Comparison of Circular & Elliptical Tubes for Heat Exchanger

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Abstract— Ever since human civilization has evolved, it has made continued Improvements to the various instruments used by them, resulting in the this modern era possible where humans enjoy their own inventions which includes energy consuming devices like fan, light, AC, etc. Recently we have observed the shortfall of energy generation in comparison to energy demand, especially in developing countries such as India, Pakistan, etc. In such situations, Improvement of energy efficiency in energy generation side as well as energy consumption side is highly desirable. Such efforts have led to development of LED bulbs and CFL bulbs on energy consumption side and many thermal efficiency improvement methods on the energy generation side. In this paper, an effort is made to study the effects of using Elliptical tube instead of circular tube on the working of a heat Exchanger.

Key words: Heat Exchangers, Thermal Power Plant, Geothermal Power Plant, Finned Heat Transfer, Elliptical Tubes

I. INTRODUCTION

Heat exchangers are one of the most utilized hardware in the process enterprises. Heat exchangers are utilized to transfer heat between two process streams. One can understand their utilization that any procedure which include cooling, heating, condensation, boiling or evaporation will require a heat exchanger for this reason. Process fluids, most often are heated or cooled during a Process in the Chemical Industries. Diverse heat exchangers are named by their application. For instance, heat exchangers being utilized to condense are known as condensers, comparably heat exchanger for boiling reasons for existing are called boilers. Performance and proficiency of heat exchangers are estimated through the measure of heat transfer utilizing minimum zone of heat transfer and pressure drop. An all the more better introduction of its proficiency is finished by ascertaining over all heat transfer coefficient. Pressure drop and zone required for a specific measure of heat transfer, gives knowledge about the capital cost and power requirements (Running cost) of a heat exchanger. The more the Pressure drop, the greater will be the pressure difference between Inlet & outlet, the more pressurizing is required on the fluid by pump or compressor. More often than not, there are loads of calculations and speculations involved while designing a heat exchanger as indicated by the requirements.

II. LITERATURE REVIEW

B.Jayachandriah, K. Rajasekhar depict that if the material of the condenser pipe is transform it will specifically influence on heat transfer rate of the condenser. In this paper creator is doing the thermal computational fluid progression analysis of the pack of the pipe. As portrayed above creator utilized two materials for pipe that is copper and metal and the shell is made of the steel 1008. In the event that the thermal conductivity of any material is high so their heat transfer rate is likewise high since it specifically promotionally to the conductivity of the material. here creator is demonstrating of the shell and tube compose heat exchanger in the CATIA V5 software, CATIA is a pre-processor were the strong geometry is made utilizing 2-D illustrations, module is then sent out as IGES petition for cross section reason.

G. S. L. Swathi, V. Subrahmanyam depict that the fundamental goal of the paper is to have material of the Heat Exchanger (Al and Cu), so the heat transfer rate ought to be increasingly and furthermore manages the pressure varieties, velocity forms and temperature circulations. Geometry was created in Gambit and Computational Fluid Dynamics calculations utilizing K-Epsilon demonstrate were utilized in Fluent software. This recreation gives the estimations of temperature, pressure, heat transfer rate and speed at different segments of the pipe in which water as a fluid and air as coolant flowing outside.

Prof. Rupesh G. Telrandhe, Prof. T.S.Karhale, Prof. B.B.Deshmukh portray that the parameters changed amid the experimentation and software analysis are tube distance across, and heat provided. The temperature is found more in substantial measurement pipe. It lessens with diminish in pipe diameter. The adjustment in temperature was found around 20 % with increment in pipe width multiplied. In the event that the heat supply builds it will influence on the yield temperature and it likewise increments.

Paresh Patel, Amiteshpaul depict that adaptability in design on the grounds that the center geometry can be differed effortlessly by changing the tube diameter, length, and game plan. Here author is do the computational fluid dynamic analysis in ANSYS with the tube materials aluminum and steel. the most extreme temperature created amid the analysis is 363 K promotion least temperature delivered is 341 K. least temperature is created at the yield of the icy fluid, the most extreme velocity delivered amid the analysis is 0.405 m/sec advertisement least velocity created is 0.2807 m/sec is or the aluminum material.

III. RESEARCH METHODOLOGY

Research is a systematic endeavor to get answers to significant inquiries about wonders or occasions through the use of logical strategies. It begins with an issue, gathers information or realities, examinations them basically and achieves choices in view of the genuine confirmations. Along these lines it is a watchful and unending quest for truth and an interminable mission for learning. This is conceivable just with the utilization of right methodology.

There were no real life testing of these parameters, as through the fabrication of an condenser with given modified parameters is possible, it is utmost difficult to get the constant supply of any working fluid at design input temperature, without any tie up with the industry. So I have

limited the project to carry the analysis in computer software only.

A. Data Taken for the Study

The data of surrounding parameters such as inlet temperature of working fluid, working fluid pressure, etc. was taken from an existing system in a real life plant, working under steady-state conditions. The construction details of the condenser was also taken from the same real life application.

IV. Result and Analysis

This analysis is used in industrial application such as heating, ventilation and air conditioning. In this analysis circle and ellipse area and circumferences are compared with each other through fined tube.

– Ellipse

An ellipse is defined as the locus of a point which moves to such an extent that the whole of its distance from two settled focuses stays consistent.

The fixed focuses are the foci of the ellipse.

i.e. |PF| + |PF'| = steady

In figure, F and F' are the two foci and D is the center of the ellipse. AA' is the major axis and BB' is the minor axis; OA and OB are the semi-axes. Likewise 2a is the length of major axis furthermore; 2b is the length of minor axis.

A. Equation of the Ellipse

An ellipse is a conic segment, shaped by the convergence of a plane with a correct circular cone. The standard shape for the equation of the ellipse is:

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

On the off chance that the ellipse is situated horizontally, the Equation is:

$$\frac{(y-k)^2}{a^2}+\frac{(x-h)^2}{b^2}=1$$

B. Comparison of Circle & Ellipse by Minor & Major Axis

Finned tube heat exchangers are broadly utilized as a part of numerous mechanical applications, for example, aerating and cooling, concoction handling frameworks, Heat exchangers for refrigeration and away tanks of waste atomic materials and so forth. All in all the expansion of heat transfer from tubes conveying stream of hot liquid to the encompassing chilly gases is achievable by appending varieties of annular fins to the external surface of the tubes.

V. Conclusion

The majority of the engineering issues require elite heat transfer parts with continuously less weights, volumes, obliging shapes and expenses. Broadened surfaces (fins) are one of the heat trading gadgets that are utilized widely to build heat transfer rates. The rate of heat transfer relies upon the surface territory of the fin. Spiral or annular fins are a standout amongst the most prevalent decisions for trading the heat transfer rate from the essential surface of barrel shaped shape. The execution of the fin communicated as far as fin productivity as curves known as the fin-proficiency curves for various kinds of fins. These curves have been gotten in view of steady convection heat transfer coefficient differential equation for annular fins of uniform thickness. It is exhibited that inexact investigative temperature profiles and heat transfer rates of good quality are effectively realistic without falling back on the correct logical temperature dispersion and heat transfer rate encapsulating adjusted Bessel capacities.

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