Two-phase Pipe Flow

(1) $$\dot{m} = \dot{m}_1 + \dot{m}_2$$

(2) $$A = A_1 + A_2$$

(3) $s_1 = A_1 / A$	(4) $s_2 = A_2 / A$

(5) $$s_1 + s_2 = 1$$

(6) $$u_m = s_1 \cdot \dot{u}_1 + s_2 \cdot \dot{u}_2$$

(7) $q_1 = \dot{m}_1 / \rho_1 = A_1 \, u_1 \Rightarrow \dot{m}_1 = \rho_1 \, A_1 \, u_1$	(8) $q_2 = \dot{m}_2 / \rho_2 = A_2 \, u_2 \Rightarrow \dot{m}_2 = \rho_2 \, A_2 \, u_2$

(9) $s_1 = \dfrac{\dot{m}_1 \, \rho_2 \, u_2}{\dot{m}_1 \, \rho_2 \, u_2 + \dot{m}_2 \, \rho_1 \, u_1}$	(10) $s_2 = \dfrac{1}{1 + \omega_{12}} \cdot A = \dfrac{\dot{m}_2 \, \rho_1 \, u_1}{\dot{m}_1 \, \rho_2 \, u_2 + \dot{m}_2 \, \rho_1 \, u_1}$

For homogeneous 2-phase pipe flow: $u_1 = u_2 = u_m$ and volumetric shares are going to be:

(11) $s_1 = \dfrac{\dot{m}_1 \, \rho_2}{\dot{m}_1 \, \rho_2 + \dot{m}_2 \, \rho_1}$	(12) $s_2 = \dfrac{\dot{m}_2 \, \rho_1}{\dot{m}_1 \, \rho_2 + \dot{m}_2 \, \rho_1}$

See also

Physics / Mechanics / Continuum mechanics / Fluid Mechanics / Fluid Dynamics / Fluid Flow / Pipe Flow / Pipe Flow Dynamics / Pipe Flow Simulation / Multiphase Pipe Flow

[Pipe] [Pipeline] [Pipeline Engineering]