Gas–Oil Relative Permeability and Capillary Pressure (Corey Form)

Oil and gas relative permeability and gas–oil capillary pressure at a gas saturation from end points, critical saturations and exponents (Corey-type).

Input parameters

Unit system: SI

Parameter	Value	Unit
Gas saturation	12.000	%
Connate water saturation	20.000	%
Residual oil saturation to gas	15.000	%
Critical gas saturation	3.0000	%
Oil relative permeability at critical gas	0.80000	
Gas relative permeability at connate water	0.70000	
Oil exponent	2.0000	
Gas exponent	2.5000	
Capillary pressure at critical liquid saturation	5.0000	psi
Capillary pressure exponent	0.60000	

Calculated results

Parameter	Value	Unit
Oil relative permeability	0.58460	
Gas relative permeability	0.005620	
Gas–oil capillary pressure	1.5707	psi
Critical (total) liquid saturation	35.000	%

Notes for this case

• Gas does not flow until its saturation exceeds the critical value S_gc; oil stops flowing at the critical liquid saturation S_wc + S_org. Solution-gas drive recovery depends strongly on the k_rg/k_ro ratio these curves give.

Formula and method

$$k_{ro} = (k_{ro})_{S_{gc}} \left(\frac{1 - S_g - S_{lc}}{1 - S_{gc} - S_{lc}} \right)^{n_{go}}, \quad k_{rg} = (k_{rg})_{S_{wc}} \left(\frac{S_g - S_{gc}}{1 - S_{lc} - S_{gc}} \right)^{n_g}, \quad S_{lc} = S_{wc} + S_{org}$$

Variables

S_g	Gas saturation	-
S_{wc}	Connate water saturation	-
S_{org}	Residual oil saturation to gas	-
S_{gc}	Critical gas saturation	-
$(k_{ro})_{S_{gc}}$	Oil relative permeability at critical gas	-
$(k_{rg})_{S_{wc}}$	Gas relative permeability at connate water	-
n_{go}	Oil exponent	-
n_g	Gas exponent	-

$(p_c)_{S_{lc}}$	Capillary pressure at critical liquid saturation	Pa
n_{pg}	Capillary pressure exponent	-
k_{ro}	Oil relative permeability	-
k_{rg}	Gas relative permeability	-
p_{cgo}	Gas–oil capillary pressure	Pa
S_{lc}	Critical (total) liquid saturation	-

Method and standards

Corey-type analytic gas–oil relative permeability.

Assumptions and limits

- Gas–oil system at connate water.

Report details

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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/relative-permeability-gas-oil

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Reopens the calculator with the inputs of this report.