A Hybrid Analytical Approximate Technique for Solving Transient Natural Convection in a Horizontal Concentric Cylinders

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ABSTRACT

A hybrid procedure combining the homotopy perturbation method and the Fourier transform has been proposed, and it was used to find an approximate analytical solution to the problem of two-dimensional transient natural convection in a horizontal cylindrical concentric annulus bounded by two isothermal surfaces. The effect of varying values of the Grashof number, Prandtl number, and radius ratio on fluid flow (air) and heat transfer is explored. Furthermore, the velocity distributions and the average Nusselt number are investigated, with Nusselt numbers utilized to express local and global heat transfer rates. Finally, the convergence of the new algorithm was theoretically checked by proving several theorems, which were then applied to the findings of the new solutions provided by the suggested approach.

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