Reservoir Drive Indices: Depletion, Gas Cap, Water and Expansion

Water influx from the material balance and the depletion, segregation (gas-cap), water and rock-fluid expansion drive indices of a combination-drive oil reservoir.

Input parameters

Unit system: SI

Parameter	Value	Unit
Initial oil in place (stock tank)	40.000	MMbbl
Gas-cap to oil volume ratio	0	
Cumulative oil produced	6.0000	MMbbl
Cumulative produced gas-oil ratio	900.00	scf/STB
Cumulative water produced	1,500,000	bbl
Two-phase formation volume factor now	1.4800	
Initial two-phase (= oil) formation volume factor	1.4200	
Initial solution gas-oil ratio	650.00	scf/STB
Gas formation volume factor now	0.001400	bbl/scf
Initial gas formation volume factor	0.001100	bbl/scf
Water formation volume factor	1.0200	
Initial water saturation	25.000	%
Water compressibility	3.0000e-06	1/psi
Pore compressibility	4.0000e-06	1/psi
Pressure drop	600.00	psi

Calculated results

Parameter	Value	Unit
Cumulative water influx	9,894,160	bbl
Net water influx	8,364,160	bbl
Depletion-drive index	21.858	%
Segregation (gas-cap) drive index	0	%
Water-drive index	76.176	%
Rock and fluid expansion index	1.9658	%

Notes for this case

- The four indices add up to 1. Keep the depletion-drive index low: it is the least efficient mechanism.

Formula and method

$$A = N_p[B_t + (R_p - R_{si})B_g], \quad DDI = \frac{N(B_t - B_{ti})}{A}, \quad SDI = \frac{NmB_{ti}(B_g - B_{gi})/B_{gi}}{A}, \quad WDI = \frac{W_e - W_pB_w}{A}$$

Variables

N	Initial oil in place (stock tank)	m³
m	Gas-cap to oil volume ratio	-
N_p	Cumulative oil produced	m³

R_p	Cumulative produced gas-oil ratio	m³/m³
W_p	Cumulative water produced	m³
B_t	Two-phase formation volume factor now	-
B_{ti}	Initial two-phase (= oil) formation volume factor	-
R_{si}	Initial solution gas-oil ratio	m³/m³
B_g	Gas formation volume factor now	m³/m³
B_{gi}	Initial gas formation volume factor	m³/m³
B_w	Water formation volume factor	-
S_{wi}	Initial water saturation	-
c_w	Water compressibility	1/Pa
c_f	Pore compressibility	1/Pa
$p_i - p$	Pressure drop	Pa
W_e	Cumulative water influx	m³
$W_e - W_p B_w$	Net water influx	m³
DDI	Depletion-drive index	-
SDI	Segregation (gas-cap) drive index	-
WDI	Water-drive index	-
EDI	Rock and fluid expansion index	-

Method and standards

Material-balance drive indices.

Assumptions and limits

- Tank model; uniform pressure.

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/oil-reservoir-drive-indices

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.