

Multiphase fluid

Fluid volume consisting of two or more contacting [phases](#)

In most practical cases in Petroleum Industry it will be a [3-phase fluid](#) (water, oil and gas).

The total [fluid density](#) of [multiphase fluid](#) is given by following equation:

$$(1) \quad \rho = \sum_{\alpha} s_{\alpha} \rho_{\alpha}$$

where

ρ_{α}	Density of α - phase	s_{α}	volumetric share of α - phase
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$$(2) \quad \rho = \frac{m}{V} = \frac{1}{V} \sum_{\alpha} m_{\alpha} = \sum_{\alpha} \frac{m_{\alpha}}{V} = \sum_{\alpha} \frac{V_{\alpha}}{V} \cdot \frac{m_{\alpha}}{V_{\alpha}} = \sum_{\alpha} s_{\alpha} \rho_{\alpha}$$

The total [fluid compressibility](#) of [multiphase fluid](#) is given by following equation:

$$(3) \quad c = \sum_{\alpha} s_{\alpha} c_{\alpha}$$

where

ρ_{α}	fluid compressibility of α - phase	s_{α}	volumetric share of α - phase
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$$(4) \quad c = \frac{1}{V} \frac{\partial V}{\partial p} = \frac{1}{V} \sum_{\alpha} \frac{\partial V_{\alpha}}{\partial p} = \sum_{\alpha} \frac{V_{\alpha}}{V} \frac{1}{V_{\alpha}} \frac{\partial V_{\alpha}}{\partial p} = \sum_{\alpha} s_{\alpha} c_{\alpha}$$

See also

[Natural Science / Physics / State of matter / Fluid](#)

[Petroleum Industry / Upstream / Subsurface E&P Disciplines / Fluid Analysis](#)