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Effect of a turbocharger and EGR on the performance and emission characteristics of a CRDI small diesel engine

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Abstract

Limited fuel capacity and pollution are major concerns in the automobile industry. Methods to tackle these issues are continuously being investigated. The present work represents the experimental evaluation of a turbocharger and exhaust gas recirculation's (EGR's) combined effect on the common rail direct injection (CRDI) small diesel engine's performance and emission attributes. The fuel handling CRDI system variables, such as injection pressure, split injection timing, and fuel injection quantity along with EGR and turbocharger technology were considered for the study. Experiments were conducted with and without EGR and turbocharger conditions. Efforts are made to correlate the performance and emission characteristics with and without EGR and turbochargers. A combination of turbocharger and EGR shows much more lowering in nitrogen oxides, carbon monoxide, and hydrocarbon emission at the cost of a slight rise in smoke percentage. The thermal efficiency and fuel economy of the engine show a significant improvement for the turbocharger system. Overall, turbocharger and EGR combinations positively impact the engine

Abbreviations: bTDC, before top dead center; BTE, brake thermal efficiency; CA, crank angle; CO, carbon monoxide; CRDI, common rail direct injection; EGR, exhaust gas recirculation; HC, hydrocarbon; IP, injection pressure; IT, injection timing; NOx, nitrogen oxides; SFC, specific fuel consumption; SOMI, start of main injection; TDC, top dead center.

