

REAL Acid Divert temporary diversion agent increased production 300% in difficult formation

The Sabriyah Field in Kuwait contains the limestone Tuba formation that is both naturally fractured and vuggy in nature, with heterogeneous rock properties and bottomhole static temperatures around 170°F/76°C. Overcoming excess fluid leak-off to achieve deeply penetrating fractures is critical to enhance production when acid fracturing in such formations. In addition, the operator wanted to treat multiple perforated intervals in a 65-ft single stage of a vertical well. Because fluid travels along the path of least resistance, acid coverage across perforated intervals can be inconsistent, leaving some of the reservoir untreated.

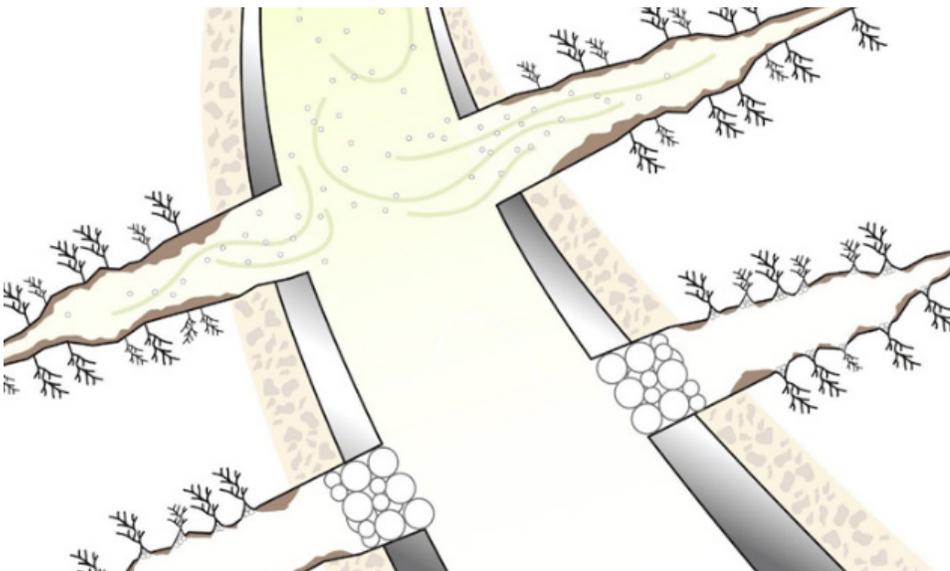
To overcome these challenges, Baker Hughes, a GE company (BHGE), recommended the **REAL Acid Divert™ temporary diverting agent**, which is a proprietary diverter formulated for near-wellbore and far-field solid particulate temporary diversions. The near-wellbore formulation is a tri-modal particulate distribution with large robust particles designed to withstand surface equipment and bridge across perforations and near-wellbore fracture widths, as well as smaller particles that help to minimize the permeability of the diverter pack. The far-field formulation, which consists of a smaller multi-modal particulate distribution,

Challenges

- Stop excess fluid leak-off in naturally fractured carbonate formation
- Achieve uniform acid coverage with a single treatment

Results

- Increased production 300%
- Mitigated leak-off to achieve uniform acid coverage
- Delivered longer acid fracture

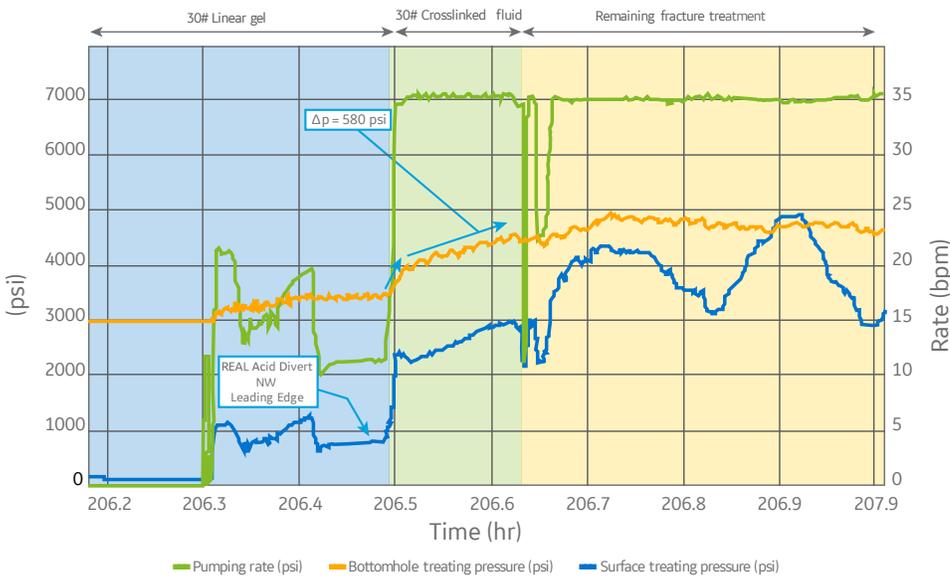




is effective in narrower fractures and wormholes, deepening penetration of the stimulation fluid along the entire fracture length. Both diverting formulations are fully degradable, and neither one inhibits the permeability of the created fracture or the perforated interval when production starts.

During the job, the treatment schedule alternated between pumping a low pH zirconium crosslinked pad stage, a REAL Acid Divert far-field stage carried in 30 pound linear gel, 28% HCL gelled acid, and a visco-elastic surfactant stage. Three stages of REAL Acid Divert near-wellbore agent were pumped throughout the treatment schedule.

When the REAL Acid Divert near-wellbore diverting agent was on the formation face, bottom-hole pressure gauges showed pressure increases over 500 psi. This indicated that the diverters were successfully blocking the zones accepting most of the fluid and redirecting the fluid to other sections. In the following months, production data revealed that the well was producing at four times the rate the operator expected based on its production forecast. The well is now the most productive in its field. The operator was extremely pleased with the results delivered by the REAL Acid Divert system, and plans to use this approach on future wells.



When the REAL Acid Divert agent reached the target interval, there was a significant increase in psi, indicating pressure would be harnessed to create new fractures rather than merely leaking off into the formation