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## Numerical investigation of critical range for the occurrence of secondary peaks in the nusselt distribution curve (Article)

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### Abstract

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The study of heat transfer augmentation in micro/nano scale and electronic packaging systems are some of the paramount areas of impending universe. In such systems the cooling of the hot heat sinks is generally achieved through the impingement of air jet. In order to study the characteristic of heat dissipation rate, variation of Nusselt number versus radial distance over the target surface is investigated. The magnitude of Nusselt Number is found to decrease gradually with increase in the radial distance away from the jet. The record of Nusselt magnitude over the radial distance is accomplished through computation using ANSYS CFX 14.5. A 2-D axis-symmetric model consisting of nozzle and target surface with discrete meshing is solved using an appropriate turbulence model, in order to develop the flow regime and record the necessary heat interactions. As far as the transition and intermediacy in flow structure at the target surface due to the unpredicted transport of shear stress is concerned, SST along with Gamma – Theta turbulence model is solved simultaneously in order to incorporate these phenomena.. The occurrence of such secondary peaks increases the heat transfer rate. Looking into the light of research area in determining the exact cause and the intervening range for the occurrence of such peaks, the current research focuses over the determination of the critical range within which the secondary peaks exists. This critical range comprises of multiple of jet to the target spacing and diameter-based Reynolds number and the corresponding critical range is between 2205 and 26, 46, 000. Not only that the velocity contour of the flow regime is mapped for the sets of parameters within the critical range. An empirical correlation for the area averaged Nusselt number terms of Reynolds number and jet to the target spacing being is proposed. This correlation improvise the calculation of the magnitude of area. © 2018 PENERBIT AKADEMI BARU-All rights reserved.

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- 1 El-Sheikh, H.A., Garimella, S.V.  
**Heat transfer from pin-fin heat sinks under multiple impinging jets**  
(2000) *IEEE Transactions on Advanced Packaging*, 23 (1), pp. 113-120. Cited 33 times.  
doi: 10.1109/6040.826769  
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- 2 Garimella, S.V., Schroeder, V.P.  
**Local heat transfer distributions in confined multiple air jet impingement**  
(2001) *Journal of Electronic Packaging, Transactions of the ASME*, 123 (3), pp. 165-172. Cited 56 times.  
doi: 10.1115/1.1371923  
[View at Publisher](#)

- 3 Yamane, Y., Ichikawa, Y., Yamamoto, M., Honami, S.  
**Effect of injection parameters on jet array impingement heat transfer**  
(2012) *International Journal of Gas Turbine, Propulsion and Power Systems*, 4 (1), pp. 27-34. Cited 13 times.  
<http://www.gtsj.org/english/jgpp/v04n01tp04.pdf>

- 4 Lytle, D., Webb, B.W.  
**Air jet impingement heat transfer at low nozzle-plate spacings**  
(1994) *International Journal of Heat and Mass Transfer*, 37 (12), pp. 1687-1697. Cited 400 times.  
doi: 10.1016/0017-9310(94)90059-0  
[View at Publisher](#)

- 5 Choo, K.S., Kim, S.J.  
**Heat transfer characteristics of impinging air jets under a fixed pumping power condition**  
(2010) *International Journal of Heat and Mass Transfer*, 53 (1-3), pp. 320-326. Cited 33 times.  
doi: 10.1016/j.ijheatmasstransfer.2009.09.027  
[View at Publisher](#)

- 6 Huang, J.-B., Jang, J.-Y.  
**Numerical Study of a Confined Axisymmetric Jet Impingement Heat Transfer with Nanofluids**  
(2013) *Engineering*, 5 (1), pp. 69-74. Cited 10 times.

- 7 Gorji, S., Seddighi, M., Ariyaratne, C., Vardy, A.E., O'Donoghue, T., Pokrajac, D., He, S.  
**A comparative study of turbulence models in a transient channel flow** ([Open Access](#))  
(2014) *Computers and Fluids*, 89, pp. 111-123. Cited 25 times.  
doi: 10.1016/j.compfluid.2013.10.037  
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