

A New Technology for Enhanced Oil Recovery and Treatment of a Near Wellbore Area in Carbonates

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Stimulation of oil wells is aimed to enhance oil recovery (EOR) by increasing injectivity of injection wells and production rate of production wells that is related to improved permeability of a near well wellbore area and a reservoir, improved conformance control by a displacing agent and a decrease in oil viscosity.

Alkaline and polymer flooding, surfactants, etc. are frequently used for EOR in carbonates. As these methods are designed for clastic reservoirs, they typically have a poorer performance for carbonates. That is associated with a more complex structure of carbonate reservoirs: high non-uniformity, fractures and low permeability while permeability is related to both particle size distribution and fractures. At the meantime, a carbonate reservoir is more susceptible to chemical treatments, in particular acidizing.

A new technology for the near wellbore area treatment is presented in the paper. The technology is based on the use of a new acidic agent, AFK, that has both a very fast speed of interaction with carbonates and an ability to form complexes with metal cations of formation water preventing colmatation and de-colmatation of the near wellbore area thus lowering the effects of clays in the reservoir. Concentration of the agent should not exceed 1 wt% that makes application of the agent fairly inexpensive. Coreflood experiments have been conducted on core samples of different reservoir properties. Test results show improved oil recovery by 14.0 % and 12.0% for core of high permeability and for core of low permeability, respectively.

Alkaline flooding is another well known EOR technology. Alkaline flooding, however, has some limitations that could hurt oil production and may even stop it completely. One should mention colmatation of the near wellbore area if the formation water is rich in cations of two-valent and three-valent metals.

A highly efficient complex-forming agent has been developed. The agent prevents colmatation of the near wellbore area and can provide de-colmatation. The use of the agent in alkaline blends allows a wider range of applications than alkaline flooding on its own. Laboratory studies show a high compatibility of new alkaline blends with formation waters of different salinity. Oil recovery in the coreflood testing was 76.0% with residual oil saturation of 18.2 %. Use of the agent provided additional 4.0 – 7.0 % oil recovery.

Pilot applications of both agents are underway.