

STUDIES ON LOW HEAT REJECTION DIESEL ENGINE WITH CRUDE TOBACCO SEED OIL

B. SUBBA RAO¹, E. RAMJEE², P. V. K. MURTHY³ & M. V. S. MURALI KRISHNA⁴

¹Mechanical Engineering Department, JJ Institute of Technology, Maheswaram, Hyderabad, India

²Mechanical Engineering Department, JNTU, Hyderabad, India

³Mechanical Engineering Department, Chaitanya Bharathi Institute of Technology, Gandipet, Hyderabad, India

⁴Jaya prakash Narayan Educational Society Group of Institutions, Mahabubnagar, Andhra Pradesh, India

ABSTRACT

Investigations were carried out to evaluate the performance of a low grade low heat rejection (LHR) diesel engine consisting of ceramic coated cylinder head with different operating conditions of crude tobacco seed oil with varied injection timing and injection pressure. Performance parameters of brake thermal efficiency (BTE), exhaust gas temperature (EGT) and volumetric efficiency (VE) were determined at various values of brake mean effective pressure (BMEP). Exhaust emissions of smoke and oxides of nitrogen (NO_x) were recorded at different values of BMEP. Combustion characteristics of peak pressure (PP), time of occurrence of peak pressure (TOPP), maximum rate of pressure rise (MRPR) and time of occurrence of maximum rate of pressure (TOMRPR) were measured with TDC (top dead centre) encoder, pressure transducer, console and special pressure-crank angle software package.

Conventional engine (CE) showed deteriorated performance, while LHR engine showed compatible performance with crude tobacco seed oil (CTSO) operation when compared with pure diesel operation at recommended injection timing and pressure. The performance of both version of the engine improved with advanced injection timing and higher injection pressure with test fuels. Peak brake thermal efficiency increased by 4%, volumetric efficiency decreased by 8%, smoke levels decreased by 4% and NO_x levels increased by 37% with vegetable oil operation on LHR engine at its optimum injection timing, when compared with pure diesel operation on CE at manufacturer's recommended injection timing.

KEYWORDS: Crude Tobacco Seed Oil, Diesel, CE, LHR Engine, Fuel Performance, Exhaust Emissions, Combustion Characteristics