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Review on Experimental Investigation of Convective Heat Transfer Coefficient by using Twisted Tape

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Abstract: The main intention of the study was to experimentally investigate transfer of heat and drop in pressure increment characteristics in a smooth circular copper tube with peripheral double u-cut twisted tape (PDUCTT) insert in a tube. The PDUCTT inserts is made from 3 mm thick and 25 mm wide copper strips. The tape has peripheral cuts with twist and depth ratio of 1.25 were twisted to obtain a twist ratio of 6 with u-cut on both sides.. This study focussed on the identification of the extreme flow regime with the PDUCTT inserts, Transfer in heat and drop in pressure connection therefore developed to vetificate the experimental data in the laminar, transitional and turbulent flow regimes as relates to Reynolds number, depth ratio.

Keywords: Prandtl Number, Convective heat transfer coefficient, Inserting tapes, Reynolds Number, Nusselt Number, passive technique.

I. INTRODUCTION

Experimental investigation of heat transfer coefficient of water refers to enhancement of heat transfer rate by enhancing the heat transfer coefficient.

The heat transfer coefficient can be increases by incorporating the inserts twisted tape to disturb the flow. These enhancement follow certain techniques that broadly classified into following three categories. Heat exchangers are found in many residential-, commercial and industrial applications because of the important roles they play in meeting our heat transfer needs. For example, heat conversion and heat recovery in energy or power generation systems; which include power stations (nuclear, fossil or renewable energy production systems), manufacturing processes, aircraft and transport industries, etc.

A. Passive Techniques

These techniques plays an important role for increment of heat transfer coefficient of the heat exchanger. By these techniques heat transfer coefficient can be improved which is the ultimate aim of increment of heat transfer rate. These can be achieved by using:

- 1) Treated Surface
- 2) Rough Surface
- 3) Extended Surface
- 4) Swirl Flow Devices
- 5) Coil Tubes
- 6) Additives for liquids

B. Active Techniques

If it is consider for design these is more complex method as it requires the flow modification and improvement due to external power input ,heat transfer coefficient. These techniques often used for the improvement of heat transfer rate because in many practical application there is need of external power

C. Compound Techniques

When any two or more than two techniques employed simultaneously for obtaining the enhancement in heat transfer rate by enhancing the heat transfer coefficient of the fluid is termed as compound enhancement. For these investigation the individual passive techniques is used but the more than one technique that are

II. SWIRL FLOW DEVICES (TWISTED TAPES)

A. Twisted Tapes

The twisted tapes are the simply metallic strip. These tapes used for converting the flow i.e. from linear to spiral along the tube length when inserted in the pipe of circular cross section. The tapes does not act as the fin as there is no good thermal contact between tube wall and the twisted tape. These plays an important role in the increment of heat transfer rate and also gives increase in pressure drop.

B. Review on Twisted Tapes

The paper focuses mainly on the review of work done on the Twisted Tapes in Turbulent and Laminar flow by using two types of twisted tapes that are described below.,

C. Plane Twisted Tapes

The review works on plane tube is describe as the following,

- 1) Behabadi [6] Experimental Investigation of Heat Transfer Coefficient and pressure drop during consideration in horizontal tube fitted with twisted tapes. The imperial correlations were created to vaticinate smooth flow and swirl tube and pressure drop.
- 2) Promvonge [7] experimentally investigated the heat transfer rate, friction factor and thermo hydraulic efficiency of combined devices of twisted tapes and wire coil. The experiment is kept out by systematize in two different form decreasing coil and increasing coil while the twisted tape was created with two different ratios.

D. Modified Twisted Tapes

The review works on Modified Twisted Tapes described in the following,

- 1) Saha [8] experimentally investigated the heat transfer enhancement and pressure drop characteristics in the tube with regularly spaced twisted tapes element. From the results it is executed that pinching of tape nay than in joining rods with tape element is be twisted tapes proposition from thermo hydraulic point of view.
- 2) Yadav[9] experimentally investigated on moiety length Twisted Tape Entry on transfer of heat and drop in pressure features in double pipe u-bend heat exchanger.
- 3) Mengna [10] find out tentetive drop in pressure and transfer in heat feature of a converging - diverging tube with equally spaced twisted tape. From result is is observed that Swirl vary in twist ratio and rotation angles.

E. Modified Twisted Tapes

The review work on Modified Twisted Tapes is described in following,

- 1) Radha krishnan[11] experimentally investigated the several thermo-physical properties and the non dimensional numbers. From result it is observed that the Nusselt number is higher for twisted tape as compared to plane tube.
- 2) Eiamsa-ard et al. [12] experimentally investigated the pressure drop and plane twisted tube pumping power required for plane twisted tube. From result it is observed that Nu, Friction Factor increased with increase in depth ratio.
- 3) Bharatdwaj et al.[13] experimentally investigated the heat transfer enhancement by using the Swirl flow devices. It is observed that the heat transfer rate increased by using the Swirl flow devices compared to plane tube.

III. CONCLUSION

This review paper has considered the heat transfer and improvement of heat transfer coefficient investigation of water by using u-cut twisted tape inserts placed in the heat exchanger. All the possible research have been summarized on the case in the literature, such as heat transfer and improvement of heat transfer coefficient of water and also the heat transfer improvement by the Swirl flow devices.

According to the literature survey the modified twisted tape have shown the greater heat transfer as compared to plain Twisted Tape due to creating the turbulence in the fluid flow of normal fluid. The aconsideration has focused on the heat exchanger efficiency improvement.

By adding the solid particles to heat transfer fluid the rate of heat transfer have been found to be greater than the base fluid. Many researchers have found the effect of turbulent flow on heat transfer.Particular for the heat exchangers with double pipe the heat transfer rate is increases by creating the turbulence in the fluid.

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