Well Interference by Superposition (Ei Solution)

Flowing pressure at a well including the pressure drop caused by up to two neighbouring producing wells, by superposition of line-source solutions.

Input parameters

Unit system: SI

Parameter	Value	Unit
Rate of the well itself	100.00	bbl/d
Skin factor of the well	-0.50000	
Wellbore radius	0.25000	ft
Rate of neighbour 2	160.00	bbl/d
Distance to neighbour 2	400.00	ft
Rate of neighbour 3	200.00	bbl/d
Distance to neighbour 3	700.00	ft
Oil formation volume factor	1.2000	
Oil viscosity	2.0000	cP
Permeability	40.000	mD
Net pay thickness	20.000	ft
Porosity	15.000	%
Total compressibility	2.0000e-05	1/psi
Initial reservoir pressure	4,500.0	psi
Time since all wells started	240.00	h

Calculated results

Parameter	Value	Unit
Drop from the well's own production	329.03	psi
Drop caused by neighbour 2	63.415	psi
Drop caused by neighbour 3	39.396	psi
Flowing pressure at the well	4,068.2	psi

Notes for this case

- Infinite-acting reservoir, all wells starting together at constant rates. The skin applies only to the well where the pressure is calculated. Set a rate to zero to leave a neighbour out.

Formula and method

$$p_i - p_{wf} = \frac{Q_1 B \mu}{4\pi k h}\left[E_1\left(\frac{\phi \mu c_t r_w^2}{4kt}\right) + 2s\right] + \sum_j \frac{Q_j B \mu}{4\pi k h} E_1\left(\frac{\phi \mu c_t r_j^2}{4kt}\right)$$

Variables

Q_1	Rate of the well itself	m³/s
s	Skin factor of the well	-
r_w	Wellbore radius	m
Q_2	Rate of neighbour 2	m³/s
r_2	Distance to neighbour 2	m

Q_3	Rate of neighbour 3	m³/s
r_3	Distance to neighbour 3	m
B_o	Oil formation volume factor	-
μ_o	Oil viscosity	Pa·s
k	Permeability	m²
h	Net pay thickness	m
ϕ	Porosity	-
c_t	Total compressibility	1/Pa
p_i	Initial reservoir pressure	Pa
t	Time since all wells started	s
Δp_1	Drop from the well's own production	Pa
Δp_2	Drop caused by neighbour 2	Pa
Δp_3	Drop caused by neighbour 3	Pa
p_{wf}	Flowing pressure at the well	Pa

Method and standards

Superposition of line-source solutions in space.

Assumptions and limits

- Infinite-acting homogeneous reservoir; constant rates from t = 0.

Report details

Report reference	FCC-3697-VGHM (the same inputs always give the same reference)
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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/interference-superposition-pressure

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Reopens the calculator with the inputs of this report.