

## EVALUATION ON THE PERFORMANCE OF DIESEL ENGINE WITH MEDIUM GRADE LOW HEAT REJECTION (LHR) COMBUSTION CHAMBER

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### ABSTRACT

Experiments were carried out to evaluate the performance of diesel engine with medium grade low heat rejection (LHR) combustion chamber with rice brawn oil based biodiesel (ERBO) with varied injection timing and injector opening pressure. Performance parameters were determined at various values of brake mean effective pressure (BMEP) of the engine and compared with conventional engine with biodiesel operation at similar operating conditions. Biodiesel showed compatible performance with conventional engine (CE), while LHR combustion chamber improved the performance in comparison with pure diesel operation at similar operating conditions. The optimum injection timing was found to be 31°bTDC with CE while it was 29°bTDC for medium grade LHR combustion chamber with biodiesel operation. Relatively, with LHR combustion chamber with biodiesel operation, peak brake thermal efficiency was comparable, at full load operation- brake specific energy consumption was comparable, exhaust gas temperature decreased by 65°C, coolant load decreased by 6%, and volumetric efficiency was comparable in comparison with pure diesel operation at similar operating conditions.

**KEYWORDS:** Need for Alternate Fuels, Vegetable Oil, Biodiesel, LHR Combustion Chamber, Performance

### NOMENCLATURE

$\rho_a$  = Density of air, kg/m<sup>3</sup>

$\rho_f$  = Density of fuel, gm/cc

$\eta_d$  = Efficiency of dynamometer, 0.85

$a$  = Area of the orifice flow meter in square metre,  $\frac{\pi \times d^2}{4}$

BP = Brake power of the engine, kW

C = Number of carbon atoms in fuel composition

$C_d$  = Coefficient of discharge, 0.65

$C_p$  = Specific heat of water in kJ/kg-K

D = Bore of the cylinder, 80mm

d = Diameter of the orifice flow meter, 20 mm

*DF=Diesel fuel*

*h=Difference of water level in U-tube water manometer in cm of water column.*

*IT= Injection timing, degree bTDC*

*k= Number of cylinders, 01*

*L= Stroke of the engine, 110 mm*

*m<sub>a</sub> = Mass of air inducted in engine, kg/h*

*m<sub>f</sub> = Mass of fuel in kg/h,*

*m<sub>w</sub>= Mass flow rate of coolant (water), kg/s*

*n= Power cycles per minute, N/2,*

*N=Speed of the engine, 1500 rpm*

*P<sub>a</sub> =Atmosphere pressure in mm of mercury,*

*R= Gas constant for air, 287 J/kg-K*

*t = Time taken for collecting 10 cc of fuel, second*

*T<sub>a</sub> = Room temperature, degree centigrade*

*T<sub>I</sub>= Inlet temperature of water, degree centigrade*

*T<sub>o</sub>= Outlet temperature of water, degree centigrade*

*V= Voltmeter reading, Volts*

*V<sub>s</sub>= Stroke volume, m<sup>3</sup>*

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