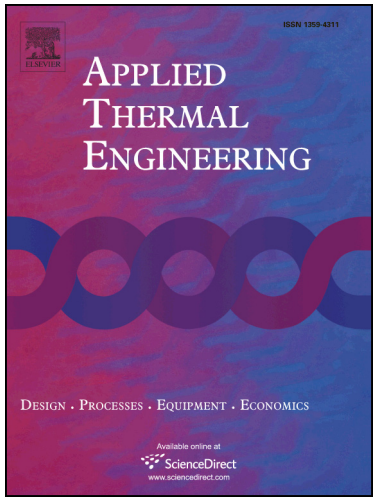

Effects of position and temperature-gradient direction on the performance of a thin plane radiator

AminHossein Jahanbin, Enzo Zanchini

PII: S1359-4311(16)30309-X
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2016.03.018
Reference: ATE 7885

To appear in: *Applied Thermal Engineering*

Received Date: 15 December 2015
Accepted Date: 5 March 2016

Please cite this article as: A. Jahanbin, E. Zanchini, Effects of position and temperature-gradient direction on the performance of a thin plane radiator, *Applied Thermal Engineering* (2016), doi: http://dx.doi.org/10.1016/j.applthermaleng.2016.03.018

EFFECTS OF POSITION AND TEMPERATURE-GRADIENT DIRECTION ON THE PERFORMANCE OF A THIN PLANE RADIATOR

AminHossein Jahanbin°, Enzo Zanchini°*

°Department of Industrial Engineering, University of Bologna, Viale Risorgimento 2, 40136 Bologna, Italy

*Corresponding author: enzo.zanchini@unibo.it

ABSTRACT

The performance of a thin plane radiator in a square room with 4 m horizontal sides and 3 m height is analyzed through a 3-D finite-volume simulation code implemented in ANSYS Fluent. The radiator is considered as placed at a distance of either 3, or 5, or 10 cm from the window wall, and having a linear temperature distribution at its surface, either increasing (normal configuration) or decreasing (reverse configuration) with height. The code is validated by comparing the mean Nusselt number on the radiator surface with that obtained by applying the correlation of Churchill and Chu for free convection on a vertical surface. Then, the code is employed to determine the velocity and temperature fields in the room, the total power released by the radiator, and the operative temperature. The latter is considered as the main performance index. The results show that the normal configuration yields a better performance than the reverse one, and that a distance of 10 cm between radiator and wall yields a slight performance increase with respect to lower distances.

Keywords: Low temperature heating; Plane radiator; CFD simulation; Operative temperature; Effects of position and temperature-gradient direction