Performance, Combustion and Emission Characterizes of Bio-fuel by using Split injection technology

Background:

The variation of operating parameter is change the engine performance and the emissions also reduced. The mass fraction burned (MFB) functions are calculated on the basis of cumulative heat release. Locations of characteristic points defining combustion advance, i.e. 5%, 50% and 95% MFB are read from MFB curves and denoted as CA05, CA50 and CA95 respectively, the EVC sweep from −80 °CA to −68 °CA at MAP=160 kPa increases λ from 1.37 to 1.48 and from 1.22 to 1.3 for the mid- and high-load cases respectively. The EGR ratio varies between 36% and 38% for the mid-load case (fuel quantity of 19 mg) and from 31% to 36% for the high-load case [1]. The engine was operated at different inlet air temperatures as 90 degree Celsius, 100 degree Celsius, 110 degree Celsius, 120 degree Celsius, 130 degree Celsius, 140 degree Celsius and 150 degree Celsius respectively. The inlet air temperature about 120 degree Celsius showed maximum reduction of smoke emission about 15HSU at 60% load. Similarly, CO and HC were reduced with increasing the inlet air temperature [2]. The variation of combustion phasing (measured in terms of CA50, the crank angle location at which 50%of the fuel has been burned) with the timing of a 1mg pilot injection. The rest of the fuel (9mg) is injected during the main injection, at the end of recompression (420 CAD). All crank angles are referenced to 0 deg at TDC, combustion. the pilot injection timing between 310 and 395 CAD, a combustion phasing range of about 7 CAD can be achieved, which represents most of the desirable phasing range for split injection system [3]. Retarded injection consists of single injection at 11degree before top dead centre (BTDC) and split injection consists of both pilot injection at 54 degree BTDC of 10% mass share and main injection at 11 degree BTDC of 90% mass share. Diesel is injected directly in to the engine cylinder for both retarded and split injections at pressures of 200,230,250,300 and 350 bar respectively. Cooled EGR is circulated along with intake air for flow rates of 5% and 10% (wt/ wt) basis [4]. The combustion timing advances for high reactivity fuels. The low reactive fuels have a lower specific heat ratio and require a higher temperature to start the auto-ignition. The variation in gross indicated mean effective pressure (IMEP), CA10 (crank angle position where 10% of the total heat release occurs) and engine misfire increases with highly retarded combustion phasing [5]. When the inlet air temperature was increased from 60 degree Celsius to 80 degree Celsius, CA10 was obtained earlier for all test fuels compared to 60 degree Celsius. Moreover, n-heptane showed significant effect on CA10 due to lower resistance of combustion compared that fuel blends. So, combustion was advanced with the increase of inlet air temperature in case n-heptane was used as test fuel [6]. In-cylinder pressure data were verified to determine combustion characteristics such as heat release, combustion duration, CA10, CA50 etc. using program that prepared with Matlab. In order to eliminate cyclic variations, consecutive 50 cycles were averaged for each test condition. Three type of test fuels were used in the experiments. 20% diisopropyl ether-80% n-heptane (D20N80), 40% diisopropyl ether-60% n-heptane by vol. (D40N60) and pure n-heptane were experimented [7]. He found that the boiling temperature of the fusel oil, which was obtained from the distillation of the fermented potato, was 130–132 °C. They performed the experiments at 3500 rpm and a wide-open throttle position with different ignition timings of 10–24 degree CA. It was found that the maximum torque was obtained as 33.09 Nm with gasoline at 26 degree CA ignition advance while it was recorded as 33.53 Nm with F10 fuel blend at 24 degree CA ignition advance. At optimum operation conditions, brake torque and brake specific fuel consumption were found to be 16.49 Nm and 326.024 g/kWh [8].

Objectives:

- To find the best operating parameters in IC engines.
- To find the best bio-fuel and production method.
- To improve the performance and reduce the emission in IC engines.
- To find the best pre and main injection timing to improve the engine performance.

Expected Outcome:

To get the perfect injection timing study and knowledge about the injection parameters.

To analysis the different operating parameters and know the difficult faced during the project and solve the problems and get output.

Reference:

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