NUMERICAL INVESTIGATION OF CONVECTIVE HEAT TRANSFER PERFORMANCE IN CORRUGATED CONVERGING PIPE

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Abstract

This study examines turbulent convective heat transfer performance (CHTP) and entropy production rate (EPR) of distilled water flowing in outwardly corrugated converging pipes (CCPs) of various diameter ratios (DR). The SST k - ω turbulence models were used to simulate the flow of H $_2$O inside the pipe. The effects of Reynolds number (5 . 0 × 10 3 [?] Re [?] 5 . 0 x 10 4), and DR (1 [?] DR [?] 2) on average Nusselt number (Nu), Poiseuille number (fRe) thermal performance evaluation criterion (PEC), EPR, and thermal effectiveness number (I) Nu were investigated parametrically. The findings revealed a significant improvement in Nu in the modified pipe compared with the straight pipe. This improvement is attributed to flow acceleration and increases in the mixing rate of hot fluid near the wall with cold fluid at the core fluid zone. Also, Nu , fRe , and EPR increase with increasing Re and DR. However, the opposite is the case for PEC and I . Finally, the values of PEC, and I revealed that the modified pipe is advantageous compared with a straight pipe at (5 x 10 3 [?] Re [?] 1 . 0 x 10 4) .

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