Incremental Oil Recovery in Heavy Oil Fields through Active Flow Control Devices

Victor Huerta[1] and P. Zegarra[2]

[1]Perupetro
[2]Baker Hughes

Abstract

Mature heavy oil fields in the Peruvian jungle have been produced for more than 40 years with natural strong water drive assisted with ESPs. Primary recovery factor with cold production methods reached 15% in average, and ultimate recovery will arrive to 17% at economic limit of 98% water cut.

Traditional completion systems in mature Peruvian oilfields include both some deviated wells with ESPs immediatly above 7" liner hanger, and horizontal wells completed open hole; thus, selective production is not possible and water flow eventually breakthrough to the well while reducing relative permeability to oil and oil rates.

Formation permeability variations throughout toe to heel borehole can cause flow rate differences between zones that can be intensified in heavy oil reservoirs. In order to maximize oil production and ultimate recovery, the completion system should assure a balanced influx of oil and unwanted fluids from the entire borehole. New completion technology allows producing selectively in horizontal wells, delaying gas or water breakthrough and avoiding by-pass oil.

Active inflow control devices (AICD) have been created to equalize the influx of oil and unwanted fluids (water or gas) by creating additional back-pressure in zones that produces at higher rates; heavy oil (higher viscosity fluid) takes a relatively non-restrictive path while water or gas (lower viscosity fluid) is sent to a tortuous path causing a decrease in its flow rate.

Many succesful applications of AICDs were reported worldwide, and some recent projects in sub-andean basins has also recorded succesful results in Colombia and Ecuador (xx% increase in oil rate, yy% decrease in water production and zz% increase in ultimate recovery factor); numerical simulation studies for a heavy oilfield in Peru shows xx% increase in oil rate, yy% decrease in water production and zz% increase in ultimate recovery factor.