

Investigation of Sequential and Simultaneous Crossflow Heat Exchangers for Automotive Application

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Abstract - In current research, forced convective heat transfer of sequential and simultaneous heat exchangers are numerically investigated. Both, the sequential and the simultaneous, modules of heat exchangers are identical in size, i.e. frontal area and volume. The simulations have been conducted on serpentine finned heat exchangers in air-to-liquid cross-flow orientation using ANSYS FLUENT, a widely used finite volume method (FVM) commercial code. The heat transfer are concurrently obtained for automatic transmission fluid (ATF) and 50% ethylene glycol-water mixture (EG). In the airside, the constant inlet temperature and velocity of the air have been maintained at 25⁰C and 6.3 m/s respectively. In liquid side, the inlet temperature of ATF and EG have also been kept constant at 150⁰C and 105⁰C respectively. For both the sequential and the simultaneous orientations, air has been used to cool ATF and EG at various massflow rates within a laminar flow regime. For a given Reynolds number, simultaneous heat exchanger module displays significant enhancement of heat transfer rate than that of the conventional sequential module.

Keywords: Automatic transmission fluid, glycol-water mixture, numerical, laminar flow, crossflow, simultaneous, sequential, heat transfer.