IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

IJARSCT
Impact Factor: 6.252

Volume 2, Issue 7, May 2022

Thermal Analysis of a Ferro Fluid Interrupted and Continuously Twisted Tape Heat Exchanger

Yuvraj D. Nikam, Arjun S. Kalekar , Ganesh P. Lad, Aditya A. Bawner, Tushar T. Kapade

Department of Computer Engineering

Matoshri College of Engineering and Research Centre, Nashik

Savitribai Phule Pune University, Nashik, India

Abstract: We looked at the convective heat transmission of a water-based Ferro fluid in a pipe. The laminar convective heat transfer of water-based Ferro fluid moving through a pipe was explored and analysed in the presence and absence of an external magnetic field. Fe3O4-Water is the working fluid. Simulation and analysis was carried out using Ans. 2019 R3. A single-tube configuration was simulated. In this tube, Ferro fluid is pumped. The outside diameter of the tube, do, is 28 millimetres, while the inner diameter, di, is 25 millimetres. The length of the tube, L= 700 mm, was taken into account. ICEM CFD for Fluent 2019 R3 was used to create the mesh. A mesh report with 158776 nodes and 145000 elements was used for meshing. Fluent was used to create this design. The MHD module in the fluent add-on model was used to apply a magnetic field. In order to provide an external magnetic field with electric potential, a conductor was supplied. There were measurements of local convective heat transfer in both the presence and absence of magnetic fields. Heat transfer augmentation was explored in the Reynolds number range of 250-800. B=500 G was used to maintain a steady external magnetic field strength. To boost the heat transfer rate, the flow pattern must be disrupted and flow redirected. Ferro fluid was shown to react to external magnetic fields. The rupture of the thermal boundary layer and the velocity boundary layer occurs when a constant magnetic field is applied. This increases the heat transfer rate. Flow recirculation happens when a magnetic field is constantly applied. The rupture of the thermal boundary layer and the enhanced mixing of the flow imply a considerable improvement in the heat transfer rate..

Keywords: Ferro fluid

REFERENCES

[1]. Khosravi, R. N. N. Koury, L. Machado, and J. J. G. Pabon, “Energy, exergy and economic analysis of a hybrid renewable energy with hydrogen storage system,” Energy, vol. 148, no. C, pp. 1087–1102, 2018.
[2]. Khosravi, R. N. N. Koury, L. Machado, and J. J. G. Pabon, “Prediction of hourly solar radiation in AbuMusa Island using machine learning algorithms,” J. Clean. Prod., vol. 176, no. C, pp. 63–75, 2018.
[3]. Khosravi, L. Machado, and R. N. Oliviera, “Time-series prediction of wind speed using machine learning algorithms: A case study Osorio wind farm, Brazil,” Appl. Energy, vol. 224, no. C, pp. 550–566, 2018.
[4]. M. Faizal, R. Saidur, S. Mekhilef, and M. Alim, “Energy, economic and environmental analysis of metal oxides nanofluid for flat-plate solar collector,” Energy Convers Manag, vol. 76, pp. 162–168, 2013.
[5]. U.S. Energy Information Administration Office of Integrated Analysis and Forecasting, “International Energy Outlook,” 2016.
[6]. Fernandez-Garcia, E. Zarza, L. Valenzuela, and P. M. Erez, “Parabolic-trough solar collectors and their application,” Renew Sustain Energy Rev, vol. 14, no. 7, pp. 1695– 1721, 2010.
[7]. E. Kaloudis, E. Papanicolaou, and V. Belessiotis, “Numerical simulations of a parabolic trough solar collector with nanofluid using a two-phase model,” Renew. Energy, vol. 97, pp. 218–229, 2016.
[8]. S. Kalogirou, “The potential of solar industrial process heat applications,” Appl. Energy, vol. 76, no. 4, pp. 318 337–361, 2003. 319

[9] V. V. Wadekar, "Ionic liquids as heat transfer fluids – an assessment using industrial exchanger geometries," Appl. Therm. Eng., vol. 111, pp. 1581–1587, 2017.