Oil API Gravity, Specific Gravity and Density at Reservoir Conditions

Specific gravity and stock-tank density of a crude from its API gravity, and its density at reservoir conditions from solution gas and formation volume factor.

Method: Ahmed; Reservoir Engineering Handbook; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Oil gravity	35.000	
Solution gas-oil ratio	375.00	scf/STB
Solution gas gravity (air = 1)	0.75000	
Oil formation volume factor	1.2500	

Calculated results

Parameter	Value	Unit
Oil specific gravity (60/60 °F)	0.84985	
Stock-tank oil density	849.01	kg/m³
Oil density at reservoir conditions	728.59	kg/m³

Notes for this case

• Water at 60 °F is 999.016 kg/m³ (62.4 lb/ft³ in Ahmed's form). Light oils are above 31.1 °API, medium 22.3–31.1, heavy below 22.3 (API classes).

Formula and method

$$\gamma_o = \frac{141.5}{\mathrm{API} + 131.5}, \quad \rho_o = \frac{62.4\gamma_o + 0.0136 R_s \gamma_g}{B_o} \ (\mathrm{lb/ft^3},\ R_s \ \mathrm{scf/STB})$$

Variables

API	Oil gravity	-
R_s	Solution gas-oil ratio	m³/m³
γ_g	Solution gas gravity (air = 1)	-
B_o	Oil formation volume factor	-
γ_o	Oil specific gravity (60/60 °F)	-
ρ_{st}	Stock-tank oil density	kg/m³
ρ_o	Oil density at reservoir conditions	kg/m³

Method and standards

Mass balance of stock-tank oil and dissolved gas.

Assumptions and limits

- Black-oil model.

References

• Ahmed
• Reservoir Engineering Handbook
• 5th ed. (Gulf Professional Publishing, 2019)
• ch. 2
• eqs. 2-67 and 2-92

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/chemical/oil-gas/oil-api-gravity-density

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.