



vertical well

$$\pi r_e^2 = A = 500 \cdot 500$$
$$r_e = \sqrt{\frac{500 \cdot 500}{\pi}}$$

Reservoir top area	[m2]	2.50E+05
Reservoir pressure, p _R	[bara]	300
Flowing bottom-hole pressure, p _{wf}	[bara]	200
p _{av}	[bara]	250
Oil viscosity, μ _o at average pressure	[cp]	1.877
Oil volume factor, B _o , at average pressure	[m3/Sm3]	1.144
Wellbore radius, r _w	[m]	0.15
Vertical well located in the center and perforated throughout		
External radius, r _e	[m]	282.1
Skin, s	[-]	0
Shape factor, s _A	[-]	0.012
Productivity Index, J	[Sm3/d/bar]	14.7
Horizontal well		
Wellbore length	[m]	500
Elevation difference between toe and heel, b (sign doesn't matter)	[m]	0
Productivity Index, J	[Sm3/d/bar]	63.2

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Function J_vertical(k, h, Uo, Bo, re, rw, s, sa)
'Productivity index for vertical well, undersaturated oil, pss, in Sm3/d/bar
'k in md
'h in m
'Uo in cp
'Bo in m^3/Sm^3
'fa is shape factor
J_vertical = (k * h) / (18.68 * Uo * Bo * (Log(re / rw) - 0.75 + s + sa))
'Natural Log in Visual Basic is Log, not LN'
End Function

Function J_horizontal(L, D, h, b, Lw, kh, kv, Bo, viso, rw)
'Productivity index for horizontal well, undersaturated oil, pss, in Sm3/d/bar
'L Reservoir length along well direction [m]
'D Reservoir width [m]
'h reservoir thickness [m]
'Lw well length [m]
'kh horizontal permeability [md]
'kv vertical permeability [md]
'Bo oil formation volume factor [m^3/Sm^3]
'viso oil viscosity [cp]
'rw well radius [m]
'b, height difference between heel and toe [m]
Pi = Atn(1) * 4
b = Abs(b)
If b / h > 0.1 Then
    s_b = 0.69
Else
    s_b = 0
End If
beta = (kh / kv) ^ 0.5
Lw_hat = Lw * (1 + ((b / Lw) ^ 2) * (beta ^ 2 - 1)) ^ 0.5
Lw_bar = Lw * (1 - (b / Lw) ^ 2) ^ 0.5
rw_hat = 0.5 * rw * (1 + (1 + (beta ^ 2 - 1) * ((Lw_bar / Lw) ^ 2)) ^ 0.5)
A1 = 0.53 * ((L / D) ^ 2) + 1.15 * (L / D) + 0.164
A2 = (1 - (Lw_bar / L)) / (0.45 + (Lw_bar / L))
fa = (Lw_bar / L) * (1 + A1 * A2)
C1 = 3 * h * beta * (Log(beta * h / (2 * Pi * rw_hat)) + s_b) / Lw_hat
C2 = (Pi * D * fa / (2 * Lw_bar))
unit_conversion_constant = (9.869E-13 * 0.001) * 24 * 3600 * 100000 * 6 * Pi / (0.001)
J_horizontal = unit_conversion_constant * kh * h / (viso * Bo * (C1 + C2))
End Function
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