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Experimental performance of glass based synthetic dye sensitized solar cell

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ABSTRACT

Owing to the depletion of fossil energy sources, the research concentrates over accretion of power from nonconventional sources of energy. The growth rate of utilizing of abundantly available solar energy lead research in area of solar cell which is cost effective, higher performance, long life. The technology of die sensitized solar cell has been explored with synthetic dye and electrolytes. The die sensitized solar cell has been manufactured in house with fully automatic special purpose machine in order to achieve accuracy of dye application, heating, electrolyte bath etc. Titanium Dioxide (TiO_2) being tested as dye for the solar cell. The electrolytic solution which is mixture of pure iodine ethylene glycol and potassium iodide. The graphite-based powder as catalyst being used as liquid conductor. The performance of this die sensitized solar cell being observed with exhaustive experimentations. The performance criteria include varying light intensity throughout the day, varying current densities, varying tilting angles of cell. It was found that the cell is producing output of 30 to 122 mV with current density of 3.85 to 6.33 mA/cm^2. The efficiency of cell range between 0.07 and 0.36%. This output is much lower in comparison to that of photo-voltaic cell. But owing to numerous advantages such as window, design glass over building as solar cell panel will make the difference with that of PV cell.

Selection and peer-review under responsibility of the scientific committee of the 1st International Conference on Energy, Material Sciences and Mechanical Engineering.

1. Introduction

The global energy scenario since few decades shows substantial growth in consumption of the energy. The world energy outlook [1] reported the energy consumption was 12.7 TW in 1998 and predicted increase of 32.9 TW by next 50 years. Most of this energy demand is being fulfilled by fossil fuels such as coal, oil, nuclear energy etc. There is huge decrease in the fossil fuel reserves owing to increase in demand. Additionally, the environmental degradation and pollution caused due to greenhouse gases adversely affect climate changes with use of traditional fuels. Hence the energy resources which are inexpensive and environment friendly are to be explored and utilized. Solar energy is one such type of energy resource, which are the most abundantly available alternate sources being explored. Some of the renewable sources are solar energy, wind energy, geothermal energy, biomass energy and hydrogen energy.

Singh et al., proposed innovative technique of utilizing the solar energy for saline and dirty water purification to fresh drinking water using passive solar still and nanofluids solar stills [2]. The author developed the single basin passive and active solar distillers with novel desalting stills, passive solar still with double slope top cover, the technology of evacuated tube solar collector (ETC) assisted desalting units, thermosiphon ETC solar desalting units improves incident flux for extracting maximum solar radiations and hence improvement of performance [3–7]. Singh and Samsher proposes the evacuated annulus tube collector (EATC) for solar desaltification. This will further improves the performance over ETC. The thermosyphon EATC solar desaltification performance was compared with the ETC system and analyze the most smarter, economic with maximum yield system [8]. Samsher et al., highlights upon the advantages of active solar stills over passive one in terms of daily yield of water [9,10]. The active solar stills with nanofluids further improved the performance by way of reduction

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Investigation of Performance Parameters Affecting the Efficiency of Solar Water Heater: A Review

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ABSTRACT

The need for installation of Solar Water heater is increasing in society because of several factors such as rapid urbanization, government interventions, low cost of installations, and environment-friendly application acting as a direct replacement to fossil fuels. During the past few years, the research and development associated with the technological enhancement of the utilization of solar energy have increased exponentially. However, there are various challenges involved in the selection of proper solar technology to provide a high-performance energy harvesting application for domestic water heating requirements. There is a wide literature available on various performance parameters required to develop an efficient Solar Water Heating System. This paper investigates a state-of-the-art review of the performance parameters affecting the efficiency of Solar Water Heaters by component-wise analysis of parameters divided broadly into the design, operational and external parameters. The technological advancements in solar water heaters are classified based on performance parameters and the paper summarizes the possibility of combining different performance parameters to achieve more efficient and cost-effective solar water heaters for the society as future scope of the review for researchers working in the similar domain.

Keywords:
Solar Water Heating System, Performance parameters, Solar Efficiency, Flat Plate Collector, Evacuated Tube Collector, Phase Change Materials, Nanoparticles

1. Introduction

Global climate change has resulted to hunt for non-conventional energy sources in place of conventional fossil fuel-based energy sources. As per the Indian context and with the government favoring the use of renewable energy, the utilization of solar energy has increased by leaps and bounds. Solar technologies can be grouped into two broad domains, Solar Photovoltaic (SPV) which generates electricity, Solar Thermal (ST) which produces heat directly from the energy of the Sun and new technology which involves both generations of electricity and process heat which is Solar Photovoltaic and Thermal (SPV/T). All these choices have their advantages and disadvantages touted in the literature. To achieve higher solar contribution by selecting the best solar technology, one has to study the dominant factor responsible for altering the efficiency of the system [1]. Even though Solar energy is available in abundance, the technology required to harness the power of the Sun is costly.

The residential sector has an 80% share of Solar Water Heating (SWH) systems, the commercial sector which includes hotels, hospitals, others have 6%, 3%, 5% respectively and the industrial sector contains a 6% share of SWH systems. The percentage of share data shows that the residential sector is

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30_Optimization of power and torque with lower exhaust noise for FSAE Vehicle

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Optimization of Power and Torque with lower Exhaust Noise for FSAE Vehicle

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Abstract. The exhaust noise is considered to contribute disturbance to large extent in any vehicle. The sound wave cancellation device is used for better noise attenuation without much compromise on engine efficiency. This paper aims to design an advanced muffler which gives considerably lower back pressure in exhaust system line, thereby optimizing the power and torque of an engine. Study includes close monitoring of parameters such as power, torque, and transmission loss within the given boundary conditions. The limiting condition laid by Formula Society of Automotive Engineer (FSAE) is satisfied using Ricardo Wave Build software.

1. Introduction

Engine is the main power source of automotive vehicle and it requires some device to reduce the continuous generated noise emitted by a vehicle. Muffler is an important component in the combustion engine as it plays a vital role in exhaust system of the vehicle. Its basic function is to reduce noise generated by the flowing burnt gases in the exhaust pipe and hence they can be considered as an acoustic noise reducer. The dampening of the pulsation in the exhaust gases are slowly allowed to expand in the muffler. Acoustic noise reduction is mostly achieved by introducing series of baffle which performs the obstruction to the sound pressure waves [1,2]. This design of baffles harmonically cancels the sound waves. This method proved to have significant noise quieting but principally due to increase in the back pressure of the gases in the exhaust system results in reduction of overall efficiency of the system. This compound path of gases in exhaust line is the major area of study. Also, effect on length variation of exhaust line on noise transmission loss needs to be observed.

Performance of engine system is characterized by analyzing its behavior with respect to speed and load parameters as discussed in [3]. Fuel consumption, exhaust noise, emissions, etc. could be considered in muffler design for optimization of torque and power. Mufflers are designed with various configurations, like Baffle type muffler which consist of baffle plates in the path of gas thereby creating obstruction to the natural flow. The main purpose of this muffler is to avoid straight path of gas and potentially reduce the noise, but power loss is very high. Whereas the principle of wave cancellation type of muffler is cancellation of flowing gas waves. This is designed to split the exhaust gases in number of paths. The overlap of crests and troughs of the flowing gas waves is used to calculate the length of path travelled, the process significantly reduces the noise level but only one frequency is attenuated. Resonance type muffler when connected to the exhaust line, due to Helmholtz principle the resistance to the gas flow is minimum hence compensation of engine power is reduced. Absorber type muffler uses sound absorbing material. This material absorbs sound of any frequencies. Backpressure due to this muffler is comparatively low but not very capable of noise reduction for range of frequencies. Resonance and absorber type muffler gives advantage of both mufflers resulting high noise attenuation with lower backpressure.

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