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RESEARCH ARTICLE

Design and experimental investigations on six-stroke SI engine using acetylene with water injection

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Abstract

In the present study, a four-stroke cycle gasoline engine is redesigned and converted into a six-stroke cycle engine and experimental study has been conducted using gasoline and acetylene as fuel with water injection at the end of the recompression stroke. Acetylene has been used as an alternative fuel along with gasoline and performance of the six-stroke spark ignition (SI) engine with these two fuels has been studied separately and compared. Brake power and thermal efficiency are found to be 5.18 and 1.55% higher with acetylene as compared to gasoline in the six-stroke engine. However, thermal efficiency is found to be 45% higher with acetylene in the six-stroke engine as compared to four-stroke SI engine. The CO and HC emissions were found to be reduced by 13.33 and 0.67% respectively with acetylene as compared to gasoline due to better combustion of acetylene. The NO_x emission was reduced by 5.65% with acetylene due to lower peak temperature by water injection. The experimental results showed better engine performance and emissions with acetylene as fuel in the six-stroke engine.

Keywords Acetylene fuel · Six-stroke engine · Exhaust heat recovery · Water injection · Engine performance

Abbreviations

SI	Spark ignition
CO	Carbon monoxide
HC	Hydrocarbon
NO_x	Nitrogen oxides
CO_2	Carbon dioxide
LPG	Liquefied petroleum gas
CA	Crank angle
TDC	Top dead center
NDIR	Non-dispersive infrared radiation
MEP	Mean effective pressure
FC	Fuel consumption
BP	Brake power
BTE	Brake thermal efficiency

Nomenclature

W_{net}	Net work (watt)
V_{disp}	Displacement volume (m^3)
N	Speed (RPM)
n_s	Number of crank revolution
P	Power (Watt)
T	Torque (N-m)

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Introduction

Today, the world is facing a crisis of fossil fuel and environmental degradation. The spark ignition (SI) engines used in transportation as well as in small power generation running on conventional fossil fuels are emitting pollutants such as HC, CO, CO_2, and NO_x. The global warming is particularly

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A comprehensive review of biodiesel and CNG as alternative fuels for compression ignition engine

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Abstract: In the substitution of alternative fuels for compression ignition (CI) engines, several investigations and review studies have been done in the last few years. This paper presents a broad review on the production, performance and emissions of biodiesel and compressed natural gas (CNG) as replacement to fossil-based diesel fuel for CI engines. The properties of biodiesel and CNG, produced from altered sources and their fatty acid composition have also been addressed. The summary of experimental set-up used by different researchers for the studies and performance and emissions characteristics of CI engines with biodiesel is present in this paper. The complete impression of this paper is that the performance of the engine slightly depreciates with the use of biodiesel and CNG partially instead of diesel, but the emissions are significantly improved. The impressive cetane number and the inherent oxygen of biodiesel improve the combustion process which leads to reductions in HC, CO and smoke formation. When CNG is using as an alternative fuel the soot and NOx emissions are decreasing for CI engines.

Keywords: biodiesel; alternative fuels; CNG; emission; smoke; NOx.

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