Surfactant-based Diverting Agent for Acidizing: Lab Evaluation and Treatment of an Injector Well in a German Oil Field

N. Lummer, T. Willert
Fangmann Energy Services GmbH & Co. KG, Salzwedel, Germany

Employing diverting agents to prevent acids from leaking into the most permeable sub-layer of the target zone is common practice. These additives function by creating a temporary blocking effect which causes fluid diversion facilitating homogeneous and successful acidizing.

This paper focuses on a surfactant-based product with a tendency of forming rodlike micelles in acidic solutions. Here, a chaotic worm-like arrangement of dissolved molecules leads to a viscosity increase. The use of a special breaker system effectively reduces said diverter viscosity and helps preventing formation damage.

Lab experiments conducted prior to the field application included rheology measurements at bottomhole temperature, corrosion testing with representative steel coupons, core flooding with sandstone samples, and breaker fluid optimization.

For the actual treatment of the injector well in a Dogger formation, we alternated between acid and diverter steps in a volume-wise increasing approach. In total, 12 m³ of 15% HCl containing an adequate corrosion inhibitor dosage were pumped through tubing to a measured depth of approx. 1,400 m. Descaling of the two perforation zones with a length of 14 and 8 meters, respectively, was the goal of this application.

1 m³ / 2 m³ of the surfactant-based system followed each acid step for effective fluid diversion. Finally, 5 m³ of a special breaker concluded the acidizing job reducing diverter viscosity and hence counteracting formation damage.

For evaluating treatment efficiency, we injected 40 m³ of formation water at ever increasing pumping rates and recorded the resulting pressure. Based upon these values, we determined a significant improvement of injectivity index directly after the job.

Long-term surveillance of well performance confirmed a two-fold increase in injection rate at constant pressure. Thus, lab and field results impressively proved the premium effectiveness of this surfactant-based diverting agent for acidizing.