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A Review Of Air Cooled Heat Excghanger Design Parameter

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Abstract:

This article experimentally and numerically investigates the thermal performance of a Crimped finned tube completely enclosed in a duct, which is cooled through an air cooled heat exchanger. The air in the heat exchanger includes external flow paths. The external air driven by the rotation of the centrifugal fan goes through the heat exchanger mounted on the top of the frame. The internal air absorbs heat released from the hot water inside the tube and then transfers the heat to the heat exchanger through the motion of centrifugal fan. Several test rigs have been set up to measure the performance of the fan and the finned tube. The Fluent software package is adopted to analyze the complicated thermal-fluid interactions among the centrifugal fan, centrifugal fans, heat exchanger, U-tube manometer. The measured data, including the fan performance curves and the temperature profiles of the heat exchanger, show good agreement with the simulated results. A detailed discussion is also included to improve the finned tube cooling Performance. Wide range of finned tube heat exchangers is constructed with the help of specialized.

European technology. They have large heat transfer area, which further improves their efficiency. We use seamless or crimped tubes in copper aluminum, mild steel, brass, aluminum brass, copper and nickel that meet the tema standards, for the construction of these heat exchangers. The tube ends can be welded or brazed. Quality checks like pneumatic, x-ray hydraulic, penetration testing are carried out in order to confirm to international quality standards. Finned tube heat exchangers are also available in customized specifications as per the clients' requirements.

Introduction

An air cooled heat exchanger, or ACHE, is simply a pressure vessel which cools a circulating fluid within finned tubes by forcing ambient air over the exterior of the tubes. A common example of an Air cooled condenser Car radiator Air cooled heat exchangers are used for two primary reasons. They increase plant efficiency They are a green solution as compared to cooling towers and shell and tube heat exchangers because they do not require an auxiliary water supply (water lost due to drift and evaporation, plus no water treatment chemicals are required).

Air cooled heat exchangers rely on thermodynamic properties of heat transfer. Specifically, heat transfer is energy released over time. Two standard formulas used to calculate

heat transfer are as follows:

Fluid Mass Flow * Cp * Delta T

Rte * Area * LMTD

Figure 1

- Maximize tube length while maintaining >=40% fan coverage
- Design air cooler with a 1 to 3 ratio. For example, if your cooler is 30' long it should typically be around 10' wide. This helps reduce the header size, the most expensive portion of an air cooler, while still maintaining proper fan coverage.
- Minimize tube rows to increase heat transfer effectiveness of area, minimize header thickness. Typically between four to six tube rows

- Try and maintain 1" tube diameters, depending on service. Even high viscosity services that appear to benefit from larger diameter tubes can typically be designed cheaper with more 1" diameter tubes.
- Use a counter-current flow where possible as it reduces surface and potentially minimize header plate thickness.
- Increase your allowable pressure drop. This allows more passes in the bundle reducing the cooler size.
- Know who offers you a thermal guarantee! Commercially available software does not offer such guarantee so please allow GEA to offer you the most economical design while still guaranteeing thermal performance!

Thermal dissipation becomes a key consideration in the operation of finned tube heat exchanger, since overheating will result in a decrease of the performance. Having information

for the flow and temperature fields inside the heat exchangers and the temperature distributions of air stream and flowing water through Experimentally. Therefore, a Computational Fluid Dynamics (CFD) software package is useful for investigating the complicated thermal-fluid interaction problems inside the tube.

Many papers have used CFD simulation methods and experimental testing methods to investigate the performances of the fan and the heat exchanger. Applied Experimental testing and simulation to explore the unsteady flow generated by a centrifugal fan. Performed numerical and Experimental analyses to discuss the influence of finned tube geometry on the unsteady flow in a centrifugal fan.Used computational fluid dynamics to predict the flow and pressure fields in the centrifugal pump. In addition, optimization of the fan performance was also investigated through the theory model provided CFD results for thermal and flow analysis to optimize the thermal performance of the air cooled heat exchanger.

The present article experimentally and numerically investigates the thermal performance of a Heat Exchanger. The article is divided into three parts. In the first part, the performances of centrifugal fans are demonstrated in order to provide the performance curves for fans simulation. Then, the temperature distributions of the heat exchanger and pressure at inlet and outlet of the tube are simulated and compared with the experimental data. Finally, the whole heat Exchanger flow fields, pressure fields, and temperature

profiles in the heat exchanger and rotor are discussed. A strategy to improve the thermal performance of the heat Exchanger is also proposed.

CFD Modelling

This paper reports the experimental and Computational Fluid Dynamics (CFD) modeling studies on heat transfer, friction factor and thermal performance of an air cooled heat exchanger equipped with two crimped finned tube of different Pitch. In the studied range find out performance of different finned tube at different condition for the maximum thermal performance factor was obtained by the Experimentally. The results have also revealed that the difference between the heat transfer rates obtained from Experimentally . The CFD predicted results were used to explain the observed results in terms of turbulence intensity. In addition, good agreements between the predicted and measured Nu number as well as friction factor values were obtained.

Experimental Testing And Simulations

In this study, the crimped tube heat exchanger completely enclosed in a duct which is cooled by forced convection air cooled supply by centrifugal fan. Dimensions of Duct 4ft x 1ft.The includes a centrifugal fan, fined tube heat exchanger, Heating coils. As shown with the blue arrows, the external flow is driven by the rotation of the centrifugal fan, which is mounted externally to the frame on the table. The external air flows through the finned tubes of the different pitch heat exchanger mounted on the middle of the duct.

Several test rigs have been set up to measure the performance of the centrifugal fan, inlet and outlet water temperature, Inlet and outlet water pressure of crimped finned tube heat exchanger. The centrifugal fan with four blades are first tested through Anemometer test apparatus. The purposes of these tests are to get the fan performance curves and compare them with the numerical results. The temperature measurement locations at the heat exchanger are demonstrated in Figures 2 and 3. Figure 2 shows the three-dimensional (3D) view of the enclosed air cooled heat exchanger. It indicates the measured temperature locations of the external air from fan to the heat exchanger. Figure 3 illustrates the four cross sections in the Duct to measure the temperatures at different location. The flow rate of the external air is measured by the anemometer at the inlet and outlet of Duct. The Fluent commercial software package is adopted to simulate the flow, pressure, and temperature fields of enclosed air cooled heat exchanger. Testing . The physical model is assumed to be an incompressible flow with constant properties. In the

calculation, the k-ε turbulent model with suitable boundary conditions is adopted by using an implicit segregated steady-state solver. For the temperature calculation, the energy function is actuated in the simulated process. In addition, a second upward scheme is used to get more accurate results.

Conclusion

In this section, the performance of the centrifugal fan, heat exchanger will be discussed. The simulated results will be compared with the experimental data to verify the numerical predictions. Then, modifications of the present design are also proposed to enhance the thermal performance of the enclosed air cooled heat Exchanger. In this experiment this obtained that the performance of Heat exchanger at different air stream supplied by centrifugal fan. Here also heat exchanger tested at different temperature condition which is regulated by heating coils. With increasing crisis of water air cooled heat exchanger is the best alternatives of water cooled heat exchanger this technology is in development phase. Fins are basically external surfaces on tube for increasing the surface area of the bare tube ,resulting in a compact Heat Exchanger. The method of attaching the fins over tube is of prime importance, since even a slightest air gap between the tube and fins will defeat the whole purpose of fins over the tube. Considering the above facts Heft has indigenously designed and developed a special purpose tube fining machine capable of producing g following types of finned tubes. HEFT was formed in 1994 to provide the service to petrochemicals, power generation, chemicals, pharmaceuticals industries with high quality HELICAL WOUND FINNED HEAT EXCHANGERS tubing used in the maintenance and manufacture of the air cooled heat exchangers, air heaters & other related heat exchangers.

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