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HEAT TRANSFER UNDER A PULSED SLOT TURBULENT IMPINGING JET AT LARGE TEMPERATURE DIFFERENCES

ABSTRACT

Pulsed impinging jets have received increasing interest for their potential in heat and mass transfer enhancement. Howevei pulsations under different flow and geometrical parameters have further understand the flow and thermal processes in pulsed imp investigation has been performed on a two dimensional pulsed tu temperature differences between the jet flow and the impinging temperature-dependent thermophysical properties along with pul Nusselt number distribution on the target surface. The numerical averaged Nusselt numbers calculated with various thermal prope impingement surface temperatures differ significantly for large K). A parametric study for both heating and cooling cases indicat single sinusoidal pulsation can be found under current conditions temperature differences at distances far from stagnation point,

KEYWORDS

pulsed impinging jet, sinusoidal pulsation, heat transfer, nusselt

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REFERENCES [view full list]

1. Martin, H., Heat and Mass Transfer between Impinging Ga Advances in: Heat Transfer, Vol. 13 (Eds. J. P. Hartnett, New York, 1977, pp. 1-60
2. Polat, S., Heat and Mass Transfer in Impingement Drying

pp. 1147-1176
3. Lienhard, V. J. H., Liquid Jet Impingement, in: Annual Re
C. L. Tien), Begell Hourse, New York, USA,1995, pp. 199-
4. Mujumdar, A. S., Impingement Drying, in: Handbook of Ir
Mujumdar), Taylor & Francis Group, New York, USA, 2007
5. Kataoka, K., Suguro, M., The Effect of Surface Renewal D
Impingement Heat Transfer, International Journal of Hea
pp. 559-567
6. Zumbrunnen, D. A., Aziz, M., Convective Heat Transfer En
in an Impinging Jet, Journal of Heat Transfer, 115 (1993)
7. Eibeck, R. A., et al., Pulse Combustion-Impinging Jet Hea
Combustion Science and Technology, 94 (1993), 1, pp. 14
8. Zumbrunnen, D. A., Balasubramanian, M., Convective Hea
Gas Injection into an Impinging Liquid Jet, Journal of Hea
1011-1017
9. Mladin, E. C., Zumbrunnen, D. A., Local Convective Heat
Jets, International Journal of Heat and Mass Transfer, 40
10. Sailor, D. J., Rohli, D. J., Fu, Q. L., Effect of Variable Dut
Transfer Enhancement for an Impinging Air Jet, Internatio
20 (1999), 6, pp. 574-580
11. Camci, C., Herr, F., Forced Convection Heat Transfer Enh
Impinging Planar Jet, Journal of Heat Transfer, 124 (2002
12. Zulkifli, R., Sopian, K. K., Studies on Pulse Jet Impingeme
Effect of Pulse Frequencies on Heat Transfer, Internationa
Technology, 4 (2007), 1, pp. 86-94
13. Zulkifli, R., et al., Comparison of Local Nusselt Number fo
at Reynolds Number of 16000, European Journal of Scient
369-378
14. Haneda, Y., et al., Enhancement of Impinging Jet Heat Tr
Fluid Interactive Flow Oscillation, International Journal of
115-124
15. Chaniotis, A.K., Poulikakos, D., Ventkos, Y., Dual Pulsatir
Constant Heat Flux Surface, ASME Journal of Heat Transf
16. Bejera, R.C., Dutta, P., Srinivasan, K., Numerical Study o
Cooling of Electronics, IEEE Transactions on Components
(2007), 2, pp. 275-284
17. Poh, H. J.. Kumar, K., Mujumdar, A. S., Heat Transfer fro
International Communication for Heat & Mass Transfer, 3
18. Poh, H. J., Mujumdar, A. S., Heat Transfer from a Pulsed
Temperature Differences, Proceedings, 5th Asia-Pacific D
2007, pp. 1171-1177
19. Fallen, M., Heat Transfer in a Pipe with Superimposed Pu
Transfer, 16 (1982), 2, pp. 89-99
20. Sheriff, H. S., Zumbrunnen, D. A., Effect of Flow Pulsatio
an Impinging Jet, Journal of Heat Transfer, 116 (1994), 4
21. Azevedo, L. F. A., Webb, B. W., Queiroz, M., Pulsed Air-
Experimental Thermal and Fluid Science, 8 (1994), 3, pp.
22. Mladin, E. C., Zumbrunnen, D. A., Nonlinear Dynamics of
Pulsatile Stagnation Flows, Journal of Thermophysics and
514-523

23. Mladin, E. C., Zumbrunnen, D. A., Alterations to Coheren
Due to Pulsations in an Impinging Air-Jet, International Jc
(2000), 2, pp. 236-248
24. Vejrazka, J., Experimental Study of a Pulsating Round Im
National Polytechnique de Grenoble, Grenoble, France, 20
25. Mladin, E. C., Zumbrunnen, D. A., Dependence of Heat Tı
Flow on Pulse Characteristics, Journal of Thermophysics a
181-192
26. Hofmann, H. M., et al., Influence of a Pulsation on Heat T
Submerged Impinging Jets, International Journal of Heat
18, pp. 3638-3648
27. Wang, S. J., Mujumdar, A. S., A Comparative Study of Fiv
Models for Impingement Heat Transfer, Applied Thermal
44
28. Fujimoto, H., et al., Numerical Simulation of Transient Cc
Impinging Free Surface Jet, Numerical Heat Transfer, Par
767-780
29. Morris, G. K., Garimella, S. V., Fitzgerald, J. A., Flow-Fie
Confined Jet Impingement Using the Reynold Stress Model
121 (1999), 4, pp. 255-262