

## Numerical investigation of turbulence models for separation fluid flow in an annular passage

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### Abstract

Separation and reattachment of air flow through a sudden expansion in an annular passage with uniform heat after step are considered in this paper. The annular passage with step is applied in the design of many heat related applications where heat transfer is concerned. In this work, numerical simulation for many turbulence models is performed using computer fluid dynamics package (commercial software) to study the effect of step flow in an annular passage. The numerical results are compared with the preliminary experimental data. The annular passage, the flowing fluid was considered when heated uniformly from the beginning of the expansion. Constant heat flux approach was also considered for the heat transfer investigation. Annular pipe flow system having Reynolds number of 17,050 and uniform heat flux equal to 2098 W/m<sup>2</sup> and a step ratio of D/d=1.8 was considered where d and D were representing the diameter of the pipe before and after expansion. Numerical simulation review shows that the reattachment point extends further with the increase of velocity for different occasions. Finally, experimental results for surface temperature ( $T_s$ ) and local Heat transfer (h) are compared with CFD results after expansion for many turbulence models.

**Keywords:** reattachment, annular passage, recirculation, sudden expansion.

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