Pressure Build-Up Test: Permeability and Skin from the Horner Plot

Permeability, skin factor and skin pressure drop from the Horner plot slope and the one-hour pressure of a pressure build-up test (Horner method).

Input parameters

Unit system: SI

Parameter	Value	Unit
Stabilised rate before shut-in	350.00	bbl/d
Oil formation volume factor	1.2500	
Oil viscosity	1.8000	cP
Net pay thickness	30.000	ft
Slope of the Horner straight line (per log cycle)	65.000	psi
Pressure on the straight line at 1 hour of shut-in	2,450.0	psi
Flowing pressure just before shut-in	1,820.0	psi
Porosity	18.000	%
Total compressibility	1.5000e-05	1/psi
Wellbore radius	0.30000	ft

Calculated results

Parameter	Value	Unit
Average permeability	65.653	mD
Skin factor	5.4611	
Pressure drop due to skin	308.33	psi

Notes for this case

- Read p_1hr on the extrapolated straight line, not from early data distorted by wellbore storage.

Formula and method

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

Variables

q_o	Stabilised rate before shut-in	m³/s
B_o	Oil formation volume factor	-
μ_o	Oil viscosity	Pa·s
h	Net pay thickness	m
m	Slope of the Horner straight line (per log cycle)	Pa
p_{1hr}	Pressure on the straight line at 1 hour of shut-in	Pa
$p_{wf}(\Delta t = 0)$	Flowing pressure just before shut-in	Pa
ϕ	Porosity	-
c_t	Total compressibility	1/Pa
r_w	Wellbore radius	m
k	Average permeability	m²
s	Skin factor	-

Δp_{skin}	Pressure drop due to skin	Pa

Method and standards

Horner semilog analysis.

Assumptions and limits

- Infinite-acting radial flow; long producing time before shut-in.

Report details

Report reference	FCC-6P7A-GPDV (the same inputs always give the same reference)
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Calculator	Pressure Build-Up Test: Permeability and Skin from the Horner Plot
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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/horner-buildup-analysis

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.