Successful Polymer Gels Application in a Highly Channeled Peripheral Injection Well: Tello Field Pilot

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Oil recovery by water injection is the most extended technology in the world for additional recovery, however, formation heterogeneity can turn it into highly inefficient and expensive by channeling injected water. This work presents a chemical option that allows controlling the channeling of important amounts of injection water in specific layers, or portions of layers, which is the main explanation for low efficiency in many secondary oil recovery processes. The core of the stages presented here is using partially hydrolyzed polyacrylamide (HPAM) crosslinked with a metallic ion (Cr+3), which, at high concentrations in the injection water (5000 – 20000 ppm), generates a rigid gel in the reservoir that forces the injected water to enter into the formation through upswept zones.

The use of the stages presented here is a process that involves from experimental evaluation for the specific reservoir to the field monitoring, and going through a strict control during the well intervention, being this last step an innovation for this kind of treatments. This study summarizes from the laboratory to the field evaluation of a successful polymer gel project for controlling water thief zones, implemented as a strategy to reduce the phenomenon of channeling identified between the injection well and the producer well. The design includes laboratory test (fluid – fluid, fluid – rock and cinetic reaction) to determine the right polymer and the necessary polymer and crosslinker concentration to obtain consistency of the gel at the reservoir conditions.

Polymer gel injection reaching 43,400 bbl of solution injected (13% of channel volume) and being the largest Latinoamerican polymer gel treatment until now. Injection strategy considered a maximal polymer concentration of 7000 ppm and a fixed polymer/crosslinker ratio ranging from 40:1 to control maximum injection pressure. Field results showed an important increase in oil recoveries (oil production up to 300%) and a reduction in water cut (5%). Comparing these results to what is normal obtained with this technology this is one of the most efficient process until now, this is more relevant when taking into account the peripheral condition of the water injection.

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