Crude Oil Viscosity: Dead, Saturated and Undersaturated

Dead-oil and gas-saturated crude viscosity by Beggs–Robinson, and undersaturated viscosity above the bubble point by Vasquez–Beggs.

Method: Ahmed; Reservoir Engineering Handbook; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Oil gravity	35.000	
Temperature	82.222	°C
Solution gas-oil ratio	500.00	scf/STB
Pressure (absolute)	3,000.0	psi
Bubble-point pressure (absolute)	2,500.0	psi

Calculated results

Parameter	Value	Unit
Dead-oil viscosity	2.1912	cP
Saturated (live) oil viscosity	0.64095	cP
Oil viscosity at the pressure	0.67284	cP

Notes for this case

- Above the bubble point: the Vasquez–Beggs undersaturated correction raises the viscosity with pressure.
- Beggs–Robinson: reported standard deviation about 14 % (dead) and 27 % (live); measured data are always better.

Formula and method

$$\mu_{od} = 10^{x} - 1,\ x = 10^{3.0324 - 0.02023\,\mathrm{API}}(T - 460)^{-1.163},\quad \mu_{ob} = a\mu_{od}^{b}$$

$$a = 10.715(R_s + 100)^{-0.515},\ b = 5.44(R_s + 150)^{-0.338},\quad \mu_o = \mu_{ob}\left(\frac{p}{p_b}\right)^{m},\ m = 2.6p^{1.187}10^{-3.9\times10^{-5}p - 5}$$

Variables

API	Oil gravity	-
T	Temperature	K
R_s	Solution gas-oil ratio	m³/m³
p	Pressure (absolute)	Pa
p_b	Bubble-point pressure (absolute)	Pa
μ_{od}	Dead-oil viscosity	Pa·s
μ_{ob}	Saturated (live) oil viscosity	Pa·s
μ_o	Oil viscosity at the pressure	Pa·s

Method and standards

Beggs–Robinson (1975) and Vasquez–Beggs (1980) in field units (cP, °R, psia, scf/STB).

Assumptions and limits

- Black-oil correlations.

References

• Ahmed
• Reservoir Engineering Handbook
• 5th ed. (Gulf Professional Publishing, 2019)
• ch. 2

- eqs. 2-117
- 2-120 and 2-121

Report details

Report reference	FCC-2VVB-14CP (the same inputs always give the same reference)
Generated	17 November 2026, 19:37 UTC
Calculator	Crude Oil Viscosity: Dead, Saturated and Undersaturated
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/beggs-robinson-oil-viscosity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.