World Academy of Science, Engineering and Technology
International Journal of Energy and Environmental Engineering
Vol:9, No:10, 2015

Placement of Inflow Control Valve for Horizontal Oil Well

Authors : S. Thanabanjerdsin, F. Srisuriyachai, J. Chewaroungroj

Abstract : Drilling horizontal well is one of the most cost-effective method to exploit reservoir by increasing exposure area between well and formation. Together with horizontal well technology, intelligent completion is often co-utilized to increases petroleum production by monitoring/control downhole production. Combination of both technological results in an opportunity to lower water cresting phenomenon, a detrimental problem that does not lower only oil recovery but also cause environmental problem due to water disposal. Flow of reservoir fluid is a result from difference between reservoir and wellbore pressure. In horizontal well, reservoir fluid around the heel location enters wellbore at higher rate compared to the toe location. As a consequence, Oil-Water Contact (OWC) at the heel side of moves upward relatively faster compared to the toe side. This causes the well to encounter an early water encroachment problem. Installation of Inflow Control Valve (ICV) in particular sections of horizontal well can involve several parameters such as number of ICV, water cut constrain of each valve, length of each section. This study is mainly focused on optimization of ICV configuration to minimize water production and at the same time, to enhance oil production. A reservoir model consisting of high aspect ratio of oil bearing zone to underneath aquifer is drilled with horizontal well and completed with variation of ICV segments. Optimization of the horizontal well configuration is firstly performed by varying number of ICV, segment length, and individual preset water cut for each segment. Simulation results show that installing ICV can increase oil recovery factor up to 5% of Original Oil In Place (OOIP) and can reduce of produced water depending on ICV segment length as well as ICV parameters. For equally partitioned-ICV segment, more number of segment results in better oil recovery. However, number of segment exceeding 10 may not give a significant additional recovery. In first production period, deformation of OWC strongly depends on number of segment along the well. Higher number of segment results in smoother deformation of OWC. After water breakthrough at heel location segment, the second production period begins. Deformation of OWC is principally dominated by ICV parameters. In certain situations that OWC is unstable such as high production rate, high viscosity fluid above aquifer and strong aquifer, second production period may give wide enough window to ICV parameter to take the roll.

Keywords : horizontal well, water cresting, inflow control valve, reservoir simulation
Conference Title : ICGPE 2015 : International Conference on Geosciences and Petroleum Engineering
Conference Location : Osaka, Japan
Conference Dates : October 08-09, 2015