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One-Dimensional Steady Solutions and Correlations of Internal Condensing Flows in Channels/Tubes and their Comparisons with Experiments SOUMYA MITRA, AMITABH NARAIN, SHANTANU KULKARNI, Michigan Technological University — Quasi-1 D steady simulation for internal condensing flows that employs solutions of singular non-linear ordinary differential equations is presented along with the governing equations and computational approach. The computational simulation results presented are for internal condensing flows in channel and tube geometry. The quasi-1 D steady simulation results are compared to the experimental results as well as full 2-dimensional CFD based results. These results are shown to be self-consistent and in agreement with one another. The paper further reports some reliable and useful correlations for internal condensing flows (covering most refrigerants of common interest) for the gravity driven case. The quasi-1 D steady simulation results are available from micrometer to larger scale condensers and in various gravity environments. For the micro-meter scale condensers, a critical diameter condition is identified, below which the flows are insensitive to the orientation of the gravity vector as the condensate is always shear driven. The paper discusses transition from gravity dominated flow to shear dominated flows. Paper outlines the difference between transverse gravity and zero gravity flow in a channel.

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