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Successful Application of a Novel Fracturing Fluid in the Wasatch Formation in Eastern Utah

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Abstract

Hydraulic fracturing of wells drilled in the Wasatch formation is a viable method of enhancing productivity. The Wasatch is a low porosity and low permeability, gas producing formation. It was deposited during the lower Tertiary period in eastern Utah and is composed of a fluvial sandstone and shale. This formation is routinely fractured as a completion method and generally requires crosslinked fracturing fluids that are not excessively viscous but are able to carry moderate to high amounts of proppant. As with most fracturing treatments, fracture clean-up and high conductivity are essential.

A novel fracturing fluid, utilizing ultra low polymer loadings was successfully applied to this formation. This fracturing fluid is based on polymer loadings ranging from 12 to 25 ppt (1.47 to 3.06 kg/m^3) with the 25 ppt (3.06 kg/m^3) reserved for temperatures ranging from 200° to 250°F (93° to 121°C). Most treatments under 200°F (93°C) utilize 15 ppt (1.83 kg/m^3) of polymer. The fluid viscosity is enhanced by crosslinking the polymer with a metal based crosslinker. This fluid is ideally suited for the Wasatch formation because the viscosity development is restricted to about 400 cP at 100 sec^{-1}. The limited viscosity allows the treatments to generate lengthy, thin fractures rather than short, thick fractures associated with borate based gels. Although the viscosity is relatively low, the proppant suspension characteristics are ideally suited to carry relatively high amounts of proppant. Most treatments have carried six to eight pounds per gallon with the highest loading being twelve pounds.

The fluid also causes minimal impairment to the sand pack. Most fracture conductivity enhancement has been traditionally directed toward improving the breakers. Although the breakers are able to efficiently degrade the polymer's molecular weight thus reducing the fluid viscosity, the fracture still contains an equivalent weight of polymer as the fragments that impair the conductivity and clean-up. The new fluid, having ultra low polymer loadings, together with today's efficient breakers, is able to clean-up better and minimize sand pack impairment caused by the degraded polymer fragments.

Case histories using the fluid , including quality control measures and problems, in the Wasatch formation will be presented.