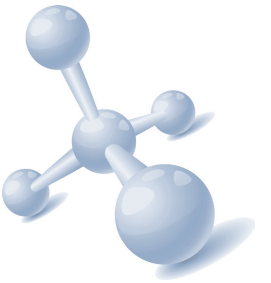

Solutions

for maintaining injectivity by stabilizing migrating and swelling clays

APPLICATION

A change in injection fluid composition can often cause permeability damage if fine particles, such as clay minerals, large-surface area silica (SiO_2) minerals, feldspars, mica, and barite are not stabilized. Such stabilization, referred to as "Clay Stabilization" for simplicity's sake, preserves injectivity. Clays are highly reactive and cause loss of injectivity because injection water destabilizes them. Clays are in ionic equilibrium with existing formation brine and any new injection water source causes a change in equilibrium. Swelling clays, such as montmorillonite, swell in the presence of fresh water and impede fluid flow. Poorly cemented clay particles, such as kaolinite and illite, can become detached during aqueous flow, especially when flowing brines become relatively fresher. Different reservoir geologies contain varying amounts of clays and vary in clay type as well. The clay stabilization process is effective in the prevention of both effects.

DESCRIPTION

The clay stabilization process results from the interaction of caustic with the clay in the presence of potassium ions. The caustic-clay chemical reaction permanently alters the clay chemistry so that the clay minerals are unaffected by changes in water composition.

The process remains the only means of stabilizing clays permanently a significant distance into the formation. The caustic reacts chemically with clays, rendering them invulnerable to destabilization through swelling or migration. The reaction should be distinguished from technologies that stabilize clays temporarily.

ADVANTAGES

The clay stabilization process provides a permanent solution to water injectivity. With most oils, the reaction between KOH and crude oil reduces interfacial tension between the water and oil, thus mobilizing oil in the target formation. This mobilization of residual oil in the near wellbore area increases the formation's relative permeability to water, further increasing injectivity. The KOH treatment can have a two-fold impact on injectivity by stabilizing clays and mobilizing residual oil.

CRITICAL DESIGN FACTORS

- Water composition – injection and formation water
- Reservoir temperature
- Clay type and content
- Well completion and mechanics

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