PERFORMANCE AND EMISSIONS TESTING OF GASOLINE AND CNG ON A SI ENGINE

A Major Dissertation Submitted in partial fulfillment of the Requirements for the award of the degree of

Master of Technology
In
Thermal Engineering

By

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DECLARATION

I, hereby declare that the dissertation entitled **"PERFORMANCE AND EMISSIONS TESTING OF GASOLINE AND CNG ON A SI ENGINE"** being presented here in the partial fulfillment for the award of the Degree of Master of Technology (Thermal Engineering), is an authentic record of own work carried out by me under the guidance and supervision of Prof. S.Maji, Professor Department of Mechanical Engineering and Dr. Amit Pal, Associate Professor, Department of Mechanical Engineering, Delhi Technological University, Delhi.

I, further declare that the dissertation has not been submitted to any other Institute/University for the award of any degree or diploma or any other purpose whatsoever.

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This is to certify that the dissertation entitled **"PERFORMANCE AND EMISSIONS TESTING OF GASOLINE AND CNG ON A SI ENGINE"** submitted by **Sandeep Kumar** (2K11/THE/16) in partial fulfillment of the requirements for the award of the Degree of Master of Technology in Thermal Engineering, is an authentic record of student's own work carried out by him under our guidance and supervision.

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ABSTRACT

Nowadays, increased attention has been focused on internal combustion engine fuels. Compressed natural gas has been introduced as an alternative to gasoline and diesel fuels in many applications. A high research octane number which allows combustion at higher compression ratios without knocking phenomenon and good emission characteristics of unburned hydrocarbons and carbon monoxide are major benefits of compressed natural gas as an engine fuel.

In Present work an experimental study is conducted using gasoline and compressed natural gas (CNG) as the main fuel in a 4-cylinder,4-stroke spark ignition Maruti wagon –R engine at different loading conditions. The engine was converted to computer integrated Bi-fueling system and operated separately either with gasoline or CNG. A personal computer (PC) based data acquisition and control system was used for controlling all the operation. A detailed comparative analysis of the Engine performance and exhaust emissions is performed.

The variation of performance parameters (BSFC, BTE, and BSEC) and emissions (CO, CO_2 and HC) for CNG is compared with gasoline for a wide range of Engine load. The results show that gasoline is having higher BSFC as compared to CNG. Whereas BTE or maximum BTE for gasoline and CNG are almost same. A CO and HC emission of CNG is lower but little more NO_X which can controlled with catalytic convertor as compared to gasoline. CNG can be successfully used as an alternative gaseous fuel in SI engine.

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LIST OF ABBREVIATIONS

A/F ratio	air fuel ratio
BMEP	brake mean effective pressure
BP	brake power
BS	bharat stage emission standards
BSEC	brake specific enrgy consumption
BSFC	brake specific fuel consumption
BTDC	before top dead center
BTE	brake thermal efficiency
CA	crank angle
CC	Cubic centimeter
CFX	Commercial computational fluid dynamics program
CR	Compression ratio
CNG	compressed natural gas
CNG/DI	direct injection compressed natural gas engine
CO	carbon mono oxide
CO_2	carbon dioxide
D	diesel oil
ECU	engine control unit
EGR	exhaust gas recirculation
FCE	fuel conversion efficiency
HC	unburnt hydro carbons

IMEP	Indicated mean effective pressure
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MAP	manifold absolute pressure
MBT	maximum brake torque
NG	natural gas
NGV	natural gas vehicle
NMHC	non methane hydrocarbon
NO_X	Oxides of nitrogen
PPM	particles per million
RPM	revolution per minute
SA	spark advance
SI	spark ignition
TWC	three way catalytic convertor
TDC	top dead center
Tsfc	trillion standard cubic feet
VOC	Volatile organic compound