Abstract

With increasing concerns of harmful emissions and limited storage of liquid fossil fuels, compressed natural gas (CNG) has come out as one of the most promising and potential alternative to the conventional automotive fuels. This study presents experimental test results of a new compressed natural gas direct injection (CNG DI) engine that has been developed by modifying a single cylinder direct injection diesel engine. The major changes carried out include (1) modifications in the existing engine components such as cylinder head, piston etc (2) development and utilization of electronic fuel injection system and capacitive discharge ignition system. The tests were conducted at constant fuel injection pressure and engine speed under different fuel injection timings (SOI) and varying engine load (BMEP) to investigate engine's performance, emission and combustion characteristics. It was found that both lower and higher BMEP conditions deliver inferior engine performance (low BTE, high BSFC & BSEC), increase engine emissions and have poorer combustion characteristics. On the other hand, moderate BMEP improved engine performance, faster and more complete combustion with relatively lower emissions for any particular injection scheme. The results also showed that fuel injection timings have a large influence on the engine performance, emission and combustion characteristics. Advanced fuel injection strategies improve engine performance (lower BSFC, high BTE), reduce engine emissions and produce faster and more complete combustion whereas retarded strategies exhibit completely opposite trends for any particular engine load.