

Case Study



TIOR-KOH[®] Clay Stabilization Technology

Experience Gained From 318 Injection Well KOH Clay Stabilization Treatments (SPE 60307)

Situation

Clays are a common component in tight sandstone formations, and have the potential to adversely affect waterflood performance. The effects of clays may be subtle, causing loss in injectivity over time, or extreme, causing the formation to “lock up” soon after initiating water injection. In addition to an overall loss in injectivity, clays tend to exacerbate heterogeneity, resulting in lower ultimate oil recovery.

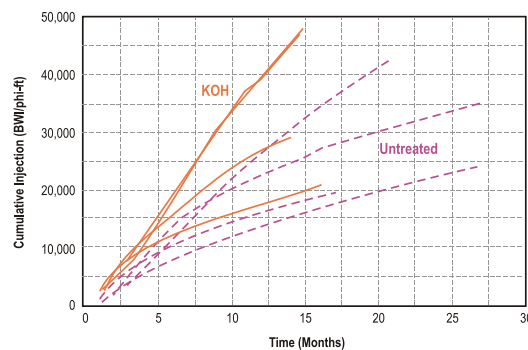
Program

Once a clay problem has been identified based on field performance and laboratory data, additional considerations on a reservoir scale are important in determining whether the KOH process is viable from a practical and economic standpoint. One example is injection water availability. If water available for waterflooding is fresh, or significantly less saline than the formation brine, clays will probably need to be stabilized. On the other hand, if a brine similar to the formation brine is available to flood the reservoir, clay stabilization may not be necessary. Well cost is another strong consideration. If wells are particularly deep and expensive to drill, then the operator has a lot more to lose if the well is damaged from clays.

Both fractured and unfractured wells have been treated. Fractures do not necessarily preclude the need for clay stabilization, as the problem of large amounts of fluid moving through a sandface still exists, and clays still cause problems. In some cases, fracturing may do more harm than good. If fracturing the formation to increase injectivity has the potential of leading to injectivity loss out of zone or directional communication to offsets, then there may be incentive to avoid fracturing and apply KOH instead of fracturing.

Results

The most common means of evaluating KOH treatments has been by comparing groups of wells that have been treated with KOH with groups that have not been treated. This is not straight-forward. Every well has individual characteristics, with pay zones and rock quality varying, sometimes significantly, from one well to the next within a formation and even within a particular reservoir. To properly evaluate the technology based on field data, the groups of comparison wells should be as large as possible, and should consist of a minimum of three wells. In many cases, all the wells in the field are treated with KOH from the beginning of injection. While this is certainly best from the standpoint of reservoir development, it does not allow evaluations or comparisons of specific injection wells. In these types of situations one possible alternative is to rely on comparisons with other, similar formations.



When plots of the same group of wells are normalized to account for differences in rock quality and pay interval, the wells treated with KOH show improved performance over untreated wells.