Design and Development of Spiral Heat Exchanger for Enhancing the Coefficient

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Abstract— A spiral heat exchanger is more conservative than numerous different sorts of warmth exchangers. The principle favorable circumstances of a winding warmth exchanger are its high generally speaking warmth move coefficient, minimal size for a given warmth trade territory, moderately low weight drop, and simplicity of cleaning. It is produced using two long metal strips that are twisted concentrically around a split place to make two winding channels, one for the hot liquid and one for the cool liquid. The one of a kind winding move of long metal strips makes the channels of a similar cross-sectional is structured and explored for the pace of warmth trade. It is discovered that the plate exchanger is equipped for taking care of up to a greatest weight of around 3 MPa check (435 psig) yet is normally worked underneath 1.0 MPa measure (150 psig).
Keywords: Spiral Heat Exchanger, PHEs

I. INTRODUCTION

The progression of the two liquids through a winding heat exchanger can be countercurrent stream, co current stream, or cross stream. For countercurrent stream, one liquid will enter at the focal point of the winding and exit at the circuit, while the other will enter at the periphery and exit at the middle. For co current stream, the two liquids will enter at the middle and exit at the periphery, or both will enter at the outline and exit at the inside. The liquid stream ways for countercurrent course through a winding heat exchanger[5]. For cross stream, one liquid will course through the winding way and the other will move through from one finish of the chamber to the next. The destinations of the examination are to configuration Spiral Heat Exchanger, To configuration test rig and to design a channel line format for dispersion of water to Spiral heat exchanger

II. LITERATURE REVIEW

Mohammed and Abed numerically examined laminar constrained convection heat move and liquid stream trademark in a creased channel, completed for the arrangement and discovered to be 500 to 2500, wavy points extend was from 0° to 60° and Prandtl number was 0.7. It was discovered that the ideal estimations of the heat move upgrade and weight drop were 3.6 and 1.11 occasions higher than those from the plane channel at wavy edge $\lambda = 40°$, individually [1]. Marjan et.al has made a test concentrate over folded plate heat exchanger by utilizing multi-walled carbon nanotubes (MWCNT). To examine grinding misfortune, heat move coefficient by convection, Nusselt number, siphoning influence and weight drop in a counter stream ridged plate heat exchanger distinctive water-based nano-liquids, for example, Gum Arabic-treated multi-walled carbon nanotubes (MWCNT-GA), functionalized MWCNT with cysteine (FMWCNT-Cys) and silver (FMWCNT-Ag) were utilized as coolants.[2].

Khan and Kumar depicted in the wake of performing test execution or viability of ridged plate heat exchanger for counter stream was discovered to be 44.5% more when contrasted with equal stream course of action. Just as exergy misfortune in counter stream is 7.2% less when contrasted with equal stream [3]. Rao et.al in their examination utilized folded plate heat exchanger with groove point 30°, 40°, 50°. From the trial examination it was discovered that 50° groove edge heat move expanded. It is additionally discovered that 60% Glycerol had high pace of heat move when contrasted with the half, 60% and water. Consequently in examination it has been discovered that with the expansion of crease edge just as with the expansion of consistency of liquid heat move rate increments [4].

Kumar et.al has made an endeavor to explore the exhibition and adequacy of layered plate heat exchanger. It was discovered that the viability of counter stream heat exchanger is 48% higher than the equal stream. Just as exergy misfortune was likewise determined and discovered 33% less in counter stream course of action when contrasted with the equal stream game plan [6].

III. METHOD AND MATERIALS

A. *Material selected:*

- Mild Steel (1mm thickness) for helical shape.
- Mild steel (2 mm thickness) for covering top and bottom of spiral heat exchanger.
- Design Specification:
- Helical shape 1:
- Base diameter 75 mm
- Helical spacing 40 mm
- No. of rounds -2
- Length – 400 mm
- Helical shape 2:
- Base diameter- 90mm
- Helical spacing – 40mm
- No. of rounds -2
- Length-400mm
- Final specification : (after insertion of helical shapes)
- Flow width : 400 mm
- Flow length : 1000 mm
- Flow height : 20mm

The design of the heat exchangers is shown in Fig 1,2 & 3.

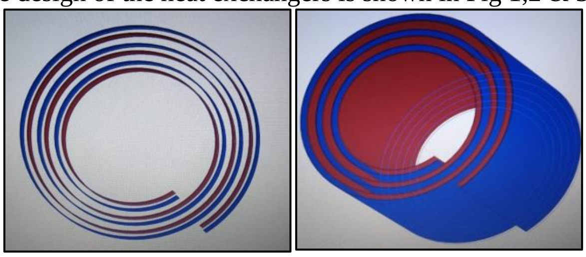

Fig. 1&2: Design of Spiral layouts

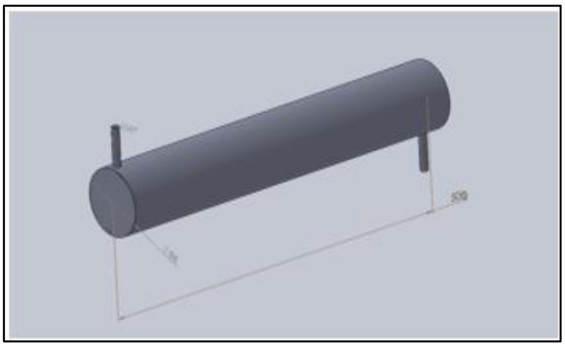

Fig. 3: Spiral heat exchanger final design

Winding plate heat exchangers are worked by moving two equal long sheets around to make a winding shape. The free last edges of channels at that point will weld together to seal the finish of channels. concerning the mass stream rate, various separations between the sheets can be picked during the plan time frame. In each channel, hot or cold liquid way, auxiliary streams are built up that lead to better blending and in this manner heat move rate is expanded and fouling is diminished. These heat exchangers are reduced yet their muddled development system cause higher essential development costs.

IV. Results and Discussions

There are no critical hot or cold spots in the exchanger that could prompt the disintegration of heat-touchy liquids. The volume of liquid held up in the exchanger is little; this element is significant with costly liquids, for quicker transient reaction, and for better procedure control. At long last, high warm execution can be accomplished in plate exchangers. The high level of counterflow in PHEs makes temperature approaches of up to 18C (28F) conceivable. The high warm adequacy (up to about 93%) encourages prudent poor quality heat recuperation. The stream instigated vibrations, clamor, warm anxieties, and passage impingement issues of shell-and-cylinder exchangers don't exist for plate heat exchangers.

V. Conclusion

Some natural constraints of the plate heat exchangers are brought about by plates and gaskets as follows. The plate exchanger is equipped for dealing with up to a greatest weight of around 3 MPa measure (435 psig) yet is generally worked beneath 1.0 MPa check (150 psig). The gasket materials (with the exception of the PTFE-covered sort) confine the utilization of PHEs in exceptionally destructive applications; they likewise limit the most extreme working temperature to 2608C (5008F) yet are typically worked underneath 1508C (3008F) to stay away from the utilization of costly gasket materials. The vortex generator with the assault point of 45° it will give the better viability of the heat move upgrade.

VI. Future Scope

The exhibition of the heat exchanger will be improved by mounting Protrusion on a superficial level. The surface geometries, which are well known in various modern applications.

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