

ABSTRACT

The Effect of Engine Compression Ratio on Engine Performance Using Compressed Natural Gas as the Fuel

Kailash Chirkoot

Both spark ignition engines and compression ignition engines are converted to the spark ignition mode to use CNG as a fuel. Spark ignition engines possess compression ratios between 8 and 10 while compression ignition engines are between 18 and 23. As CNG is being used in engines with a large range of compression ratios, one can question whether there is a compression ratio for optimal performance. Theoretically, as the compression ratio is increased the thermal efficiencies increase. In the continued quest for improved fuel consumption, improved performance, and reduced emissions, it is worthwhile to investigate the effects of varying the engine compression ratio on the performance using CNG.

The ICENG Simulation Software was used to investigate the effects of compression ratio on engine performance. Also, a Ricardo E6 Variable Compression Ratio Engine mounted on a 'Hydra' Test Bed was used to investigate the performance of CNG as a fuel for various compression ratios, speeds and air-fuel ratios at full load. The engine was also equipped with a TECQUIPMENT E32 Electronic Indicating System for measuring the engine cylinder pressure with crank angle; and a Planet 5 Exhaust Gas Analyzer for measuring the exhaust emissions.

The simulations indicated that there existed a threshold of 19.3 for increased performance with increased engine compression ratio. The experimental data showed that the optimum compression ratio for a CNG engine was 16.05. This range lies above that for gasoline engines and lower for those used in diesel engines. It is recommended that the compression ratio of gasoline engine converted to use CNG be increased to 14 and the compression ratio of diesel engines be reduced by machining the pistons crown to create a compact combustion chamber or "Nebula" Ricardo chamber design.

Keywords: Kailash Chirkoot; Engine Compression Ratio; Engine Performance; Compressed Natural Gas (CNG).