

Magnetohydrodynamic Flows in a Conduit with Multiple Channels under a Magnetic Field Applied Perpendicular to the Plane of Flow

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Abstract : This study numerically analyzes a steady-state, three-dimensional liquid-metal magnetohydrodynamic flows in a conduit with multiple channels under a uniform magnetic field. The geometry of the conduit is of a four-parallel-channels system including one inflow channel and three outflow channels. The liquid-metal flows in the inflow channel, then turns 180° in the transition segment, finally flows into three different outflow channels simultaneously. This kind of channel system can induce counter flow and co-flow, which is rarely investigated before. The axial velocity in the side layer near the first partitioning wall, which is located between the inflow channel and the first outflow channel, is the highest. 'M-shaped' velocity profiles are obtained in the side layers of the inflow and outflow channels. The interdependency of the current, fluid velocity, pressure, electric potential is examined in order to describe the electromagnetic characteristics of the liquid-metal flows.

Keywords : liquid-metal, multiple channels, magnetic field, magnetohydrodynamic

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