Gas Well Deliverability: Back-Pressure (C and n) and LIT Methods

Back-pressure exponent n, coefficient C, absolute open flow and rate at a chosen bottom-hole pressure from two stabilised tests, with the LIT quadratic check.

Input parameters

Unit system: SI

Parameter	Value	Unit
Average reservoir pressure (shut-in)	2,800.0	psi
Bottom-hole pressure, test 1	2,500.0	psi
Gas rate, test 1	850.00	Mscf/d
Bottom-hole pressure, test 2	1,900.0	psi
Gas rate, test 2	1,900.0	Mscf/d
Bottom-hole pressure for the forecast	1,200.0	psi

Calculated results

Parameter	Value	Unit
Back-pressure exponent	0.82207	
Performance coefficient (Mscf/d per psi^2n)	0.006783	
Absolute open flow (back-pressure)	3,155.4	Mscf/d
Rate at the forecast pressure (back-pressure)	2,670.5	Mscf/d
Absolute open flow (LIT quadratic)	3,011.9	Mscf/d
Rate at the forecast pressure (LIT)	2,598.5	Mscf/d

Notes for this case

- The back-pressure line Q = C(p̄² − p_wf²)ⁿ is fitted through the two tests. The LIT form Δp² = aQ + bQ² separates the laminar (a) and turbulent (b) terms and is less prone to error when extrapolated to open flow.

Formula and method

$$n = \frac{\log(Q_2/Q_1)}{\log\frac{\bar{p}_r^2 - p_{wf2}^2}{\bar{p}_r^2 - p_{wf1}^2}}, \quad Q = C(\bar{p}_r^2 - p_{wf}^2)^n, \quad \bar{p}_r^2 - p_{wf}^2 = aQ + bQ^2$$

Variables

$\bar{p}_r$	Average reservoir pressure (shut-in)	Pa
p_{wf1}	Bottom-hole pressure, test 1	Pa
Q_1	Gas rate, test 1	Nm³/s
p_{wf2}	Bottom-hole pressure, test 2	Pa
Q_2	Gas rate, test 2	Nm³/s
p_{wf}	Bottom-hole pressure for the forecast	Pa
n	Back-pressure exponent	-
C	Performance coefficient (Mscf/d per psi^2n)	-
AOF	Absolute open flow (back-pressure)	Nm³/s
Q_g	Rate at the forecast pressure (back-pressure)	Nm³/s
AOF_{LIT}	Absolute open flow (LIT quadratic)	Nm³/s

Q_{LIT}	Rate at the forecast pressure (LIT)	Nm³/s

Method and standards

Back-pressure and LIT deliverability.

Assumptions and limits

- Stabilised (pseudo-steady) flow periods; same reservoir pressure.

Report details

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This calculator online

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