EXPERIMENTAL INVESTIGATIONS ON TWO STROKE SI ENGINE WITH PISTON COATINGS AND GASOLINE BLENDS

By

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ABSTRACT

The use of alternative fuels in the transport sector can help mitigate the vehicles' greenhouse gas emissions. To achieve this goal, together with a positive energy balance in the global production process of piston coatings and gasoline blends, it is essential that added coatings and gasoline blends to petrol does not reduce the efficiency of the internal combustion engine. The aim of the work has been to characterize the effect of Magnesium Partially Stabilized Zirconium (Mg-PSZ) piston coatings for different gasoline blends of ethanol and butanol on engine behaviour like engine performance parameters efficiencies, and emission characteristics. Blends of proportions of 20% ethanol and 20% butanol gasoline blend has been tested. The engine performance parameters of SFC is 1.78% minimized at B20 for Mg-PSZ, break thermal efficiencies is 4.5% maximized at B20 for Mg-PSZ, emission characteristics of HC is minimized by 2.38% at E20 and CO is minimized by 3.65% at E20 for Mg-PSZ coated piston is compared with the normal piston of gasoline, and gasoline blends at different concentrations have been made through the analysis in the combustion chamber of the testing engine.

Key words: Piston Coatings, Gasoline Blends, Engine Performance, Emission Characteristics, Magnesium Partially Stabilized Zirconium.

INTRODUCTION

Two-stroke engines complete all cycles in a single crankshaft revolution. The two-stroke engines are used extensively in the transport field. These two-stroke engines are presently ignored because they release high combustion gases. Several researchers have done their research using various gasoline blends and different forms of piston thermal barrier coatings to minimize these emissions.

Thermal barrier coatings are duplex systems which consist of a ceramic topcoat and an intermediate metal bond coat. The topcoat is made of ceramic material whose purpose is to reduce the temperature of the less heat-resistant material below it. The bond coat is designed to protect the metal substratum against oxidation and corrosion and to encourage adherence to ceramic topcoat.

1. Literature Review

Vivek Rao Bhamne et al. (2017) investigated the function of potential two-stroke petrol engine. The author explained about the use of composite materials of the cylinder head, piston crown, piston, and combustion chamber to reduce emissions in the two-stroke engines. Gasoline blends are also used to reduce exhaust emissions and improve engine efficiency.

Dudareva et al. (2017) has discussed on thermal efficiency of engine with piston coatings of Micro Arc Oxidation (MAO) on pistons in internal combustion engines. Their primary goal is to reduce the thickness of the coatings and simulate the piston's thermal state with ANSYS. They concluded by the experimental investigations that the MAO coatings are

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A nanofluids and nanocoatings used for solar energy harvesting and heat transfer applications: A retrospective review analysis

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ABSTRACT

It is known that harvesting the solar power is key issue in current scenario because of scarcity of non-renewable energy in future days to come. Hence the solar harvesting systems takes an important stand globally. Grabbing the solar energy is difficult task due to low thermal conductivity of fluids which are carrying heat and poor optical coatings of solar power devices. In order to enhance the heat transfer rate of fluids there should be an alternative, such alternative is nanofluid. Nanofluids are having nanoparticles suspended in base fluids stably. This paper critically reviewed and conveyed the up to date literature of usage of nanofluids and nanocoating's in solar energy harvesting operating in low, medium and high temperature ranges for effectiveness in performance. Further solar energy conversion systems efficiencies can be raised by using the additives in base fluids termed as nanofluids and nano selective coatings for solar concentrators to improve optical performance.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Newer Trends and Innovation in Mechanical Engineering: Materials Science.

1. Introduction

Renewable sources are perfect alternative to bridge the gap between scarcity of power and conservation of power globally in current situations. There has been latest development in solar harvesting [2] leads to consider favourable actions pointing towards better projections in solar energy applications. The dearth of the conservative energy sources such as fossil fuels like petrol, gas etc and their perilous influence on the human society is key factor in which researchers are focusing their research in the field of solar energy which can be replenished continuously Fig. 1. Table 1.

Hence, we need to harvest the solar energy by constructing solar collecting systems such as parabolic shaped and flat shaped solar collectors. It is known that coating on the absorber surface greatly influence the performance of solar thermal energy conversion system. Mainly solar absorptance (α_s) and low thermal emittance (ε_T) of selective coatings during operating condition can effectively convert solar energy in to useful energy. Solar absorber selective coatings are bifurcated in to three segments with respect to thermal emittance such as

a) low-temperature ($T < 100$℃),
b) mid-temperature (100℃ $< T < 400$℃),
c) high temperature (T greater than 400℃)

The main aim of this paper is to discuss about direct energy conversion, here figure 2 shows that solar energy is utilised as direct and indirect conversion. But here we are focusing on direct conversion, let us focus on it. It is clear that solar harvesting can be done through thermal energy and photovoltaic energy. Many industries have been practicing the Rankine power cycle for power production by means of thermal energy only. It has been known that the photovoltaic solar cell is another source of generating of power for house hold applications. Below Figure 2 shows that how solar energy utilization is categorised into direct and indirect conversion.

2. Nanofluids in solar energy conversion and heat transfer applications

The harvesting of Solar Energy can be possible using high end heat carrier fluids such as water or oil. For process heat applications, base fluid [Reddy k s et al 2016] is either water or oil been used to harvest heat from renewable energy using solar collectors.

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MHD JEFFREY FLUID FLOW PAST A VERTICAL PLATE WITH UNIFORM BOUNDARIES

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