



Nanofluid – Technology of Tomorrow for Non-Conventional Energy Resources

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Abstract - Sun based vitality is one of the best and simplest wellsprings of renewable vitality with the least ecological impact. Diminishing fossil fuel, a consequence of that necessity and handiness of sunlight based vitality is expanding. There are numerous uses of sun-powered vitality utilised as a part of regular life like sun oriented water heater, sunlight based cooker and so on. Sun oriented water heater has the constraint of less effectiveness given low thermal conductivity working liquid water. In this exploration, the execution of sun oriented authority can be further enhanced by utilising nanofluid having high thermal conductivity instead of utilising water as working liquid. 0.06%vol. of Al_2O_3 nanoparticles blended with the base liquid taken as distilled water. We examined that the significant impacts of nanofluids on the thermal fluid properties like thermal conductivity and specific heat capacity. Nanoparticles like Al_2O_3 have the propensity to enhance radiative properties of fluids, increasing more proficiency of direct absorption sun based collector. As the consequence of utilising Al_2O_3 nanofluid as working liquid productivity of household sunlight based water heater is expanded.

Keywords - Al_2O_3 Nano-powder, Nanofluid, Evacuated Tube, Solar Energy, Solar Water Heater

I. INTRODUCTION

Pure alumina has been utilised for joining teeth and hips in the 70s. Al_2O_3 is otherwise called an alumina. Be that as it may, its names are contrasted as indicated by its application. Its high hardness, amazing dielectric properties, obstinacy and excellent thermal properties settle on it the material of decision for an extensive variety of uses. Its applications are filler, glass, catalysis, purging, rough, paint, composite fibre, grating security, heating gadgets, etc. [1]. The nanoparticles of Al_2O_3 are utilised to study thermal conductivity of nanofluid with the usual size in the vicinity of 8 and 150nm. Nanofluids have been set up by single stage technique and two stage technique. An uncommon consideration concentrate on the thermal conductivity it is changed by volume part. Distinctive sorts of base liquid are utilised like as refined water, ethylene glycol and propylene glycol. The nanofluid is set up by nanoparticles which are included distinctive fixation in base liquids. If the 4% volume of nanoparticles are utilised to build thermal conductivity if there should arise an occurrence of base liquid is water; then thermal conductivity is expanded by 32%, and base liquid is ethylene glycol then warm conductivity is expanded by 30% [2]. Nano-liquid has one sort of conceivably to valuable in numerous application like as warmth exchange, residential cooler chiller, atomic reactor coolant procedure of pounding and space innovation. Strong metals have huge warm conductivity contrast and base liquid. The particles estimate likewise impact on a nanofluid warm conductivity like as the little particles have a less warm conductivity in the base liquid. The particles size increment than the thermal conductivity of nanofluid likewise increment. Suresh and Davis show broke down the thermal conductivity of Al_2O_3 -nanoparticles are expanded within the base liquid water. Particles size additionally influences on soundness. Nano-liquid temperature expanded with warmth exchange co-effective likewise expanded. The Reynolds number expanded with the heat exchange of nanofluid expanded. Presently compel convection stream inside the consistently warmed tube is measured the steady heat flux. Al_2O_3 have a most astounding thermal conductivity in water contrast with ethylene glycol with various temperature [3]. Thermal conductivity has a vital part in warmth exchange gear. Warm exchange co-productive expanded with volume contact expanded. Hub removes expanded with warmth exchange co-effective diminished. The divider shear stretch diminished with expanded divider heat flux and heat move in nanofluid. It additionally watched that heat exchange rates with Al_2O_3 -water is higher than the CuO -water. The exceptional heat conductivity measured by expert warm property meter. Hotwire strategy utilised for measuring thermal property [4]. The utilisation of sunlight based vitality as most extreme as we can utilise because in future all vitality might be pulverised except sun oriented vitality. For gathering more warmth in the sun oriented gatherer of sun based water warmer, different nanofluids are to be utilised as to utilise sun based vitality. In this paper, the investigation of various nanofluids like Al_2O_3 , CuO , Xuan and Li, etc. is given. In this examination, fundamentally they incorporate rate change in heat exchange by different nanofluids. They additionally provide an outline of getting a last upgrade by fluctuating volume focus. Generally speaking, the paper depends on utilising nanofluid to improve warm exchange limit by utilising sun-powered vitality which is the lead venture towards utilisation of renewable vitality

sources [5]. The current advancement of nanofluid in the utilisation of warmth exchange reason. Various methods give the detail readiness of nanofluid by considering different parameters like volume portion, molecule estimate, base liquid, temperature, and so on further solidness of nanofluid is examined after the arrangement of nanofluid. In this paper, we can likewise demonstrate the diagrams and graphs of various parameters like volume part and temperature to the warm conductivity. It can be supportive to realise that what impacts are made on the thermal conductivity of nanofluid by changing volume division and temperature [6]. The utilisation renewable vitality assets like sun based vitality in the type of nanofluid. Nanofluid has numerous applications like motor cooling, cooling of electronic circuits, atomic framework cooling, sunlight based water heater, and so forth here essentially sun-powered water heating application is considered and made an investigation of change in execution. Execution can be enhanced by fluctuating size, shape, material and volume part of the nanoparticles. They infer that nanofluid can enhance the effectiveness by 7% when contrasted with water in sun powered water radiator. Nanofluid is filled in vacuum tube which is inside in water tube. The vacuum tube is secured with safeguard covering. Jacketed tank is inside in barrel which is mounted on water tube it is straightforwardly associated with a vacuum tube. At the point when the stream of water interacts with jacketed tank liquid gets to be distinctly hot and forget from opposite side [7].

II. PREPARATION OF NANOFLUID

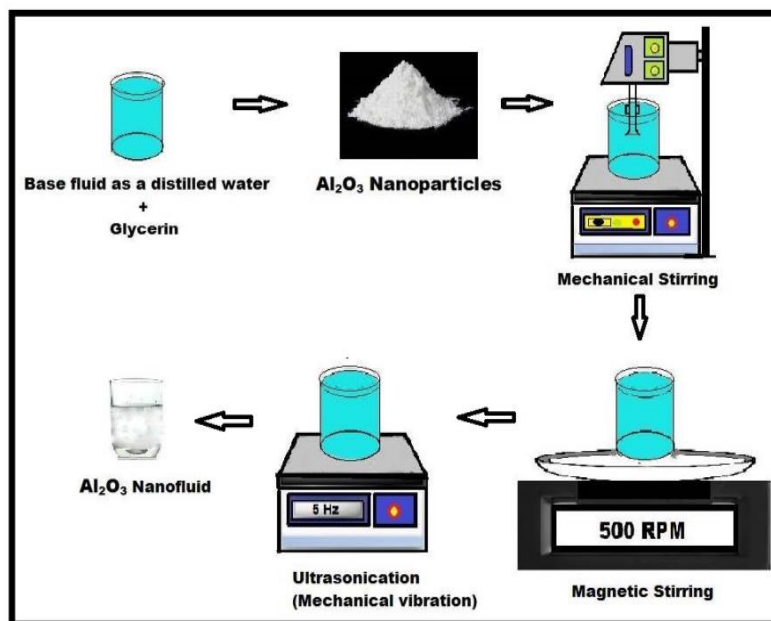


Figure 1: Nanofluid Preparation Chart

Nanofluid comprises nanoparticles which are suspended in base liquid. The readiness of nanofluid in which first you have chosen to base liquid and nanoparticles as per your application. The various particles and liquid have an alternate property. In the wake of choosing nanoparticles and the base fluid, you have taken a base liquid and nanoparticles in quantitative proportion or rate. After considering all criteria, you have taken after above outline in which you have taken a respectable starting point liquid in which nanoparticles are included. At that point, this base liquid with nanoparticles will go to next process in this procedure you have utilised mechanical mixing. In this procedure, you have just given an RPM to base with nanoparticles. After this procedure, it will go to next process in this procedure you have utilised attractive mixing in this procedure you have given warmth and RPM to base liquid with nanoparticles. After this procedure, every one of the particles has similarly warm appropriating limit. At that point, it will go to next process in this procedure you have utilised ultrasonicator in this procedure you has offered vibration to base liquid with nanoparticles. Thus, after this procedure, every one of the particles is homogeneous and stable in base liquid. As per above graph, we have taken after all the procedure, and we have an arranged an Al₂O₃ nanofluid.

III. WORKING OF SINGLE EVACUATED SOLAR WATER HEATER

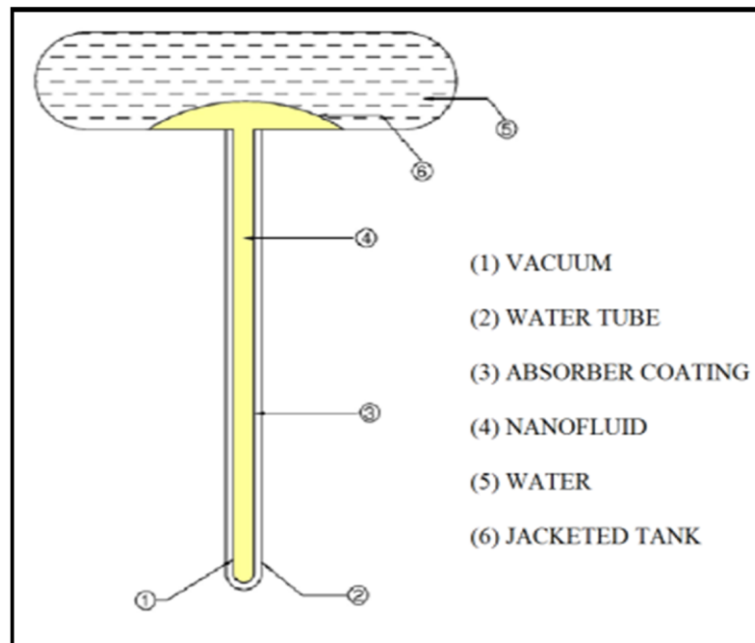


Figure 2: Single Evacuated Tube Solar Water Heater Containing Nanofluid

After planning Al_2O_3 nanofluid, we have utilised this nanofluid in sun powered water radiator. Al_2O_3 nanofluid filled in a safeguard covering tube, which is rest inside the emptied tube. Jacketed tank which is likewise rested inside the water tank. Jacketed tank and safeguard covering tube both are straightforwardly associated with each other. At the point when the nanofluid is warmed because of sun-powered raise, as per thermosiphon stream nanofluid move inside this safeguard covering tube. Because of warming, the thickness of nanofluid is diminished, and it will go to upward toward jacketed tank when the water is ignored this jacketed tank convective warmth exchange happens amongst nanofluid and water. Because of this procedure water is warmed.



Figure 3: Working setup of Single Evacuated Tube Solar Water Heater Containing Nanofluid

3.1 PROPERTIES:

PROPERTIES	10% OF NANOPARTICLES WITH BASE FLUID	20% OF NANOPARTICLES WITH BASE FLUID	WATER
THERMALCONDUCTIVITY (ACCORDING TO GRAPH)	>20% OF NANOPARTICLES WITH BASE FLUID	> WATER	<10% AND 20% OF NANOPARTICLES WITH BASE FLUID
RISING TEMPERATURE RANGE	30.62 ⁰ C TO 71 ⁰ C	30.56 ⁰ C TO 70.75 ⁰ C	30.25 ⁰ C TO 59.88 ⁰ C

Table 1: Properties of Nanofluid and Water

Above Table 1, Temperature data ranges we have obtained with the use of the three-wire method. According to temperature ranges, we have seen that the thermal conductivity of 10% nanoparticles with base fluid is more compare to water and 20% of nanoparticles with the base fluid. This temperature ranges denoted heat transfer capacity of 10% nanoparticles with base fluid and 20% of nanoparticles with the base fluid.

IV. COMPARING THE GRAPHS OF TIME→TEMPERATURE FOR 10% OF NANOPARTICLES WITH BASE FLUID, 20% OF NANOPARTICLES WITH BASE FLUID AND WATER.

% OF Al ₂ O ₃ PARTICLES WITH BASE FLUID + WATER	TEMPERATURE (°C)						
	1 SEC.	500 SEC.	1000 SEC.	1500 SEC.	2000 SEC.	2500 SEC.	3000 SEC.
10% Al ₂ O ₃ +water+ glycerin	30.62 ⁰ c	33.25 ⁰ c	45.88 ⁰ c	57.63 ⁰ c	64.69 ⁰ c	68.31 ⁰ c	70.62 ⁰ c
20% Al ₂ O ₃ + water + glycerin	30.56 ⁰ c	32.88 ⁰ c	43.94 ⁰ c	55.44 ⁰ c	63.69 ⁰ c	68.31 ⁰ c	70.37 ⁰ c
water	30.25 ⁰ c	32.06 ⁰ c	39.37 ⁰ c	47.88 ⁰ c	53.50 ⁰ c	56.94 ⁰ c	59.06 ⁰ c

Table 2: Comparison Between Nanofluid and Water

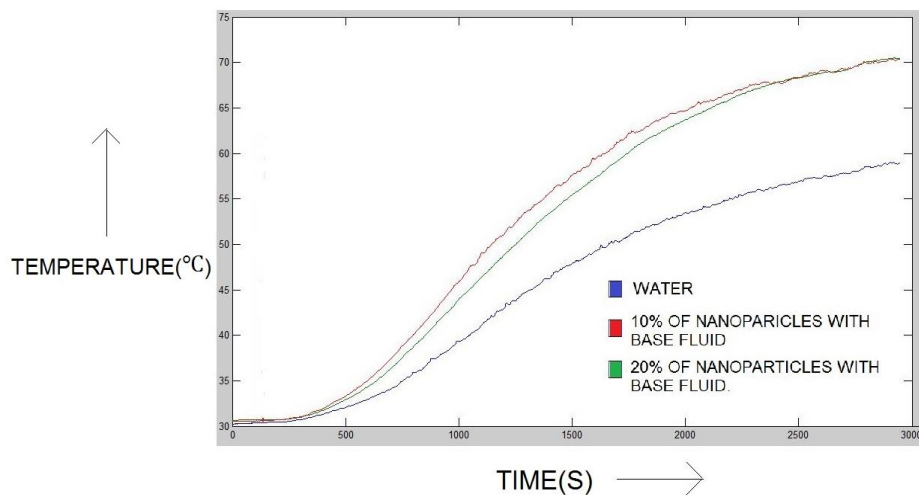


Figure 4: Comparison Graph of 10% and 20% Nanofluid with Base Fluid and Water

As it can be found in the above outline, the radiator liquid warms in around 3000 secs (50 minutes). Nanofluid with the centralization of 10% nanoparticles showed insignificant time for warming, and a brisk rising in temperature by

techniques for the sun arranged warmth shafts for use in sun situated experts, and it has demonstrated the temperature climb to which 70°C . Nanofluid with a gathering of 20% nanoparticles showed the perfect open door for warming and rise in temperature difference, and 10% of nanoparticles is less, and it has shown the temperature rise to which underneath 70°C . Each one of the data accumulated as complexity and water in light of the way that the water has a less warmth passing on the capacity to manufacture its temperature climb between 55°C . to 60°C .

V. CONCLUSION

Our hopes to extend the general capability of a sunlight based water heater by the usage of nanofluid and moreover increase the thermal conductivity and specific heat utmost of nanofluid. That is the reason we have performed attempt in which we have brought Water, 10% of nanoparticles with a nanofluid and 20% of nanoparticles with nanofluid. After watched the graphs we have picked 10% of nanoparticles with water since it has a quick temperature rising point of confinement in a shorter time as complexity and water and 20% of nanoparticles with nanofluid.

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