Increase Oil Production Without Increasing Water Cut in Ecuador

Combination of organic clay acid and OilMAX matrix diverter doubles production

**CHALLENGE**
Increase oil production in a well with a high water cut, without increasing the water cut.

**SOLUTION**
Use a matrix stimulation treatment combining organic clay acid (OCA) and OilMAX* diversion and conformance control to maximize zonal coverage and minimize water production.

**RESULTS**
Doubled production. Sustained production increase with same water cut as pre-treatment.

**Stimulating oil intervals and diverting from water zone**
Petroecuador, the Ecuadorian national oil company, produces from the Napo “U” Inferior sandstone formation in the Shushufindi field with permeability ranging from 90 to 300 mD. Pressure support from a lateral aquifer results in increasing water production with time. In September 2008, water broke through in the high permeability intervals in a well producing 500 bbl/d of oil, with 60% water cut.

Oil production then decreased to 200 bbl/d. This production decline was the result of a high drawdown, the onset of water production, and the high clay content—including kaolinite—in the formation. The primary damage mechanism was identified as fines migration, a common problem in Ecuador. This was in addition to an emulsion caused by completion fluids during a previous workover.

**Engineered solution**
A treatment was needed to remove the damage in the intervals producing oil and “good” water without stimulating the interval where water had already broken through. Schlumberger proposed the following treatment:
1. brine with mutual solvent and de-emulsifier to break the emulsion
2. OilMax treatment to divert away from intervals with high water cut and high permeability streaks
3. acetic acid preflush and OCA* LT organic clay acid main treatment fluid to remove the damage caused by fines migration.

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The combination of organic clay acid and OilMAX diverter treatment increased fluid production back to 1,200 bbl/d and reduced the well’s skin to zero.
The stimulation treatment using OilMAX diverter enabled the treatment to be diverted to the intervals where water had not broken through. A nodal analysis model predicted that the well had a skin of approximately 10 prior to the treatment, and this skin was reduced to nearly zero after the treatment. The production level after the treatment is stable after more than 5 months with no increase in water cut, indicating that the stimulation treatment was successful in stabilizing the clays and limiting water production.

**Achieving sustained production increase**

After the treatment, oil production increased from 200 to 500 bbl/d with no change in the water cut. The OilMAX diverter, successfully diverting the stimulation fluid away from the intervals with high water cut, allowed it to successfully stimulate the oil-producing intervals.

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