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A Review on Heat Transfer Augmentation Techniques for Double Pipe Heat Exchanger

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Abstract- **Now a days for enhancing the convective heat transfer in various industries such as thermal power plants, chemical processing plants, air conditioning equipment, refrigerators, petrochemical, biomedical and food processing plants heat exchangers are employed with twisted-tape inserts have widely been applied. By employing, twisted tape insert bring together swirl into the fluid flow which subsequently interrupts a thermal boundary layer on the tube surface. warm execution of warmth exchangers can be improved by warmth move augmentation techniques. Tape addition is one of the aloof warmth move augmentation technique and utilized in most extreme warmth move application, for instance, cooling and refrigeration systems food processes. Therefore various enhancement techniques have been reviewed.**

Keywords- **Heat Transfer, Augmentation Techniques, DPHE, Twisted Tape**

I. INTRODUCTION

Heat exchangers were used in a wide-ranging of applications including power generation plants, nuclear reactors for generation of electricity, Refrigeration & Air Conditioning (RAC) systems, self-propelled industries, food industries, heat retrieval systems, and chemical handling. The upgrading methods can be distributed into two groups: active and passive methods. The active method requires peripheral forces. The uninvolved strategies need discrete surface geometries. The two strategies have been normally used to improve execution of warmth exchangers.

Because of their reduced structure and high warmth move coefficient helical cylinders have been announced as one of the latent warmth move improvement technique and they are comprehensively utilized in numerous mechanical applications [1, 4, 16]. The advancement of superior warm frameworks has invigorated enthusiasm for techniques to improve heat transfer. In heat exchangers, enhancement of heat transfer is achieved by increasing the convection heat transfer coefficient or by increasing the convection surface area. One of the strategy to build the convection coefficient inside a warmth exchanger is by presents embeds inside the channels/tubes.

Warmth Exchanger is a gadget where the trading of energy takes place between two liquids at various temperature. A heat exchanger uses the way that, any place there is a temperature contrast, stream of vitality happens So, that Heat will Flow from higher Temperature heat reservoir to the Lower Temperature heat Reservoir. The flowing fluids provide the necessary temperature difference and thus force the energy to flow between them. The energy flowing in a heat exchanger may be either sensible energy or latent heat of flowing fluids. The fluid which gives its energy is known as hot fluid. The fluid which receives energy is known as cold fluid. It is but obvious those, Temperature of hot fluid will decrease while the temperature of cold fluid will increase in heat exchanger. The purpose of heat exchanger is either to heat or cool the desired fluid. In a special case, when one of fluid undergoes change in its phase, its temperature remains unchanged. These types of heat exchanger are known as condensers or evaporators. Heat exchangers with the convective heat transfer of fluid in side the tubes are frequently used in many engineering application.

The techniques of heat transfer enhancement to accommodate high heat flux i.e., to reduce size and cost of heat exchangers have received serious attention passed years. Upgrade of warmth move Rate in a wide range of canteen specialized device is of extraordinary criticalness for industry. Alongside the investment funds of essential vitality, it likewise leads to a decrease in size and weight. Up to the present, several heat move improvement methods have been developed. Twisted-tape is a standout amongst the most significant individuals of enhancement systems, which utilized broadly in heat exchangers. 2.

II. LITERATURE REVIEW

Shailesh Dewangan (2018) made helical ribs on the tube surface by machining the surface on the lathe so that artificial roughness can be created. The artificial roughness that results in an undesirable increase in the pressure drop due to the increased friction; thus the design of the tubes surface of heat exchanger should be executed with the objectives of high heat transfer rates.

Sreenivasalu Reddy (2017) reviewed the warmth move examination in the level twofold pipes with helical balances in the annulus side. The material is copper with inward cylinder interior width 10 mm, internal cylinder thickness 1 mm, external cylinder outside distance across 40 mm, external cylinder thickness 1.5 mm, helical pitch of 50mm, 75mm and 100mm, heat exchanger length 1100 mm. The trial after effects of plain cylinder are approved with numerical outcomes. The outcomes got for helical blades in the annulus side give improved warmth move execution contrasted with the basic twofold pipe exchangers.

Riddheshwar R. Bilawane (2017) exhibited a survey of one of the aloof growth strategies utilized in a concentric cylinder heat exchanger utilizing inward wavy cylinder. The exhibition of counter stream heat exchanger will be examined with internal plain cylinder and inward wavy cylinder.

At that point this upgraded exhibition because of inward wavy cylinder will be contrasted and execution of warmth exchanger with internal plain cylinder and level of improvement willbe calculated in different hot fluid temperature input and different mass flow rates of hot as well as cold water. Tentatively, Overall warmth move upgrade will be examined and furthermore, the exploratory outcomes will be approved with CFD

simulation.Patel Yogeshwari (2017) talked about systematic arrangement of the compartment based twofold pipe heat exchanger model got utilizing Differential Transform Method for parallel stream with hypothetical shifting introductory and limit condition. The working liquid is transformer oil for example hot liquid and water go about as coolant. Convergence analysis of solution is also discussed. Pourahmad and Pesteei (2016) experimentally investigated on double pipe heat exchanger by inserting wavy strip tabulators' in the inner pipe, their findings are on considerable improvements in enhancement of heat transfer characteristics.

Dhanraj S. Pimple (2016) investigated the heat transfer and friction factor data for single -phase flow in a shell and tube heat exchanger fitted with a helical tape insert. In the twofold concentric cylinder heat exchanger, tourist was gone through the inward cylinder while the virus water was moved through the annulus. The impacts of the helical addition on warmth move rate and erosion factor were contemplated for counter stream, and Nusselt numbers and contact factor acquired were contrasted and past information for pivotal streams in the plain cylinder. The stream considered is in a low Reynolds number range somewhere in the range of 2300 and 8800. A most extreme rate addition of 165% in warmth move rate is gotten for utilizing the helical supplement in correlation with the plain tube.

K.A. Goudiya (2016) presented the literature survey of enhancement techniques in heat transfer using inserts.

Ayush Kumar (2015) discussed with different configurations. Here CDD (merged dissimilar spring tabulators) CDDSTs were put in the inward container of twofold pipe heat exchanger and impact on warmth improvement and rubbing component was tentatively researched. CDDSTs at different pitches i.e (p=0,p=15,p=16) were utilized for the various scopes of Reynolds number. For virus water its extents among 9000to17000 and for high temp water 18000 to 24000.

At long last outcomes from CDDSTs were contrasted and plane cylinder and results demonstrated that Nusselt number expanded while grinding element diminished with expanded in Reynolds number. Contact factor was expanded by 287% while Nusselt no. expanded by 28%. Anyway warm execution factor was most extreme for CDDSTs (p = 15) with worth 0.319.

Abhishek Tripathi (2015) introduced an audit on various plan of finned cylinder groups set on inline course of action and amazed game plan in cross stream. Countless trial and numerical works had been performed for improvement of air-side warmth move.

A short discourse is done on the impact of neighborhood warmth move conduct of round finned cylinder and examination of geometric and stream parameters incorporated into this paper. Various parameters like blade stature, balance dividing, balance thickness, tube distance across, tube separating, impacts of column and course of action of cylinder packs influence straightforwardly on the exhibition of strong round finned tube. Every one of these parameters are quickly talked about in this paper.

Discussions on some important points which affect the performance of tube bundles (i.e. inline and staggered arrangement) from various authors and their problem and related issues are presented in this paper. The flow profiles and the related heat transfer characteristics in the complex geometries are still needed to be verified.

Patnala Sankara Rao (2014) studied the performance of
(i) bare tube-in-tube heat exchanger,
(ii) tube in tube with twisted tape insert and
(iii) helical insert at annulus and twisted tape insert inside the inner tube of the heat exchanger.

Numerical results have been compared with the available analytical solution. It has been observed that there is a

good agreement between these two results: within ±19.78 percentage error limit for Nusselt number measurement and ±25 percentage error for friction factor.

Antony luki. A (2013) examined enlarged surface has been accomplished with dimples deliberately situated in an example along the container of a concentric cylinder heat exchanger with the expanded region on the cylinder side. Enlarged surfaces to expanding the warmth move coefficient with a resulting increment in the grinding factor.

In this examination to change the inward container of twofold pipe heat exchanger utilizing dimpled tube. In this structure the inward cylinders consider as the hot pipe gas and external cylinder is nano liquid. Here In this examination the properties of nano liquid from the alumina as the nano liquid with ethyl glycol as the base liquid. a. From this plan count the warmth move coefficient is expanded contrasted with plain concentric cylinder heat exchanger.

Correspondingly the viability is 8% expansion contrasted with plain concentric cylinder heat exchanger. The hypothetical outcomes demonstrate that the utilizing dimpled tube in concentric cylinder heat exchanger gives better execution. The displaying and investigation is done to fluctuate the dimple cylinder cross segments, ellipsoidal and round shapes utilizing CFD. At long last the upgraded dimple cylinder is contrast and the hypothetical, explanatory and examination the results.M.

Kannan (2012) made examination of various kinds of warmth move expansion strategies or techniques in warmth exchangers by broadened surfaces, check gadgets and whirl stream gadget. The framework has pursued distinctive geometric profiles for feasible warmth moved in exploratory outcome and contrast and reproduction result. The goal of these Experiments is to help the general warmth move forms and the strategies and gadgets that can be executed to upgrade more warmth move rate. The exploratory arrangement and mechanical assembly required to do the twofold pipe heat exchanger test.

The contraption incorporates tube-inside a-tube heat exchangers with strung thermometer at each end, estimating flagon, a water siphon and electric fountain gadget. Three of the four warmth exchangers are adjusted by one kind of the previously mentioned warmth move improvement procedures. These strategies used to establish out the warmth misfortune from the surface and related temperature of smooth movements likewise used to establish the viability, the adequacy are contrasting the diverse stream rates for which one is most extreme conceivable warmth move in twofold pipe heat exchanger. Annular strategy is higher rate of warmth move than other three strategies.

III. CONCLUSION

From the above study of various researches on heat transfer enhancement, this can be observed, that many of the authors have used active and passive methods for enhancing the heat transfer rate in a heat exchanger. Most of them have worked on either experimental or numerical analysis but the combined study of both hasn't been performed. In above studies twisted tape inserts of different twisted angles and twisted ratios are taken into considerations. Some of them have also used twin twisted tape inserts inside heat exchanger tubes for heat transfer enhancement.

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