Numerical Analysis of the Double Tube Heat Exchanger with Leaf Shape of Fins by Using Ansys Fluent-A Review

Nagendra Bharti[1], Saumitra Sharma[2]

[1]*MTech Scholar*, [2]*Assistant Prof. ME Department*

Oriental College of technology, Bhopal

Abstract – A heat exchanger is a device used to transfer heat between a solid object and a fluid, or between two or more fluids. The fluids may be separated by a solid wall to prevent mixing or they may be in direct contact heat exchanger is a device used to transfer heat between a solid object and a fluid, or between two or more fluids. The fluids may be separated by a solid wall to prevent mixing or they may be in direct contact heat exchanger is a device used to transfer heat between a solid object and a fluid, or between two or more fluids. The fluids may be separated by a solid wall to prevent mixing or they may be in direct contact There number of method to increase the heat transfer in the heat exchanger .to increase surface area of the heat exchanger is one of them Enhanced surfaces, such as fins, can add a significant amount of surface area in the same package space. Heat exchangers are typically held to tightly constrained package envelopes, so adding enhanced surfaces is a common practice to improve performance. In this work performance of the heat exchanger with fins judged of the basis of the LMTD and over heat transfer coefficient using CFD technique .As expected manually it is very difficult that's why ANSYS Fluent 16.0 used to analyze. At end of the work it is found heat transfer of the heat exchanger is increased after applying the fins.

Keywords: heat exchanger, CFD, ANSYS FLUENT, LMTD, FINS

I. INTRODUCTION

In the high temperature process industries especially for petrochemical and refineries account for 78% of energy used in the next three decades. Waste heat is generated by the process of fuel combustion or chemical reaction, and then release into the environment even though it could still be reused for some useful and economic purpose. The strategy of how to recover this heat depends on the temperature of waste heat gases and economics involved.

The shell and tube heat exchanger is realized as the important equipment in waste heat recovery system. However, its volume is large and manufacturing costs is high because of the low heat transfer efficiency. It is necessary to improve heat transfer performance of heat exchanger by reducing the metal consumption and save operating cost.

Finned tube heat exchanger is widely used to enhance the heat transfer in many thermal engineering fields. Huge amount of hot flue gases is generated from Boilers, Kilns, Ovens and Furnaces. If some of this waste heat produced by different methods could be recovered, a considerable amount of primary fuel could be saved. The energy lost by waste gases produced by the furnace cannot be fully recovered. However, much of the heat could be recovered and loss minimized by adopting following method discussed.

This work attempts the analysis of double tube heat exchanger with the comparison of with fin to without fin. This work also attempts the analysis of double tube heat exchanger with different mass flow rate and regress the friction on changing the mass flow rate. We have to increase the mass flow rate then velocity should be increased. If velocity increased Reynolds number is also increased and friction should be minimized.

II. SYSTEM MODEL

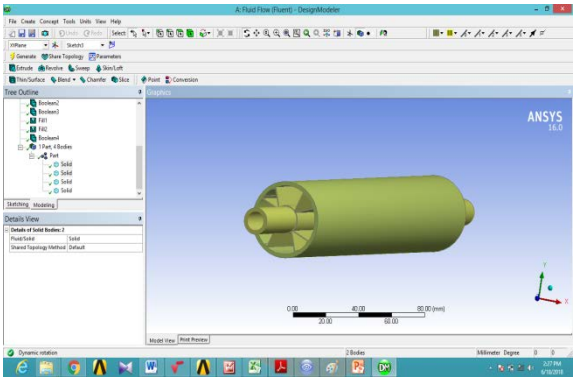

Fig. 2.1 concentric duble tube heat exchanger with internal fins

III. PREVIOUS WORK

In our study on concentric double tube heat exchanger there is different fin profile like triangular, rectangular and concave etc for internal fins should be used. The width and length of the fin is changed to increase the heat transfer rate. Mostly researchers mainly focus on how to change the fins shape to achieve the desired heat transfer rate.

IV. PROPOSED METHODOLOGY

- Analyze the double tube heat exchanger by passive method.
- With the help of four fins sample of blossom shape fins numerically analyzed.
- The effects of geometric structure on different temperature analyze.
- To develop the mathematical modelling.
- See the effect of temperature on different mass flow rate.
- The heat transfer rate on different mass flow rate is calculated.
- The dimensionless number that is Reynolds number is regressed.
- Friction factor on the changing of different mass flow rate were analyzed.

V. CONCLUSION

- According to analysis of the double tube heat exchanger with fins and without fins it is found that it is always beneficial to use heat exchanger which is equipped with fins.
- Heat transfer in concentric double tube heat exchanger with fins is more than the without fins.
- The shape of fin is change the heat transfer rate is increased if effectiveness of the fins should be more than 1.
- The mass flow rate is changed then the heat transfer rate should be increased.
- By changing the mass flow rate friction is minimize.

REFERENCES

[1] Bandu A.mule et.al. “Analysis of double pipe heat exchanger with helical fins.” International Research Journal Engineering and Technology. (2017) vol.4,Pp. 961-966.

[2] Shiva kumar et.al. “Numerical study of heat transfer in a finned double pipe heat exchanger.”World journal of Modeling and Simulation. (2015) vol.11, Pp. 43-54.

[3] Monica J. Indhe et.al. “Optimization of longitudinal fin profile for double pipe heat exchanger.” International Research Journal Engineering and Technology. (2015) vol.2, Pp. 517- 529.

[4] M.j. scott et.al. “A parametric analysis of the performance of internally finned tube for heat exchanger application” (2009) Pp. 38-43.

[5] Mayank bhola et.al. “Heat transfer enhancement in concentric tube heat exchanger in ANSYS FLUENT.” International Research Journal Engineering and Technology. (2015) vol.4, Pp. 7-10.

[6] Holger martin et.al. “Calculation of heat transfer from pressure drop in tube bundles.” Edizioni ETS ,Pisa (2000) Pp. 1155-1160.

[7] Milind v. rane et.al. “Water to water heat transfer in tube – tube heat exchanger.” Applied Thermal Engineering. (2005) Pp. 2715- 2729.

[8] Tejal m. rana “Effect of tube diameter on heat transfer through staggered tube bundles of shell and tube heat exchanger.” International Journal of Advance Engineering and Research Development. (2017).