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Design Development of Change in Pitch of Helical Copper Pipe Heat Exchanger

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***Abstract*: Helical heat exchanger is more compact, offer better heat transfer rates and heat transfer rate can be further improved by passive techniques. In Present Experimental work I have design the Helical Coil Heat Exchanger by taking the reference of designing Helical coil in Shell Heat Exchanger. By addition of variable pitch where in the shape geometry of the helical heat exchanger will be changed from a variable pitch heat exchanger . The geometry of the tubes plays a significant part in design and development of the heat exchanger. On the basis of design, by some suitable manufacturing process fabricated the coil.**

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INTRODUCTION

Paper work discusses the design of copper tube heat exchanger where in the copper tube is wound in a helical shape and hot fluid is always passed from top of the heat exchanger.

The modeling is done using Unigraphix Nx-8 and analysis has been done using Ansys work bench 16.0 . Test and performance comparison has been done in Parallel flow configuration for three pitch positions namely 0(close coil), 10mm and 20 mm respectively

1. PROBLEMSTATEMENT

Study of the variable pitch Helical heat exchanger along the axis of Helical is expected to enhance the Heat transfer rate of the fluid coming down in the Helical form.

Thus in-order to try out the possibilities as proposed in the research work is needed to be done and through our project we shall fabricate the objectives and carryout experimental work to support the claim of reducing in fouling and better performance through change in pitch will be done.

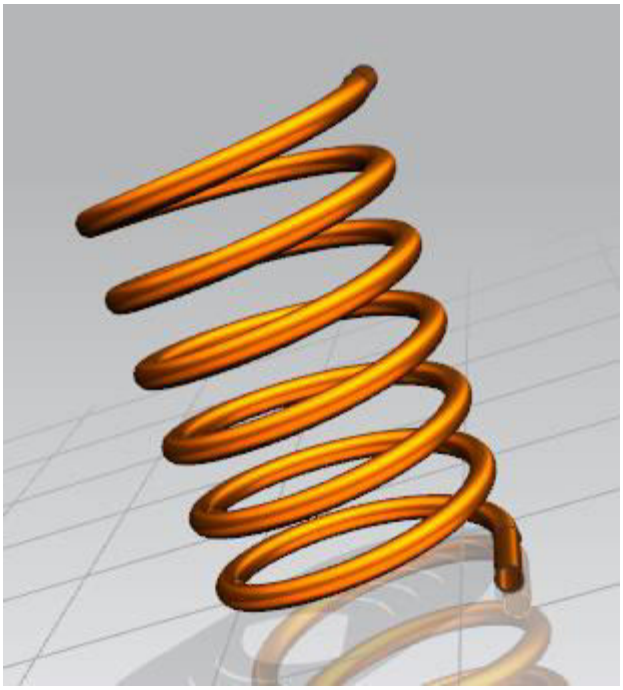

Fig: 1.Design of Helical Copper Coil

2. OBJECTIVES

a) Design Development and analysis of Helical copper tube heat exchanger of copper material.

b) Thermal analysis of heat exchanger usingANSYS

c) To study performance parameters of heat exchanger with variation in pitch of 0 (closed coil) , 10 mm and 20 mm in parallel flow configuration

d) Optimization of flow parameters to obtain maximum heat transfer for heat exchanger using minitab software

3. METHODOLOGY

Stage-1: Selection of materials and mechanical designing of the components by theoretical method using various formula and empirical relations

Stage-2: 3-D modeling of set-up using Unigraphics NX

Stage-3: Analysis and validation of designing of critical components by using Hyper mesh/ Ansys /Thermal Analysis

Stage-4: Manufacturing of heat exchanger and Test rig required for experimental analysis and validation. Suitable machines and methods will be employed to manufacture, fabricate and assemble the test trial unit and specimen components

Stage-5: Test and trial will be conducted in the parallel flow configuration to determine the LMTD, Capacity ratio, Effectiveness (NTU-Method), Overall Heat transfer coefficient and fouling factor

Stage -6: Three values of pitch augmentation , Close coil , H1 (10 mm) & H2(20 mm) will be used as subject factors

4.FINAL SPECIFICATION OF HEAT EXCHANGER:

Outside diameter of inner tube	6.4 mm
Inside side diameter of inner tube	5.4 mm
Pitch diameter	125 mm
Radial pitch	30 mm
Overall length of shell	300 mm
Material of tube	Copper

5. ARRANGEMENTS OF TUBES:

The arrangement of the tubes to attain maximum surface area would be to develop a Helical heat exchanger with the cross-section of the tube structure as follows:

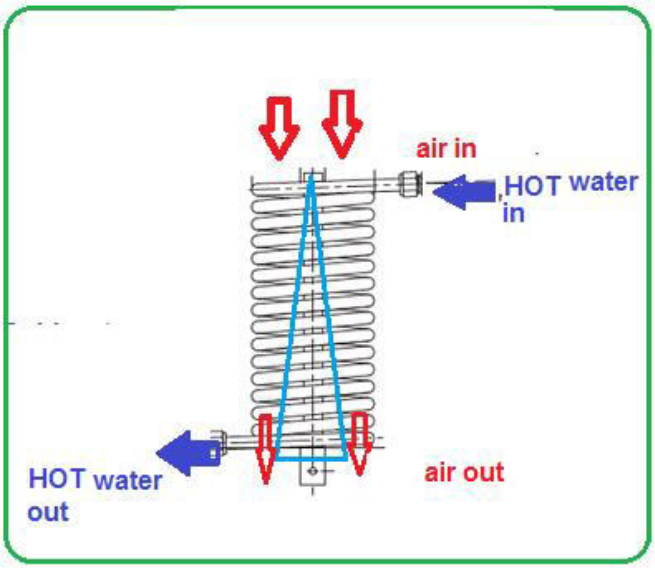

Fig: 2.Arrangement of Tube

6. COMPONENTS OF VARIABLE PITCH MECHANISM :

The arrangement is suitable designed to change the pitch of the coil , the variation is done by rotating the nut in the coil base , and the motion of the screw which translates up or down will cause the pitch to change as it pulls or pushes the top lock along with the movable top end of the coil.

7. ARRANGEMENT OF HELICAL COIL HEAT EXCHANGER WITH VARIABLE PITCH MECHANISM :

8. CONCLUSION:

a) Helical heat exchanger is more compact, offer better heat transfer rates and heat transfer rate can be further improved by passive techniques. Its shape offers advantages such as more fluid contact, elimination of dead zones, and secondary turbulence.

b) Variation in pitch of the coil we will enhance the heat transfer rate of the fluid.

c) In Present we design the Helical Copper Coil. Validation of component done by using Hyper Mesh / Ansys /Thermal Analysis. Also Fabrication of components used for variation of pitch is done.

d) Due to Variation in Pitch of helical coil heat Exchanger We will determine the LMTD, Capacity Ratio , Effectiveness (NTU Method) , Overall heat transfer coefficient.

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