Wellhead Choke Performance: Gilbert, Ros, Baxendell, Achong

Wellhead pressure for liquid rate, gas-liquid ratio and choke size by the Gilbert-type correlations, and the choke size for a target wellhead pressure.

Input parameters

Unit system: SI

Parameter	Value	Unit
Liquid rate	1,200.0	bbl/d
Gas-liquid ratio	800.00	scf/STB
Choke bean size	0.37500	in
Target wellhead pressure (for sizing)	450.00	psi

Calculated results

Parameter	Value	Unit
Wellhead pressure, Gilbert	1,137.5	psi
Wellhead pressure, Ros	1,028.2	psi
Wellhead pressure, Baxendell	956.19	psi
Wellhead pressure, Achong	900.60	psi
Choke size for the target pressure (Gilbert)	0.61251	in
That choke size in 64ths of an inch	39.201	

Notes for this case

- Critical (sonic) flow through the choke: the downstream line pressure must be below about half the wellhead pressure, so that flowline changes do not reach the well. The correlations are empirical; Gilbert's is the most widely used.

Formula and method

$$p_{wh} = \frac{a_1 Q_L (GLR)^{a_2}}{d^{a_3}};\quad \text{Gilbert } (3.86\times10^{-3}, 0.546, 1.89),\ \text{Ros } (4.26\times10^{-3}, 0.5, 2.0),\ \text{Baxendell } (3.12\times10^{-3}, 0.546, 1.93),\ \text{Achong } (1.54\times10^{-3}, 0.65, 1.88)$$

Variables

Q_L	Liquid rate	m³/s
GLR	Gas-liquid ratio	m³/m³
d	Choke bean size	m
$p_{wh,target}$	Target wellhead pressure (for sizing)	Pa
$p_{wh,Gilbert}$	Wellhead pressure, Gilbert	Pa
$p_{wh,Ros}$	Wellhead pressure, Ros	Pa
$p_{wh,Baxendell}$	Wellhead pressure, Baxendell	Pa
$p_{wh,Achong}$	Wellhead pressure, Achong	Pa
$d_{Gilbert}$	Choke size for the target pressure (Gilbert)	m
$d/64$	That choke size in 64ths of an inch	-

Method and standards

Gilbert-type critical-flow choke correlations (psi, STB/d, scf/STB, in).

Assumptions and limits

- Critical flow through the choke.

Report details

Report reference	FCC-BE0W-DB51 (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/oil-gas/wellhead-choke-performance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.