

Premixed charge compression ignition (PCCI) eliminates locally rich fuel-air mixtures and reduces the combustion temperature in an engine combustion chamber, thus simultaneously achieving extremely low PM and NO_x emissions with relatively superior engine performance, compared to conventional CI combustion mode. This experimental study developed optimized fuel injection and EGR strategy to achieve diesel PCCI combustion and to explore the possibility of mode switching between conventional CI to PCCI combustion modes with the aim of implementing the PCCI combustion mode in a production grade diesel engine. Experiments were conducted for performance, emissions and particulate characteristics of diesel PCCI combustion w.r.t. baseline CI combustion mode. FIPs, SoMI timings, SoPI timings and EGR rates were varied in order to investigate their effect on engine performance, regulated and unregulated emissions and particulates. Optimized fuel injection and EGR strategy for PCCI combustion were developed and finally a smooth mode switching strategy between CI and PCCI combustion modes was implemented on the production grade test engine. Finally, on the basis of mode switching investigations, it was found suitable to deploy PCCI combustion mode at low-to-medium engine loads and conventional CI combustion mode at high engine loads.