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Review Paper on Radiators By Using Different Nano-Fluid

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Abstract : *Cooling system plays important roles to control the temperature of car's engine. One of the important element in car cooling system is the radiator. Radiator plays an important role in heat exchange. Conventional coolants like water, ethylene glycol are not efficient enough to improve the car's performance. Therefore with the development of new technology in the field of 'nano-materials' and 'nano-fluids', it seems to effectively use these technologies in car radiators to improve engine efficiency, reduce weight of vehicle and size of radiator.*
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Keywords: *Cooling System, Car engine, Heat Exchanger , Nano-Fluid, Radiator.*

I. Introduction

Automotive radiator is key component of engine cooling system. Radiators are compact heat exchangers optimized and evaluated by considering different working conditions. Coolant surrounding engine after absorbing heat from it passes through radiator. In radiator, coolant gets cooled down and re-circulated into system. It means the radiator is normally used as a cooling system of the engine and generally water is the heat transfer medium. There are various components that make up the cooling system and they are Air blower, Cooling fans, Radiator Parts, Radiators and Water pumps. Each of these components plays essential role..

II. Literature Review

[1] A. Dimoudi, A. Androutsopoulos- Energy conservation in buildings is becoming an issue of great importance. Space cooling is getting important in most countries and different techniques have been developed one of which is radiative cooling. A prototype roof component, exploiting radiative cooling, was built and tested in the outdoor test facilities of the Centre of Renewable Energy Sources in Greece. The component comprises a radiator, which is utilizing water as the fluid medium and its cooling performance was investigated. This paper presents the construction of the component, the experimental set-up and the results taken during the monitoring procedure.

[2] **Ms. Madhura P. Jadhav, Mr. Deepak B. Jadhav, Mr.M.E.Nimgade**

Nanofluid is the leading technique which has been widely used for enhancement of heat transfer rate in various applications. This paper gives review regarding properties of nanofluids and experimental study on heat transfer rate enhancement in automotive cooling system. Nanofluids are produced by suspending nanoparticles in base fluid. Suspension of nanofluid in base fluid totally changes the properties of base fluid and one can get the fluid with better performance as a resultant fluid. In this paper comparison between TiO2-W and SiO2-W nanofluids used to enhance heat transfer rate in automotive cooling system. The result shows that the Nusselt number increases with volume flow rate and slightly increases with inlet temperature and nano-fluid volume concentration. By using nano-fluids up to 22.1% heat transfer rate has been increased.

[3]. **A.K.A. Shati , S.G. Blakey, S.B.M. Beck**

The effect of altering the emissivity and the roughness of a wall behind a radiator on the radiator heat output has been studied experimentally and by using computational fluid dynamics. The results indicate that the presence of large scale surface roughness and a high emissivity surface increases both the heat flow rate and the air velocity behind the radiator compared to a smooth shiny surface. The former increases the wall surface emissivity which causes the surface temperature of the wall to increase, effectively creating additional convective heat transfer surface. The surface roughness will increase both the surface area for heat transfer and the turbulent intensity which increase the mass transfer and free convective heat flux through the air gap. The results indicate that the heat transfer can be increased by about 26% through the use of a high emissivity saw-tooth surface compared to a smooth shiny one. This means that using a wall surface with high roughness and emissivity behind the radiator will increase the heat output from the radiator.

[4] Adnan M. Hussein, R.A. Bakar , K. Kadirgama , K.V. Sharma

The increasing demand of nanofluids in industrial applications has led to increased attention from many researchers. In this paper, heat transfer enhancement using TiO_2 and SiO_2 nanopowders suspended in pure water is presented. The test setup includes a car radiator, and the effects on heat transfer enhancement under the operating conditions are analyzed under laminar flow conditions. The volume flow rate, inlet temperature and nanofluid volume concentration are in the range of 2–8 LPM, 60–80 °C and 1–2% respectively. The results showed that the Nusselt number increased with volume flow rate and slightly increased with inlet temperature and nanofluid volume concentration. The regression equation for input (volume flow rate, inlet temperature and nanofluid volume concentration) and response (Nusselt number) was found. The results of the analysis indicated that significant input parameters to enhance heat transfer with car radiator. These experimental results were found to be in good agreement with other researchers' data, with a deviation of only approximately 4%.

[5] Benjamin Siedel, Valérie Sartre, Frédéric Lefèvre

A complete steady-state model has been developed to determine the thermo hydraulic behaviour of a loop heat pipe. The model combines a fine discretization of the condenser and the transport lines with a 2-D description of the evaporator. These original features enable to take into account heat losses to the ambient and through the transport lines as well as to evaluate the parasitic heat flux through the wick and the evaporator body. The present numerical simulations may improve the understanding of the physical mechanisms operating in an LHP evaporator, and their coupling with the other parts of the LHP, and provide guidance for the LHP design, aiming to reduce the thermal resistance of the system. The comparison between experimental data of a flat disk-shaped evaporator from the literature and theoretical simulations validates the proposed model. Simulations show the significance of heat conduction through the liquid line.

Equations

According to Newton's cooling law the following procedure was followed to obtain the heat transfer coefficient and corresponding Nusselt number as:

$Q=hA\Delta T=h(Tb-Ta)$……..(1)

A is surface area of tube, Tb is the bulk temperature:

$Tb=Tin-Tout/2$………….(2)

(Tin, Tout) are inlet and outlet temperatures and Ts is the tube wall temperature which is the mean value measured by the two surface thermocouples as:

$Ts=T1+$ ----------$T8/8$……(3)

Heat transfer rate is calculated by:

$Q = m.\ Cp.\ \Delta T$

$= m.\ Cp.\ (Tin-Tout)$…….(4)

m is the mass flow rate, which is determined as:

$m = \rho \times V$……(5)

The heat transfer coefficient can be evaluated by collecting Eq. (1) and (4):

$hexp=m.\ Cp.\ (Tin-Tout)\ /\ n.\ As.\ (Tb-Ta)$

Where n is a number of radiator tubes, and the Nusselt number can be calculated as,

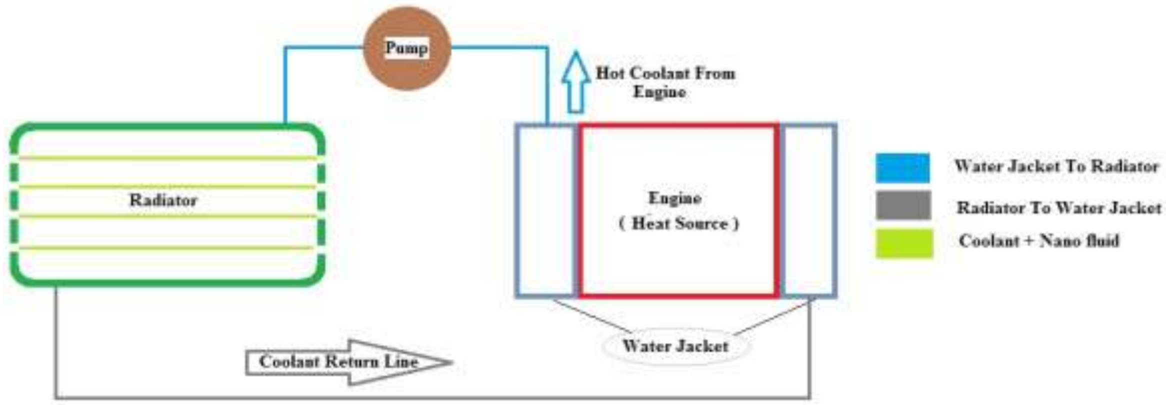
$Nu = hexp \times Dhk$

Dh - hydraulic diameter of the tube which estimated by description of the problem undertaken as cylindrical geometry Assuming all thermal properties are estimated at the bulk temperature of the fluid Reynolds number (Re) is determined as:

$Re=\rho\times Dh\times u\ /\ \mu$

Where u is the velocity at the inlet of the radiator.

FIGURES AND TABLES



WORKING

From fig. we see that engine hot fluid pump into radiator. In radiator there is coolant plus nano-fluid is used to cool the engine hot fluid. Without mixing the nanofluid with engine fluid. And then this cool fluid again recirulating in the engine and this cycle is carried out .

III. Conclusion

This paper presents the construction of the component, the experimental set-up and the results taken during the monitoring procedure. Nanofluid is the leading technique which has been widely used for enhancement of heat transfer rate in various applications.

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