

## عنوان مقاله:

Experimental Investigation of Multi-Jet Air Impingement in Various Conditions and Analysis using Desirability Based Response Surface Methodology

## محل انتشار:

دوماهنامه مکانیک سیالات کاربردی، دوره 14، شماره 1 (سال: 1400)

تعداد صفحات اصل مقاله: 15

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## خلاصه مقاله:

This experimental analysis encapsulates the influence of Reynolds number (Re), diameter of nozzle, height to diameter (H/D) ratio and position of nozzle such as in-line and staggered over the responses heat transfer coefficient, temperature and Nusselt number of a hot flat plate exposed to cooling by multi-jet air impingement. For this analysis, a  $15 \times 10$  cm flat plate is being heated using a heating coil having a heat flux of  $7666.67 \text{ W/m}^2$  which is maintained as constant through entire experiment. An H/D ratio of 2D, 4D and 6D is considered along with pipe diameters of 4, 6 and 8 mm and Reynolds number are changed between 18000 to 22000. Experimental design was performed with response surface methodology based central composite design. For all output responses, a quadratic model is chosen for analysis and a second order mathematical model is evolved for predicting with a higher  $R^2$  value. Desirability analysis is performed for multi-objective optimization and the optimum input parameters obtained are Reynolds no. of 20347, pipe diameter of 8 mm, H/D ratio of 2 and in-line nozzle position with the maximum heat transfer coefficient of  $189.411 \text{ W/m}^2 \text{ K}$ , Nusselt number of 28.8712 and minimum temperature of  $56.983^\circ\text{C}$ . Optimum condition-based confirmation experiments result in enhanced Nusselt number and heat transfer coefficient.

## کلمات کلیدی:

Jet impingement cooling, Staggered and inline position, Heat transfer, Response surface methodology, Nusselt number, Reynolds number

## لینک ثابت مقاله در پایگاه سیویلیکا:

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