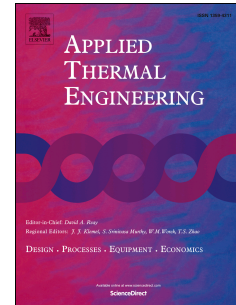


# Accepted Manuscript

Correlation Studies of Hydrodynamics and Heat Transfer in Metal Foam Heat Exchangers

Shaolin Mao, Norman Love, Alma Leanos, Gerardo Rodriguez-Melo



PII: S1359-4311(14)00515-8

DOI: [10.1016/j.applthermaleng.2014.06.035](https://doi.org/10.1016/j.applthermaleng.2014.06.035)

Reference: ATE 5742

To appear in: *Applied Thermal Engineering*

Received Date: 21 February 2014

Revised Date: 9 June 2014

Accepted Date: 15 June 2014

Please cite this article as: S. Mao, N. Love, A. Leanos, G. Rodriguez-Melo, Correlation Studies of Hydrodynamics and Heat Transfer in Metal Foam Heat Exchangers, *Applied Thermal Engineering* (2014), doi: 10.1016/j.applthermaleng.2014.06.035.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Correlation Studies of Hydrodynamics and Heat Transfer in Metal Foam Heat Exchangers

Shaolin Mao<sup>1</sup>, Norman Love, Alma Leanos, Gerardo Rodriguez-Melo  
Department of Mechanical Engineering, The University of Texas at El Paso, TX 79968, USA

### Abstract

This study presents the correlations of both hydrodynamics and heat transfer in a metal foam heat exchanger. The present work is focused on the application to dry cooling such as air-cooled condensers (ACCs). In particular empirical correlations for the permeability, form drag coefficient, friction factor, and the overall heat transfer coefficient for different samples of metallic foam have been validated and verified with available experimental data and numerical simulations. The modified correlations used in this study are established through the validation & verification studies of metal foam heat exchangers. In order to address the difference, finned tube heat exchangers are used to compare to the metal foam heat exchangers with the same geometry size and layout. For fully wrapped metal foam heat exchangers, the prediction using empirical correlation is consistent with computational fluid dynamics (CFD) simulations. However, the scenarios become complicated for partially wrapped metal foam heat exchangers. The numerical results show that there is an optimal choice of the porosity of metal foam in which the wall heat transfer coefficient and pressure drop reach the design goal. Overall, the heat transfer capability of metal foam heat exchangers can supersede conventional compact heat exchangers given optimal scenario.

**Key words:** metal foam, metallic foam, dry cooling, air-cooled condenser, porous medium, Darcy-Forchheimer model

---

<sup>1</sup> Corresponding author. Voice: +1 915 747 5830. E-mail: [smao@utep.edu](mailto:smao@utep.edu), [slm\\_wvu@yahoo.com](mailto:slm_wvu@yahoo.com)

Download English Version:

<https://daneshyari.com/en/article/646088>

Download Persian Version:

<https://daneshyari.com/article/646088>

[Daneshyari.com](https://daneshyari.com)