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VNC - 2020 TASU

VIDYAVARDHINI'S NATIONAL CONFERENCE ON TECHNICAL ADVANCEMENTS FOR SOCIAL UPLIFTMENT

VNC - 2020 TASU

4TH APRIL, 2020

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155_Numerical investigation of variable tube diameter helical coil heat exchanger

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Vidyavardhini means a Body committed to enhancement of Knowledge. Vidyavardhini was established as a registered society in 1970 by late Padmashri H. G. alias Bhausaheb Vartak for the noble cause of education in rural areas.

Vidyavardhini's College of Engineering and Technology, Vasai is located on the sprawling campus of Vidyavardhini, spread over an area of 12.27 acres. It is a short, two minutes walk from Vasai Road (W) Railway Station. The college is also accessible by road from Mumbai.

Vidyavardhini Society received approval from AICTE to start the new college of Engineering & Technology with effect from July, 1994. The college is affiliated to the University of Mumbai for the four year degree program leading to the degree of Bachelor of Engineering in six branches.

Objective of VNC 2020 TASU

Technology has always been potential tool for simplifying the way we do things. Present time demands directing the technological advancements towards addressing societal challenges such as improving health care, education environment, sanitation, agriculture, smart city, etc., VNC 2020 TASU aims to provide an opportunity to researchers, academicians, Industrialist and students to interact and share their ideologies and contributions made for social upliftment with the aid of technological advancements.

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1. Selected Papers will be published in International Journal of Information Technology, Published by Springer Nature, ISSN: 2511-2104 (Print Version), ISSN: 2511-2112 (Electronic Version)
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Important Dates:

Submission of full length paper
15TH Feb 2020
Paper Acceptance Notification
22ND Feb 2020
Submission of Final Version of Paper
29TH Feb 2020
Registration Deadline
5TH March 2020
PPT Submission
20TH March 2020
Conference
4TH April 2020

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Numerical Investigation of variable tube diameter helical coil heat exchanger

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Abstract- *A helical coil-tube heat exchanger is widely used in industrial applications due to its compactness. The performance of compact heat exchangers has been recognized in various industries for the last 60 years or more due to several advantages. However, flow rate and heat transfer correlation related to helical coil-tube heat exchanger are very sophisticated. A computational fluid dynamics (CFD) methodology using ANSYS FLUENT 15.0 is used here to investigate effects of tube diameter and mass flow rate on the heat transfer and pressure drop characteristics in a helical coil heat exchanger. Simulation has been done by varying the mass flow rate from 180 Lph to 420 Lph on different configuration of helical coiled tube. The result shows that the temperature drop, and pressure drop are affected by geometry of helical coil heat exchanger.*

Keywords— *Computational fluid dynamics, helical coil heat exchanger, Heat transfer, temperature drop*

I. INTRODUCTION

Heat transfer rate in helical coils heat exchanger is higher than as compared to straight tube coils heat exchangers, because of its size, higher film heat transfer coefficient, they are widely used in industrial applications. Helical coil heat exchangers have less expensive design. Helical coil heat exchanger are effective in handling higher temperatures and extreme temperature differentials. Helical coils are found to be very effective in enhancing heat transfer compared to straight tube in single phase flow, boiling heat transfer.

Detail study of the performance characteristics of a spiral coil heat exchanger under wet-surface conditions was done by Naphon and Wongwises et al. in year (2005)[1]. The numerical and experimental studies to find out the heat transfer rate and predict the performance of a spiral coil heat exchangers was done by both of them. Cooling and dehumidifying conditions were used for analysis. They found that the rate of mass flow and temperature of air at the inlet affects the temperature of air and water at the outlet. This experiment shows the relation between outlet temperature of air and water with increase in mass flow rate of water.

Kumar et al. (2006) [2] had conducted investigation on hydrodynamic and heat transfer characteristic of tube in tube helical heat exchanger at pilot plant scale. They conducted the experiment in a counter flow heat exchanger. Overall heat transfer coefficients were assessed. Nusselt number and friction factor coefficient for inner and outer tube was found and compared with numerical value got from CFD package (FLUENT).

Numerical values received from CFD package (FLUENT) were compared with calculated values of Nusselt number and friction factor coefficient for inner and outer tube. They found that the overall heat transfer coefficient increase with inner coil tube Dean Number for constant flow rate in annulus region.

Jayakumar et al. (2008) [3] had done numerical and experimental work on helical coil heat exchanger considering fluid to fluid heat transfer. They had taken different boundary conditions for example constant heat transfer coefficient, constant heat flux and constant wall temperature. In their study they found that constant value of thermal and transport properties of heat transfer medium results inaccurate heat transfer coefficient. Also the practical applications, the heat transfer in fluid to fluid heat exchangers in arbitrary boundary conditions such as constant wall temperature or constant heat flux conditions are not applicable. Based on the numerical and experimental analysis within certain error limits correlation was developed to calculate the inner heat transfer coefficient of helical coil. Kharat et al. (2009) [4] had done the experiments to study the heat transfer rate on a concentric helical coil heat exchanger and develop the correlation for heat transfer coefficient. Heat transfer coefficient has improved for the tube containing flue gas of the heat exchanger by using CFD simulation and the experimental study. The effect of different operating variables was studied. The variables they had considered are gap between the concentric coils, diameter of tube and coil diameter. The heat transfer coefficients are

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in the Vidyavardhini's National conference 2020 "Technical Advancements for Social upliftments" organised by Vidyavardhini's College of Engineering and Technology, Vasai held on 27th June, 2020

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