IMPACT OF CONICAL PISTON CROWN EQUIPPED COMPRESSION IGNITION ENGINE ON PERFORMANCE

Olumide Adewole Towoju
Adeleke University
NIGERIA
olumidetowo@yahoo.com

Ademola A. Dare
University of Ibadan
NIGERIA
ademoladare@yahoo.com

ABSTRACT

The significant roles being played by compression ignition engines in the energy and transportation industries is been taken aback due to low thermal efficiency and high emission which remains to be fully addressed despite the continuous redesigning of its combustion chamber. Literature is sparse on the impact of the use of non-cylindrical piston crown in addressing these setbacks. The performance of a conical piston crown equipped compression ignition is investigated numerically in this study. Numerical model was developed from mass balance, momentum, energy and k-ε turbulent equations using finite element technique with an equivalence ratio of 0.5, initial pressure of 10000 N/m^2, and initial temperature of 313 K. Performance parameters; engine power, thermal efficiency, specific fuel consumption and carbon-monoxide emission fraction were estimated for cone and inverted cone-shaped piston crowns with cone base-angle of 25°, 30°, 35°, 40° and 45° respectively. The 40° cone-shaped piston crown equipped engine showed the best improvements in performance. Numerical estimates of the performance parameters for the standard engine were 481.64 J, 30.90 %, 0.1938 kg/kWh and 1.0 respectively, and for 40° cone-shaped piston crown equipped engine was 486.41J, 30.91 %, 0.1918 kg/kWh and 0.9996 respectively. Conical piston crowns equipped compression ignition engine resulted in improved performance.

Keywords: Compression-Ignition Engine, Numerical Model, Piston Crown, Reduced n-Heptane.