**Paper No: PU-SOE-MAT- 02**

**Analysis of Fully Developed Mixed Convection in Open-Ended Annuli with Viscous Dissipation**

Girish Na, **M. Sankarb**, **Keerthi Reddy Nb**

a. Department of Mathematics, JSS Academy of Technical Education, Bengaluru, India

**b.** Department of Mathematics, School of Engineering, Presidency University, Bengaluru, India

**Abstract**

The vertical, open-ended double-passage annular space between three vertical concentric co-axial cylinders is an important geometry representing significant number of industrial applications. For a design engineer, the knowledge of fully developed mixed convection in this geometry is very essential. Hence, in this paper, it is proposed to numerically as well as analytically investigate the fully developed mixed convective flow in the vertical annuli having two annular passages with open upper and lower boundaries by taking viscous dissipation into consideration. The prime objective of the analysis is to bring out the influences of the location of middle cylinder, known as baffle, and viscous dissipation on the fluid flow and temperature profiles as well as the associated thermal transport rates. By neglecting the viscous dissipation influences, exact solutions are determined, while the finite difference-based numerical solutions are achieved in the presence of viscous dissipation. Further, excellent agreement is obtained between the analytical and numerical solutions under limiting conditions. The roles of viscous dissipation and baffle location are meticulously brought out through the flow pattern, temperature profiles and heat transport rates.

**Keywords:**

Baffle, Double-passage annuli, Viscous dissipation, Fully developed flow

**Publication Details:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Journal Name** | **Vol.** | **Month & Year** | **Page No.** | **Publisher** | **Scimago Ranking** |
| Journal of Thermal Analysis and Calorimetry | **-** | Dec. 2019 | Online publication | Springer | Q2 |