A Review on Double Tube Heat Exchanger for Investing Heat Transfer Enhancement

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Abstract— for the performance of the heat exchanger, it was decided to increase the turbulence and mixing of the hot fluid flow inside the hot fluid tube by means of specially developed Delta fins, which are placed in both straight and offset configuration. . The added fins have the dual purpose of increasing the heat exchange surface and improving the mixing of the particles and thus increasing the heat transfer. Presentation of the heat transfer mechanism and introduction of the double tube heat exchanger in this work.

Keywords — *DTHE, heat exchanger, temperature, CFD.*

I. INTRODUCTION

The movement of heat is still an incredible place of interest for architects and researchers, as well as for creators, designers, and makers. Impressive efforts have been made to study conventional applications such as plastics manufacturing, general assembly, and electrical equipment, including general electrical chassis, heat exchangers, and elite gas turbines. Furthermore, a critical number of distributions cover elements that are both essential explorations and important new applications, eg. B. miniature conduit junctions, biological heat exchange, hardware cooling, semiconductors, and a series of regular miracles ranging from thermals in the seas to thermal vehicles in celestial environments. Efficient use of available energy is currently a requirement of one hour. This, of course, requires a powerful deal. In nuclear power, the devices are heat exchangers. Heat exchangers can be described as devices that transfer energy from a hot liquid to a cold liquid with the most extreme design and the lowest possible speculative and labor costs. Heat exchangers are used in a wide variety of applications. Some of the uses of heat exchangers can be found in the material handling industry, nuclear power plants, air circulation systems, refrigerators, rocket radiators, vehicles, etc. An extended heat exchanger design can lead to more careful planning of the heat exchanger, which can help save energy, material and expense. Investment fund under a heat exchange measure. To increase exposure to heat from heat exchangers, methods are used to increase the movement of heat. Thermal movement expansion strategies refer to various techniques used to increase the speed of thermal movement without affecting the overall design of the frame as a whole. For the most part, these methods are divided into two groups, passive and dynamic. Dynamic strategies include the use of an external power supply to improve thermal motion, some examples of dynamic methods that pulsate through reactive cams and cylinders, the use of an attractive field to destroy immune light particles in a flowing stream, etc., surface or design changes in the flow - Ducting by introducing fittings or additional material, eg. Use of indentations, use of rough surfaces, etc.

II. LITERATURE REVIEW

R. Thejaraju et al. [1] in the current work, the heat move properties, stream obstruction, and absolute thermohydraulic execution of a fierce wind current in a roundabout line with API in the Reynolds number scope of 6000-18000 were concentrated by mathematical reproduction. Our primary spotlight was on the impacts of honey bees with forward or in reverse design and point plates with various tendency points (θ = 30°, 45° and 60°) embedded into the round tube for a steady pitch of 0.03m. The outcomes show that the Nusselt number expanded from 2.39 to 4.63 occasions (Nu = 124.25 to 239.76) contrasted with the smooth cylinder. The worth of the exhibition file (PI) is in the request for 1.34 to 1.63, which shows that the corner embed has a generally excellent by and large thermo-pressure driven execution.

A.T. Wijayanta et al. [2] in the current work, the heat move properties, stream obstruction, and absolute thermohydraulic execution of a fierce wind current in a roundabout line with API in the Reynolds number scope of 6000-18000 were concentrated by mathematical reproduction. Our primary spotlight was on the impacts of honey bees with forward or in reverse design and point plates with various tendency points (θ = 30 °, 45 ° and 60 °) embedded into the round tube for a steady pitch of 0.03m. The outcomes show that the Nusselt number expanded from 2.39 to 4.63 occasions (Nu = 124.25 to 239.76) contrasted with the smooth cylinder. The worth of the exhibition file (PI) is in the request for 1.34 to 1.63, which shows that the corner embed has a generally excellent by and large thermo-pressure driven execution.

A. Bartwal et al. [3] Numerous investigations have been recorded in the advancement of smaller than normal heat transport gadgets utilizing an uninvolved warmth move intensification method. In a similar setting, another kind of addition math was created which permits to expand of the pace of heat move by convection by breaking the warm limit layer. The roundabout ring with wire network embeds was chosen in the current exploration fill in as an inclusion device to improve heat move.

M. R. Salem et al. [4] This work tentatively explores the properties of convective warmth move and the pressing factor drop of the water stream on the annular side of flat twofold cylinder heat exchangers. Twelve counter-current warmth exchangers are worked with/without single portion punctured confuses (SSPBs), which are produced with various opening distances, pits, cuts, pitch proportions and pitch points. The investigations are for the Reynolds number on the ring from 1380 to 5700 and for the Prandtl number from 5.82 to 7.86 completed.

V. M. Hameed et al. [5] An experimental study was conducted to investigate the performance of a double-tube heat exchanger with triangular copper fins used to expand the outer surface of the tube. For the inside of the tube, on the other hand, a type of external reinforcement is used by means of twisted clamps with inserts with different torsion ratios inside the tube. The results of ninety experiments were reported. These series have been made for smooth tubes, finned tubes and finned tubes with twisted tape in three different torsion ratios.

M. Sheikholeslami et al. [6] the influence of perforated and typical spiral-shaped fins on hydrothermal treatment in a water-to-air heat exchanger is shown. Air and water circulate in the outer and inner tubes respectively. The effects of the division ratio (λ), the Reynolds number (Rea) and the open area ratio (PR) are studied. Empirical formulas are obtained for heat output (η), Darcy factor (f) and Nusselt number (Nu). NSGA II and ANSYS FLUENT14 are selected for optimization and numerical simulation. The results show that a higher open area ratio provides better thermal performance than a lower one. The temperature gradient weakens as the open area ratio improves.

S. Skullong et al. [7] Effects of inserting a straight strip with double-sided delta wing pairs (called a "delta wing belt", DWT), which is used as a longitudinal vortex generator (LVG), on forced convection heat transfer and Frictional properties of heat flow with a uniform heat flow heat exchanger tube are investigated experimentally and numerically in the present work.

R.L. Mohanty et al. [8] In the present work, the performance of a double pipe heat exchanger [DPHE] with the Computational Fluid Dynamics (CFD) package [FLUENT 14.0] was evaluated and the results obtained were compared where possible. The whole analysis was done by selecting an existing design of a dual pipe heat exchanger with fixed flow conditions at the heat exchanger inlet. Research was carried out for different heat exchanger configurations using twist ribbon inserts with different torsion ratios, equally spaced twist ribbon and twist in the centre and with a protrusion on the outside. The effects of all these operations on the performance of the heat exchanger have been analyzed in detail.

L. Zhang et al. [9] In order to improve the understanding of the improved heat transfer for the shell side of a double-tube heat exchanger with spiral fins and fins, the three-dimensional velocity components for the shell side with and without fins were experimentally performed with a L 'laser Doppler anemometer (LDA) under the cylindrical coordinate system and fluid flow properties, i.e. the distributions of axial velocity, lateral flow, flow function and vorticity were analyzed using an orthogonal helical coordinate system.

S.Kumar et al. [10] this study examines the performance of a concentric tube heat exchanger with passive heat transfer technology. The performance of the heat transfer process in a given heat exchanger is determined for three different longitudinal, rectangular, triangular and parabolic fin profiles. Numerical analysis was performed in a parallel flow dual tube heat exchanger for the above profiles for different mass flow conditions in the inner and outer tubes. The width of the base and the height of the fins were kept constant for all three types. The simulated results showed an improvement in the heat transfer rate for a finned tube compared to a finless tube.

III. DOUBLE-PIPE HEAT EXCHANGER

Double tube heat exchangers, a form of shell and tube heat exchanger, use the simplest design and configuration of the heat exchanger, which consists of two or more concentric cylindrical tubes or tubes (one larger tube and one or more smaller tubes). Depending on the design of all cowl and tube heat exchangers, one fluid flows through the smaller tube and the other fluid flows around the smaller tube within the larger tube.

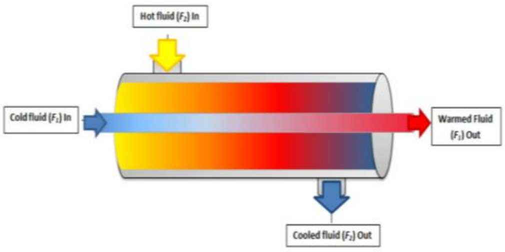

Fig. 1 Heat Transfer in a Double Pipe Heat Exchanger

The design requirements for dual-tube heat exchangers include the properties of the above types of recuperative and indirect contact, as the fluids remain separate and circulate in their channels during the heat transfer process. However, there is some flexibility in the design of dual tube heat exchangers as they can be designed in co-current or counter-current configurations and used modularly in series, parallel or series-parallel configurations within a system. For example, Figure 1 below shows the heat transfer in an insulated double tube heat exchanger with a DC configuration

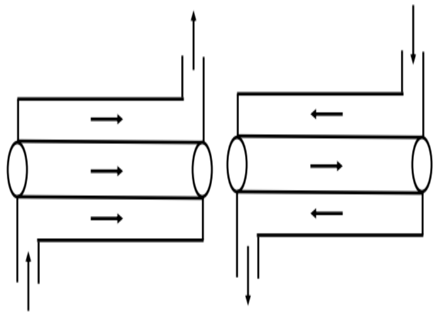

Fig. 2 Parallel Flow (left) and Counter Flow (right).

IV. HEAT TRANSFER MECHANISM

There are two types of heat transfer mechanisms used by heat exchangers: single-phase or two-phase heat transfer.

In single-phase heat exchangers, the fluids do not undergo any phase changes during the entire heat transfer process, so the warmer and colder fluids remain in the same physical state they entered the heat exchanger. For example, in water-to-water heat transfer applications, warmer water loses heat, which is then transferred to colder water and is not converted to gas or solid.

On the other hand, the fluids in two-phase heat exchangers undergo a phase change during the heat transfer process. The phase change can occur in one or both fluids involved, resulting in a transition from liquid to gas or from gas to liquid. Typically, devices that use a two-phase heat transfer mechanism require more complex design considerations than those that use a single-phase heat transfer mechanism. Some of the types of two-phase heat exchangers available include boilers, condensers and evaporators.

V. PASSIVE HEAT TRANSFER TECHNIQUE

As for passive heat transfer techniques, no external energy is needed to drive the upgrade system and instead the additional energy is absorbed by the main drives with an increase in pressure drop for the entire system. Some of the techniques involved are geometric modifications, insert insertion, twisted tapes, bands, elongated surfaces, vortex devices, treated surfaces, rough surfaces, wire spools, fluid additives and surface tension devices.

VI. CONCLUSION

There is still a demand for heat exchangers that can transfer heat efficiently while requiring less space. Researchers based on heat exchangers are still trying to develop an optimal heat exchanger design that will convert the given input into efficient performance. Many scientists have accelerated the pace of heat movements by introducing Insert, changing the container layout of the central heat exchanger, and also using nanofluids. A lot of research has been done with the DPHE on independent parallel, counter current and counter current systems. This article introduces the double tube heat exchanger and heat transfer mechanism.

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