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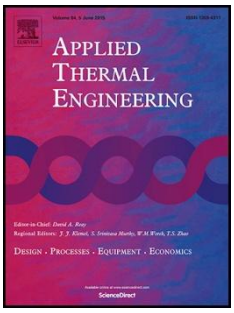

Title: Study of a fogging system using a computational fluid dynamics simulation

Author: J.A. Pinilla, M. Asuaje, N. Ratkovich

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Study of a fogging system using a computational fluid dynamics simulation

J.A. Pinilla[a,*], M. Asuaje[b], N. Ratkovich[a]

[a]*Universidad de los Andes, Department of Chemical Engineering, Product and Process Design Group (GDPP), Cra. 1 No. 18A-12, Bogota, Colombia.*
[b]*Universidad Simon Bolivar, Department of Conversion and Transport of Energy, Caracas, Venezuela.*

*Corresponding author. Tel.: +57 1339 4949 ext: 1879; E-mail address: ja.pinilla1368@uniandes.edu.co

Keywords: Evaporative cooling, fogging system, relative humidity, CFD

Highlights

- Fogging is the most effective methods for lowering air temperature in gas turbines.
- A CFD study was performed to investigate mist dynamics at a turbine's inlet duct.
- Residence time, mass transfer and coalescence of water droplets was studies.
- CFD results compared against experimental data with differences from 3 to 6%.
- Larger mass transfer occurs with droplets of 20µm and lowest relative humidity.

Abstract:

Fogging is one of the most effective methods for lowering the air temperature in rooms and greenhouses. It also has many industrial applications, especially in gas turbines where this method presents great advantages over others in terms of achieving better turbine performance in hot weather conditions.

With this in mind, a numerical study was performed in STAR-CCM+ to investigate mist dynamics at a turbine's inlet duct, specifically measuring: (i) residence time of water droplets; (ii) mass transfer between water and air; (iii) coalescence and agglomeration of the water droplets; and, (iv) changes in air density and temperature inside the duct. The results were compared against the same variables taken from experimental wind tunnel data, and found to be similar with respect to the behavior of temperature and relative humidity.

Therefore, it was possible to conclude that the results obtained in the simulation were close to those reported experimentally with differences from 3 to 6%. Based on the profiles and contour