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CERAMIC INSULATED COMBUSTION CHAMBER FOR ALCOHOL IN DI DIESEL ENGINE

S. SUNIL KUMAR REDDY, V. PANDURANGADU, R. RAMACHANDRA AND C. V. SUBBA REDDY

Abstract

The crisis of petroleum in recent years has simulated a world-wide search for alternative fuels and also emphasized the need for using petroleum fuels with utmost economy. This leads to the recognition of alcohol as a preferable replacement because these are derived from indigenous sources and are renewable. As India is an agricultural country, there is a wide scope for the production of alcohols derived from sugar cane. However alcohols by their nature do not make a good CI engine fuel due to its low cetane number and high latent heat of vaporization. But they have peculiar property of igniting in the high temperature combustion chambers. This tendency of alcohols is being exploited in developing the insulated engine (IE) which reduces the ignition delay and aids combustion. Now-a-days extensive research is going on not only for finding the suitable alternate fuel to diesel but also for improving the engine thermal efficiency. Even the most efficient diesel engine rejects two-thirds of the heat energy of the fuel, one-third to the coolant, and another one–third to the exhaust, converting only about one-third into useful work. By reducing the lost energy and eliminating the need for a conventional cooling system, this engine system will dramatically improve overall performance. One of the methods adopted to achieve this is by going for an Insulated engine. In an insulated engine, the energy loss is avoided by applying a layer of insulating material over the walls of the combustion chamber and by providing air gap insulation to the piston. For mainly improving performance of an engine, thermally insulated components are used. They not only reduce the heat transfer to the cooling system but also improve thermal efficiency.

Initially modifications are carried out by employing PSZ coated cylinder head, valves and air-gap liner on the engine. During experimentation four different levels of insulations are tried on the test engine with an objective to find the best one in terms of performance, emissions and other combustion parameters. In all these IE configurations alcohol is used as a fuel to find out performance, emissions and combustion characteristics. Tests are conducted on a single cylinder 4-stroke, water-cooled 3.68 KW Kirloskar C.I. engine. For comparison the engine is operated with the diesel fuel without any thermal insulation i.e. in the normal mode. Out of all IE configurations tested, one of them (Aluminium Piston with Air gap, an Air gap liner and PSZ coated head and valves) is found to be best in terms of efficiency and emissions. All the above investigations are fruitful and these results are expected to lead to a substantial contribution to the development of insulated engine.