DOI: 10.4172/2472-0518.1000138

Analysis of Wellbore Pressure Drop on Horizontal Well Performance

Ohaegbulam MC*, Izuwa NC and Onwukwe SI

Department of Petroleum Engineering, Federal University of Technology, Owerri, Imo State, Nigeria

Abstract

The problem of wellbore pressure drop on horizontal well performance has been a concern to many researchers and the petroleum industry. Wellbore pressure losses in horizontal well not only increases gas or water conning tendency at the heel of the wellbore but also chokes oil production at the distant part of the wellbore especially for long horizontal wellbore thereby rendering some part of the horizontal well unproductive. This limits the usefulness of

***Corresponding author:** Ohaebulam MC, Research Engineer at Petroleum Engineering Department FUTO, Department of Petroleum Engineering Federal University of Technology Owerri, Nigeria, Tel+ 23408066796449; E-mail: chukwudiohaegbulam43@gmail.com

Received April 24, 2017; **Accepted** May 11, 2017; **Published** May 19, 2017

Citation: Ohaegbulam MC, Izuwa NC, Onwukwe SI (2017) Analysis of Wellbore Pressure Drop on Horizontal Well Performance. Oil Gas Res 3: 138. doi: 10.4172/2472-0518.1000138

length [2]. Most inflow equations Elegaghad [3-6] are based on the on the assumption that the wellbore flowing pressure is constant over the length of the horizontal well, implying that the wellbore pressure drop is negligible compared with other pressure drops in the system. Consequently the predictions of well performance and the reservoir drainage pattern may be erroneous. Numerous studies have examined the roles of wellbore pressure drop on the production performance of horizontal wells. Dikkens [7] was the first author to present analytical model to couple turbulent flow in the horizontal wellbore to the flow in the reservoir. He showed that in most practical situations, a horizontal well will exhibit turbulent flow and as such the infinite conductivity assumption should not be considered. He assumed a steady-state, single-phase pressure drop in the wellbore due to laminar or turbulent flow and linked the wellbore to the reservoir using a material balance relationships. He solved this problem analytically for an infinite length horizontal well and numerically for a finite length horizontal well. He concluded that beyond a certain well length, frictional losses would result in constant oil production as the well length increases. One of the shortcomings Erdal et al. [8] of Dikkens analytical model is that it cannot incorporate any frictional factor correlation. Novy [9] generalized Dikken work by developing an equation for both single-phase oil and single-phase gas flow. The problem was formulated as a boundary value problem and was solved using a finite difference scheme. He showed that wellbore pressure due to frictional effects reduce production rate by at least 10% when the wellbore pressure drop is more than 15% of the draw down at the heel of well. He concluded that if the ratios of wellbore pressure to the reservoir draw down at the heel is greater than 10%, then friction losses will significantly reduce oil production rate. Alfred and Ding [10] presented a simple analytic equation that can be used to determine the relative effects of wellbore pressure drop on horizontal well performance. The equation assumed a steady-state flow in the reservoir and wellbore respectively. Cho and Subhash [11]

Citation: Ohaegbulam MC, Izuwa NC, Onwukwe SI (2017) Analysis of Wellbore Pressure Drop on Horizontal Well Performance. Oil Gas Res 3: 138. doi: 10.4172/2472-0518.1000138

note that for a constant area slightly compressible steady-state ow, the e ect of acceleration is negligible and is generally neglected while for compressible uid, acceleration e ect is not negligible, hence cannot be neglected [16,17].

e fundamental law of uid motion in porous media is Darcy's law which states that the velocity of a homogenous uid in porous medium is proportional to the pressure gradient and inversely proportional to the uid viscosity:

Case 2: both the drain hole and the vertical section of the horizontal well are considered, node 1-3. From Figure 1 at node 1, out ow pressure:

$_1$ (28)

At node 2, out ow pressure:

$_2$ (29)

At node 3, out ow pressure:

$_3$ (30)

Substituting eqn. (30) in eqn. (15) and integrating:

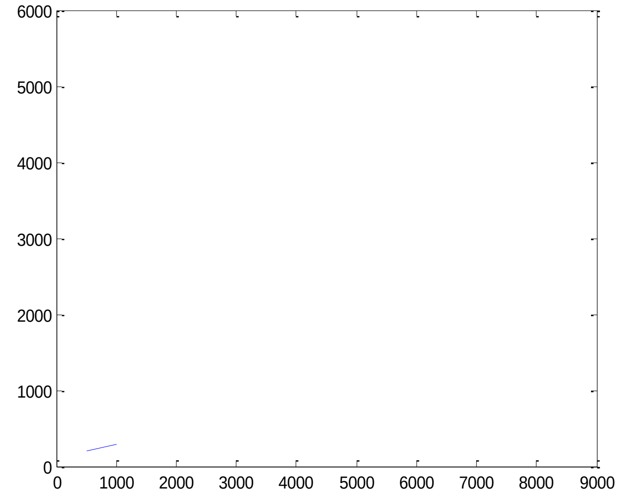
$_0$ (31)

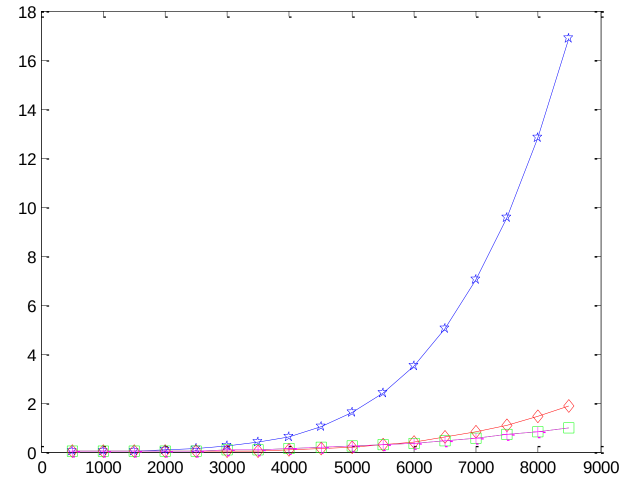
$_0$ $_0$ (32)

$_0$ (33)

Where ΔP

Citation: Ohaegbulam MC, Izuwa NC, Onwukwe SI (2017) Analysis of Wellbore Pressure Drop on Horizontal Well Performance. Oil Gas Res 3: 138. doi: 10.4172/2472-0518.1000138




18
16
14
12
10
8
6
4
2
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

14.