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AN EFFICIENT PROCEDURE FOR THE ANALYSIS OF FLOW MALDISTRIBUTION IN CROSS-FLOW MICRO HEAT EXCHANGERS

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ABSTRACT Recently, as an alternative to massive CFD, the authors have developed a simplified FEM procedure for the solution of steady state conjugate convection-conduction heat transfer problems in cross-flow micro heat exchangers. This procedure is based on the assumption that all the microchannels are identical, the fluid and the mass flow rate in each microchannel are the same and all the thermophysical properties are constant. In this work the procedure is extended to allow taking into account the effects of the flow maldistribution caused by the temperature dependence of viscosity. The revision consists in implementing an iterative scheme so that the velocity field in each microchannel can be updated to account for a redistribution of the total mass flow rate on the basis of the constraint that the pressure drop must be the same for all the microchannels of each layer, but the average value of viscosity and, consequently, of the Reynolds number are different. Thermophysical properties are assumed constant within each microchannel, but they may vary from one microchannels to another.