the world. In order to reduce the emissions levels, this study focuses on the effects of hot exhaust gas recirculation (EGR) system on the performance and emissions of a direct injection (DI) diesel engine. The performance studied includes engine power, torque, brake mean effective pressure, fuel consumption and the exhaust emission. The engine used in this study was a single-cylinder, four-stroke engine with an air-cooled system at a rated speed of 3600 rpm with displacement of 0.219 litres. The engine was operated at varying speeds of 1600 to 3600 rpm with different percentages of EGR (5%, 7%, 10% and 15%). Based on the results, it was shown that EGR had decreased the engine brake power and torque while increasing fuel consumption at the same time. The engine with EGR has reduced the emission level of NO_x from 800 to 240 ppm and CO₂, from 9% to 4%, while increasing the CO from 2% to 4% and UHC from 10 to 100 ppm. Hence, it was concluded that low emission level of NO_x and CO₂ could be obtained using EGR as it can be used to improve the emission level of a homogeneous charge compression ignition (HCCI) even further in the extension of this study.

Keyword: EGR; Performance; Emissions; Diesel engine; In-cylinder pressure

