# Pipe Flow Mass Conservation

(1) $$\dot{m}(t,l) = \dot{m} = \text{const}$$

where

| | |
|---|---|
| $\dot{m}$ | mass flowrate along the pipe |

The physical meaning of Pipe Flow Mass Conservation is that total mass passing through cross-section area of a pipe at any location of its trajectory is staying constant as there is no mass exchange of the fluid through the walls.

Equation (1) can be also written as:

(2) $$\dot{m}(t,l) = \rho(p) \cdot q(t,l) = \text{const}$$

where

| | |
|---|---|
| $\dot{m}$ | mass flowrate along the pipe |
| $\rho(T,p)$ | fluid density |
| $p(t,l)$ | fluid pressure distribution along the pipe |
| $q(t,l)$ | volumetric flowrate of the pipe flow |

## Alternative forms

In case of a Pipe Flow with constant cross-section area $A(l) = A = \text{const}$ it also leads to conservation of mass flux:

(3) $$j_m(t,l) = j_m = \frac{\dot{m}}{A} = \text{const}$$

where

| | |
|---|---|
| $j_m$ | mass flux along the pipe |

Equation (3) can be also written as:

(4) $$j_m = \rho \cdot u = \text{const}$$

where

| | |
|---|---|
| $u$ | superficial velocity of the pipe flow |

## See also

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

[ Mass conservation ]