11/21

26

Materials Today: Proceedings 52 (2022) 1603–1605

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Heat transfer analysis in fin and tube exchanger using CFD

Ravikumar M [a], Radha Krishnan Beemaraj [b,*], Arunraja K.M [c], Pandiarajan P [d], Sundaresan R [e]

[a] Mechanical Engineering, Bannari Amman Institute of Technology Erode, Tamil Nadu, India
[b] Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Theni, Tamil Nadu, India
[c] Mechanical Engineering, Hindusthan Institute of Technology, Coimbatore, India
[d] Mechanical Engineering, PSNA College of Engineering & Technology, Dindigul, India
[e] College of Applied Industrial Technology, Al Haque, Jazan University, Saudi Arabia

ARTICLE INFO

Article history:
Available online 30 November 2021

Keywords:
Heat transfer
Computer fluid dynamics
Aluminum fin
Tube heat exchangers

ABSTRACT

The designs of fine tubes and thermal exchangers rely on the fabrication of copper and aluminum fin and tube heat exchangers. The heat was regulated through copper tubes and pipes by flowing water. The major objective of this work will be to enhance the rate of heat transmission by altering the existing tube and finish. The copper U-tube was replaced with the spline fin in the heat exchanger in this project. Pressure drop, speed, and heat transfer properties of the heat exchanger were evaluated using solid works and the study was conducted using computer fluid dynamics (CFD). From the results, it has been determined that the improvement of thermal transfer rate and efficiency in spline fin is up to 5 percent higher than the flat fin and also increases pressure and the higher pumping power in a heat exchanger by placing fluid within the fin through cross-flow.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Smart and Sustainable Developments in Materials, Manufacturing and Energy Engineering

1. Introduction

A heat exchanger is a device for transferring or exchanging thermal energy, at different temperatures and in thermal contact between, two or more fluids, a solid surface, and a fluid or solid particles and fluid. Heat exchangers are frequently used in many industrial applications and energy recovery systems. Various ongoing studies enhance the efficiency of heat exchanges [1–2]. The materials and redesign of the heat exchanger are the main approaches for enhancing the efficiency of the heat swap [3]. The performance of a heat exchanger for fining and tube generally means that the exchanger is either transferred or operated at a lower temperature. This limitation immediately correlates to improving the total heat transfer coefficient without a significant increase in the surface area [4–5].

The surface area has an impact on the overall heat transfer coefficient. A high-efficiency compact heat exchanger can help you meet goals like increasing energy efficiency and lowering CO2 emissions. There was a thermal exchanger with an offset strip-fin titanium brazed plate. For tests of 10–30 percent, water and Ethylene Glycol solutions were employed [6–7]. The single-phase convection coefficients were shown to have an empirical relationship. Experimental data and other correlations were used to confirm the findings. CFD study of the fin-tubes thermal exchanger [8]. In this work, the flow field in a common flow-up system surrounding delta winglet vortex generators was analyzed using computational fluid dynamics methods for the flow characteristics and the heat transfer. Include changes in the finished shape, from a single fin to the splinter and louver type, efforts to increase their performance [9–10]. The performance of vortex generators has also been examined in the context of an increase in heat transmission. Recently the study interest in Delta's winglet vortex generators was partially due to experimental data indicating that their addition to finishing tube warmth exchangers significantly decreases the pressure loss of about the same level at heat transfer capacity [11].

In a heat exchanger system, copper rods with aluminum fins were used. Before 5 years of operation, the failure was caused by troughs on the outer tube Till it's drilled, it expands. Leaks of pinholes were noticed at the time of failure in the copper tube [11–12]. It has been determined that corrosion has caused damage to the tube through two elements that contain water that contains suspended solid particles. The cutting in half of the tubes showed

* Corresponding author.
E-mail address: radhakrishnancadcam@gmail.com (R.K. Beemaraj).

https://doi.org/10.1016/j.matpr.2021.11.266
2214-7853/
Selection and peer-review under responsibility of the scientific committee of the International Conference on Smart and Sustainable Developments in Materials, Manufacturing and Energy Engineering