Skin Factor, Skin Pressure Drop and Flow Efficiency (Hawkins)

Skin factor of a damaged or stimulated zone by Hawkins, the extra pressure drop it causes, apparent wellbore radius, flow efficiency and damage ratio.

Input parameters

Unit system: SI

Parameter	Value	Unit
Formation permeability	25.000	mD
Permeability of the altered zone	125.00	mD
Radius of the altered zone	3.0000	ft
Wellbore radius	0.35400	ft
Oil rate (stock tank)	450.00	bbl/d
Oil viscosity	0.80000	cP
Oil formation volume factor	1.3000	
Net pay thickness	40.000	ft
Average reservoir pressure	2,800.0	psi
Flowing bottom-hole pressure	2,100.0	psi

Calculated results

Parameter	Value	Unit
Skin factor	-1.7097	
Pressure drop across the skin	-112.98	psi
Apparent wellbore radius	1.9566	ft
Flow efficiency	116.14	%
Damage ratio	0.86103	
Bottom-hole pressure for the same rate without skin	1,987.0	psi

Notes for this case

- Negative skin: the zone is stimulated (acidised or fractured) and the well flows as if its radius were r_wa.
- Flow efficiency compares the actual drawdown with the drawdown the well would need without skin at the same rate.

Formula and method

$$s = \left(\frac{k}{k_{skin}} - 1\right) \ln\frac{r_{skin}}{r_w}, \quad \Delta p_{skin} = \frac{q_o B_o \mu_o}{2\pi k h} s, \quad r_{wa} = r_w e^{-s}, \quad FE = \frac{\bar{p} - p_{wf} - \Delta p_{skin}}{\bar{p} - p_{wf}}$$

Variables

k	Formation permeability	m²
k_{skin}	Permeability of the altered zone	m²
r_{skin}	Radius of the altered zone	m
r_w	Wellbore radius	m
q_o	Oil rate (stock tank)	m³/s
μ_o	Oil viscosity	Pa·s
B_o	Oil formation volume factor	-
h	Net pay thickness	m
$\bar{p}$	Average reservoir pressure	Pa

p_{wf}	Flowing bottom-hole pressure	Pa
s	Skin factor	-
Δp_{skin}	Pressure drop across the skin	Pa
r_{wa}	Apparent wellbore radius	m
FE	Flow efficiency	-
DR	Damage ratio	-
$p_{wf,ideal}$	Bottom-hole pressure for the same rate without skin	Pa

Method and standards

Hawkins steady-state skin.

Assumptions and limits

- Uniform altered zone; Darcy flow.

Report details

Report reference	FCC-1JH2-JK6N (the same inputs always give the same reference)
Generated	23 November 2026, 17:26 UTC
Calculator	Skin Factor, Skin Pressure Drop and Flow Efficiency (Hawkins)
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
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/skin-factor-hawkins

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.