A Review on different types of heat exchangers

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Abstract

*A **heat exchanger** is a system or device which is used to transfer heat between two or more fluids. Heat exchangers are used in both cooling and heating processes. The exchange of heat can be direct or indirect as per the suitability. Heat exchangers are the devices which have a wide application in almost all sectors of prime importance. The oldest example of heat exchanger is radiators in internal combustion engines. This paper presents a review of various types of heat exchangers and amendments done on its design parameters by various researchers to improve its effectiveness and suitability for various applications.*

Keywords: Heat exchangers, effectiveness, efficiency.

Introduction

A **heat exchanger** is a device that allows heat from a fluid (a liquid or a gas) to pass to other fluid (another liquid or gas) *without the two fluids having to mix together or come into direct contact*. We can see heat exchangers in all kinds of places and works around us, usually working to heat or cool buildings or helping engines and machines to work more efficiently and effectively. There are many types of heat exchangers available. The most widely used among all is shell and tube heat exchanger. In **shell and tube** heat exchangers, one fluid flows through a set of metal tubes while the second fluid passes through a sealed shell that surrounds them. The material use for the fabrication of heat exchangers are generally metals, ceramics or composites. Various factors account for the effectiveness and efficiency of heat exchangers which includes its material, designing parameters or operating conditions. This paper presents the contribution and research done by various researchers in this field and shows the various designing aspects of heat exchangers which makes it more effective.

Contribution of various researchers in chronological order:

S.no	year	Researcher	Work/Parameters	Findings
1.	2013	Irfan et al. [1]	This paper presents the review on the modern heat exchangers which are being used nowadays.	The thermal and mechanical design of STHE was carried out using TEMA/ASME standards both manually and using software. It is concluded from their design that the STHE obtained by both approaches is very easy, simple and advance for modern heat exchanger.
2.	2014	Dawit Bogale [2]	This paper presents the thermal and mechanical design of different components of heat exchangers	He concluded that the STHEx in HBSC which is the redesigned STHEX works efficiently to achieve the required outlet temperature 34 degree Celsius of temp which is ready for customer for use.

			which are investigated through governing equations of vibrations in CFD.	
3.	2015	Sachin et al. [3]	This paper presents The review done on different types of Shell and tube type of heat exchanger.	They concluded that the performance of heat exchangers can be improved by using Helical Baffles instead of Segmental Baffles.
4.	2016	L.D.Jathar et al. [4]	This paper presents the Design of Shell and Tube Heat Exchanger for Waste Water	They concluded that the pipe having washer inserts provides considerable improvement of the rate of heat transfer than one without washer pipe.
5.	2016	Akshay et al. [5]	This paper presents a review on the Experimental Analysis of Parallel and Counter Flow Heat Exchanger	They concluded that the Heat transfer is higher in case of counter flow heat exchanger using water or any other oil as heat carrying medium.
6.	2017	Aishwary et al. [6]	This paper presents a review on the heat transfer enhancement techniques for heat exchangers with twisted inserts	They concluded that the enhancement devices of the Rotating twist insert show a considerable increase in Nusselt number and friction factor relative to the plain section without inserts.
7.	2018	Stephen raj et al. [7]	In this paper they have used multi model optimisation technique for the design of heat exchanger.	They concluded from the from the simulation the optimum design of baffle and travel tube design for maximum rate of transfer of heat is identified. It also deals with finding the suitable fluid for maximum rate of heat transfer.
8.	2018	Srinivasan et al. [8]	In this paper modifications have been done in the design of the heat exchanger. For this purpose, they have selected a reference heat exchanger with its practical performance results. For this they have generated a CAD model using solid works and it then was analysed using the CFD software under the actual operating conditions.	They concluded that the rectangular tube is having better performance than the circular tube.

9.	2018	Avinash et al. [9]	In this paper shell and tube type heat exchanger is designed. The main objective of this research was to change the cross section of tube to improve the efficiency of the heat exchanger.	They concluded that the K-w turbulence model provide better suitability for the simulation and is good than others.
10.	2019	Sai Kumar et al. [10]	This paper presents the experimental investigations which was carried for improving the performance of the radiator by varying the orientation of fin geometry.	They conclude that the performance of the heat exchanger using the louvered fins is enhanced by 35.4 % when compared with that having plain fins.
11.	2020	Afwan Heru Cahya et al. [11]	This paper presents the scenario of ocean thermal energy in India	The did calculations of the Shell and Tube Heat Exchanger (STHE) which aims at determining the quality of heat exchanger based on the overall heat transfer coefficient.

Conclusion

By looking at the contributions done by various researchers it can be concluded that by changing the design parameters and operating conditions of heat exchangers, it can get more effective and efficient. Some researchers also show that by the use of extended surfaces or fins over the heat exchangers increases its effectiveness. Also using baffles of certain design make it even more suitable for different purposes and applications.

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