# Numerical Investigation of Nondimensional Constant and Empirical Relation Representing Nusselt Profile Nonuniformity

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## Abstract

The use of air jet impingement for cooling is the most expensive task as far as the efficiency of the component is concerned: not only this, but the generation of characteristic cooling over the target surface (heat sink) is of great significance in material processing firms. The conversion of the temperature profile to a Nusselt profile is widely used when the concern of nondimensionality comes into the picture. So, the present work reports the Nusselt profile for different impinging parameters, and the nonuniformities concerned with the profiles are evaluated. The standard deviation is the parameter used to represent the nonuniformity in the Nusselt profile for the present study. A nondimensional constant (ratio of Reynolds number and nozzle-target spacing) is defined to represent the start and end of nonuniformity in the Nusselt profile. When this constant exceeds a value of 6000, the nonuniformity in the profile ends. Also, an empirical relation representing the standard deviation is proposed in terms of the Reynolds number and nozzle-target spacing. The generation of turbulence vortices at the exit of the nozzle is responsible for the end of nonuniformity in the Nusselt profile.

## Keywords

**KeyWords Plus:** CONVECTIVE HEAT-TRANSFER; UNCERTAINTY ANALYSIS; TURBULENT PRANDTL; JET IMPINGEMENT; AIR-JET; SURFACE; NUMBER; FLUX

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