Drawdown Test: Permeability and Skin from the Semilog Slope

Permeability, skin factor and skin pressure drop from the semilog straight line of a constant-rate pressure drawdown test (slope and one-hour pressure).

Input parameters

Unit system: SI

Parameter	Value	Unit
Constant oil rate during the test	600.00	bbl/d
Oil formation volume factor	1.3000	
Oil viscosity	0.80000	cP
Net pay thickness	40.000	ft
Slope of the semilog straight line (per log cycle)	45.000	psi
Initial reservoir pressure	3,800.0	psi
Pressure on the straight line at 1 hour	3,420.0	psi
Porosity	18.000	%
Total compressibility	1.4000e-05	1/psi
Wellbore radius	0.35400	ft

Calculated results

Parameter	Value	Unit
Permeability	56.357	mD
Skin factor	3.8264	
Pressure drop due to skin	149.56	psi
Radius reached by the pressure disturbance after 1 hour	171.71	ft

Notes for this case

- Use data after wellbore storage ends and before boundaries are felt (the middle-time straight line). Read p_1hr on the extrapolated line even if the measured point at 1 hour is still distorted by storage.

Formula and method

$$k = \frac{Q_o B_o \mu_o \ln 10}{4\pi |m| h}, \quad s = 1.1513 \left[\frac{p_i - p_{1hr}}{|m|} - \log \frac{4k(1\,\mathrm{h})}{\gamma \phi \mu c_t r_w^2} \right], \quad \Delta p_{skin} = 0.869 |m| s$$

Variables

Q_o	Constant oil rate during the test	m³/s
B_o	Oil formation volume factor	-
μ_o	Oil viscosity	Pa·s
h	Net pay thickness	m
	m	$
p_i	Initial reservoir pressure	Pa
p_{1hr}	Pressure on the straight line at 1 hour	Pa
ϕ	Porosity	-
c_t	Total compressibility	1/Pa
r_w	Wellbore radius	m

k	Permeability	m²
s	Skin factor	-
Δp_{skin}	Pressure drop due to skin	Pa
$r_{inv}(1\,\mathrm{h})$	Radius reached by the pressure disturbance after 1 hour	m

Method and standards

Semilog drawdown analysis.

Assumptions and limits

- Infinite-acting radial flow; constant rate.

Report details

Report reference	FCC-7VR6-5NHP (the same inputs always give the same reference)
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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/reservoir-engineering/drawdown-test-analysis

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Reopens the calculator with the inputs of this report.