EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER CO-EFFICIENT AND EFFECTIVENESS OF COUNTERFLOW HEAT EXCHANGER USING CUO AS A NANOFLUID

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Abstract- *In this review paper the heat transfer coefficient in convective form with twisted tape inside heat exchanger will be done by experimental as well as computational methods. The heat transfer rate will show the performance of heat exchanger. There should need to look after the new future techniques to enrich the heat transfer rate. There are several heat transfer rate enhancement techniques exist out of which passive heat transfer enhancement techniques are preferred as they do not affects the overall performance of system. Heat transfer methods with twisted tape inserts will broadly useful in several industries for their cost savings, lower maintenance requires and fact is that they can be easily setup.*

Keywords- heat exchanger, heat transfer rate, double pipe heat exchanger, twisted tape.

I. INTRODUCTION

Heat exchanger is a device in which heat transfer takes place between two liquids that enters and exits at dissimilar temperature and in thermal contact. The main function of heat exchanger is either to remove the heat from the hot fluid or to add heat to cold fluid. Transfer of heat takes place by the law of conservation of energy, where the heat lost by the hot fluid will be always equal to heat raised by cold fluid. Heat transfer between the fluids takes place without any external heat or work interactions. [1] The investigation tells about free convention of nanofluid which is analyzed in open cavity source. This simulation provides velocity detracts with argument of Lorentz force in unsteady free convection swirling flow device. heat transfer in convective form increase with augment of swirl intensity but pressure drop of increase .heat transfer takes place in rhombus with heated square obstacles by using CuO-water nanofluid. It also improves hydrothermal treatments by employing v-finned twisted tapes. Existence of magnetic field in cubical cavity shows transportation of nanofluid in convective motion inside rotating cavity by using heat flux boundary conditions. Due stronger secondary flow the width ratio of augment decreases with thermal boundary layer thickness and increases inlet velocity. [2] nanoparticles have much larger surface area as compared to micro size particles so thermal conductivity increases in terms of surface to volume ratio. Compared to others oxide base nanofluids suspended copper nanoparticles will have higher effect and higher nusselt number in fully developed flow with constant wall heat flux. The effect of Al2O3 nanoparticle in laminar flow has greater nusselt value using Al2O3 and ZrO2 nanoparticles has no improvement in heat transfer and remains same. Reynolds number and nusselts number increases significantly by using nanofluid over base fluid in rectangular micro channel. [3] By decreasing width of heat sink channel and increasing area saturated by heat transfer fluid, Convective heat transfer of single phase flow can be improved. Experimental shows that nanofluids have great potential for heat transfer enrichment, effectiveness and better thermal conductivity than pure fluids. Using Al2O3 and CuO as a coolant increases thermal performance of microchannel and no extra increase in pressure drop due to fine solid particles and lower volume concentration. It reduces the temperature difference between bottom wall microchannel heat exchanger system and bulk compared to pure fluids. Mostly higher heat transfer achieved at entrance and lower at fully developed region. [4] As in case of spiral heat exchanger, cold nanofluids flow inside heat exchanger while hot water flows otherside. By increasing gap magnitude, Decreases it's concentration and Reynolds number while increase by heat flux. The effect overall heat transfer co-efficient and convective heat transfer co-efficient enhance with increasing Reynolds number enhances effectiveness. Reducing gap between plates intensified pumping power. At higher concentration has more augmentation. While increasing concentration at constant mass flow rate. Pumping power get decreased and optimum concentration is obtains with maximum heat transfer occurs. [5] Efficiency and thermal performance of parallel flow and counter flow concentric tube heat exchanger improved by using nanofluids as working fluid during turbulent flow to replace water as hot fluid. Because metal oxides present in nanofluid which are not found in pure water or alumina nanofluid. Due to increased amount of heat transferred to cold fluid owing to an increase in temperature of hot fluids in both types and improves heat exchanger performance. [6] It has higher thermal properties as compared to other base fluid. Effect of rapid fluid mixing strengthens energy transportation inside nanofluids by changing temperature profiles. Heat transfer rate enhances with nanoparticle dispersed in de-ionized water.[7] In this experimental work, twisted tapes helps in enhancement of heat transfer , convective heat transfer and thermal performance factor inserted in concentric pipe v-bed heat exchanger compared to non-twisted tape system using nanofluids. Nusselt number and friction factor with increase of Reynolds number of entire pipe concentration of nanofluid with trapezoidal-cut twisted tapes insert increases compared to pure base fluids. This performance parameters of heat exchanger indicates that by increasing volume concentration of nanoparticle enhance heat transfer co-efficient and friction factor. External pipes appears larger heat transfer than internal pipes due to secondary flow. [8] At same mass flow rate and internal temperature convective heat transfer co-efficient of nanofluid dispersed in distilled water is slightly greater than pure base liquid like water. Thermal conductivity, viscosity of nanofluid and friction factor increases by flow rate increase and volume concentration of nanofluids. [9] There are several heat transfer enhancement techniques exists but out of which passive heat transfer is preferred which does not affect overall performance of system. The effectiveness in counter flow arrangement without twisted tapes is lesser than parallel flow arrangement with twisted plate because temperature difference is constant throughout cross section in counter flow. But in parallel flow temperature difference get decreased and also creates turbulence in hot fluids. [10] Chemical reaction and heat generation of nanofluid is higher then simple nanofluid. There is an increment in concentration profile but decreases concentration at surface.

II. CONCLUSION

From this review it has been understood that,

- Effectiveness in parallel flow arrangement with twisted plate in higher than effectiveness in counter flow arrangement without twisted tapes under turbulence condition
- Convective heat transfer co-efficient of nanofluid dispersed in distilled water is infirm greater than pure base liquid.
- Twisted tapes helps in enhancement of heat transfer in convective form , overall heat transfer, thermal performance factor in heat exchanger
- Increasing volume concentration of nanofluids and thermal boundary layer thickness which increase thermal conductivity, friction factor, viscosity of nanofluid.
- Effect rapid fluid mixing strengthens energy transportation inside nanofluids by modifying temperature profiles.

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