Oil Well Rate and Productivity Index (Radial Darcy Flow)

Oil well rate and productivity index from permeability, net pay, drawdown, viscosity, formation volume factor, drainage and well radius and skin.

Input parameters

Unit system: SI

Parameter	Value	Unit
Permeability	50.000	mD
Net pay thickness	12.192	m
Reservoir pressure (average or at the drainage boundary)	3,000.0	psi
Flowing bottom-hole pressure	2,000.0	psi
Oil viscosity	1.2000	cP
Oil formation volume factor	1.3000	
Drainage radius	304.80	m
Wellbore radius	0.091440	m
Skin factor	3.0000	
Flow regime	Pseudo-steady state (average pressure)	

Calculated results

Parameter	Value	Unit
Oil rate (stock tank)	876.24	bbl/d
Productivity index	2.3386e-10	
Productivity index (stock-tank m³/d per bar)	2.0205	

Notes for this case

- Single-phase oil above the bubble point, homogeneous reservoir, centred well. Below the bubble point gas comes out of solution: use Vogel's inflow relation. J in the first output is in SI (m³/s per Pa).

Formula and method

$$q_o = \frac{2\pi k h(\bar{p} - p_{wf})}{\mu_o B_o \left[\ln\frac{r_e}{r_w} - 0.75 + s\right]} \ (\text{pseudo} - \text{steady}), \quad J = \frac{q_o}{\bar{p} - p_{wf}}$$

Variables

k	Permeability	m²
h	Net pay thickness	m
$\bar{p}$	Reservoir pressure (average or at the drainage boundary)	Pa
p_{wf}	Flowing bottom-hole pressure	Pa
μ_o	Oil viscosity	Pa·s
B_o	Oil formation volume factor	-
r_e	Drainage radius	m
r_w	Wellbore radius	m
s	Skin factor	-
regime	Flow regime	-
q_o	Oil rate (stock tank)	m³/s

J	Productivity index	-

Method and standards

Darcy's law for radial flow in SI units.

Assumptions and limits

- Single-phase, homogeneous, radial drainage.

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/well-productivity-radial-darcy

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Reopens the calculator with the inputs of this report.