Permeability from Porosity and Connate Water (Timur, Morris–Biggs)

Estimated absolute permeability from porosity and connate (irreducible) water saturation by Timur, Morris–Biggs for oil and gas, and the correlation.

Input parameters

Unit system: SI

Parameter	Value	Unit
Porosity	10.000	%
Connate (irreducible) water saturation	45.000	%

Calculated results

Parameter	Value	Unit
Timur	1.6870	mD
Morris–Biggs, oil zone	0.30864	mD
Morris–Biggs, gas zone	0.012346	mD
2017 porosity and connate water correlation	1.1532	mD

Notes for this case

• Order-of-magnitude estimates for clean sands from logs; the spread between methods is itself a measure of the uncertainty. Calibrate against core or well tests wherever possible.

Formula and method

$$k = 8581\frac{\phi^{4.4}}{S_{wc}^2}, \quad k = 62500\frac{\phi^6}{S_{wc}^2}\ \text{(oil)},\ 2500\frac{\phi^6}{S_{wc}^2}\ \text{(gas)}, \quad k = 151.7\left(\frac{\phi}{S_{wc}}\right)^{3.5323} + 0.01665e^{31.93\phi}\ \text{(mD)}$$

Variables

ϕ	Porosity	-
S_{wc}	Connate (irreducible) water saturation	-
k_{Timur}	Timur	m²
$k_{MB,oil}$	Morris–Biggs, oil zone	m²
$k_{MB,gas}$	Morris–Biggs, gas zone	m²
k_{2017}	2017 porosity and connate water correlation	m²

Method and standards

Empirical porosity–water saturation permeability correlations.

Assumptions and limits

- Clean sandstones at irreducible water.

Report details

Report reference	FCC-YK08-7ASK (the same inputs always give the same reference)
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Calculator	Permeability from Porosity and Connate Water (Timur, Morris–Biggs)
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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/permeability-from-porosity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.