Oil Formation Volume Factor: Six Correlations Compared

Oil formation volume factor at or below the bubble point by Standing, Vasquez–Beggs, Glasø, Marhoun, Petrosky–Farshad and the material balance.

Input parameters

Unit system: SI

Parameter	Value	Unit
Solution gas-oil ratio	650.00	scf/STB
Gas gravity (air = 1)	0.80000	
Oil gravity	35.000	
Temperature	200.00	°F
Separator pressure (for Vasquez–Beggs)	114.70	psi
Separator temperature	70.000	°F
Measured oil density at the conditions (for the material balance)	42.000	lb/ft³

Calculated results

Parameter	Value	Unit
Standing	1.3861	
Vasquez–Beggs	1.3762	
Glasø	1.3594	
Marhoun	1.3806	
Petrosky–Farshad	1.3880	
Material balance from density	1.4310	

Notes for this case

• At or below the bubble point. The comparison on six crudes gave average errors of 0.6 % (material balance, needs a measured density) to 2.8 %; Glasø tends to under-predict and Vasquez–Beggs to over-predict.

Formula and method

$$B_o = 0.9759 + 0.00012\left[R_s\sqrt{\gamma_g/\gamma_o} + 1.25T\right]^{1.2},\quad B_o = 1 + 10^{A},\ A = -6.58511 + 2.91329\log B^{*} - 0.27683(\log B^{*})^2,\quad B_o = \frac{62.4\gamma_o + 0.0136R_s\gamma_g}{\rho_o}$$

Variables

R_s	Solution gas-oil ratio	m³/m³
γ_g	Gas gravity (air = 1)	-
API	Oil gravity	-
T	Temperature	K
p_{sep}	Separator pressure (for Vasquez–Beggs)	Pa
T_{sep}	Separator temperature	K
ρ_o	Measured oil density at the conditions (for the material balance)	kg/m³
$B_{o,Standing}$	Standing	-
$B_{o,VB}$	Vasquez–Beggs	-
$B_{o,Glaso}$	Glasø	-
$B_{o,Marhoun}$	Marhoun	-
$B_{o,PF}$	Petrosky–Farshad	-

$B_{o,MB}$	Material balance from density	-

Method and standards

Black-oil formation volume factor correlations (°F, °R, scf/STB, lb/ft³).

Assumptions and limits

- Black oils at or below the bubble point.

Report details

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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-fvf-correlations

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Reopens the calculator with the inputs of this report.