HEAT TRANSFER ENHANCEMENT USING POROUS INSERT IN RECIPROCATING ENGINE

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ABSTRACT

In this work, we present a numerical solution for laminar convective heat transfer in a pipe partially filled with a porous insert and provided with a flat piston to ensure a compression-expansion cycle. In addition to the compressible Navier-Stokes equations for the fluid region, Brinkman-Lapwood-Forccheimer extended Darcy's equations are introduced into the numerical solver to model flow through porous medium. The mathematical model for energy transport is based on the local thermal equilibrium assumption. The control volume-based finite element method was adopted to solve the governing differential equations. The characteristic features of the porous insert on hydrodynamic and heat transfer behaviour have been investigated. The pressure drop occurring across the porous medium is attributed to several factors, including the porous radius, Darcy number and Womersely number.