Composite IPR for an Undersaturated Oil Well (Vogel Below p_b)

Productivity index, rate at the bubble point, maximum rate and rate at a chosen pressure for an undersaturated reservoir: straight line above p_b, Vogel below.

Input parameters

Unit system: SI

Parameter	Value	Unit
Average reservoir pressure	4,200.0	psi
Bubble-point pressure	1,800.0	psi
Stabilised test rate	900.00	bbl/d
Test bottom-hole pressure	3,300.0	psi
Bottom-hole pressure for the forecast	2,500.0	psi

Calculated results

Parameter	Value	Unit
Productivity index above the bubble point	1.0000	bbl/(d·psi)
Rate at the bubble point	2,400.0	bbl/d
Maximum rate (AOF)	3,400.0	bbl/d
Rate at the forecast pressure	1,700.0	bbl/d

Notes for this case

• Above the bubble point inflow is linear (constant J); below it free gas reduces the oil mobility and Vogel's curve applies, joined smoothly at p_b. The test may be taken above or below the bubble point.

Formula and method

$$Q_o = J(\bar{p}_r - p_{wf}) \ (p_{wf} \geq p_b), \quad Q_o = Q_{ob} + \frac{J p_b}{1.8}\left[1 - 0.2\frac{p_{wf}}{p_b} - 0.8\left(\frac{p_{wf}}{p_b}\right)^2\right] \ (p_{wf} < p_b)$$

Variables

$\bar{p}_r$	Average reservoir pressure	Pa
p_b	Bubble-point pressure	Pa
Q_{test}	Stabilised test rate	m³/s
$p_{wf,test}$	Test bottom-hole pressure	Pa
p_{wf}	Bottom-hole pressure for the forecast	Pa
J	Productivity index above the bubble point	m³/(s·Pa)
Q_{ob}	Rate at the bubble point	m³/s
$Q_{o,max}$	Maximum rate (AOF)	m³/s
Q_o	Rate at the forecast pressure	m³/s

Method and standards

Generalised (composite) Vogel IPR.

Assumptions and limits

- Undersaturated reservoir; zero skin.

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/reservoir-engineering/composite-ipr-undersaturated

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Reopens the calculator with the inputs of this report.