A Review Paper on Design And Simulation Of Shell And Tube Heat Exchanger

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***Abstract*– In this paper, the shell and tube heat exchanger is considered in which hot water is flowing inside one tube and cold water runs over that tube. Computational fluid dynamics technique which is a computer based analysis is used to simulate. the heat exchanger involving fluid flow, heat transfer. Lots of researches are going on to improve the heat transfer rate of the heat exchanger. Here, we have fabricated the shell and tube heat exchanger with selecting the materials on the primary objective of enhancing the heat transfer effectiveness. We casted the tube in the spiral. shape with the helical angle of 30. The project's ideology is based on the use of baffles attached to the heat exchanger to increase the flow rate of highly viscous fluids. The paper's intended result is to determine the rate of heat transfer using hot water as the hot liquid. Shell and Tube heat exchangers are having special importance in boilers, oil coolers, condensers, pre-heaters. They are also widely used in process applications as well as the refrigeration and air conditioning industry. The robustness and medium weighted shape of Shell and Tube heat exchangers make them well suited for high pressure operations.**

***Key Words*: Shell and tube heat exchanger,Effectiveness Helical tube,ANSYS Fluent.**

1.INTRODUCTION

Heat exchanger can be defined as a device that transfers heat from one fluid to another. The fluids can be single-phase or two-phase, and they are separable or are in direct contact, depending over exchanger's type. Heat exchanger can be defined as a device that transfers heat from one fluid to another. The fluids can be single-phase or two-phase, and they are separable or are in direct contact, depending over exchanger's type. (Hemanth and Mulabagal, 2017) Heat exchangers are not generally thought of as devices that use energy sources like nuclear-fuel pins or fired heaters, despite the fact that many of the principals involved in their design are the same. In many industrial applications, it is beneficial to raise one fluid's temperature while reducing another's temperature. This double action is economically accomplished by a heat exchanger. Shell and tube heat exchangers. Shell and tube heat exchangers consist of a series of tubes. One set of these tubes contains the fluid that must be either heated or cooled. The second fluid runs over the tubes that are being heated or cooled so that it can either provide the heat or absorb the heat required. A set of tubes is called the tube bundle and can be made up of several types of tubes: plain, longitudinally finned, etc. Shell and tube heat exchangers are typically used for high- pressure applications. Heat exchangers are devices used to transfer heat energy from one fluid to another. Typical heat exchangers experienced by us in our daily lives include condensers and evaporators used in air conditioning units and refrigerators. Boilers and condensers in thermal power plants are examples of large industrial heat exchangers. Our automobiles incorporate heat exchangers in the form of oil coolers and radiators. The tube setup, the type, position, and opening of the baffles, the spacing between the baffles, the location of the most extreme baffles, and additional possibilities for improving heat transfer are among the most important geometric parameters [6]. Shell and tube heat exchangers. are the most common kind of heat exchanger because of their simple design and performance characteristics. These shell and tube heat exchangers do what they are supposed to do, but they can still be effectively constructed with higher heat transfer rates. Heat exchangers are often used in heating. and cooling systems when controlling the system temperature is needed for a high-quality product. The effectiveness and efficiency of the heat exchanger impact the quality of the result.

1.1 Basic Design Procedure of a Heat Exchanger

In general, a selected shell-and-tube heat exchanger must satisfy the process requirements within the design limitations. In Figure 1-3, the basic logical structure of the design steps of heat exchangers is presented. And the details of the basic logical structure are discussed below.

- First step is the problem identification. The design problem must be identified completely. Inlet and outlet temperatures, and pressures of the streams, flow rates, and fluid states must be determined in detail.

- Next step is the selection of the basic configuration of the heat exchanger.
- Then, the heat exchanger design parameters are tentatively selected. Preliminary estimate of the heat exchanger size can be made.
- Next step is the rating of the design. Rating is the computational process in which the thermal performance and the pressure drops for both streams are determined.
- After the rating step is completed, the next step is the evaluation of the design. In this step, pressure drops, outlet temperature values and the heat duty of the heat exchanger is examined. If the examined parameters are not acceptable, the design parameters should be modified. The design should be rated again until the required design criteria are met.
- And the final step is the mechanical design and costing.

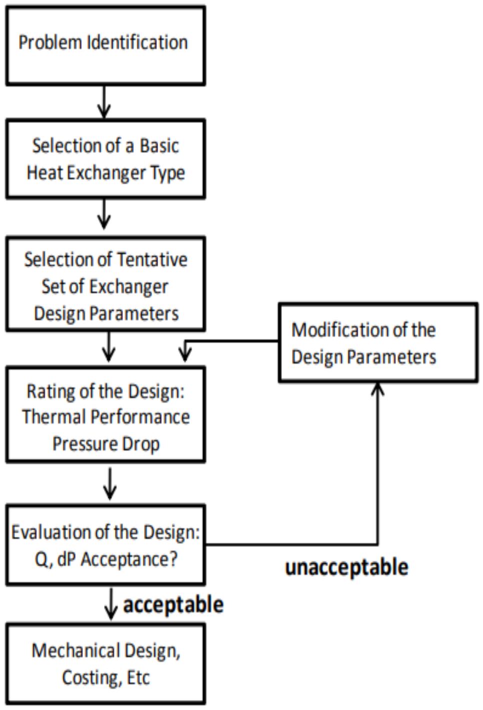

Fig. 6. Basic logical structure of the process heat exchanger design procedure (Bell 2004)

2. METHODOLOGY

Design is an activity aimed at providing complete descriptions of an engineering system, part of a system, or just of a single system component design methodology for a heat exchanger as a component must be consistent with the life-cycle design of a system. There are two main design for this paper even for general design of STHEX

2.1. Thermal Design

Heat exchanger thermal/hydraulic design procedures top in involve exchanger rating (quantitative heat transfer and pressure drop evaluation)and/or exchanger sizing. Only two important relationships constitute the entire thermal design. Two of the simplest (and most important) problems are referred to as the rating and sizing problems.

2.2. Rating Problem

Determination of heat transfer and pressure drop performance of either an existing exchanger or an already sized exchanger (to check vendor's design) is referred to as a rating problem. Inputs to the rating problem are the heat exchanger construction, flow arrangement and overall dimensions, complete details on the materials and surface geometries on both sides, including their non-dimensional heat transfer and pressure drop characteristics (jor Nu and f vs. Re).(fluid flow rates, inlet temperatures, and fouling factors. The fluid outlet temperatures, total heat transfer rate, and pressure drops on each side of the exchanger are then determined in the rating problem. The rating problem is also sometimes referred to as the performance orsimulation problem.

2.3. Sizing Problem

In a broad sense, the design of a new heat exchanger means the determination/selection of an exchanger construction type, flow arrangement, tube/plate and fin material, and the physical size of an exchanger to meet the specifiedheat transfer and pressure drops within all specifiedconstraints. However, in a sizingproblem for an extended surface exchanger, we will determine the physical size (length, width, height, and surface areas on each side) of an exchanger. For a STHEx a sizing problem in general refers to the determination of shell type. diameter and length, tube diameter and number, tube layout, pass arrangement, and so on. Inputs to the sizing problem are surface geometries (including their dimensionless heat transfer and pressure drop characteristics), fluid flow rates, inlet and outlet fluid

3. CONCLUSIONS

In this research paper, shell and tube heat exchanger are modelled using Creo parametric and analyses have been performed using Ansys flunt. The main contribution of this paper was to design and simulate of Shell-and-Tube Heat Exchanger (STHE) with the effect of baffles using Ansys-CFx software, generating the high quality of Mesh (Tetrahedra) and CFx as the CFD solver Besides, the contour plot and volume rendering are generated for a better understanding flow through Exchanger (STHE). Finally, the air is found to have better performance found simulation is done under a steady-state phenomenon.

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