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Experimental Investigation and Analysis of Heat Pipe Using Nano Fluid in Solar Water Heater System

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***Abstract*:** *An Solar energy conversion systems are facing the problem of having low optical and thermal performance. The reasons behind this arelow thermal conductivity of flowing fluid and non-effective optical coating of the solar collector. Henceour aim to improve the thermal and optical performance of the energy conversion systems. This project focuses on the application of nano-fluids for solar collectors operating in low, medium and high temperature ranges to increase its performance. A review on applications of nano- fluids and nanocomposites shows the desired improvement in thermal and optical properties of solar energy conversion systems.which includes use of concentrated and non-concentrated systems that convert solar energy into electricity or thermal power. The conversion platform for our efficiencies of these systems can possibly be enhanced by using a nano-fluid as the heat transfer medium. Enhancement of heat transfer in solar collector using nano-fluid which increases the overall performance of the system. Nano-fluid based solar collector are commonly used in areas such as industries safety and rural interest development.*

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I. Introduction

There are many challenges which are facing now a day's is sustainable energy generation, Electricity demand is growing at a faster rate but the shortage .Fossil fuels and environmental considerations will constrain the use of fossil fuels in the future.. This has become more popular as the price of fossil fuels continues to increase. The solar energy provides a solution to overcome from sustainable energy generation problem, towards the use of solar energy is due to discontinuity in electricity supply, government losses by providing over-subsidized LPG, and increase in CO2 emission. The non-concentrating collector are not applicable for electricity purpose . So, overcome this problem, concentrating collectors are used. The use of conventional fluids in solar collectors has low efficiency as compared to nano-fluids. This is due to its poor thermo-physical properties as compare to nano-fluids. Since at 1970's, solar technology has emerged as a result the cost of energy has increasing.

Energy consumption, in most cases is used for heating and cooling purpose and many attempts had been made thereafter to save space heating and cooling energy. As we know specific solar heating system having different equipment over the basic component of solar heating system a collector where heat is collected from the solar energy, heat storage and a heat circulation system. The solar collector is typically installed on the roof and mounted on the south facing slope. There are three mainconcepts of concentrating solar thermal collectors (a) Parabolic trough, line focusing, trough curvature in one direction, one-axis tracking, concentration factor 30 to 80, 30 to above 100 MW (b) Central receiver, point-area focusing, different element of paraboloids with various focal lengths having two-axes tracking with concentration factor 200 to 1000, 30 to 200 MW (c) Parabolic dish, point focusing, parabolic shape, two-axes tracking, concentration factor 1000 to 4000, 7.5 to 50 kW.

II. Nano Fluid

A. Why NanoFluid?

The rise in effective thermal conductivity is important in improving the heat transfer behavior of fluids. The number of other variables also plays key role, For example, for forced convection various parameters which affect the heat transfer coefficient for the fluid are geometry of the system through which the fluid is flowing, density, viscosity, thermal conductivity and specific heat along with extrinsic parameters such as diameter and average viscosity.

Therefore, it is important to measure the heat transfer performance of nano-fluids directly under flow conditions. Researchers have shown that nano-fluids have not only better heat conductivity but also greater convective heat transfer capability than that of base fluids. The effective utilization and more usages of nano-fluids in heat exchangers as a heat transfer fluids. And other advantages of nano-fluid in enhancement of heat transferare

- Due to nano size particles, pressure drop is minimum

- Higher thermal conductivity of nano particles will increase the heat transfer rate.
- Use ofnano-fluid will leadto lighter an smaller heat exchanger.
- Heat transfer rate increases due to large surface area of the nano particles in the base fluid.
- Nano-fluids are most suitable for rapid cooling

B.Heat Transfer Performance usingNano-fluid

Today's use of nano-fluid technology instead of conventional fluids, we use to increase performance of solar collectors. The selection of nano-fluid is most important for using in solar collectors, this have some limitations i.e. metal corrosion and rusting of components, pumping power problem, pressure drop, high cost of fluid, etc. Pressure drop enhances by employing CuO-oil based nano-fluid under laminar regime, Pressure drop enhances by enhancing volumetric concentration of TiO2- water based nano-fluid under turbulent regime. So, the proper selection of nano-fluids is most important for improving the performance of solar collectors.we are better viscosity get and gainer in the cooperations .
The nano fluid used is totally having no pollutive nature.

B. Application

Nano-fluids can be used to cool automobile engines and welding equipments and Heating of effective space in both residential and natural uses Nano-fluid Fast In the transportation industry, nano cars, General Motors (GM), Ford among others are focusing on nano-fluid research projects. Some common applications are,

- Enginecooling
- Engine transmissionoil
- Cooling of electroniccircuits
- Nuclear systemcooling
- Non pollutive source of energy

In the hill station, the most common problem to thedrivers is to park their vehicle in the slope and to start up the car. While waiting in the traffic the cars have to move on step by step very slowly, this situation is a difficult one for the drivers to make their car not to roll back in the slope. This function can be achieved by using the ratchet and pawl mechanism.

III. Objectives

- The Design solar collector plate for maximum heatentrapment
- Design and optimised of new closed system which uses nano-fluid in system for maximum heatentrap
- Experimental analysis of new proposed system with conventional solar heater.

IV. Components

SolarResources

Maximum incidation of energy on earth with radiations inwavelength range between 0.3 to 3.0 μm, that portionof thespectrum which includes most of the energy ofsolarradiation. The average produced over the entiresurface ofthe planet, twenty-four (24) hours per day in ayear isapproximately 4.2kW/h of energy depending onthe earth'slocation. All the energy stored in the earth's coal, oil just twenty at noon earth's surface is about1000kW/m2.

SolarRadiation

Energy falling on earth and produced by sun with amount having the concentrated energy with intense quality in some desired quantity is nothing but solar radiations.
The total energy is radiated in outward directions.

Solar Water Heater UsingNanoFluids

The inormous energy of water and by using it with Solar energy as a medium. A system in whichthe sun's heat is gathered bya solar collector and used toincrease the temperature of aheat-transfer fluid (such aswater or a non freezing Solar water heater is being used worldwide for lowtemperature applications mostlyinthe domestic sector forwashing clothes and bathingpurposes. Thermo syphon flat plate solar water heater is asolar passive system, which canproduce hot water in thetemperature range of 60–90C.Closed loop or heat-exchanger type or Indirect type solarwater heater are used water heater are usedin which a primary fluid namely purewater or glycol–water mixture is added, to prevent theformation ofscaling on the inner surface of the copper tubes due to passage of high saline water and to prevent damage to tubes due to water freezing in cold climates. Due to effectiveness fluid is reduced. In order to increase the outlet useful temperature and

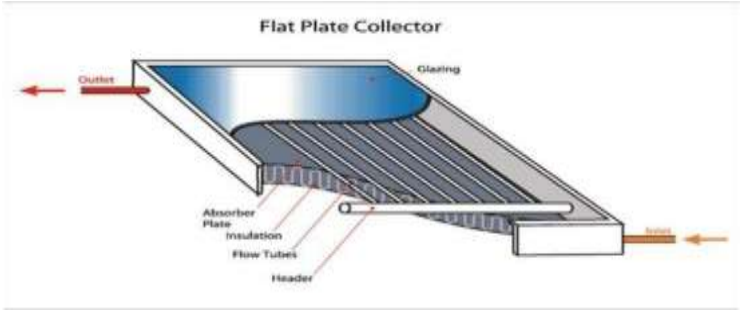
thermal efficiency, nano-particles having high thermal properties are mixed with the primary fluid to form nano-fluids, there by increasing the effective thermal conductivity of the primary solution. The effect of nano-fluids in several industrial and residential applications was experimentally and theoretically analyzed by several researchers all over the world. The thermal performance using nano-fluids depends on several thermo physical properties of nano-particles such as particle diameter, shape and the pH, viscosity, thermal conductivity, volume fraction, specific heat of nano-fluid

SolarCollectors

They gather the sun's energy, transformitsradiation into heat, and then transfer that heat into afluid(usually water or air). The applications of solar thermal energy are solar water heating, solar pool heaters and space heating system.it is a array of differ plats arranged in seriesof the glass collectors with absorber surface

Flat PlateCollector

Flat plate collector (FPC) based systems are of metallic are two types fluid based(FPC) and air based (FPC). The flat plate collector having temperature limit upto 1000 degree ,also having low concentration factor.



Schematic Diagram

Experimental Setup

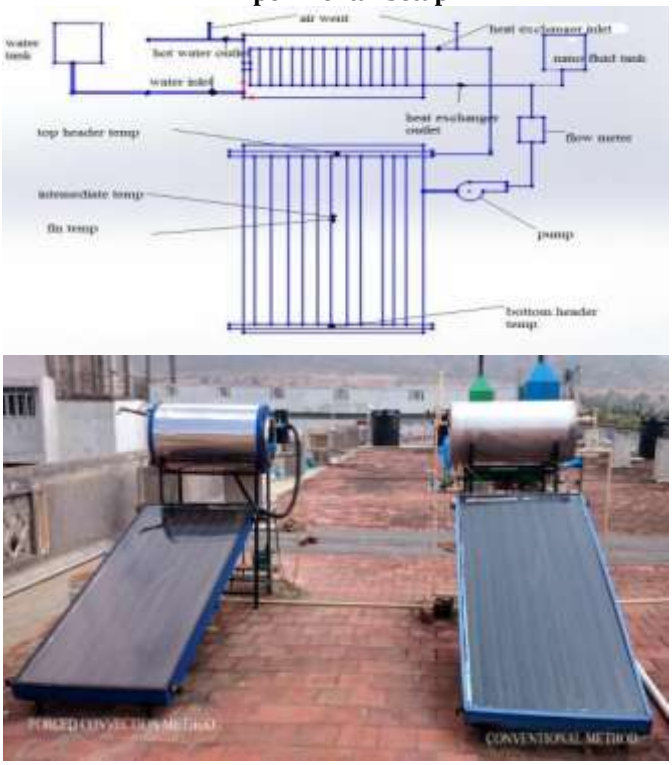


Fig No.3 Experimental Setup

V. Futurescope

Rising global population and living standards concerns over climate change, secure and safe low carbon energy supplies. Over the next 40 years, in order to sustain life and standards of living to which have

grown accustomed, we must develop deep solutions for emissivity scaling tetra-watts of affordable sustainable energy and develop means to reduce on CO2 emissions. A pivotal future research should be determining the energy transport mechanism and green energy (solar thermal) in nano- fluids. Due to increase heat transfer rates under a variety of constraints. Nano-fluids have to satisfy many such needs and constraints. For solar thermal applications, the important features of nano-fluids are the high transfer coefficients for liquids with high boiling points and medium pressures. Increased heat transfer rates in solar collectors could reduce the pumping power needs. However, ideal or even optimized nano- fluids for solar thermal applications do not exist yet. The above review shows that the application of nano-fluids in solar energy applications is still in its early stages so far, theoretical investigations have been reported on parabolic trough collectors; subsequently experimental studies can be performed. Practical implications of nano-fluids are influenced by major factors such as production cost, synthesis methods, physical & chemical parameters. The evolvement of nanotechnology in future may overcome these factor

VI. Conclusion

Losses from the heated water exist inside the inner tank heated by the flat plate solar water heater. Storage tank is placed at the top of frame and collectors. The highest improvement in efficiency was observed in forced circulations. However, the highest efficiency of the solar water heater was obtained at the flow rate of 1 l pm. Many researchers, over the decades have increased the efficiency of solar water heater to the present level. Yet, the current efficiency of the solar water heater is less compared to other conventional technologies.

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