

A strategy for cutting the high costs of over-flushing - Eagle Ford

Model to guide completion/stimulation designs to enhance fracture performance, slash water use

Eagle Ford, South Texas

The challenge

The precise installation of a cased plug and perf completion requires a debris and proppant-free lateral. Therefore, to clear the way for the toolstring to reach targeted setting depth, operators typically over-flush after each fracture treatment by 50 and up to 100 bbl in excess of the initial perforation volumes. This widely accepted practice has long raised concerns about the risks of weakening near-wellbore proppant conductivity and, thus, reducing sustained production. In addition, over-flushing requires tremendous volumes of precious freshwater.

The solution

To better understand the impact of over-flushing on continuity between the proppant pack in the fractures and the wellbore, STRATAGEN® conducted an investigation in the liquids-rich window of the Eagle Ford. The FRACPRO® fracture design and analysis software was used to construct a 3D fracture model to simulate stimulation scenarios with various over-flush volumes. Fracture modeling confirmed that over-flushing fracture-stimulation treatments as low as 20-bbl has a measurable impact on near-wellbore proppant concentration and production. Widely recognized proppant transport and settling and critical velocity equations were then used to develop a new treatment methodology. The new approach uses real-time wellbore modeling, verified with fluid sampling, to monitor the calculated bottomhole proppant concentration, while sequentially reducing over-flushing volumes.

Well Data

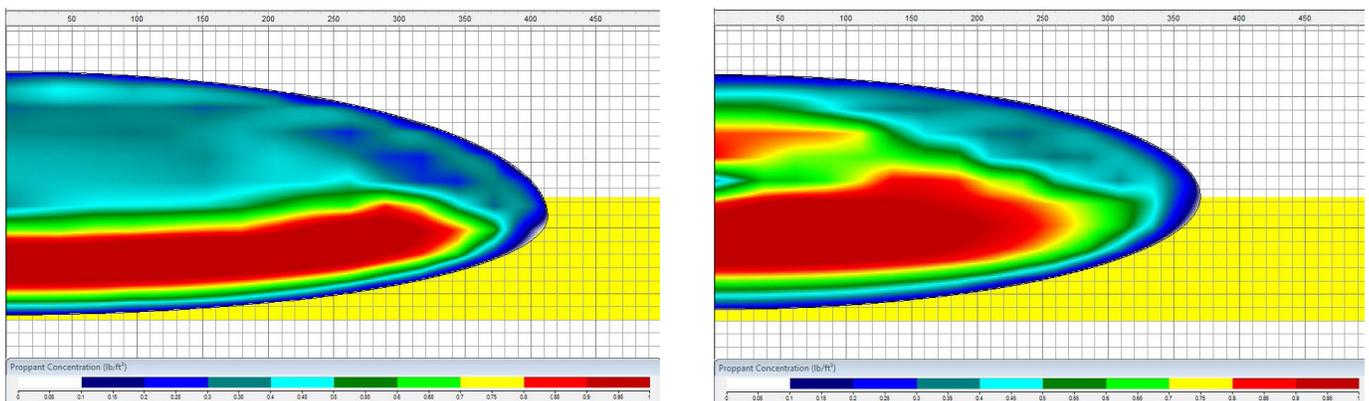
Location: Eagle Ford, South Texas

Well type: Oil

Completion design: Plug and perf

Diagnostics: FRACPRO fracture design/analysis software; proppant transport/settling equations

Fracture profiles for flushing to 0 lbm/gal at top perforation



Deepest cluster on left, shallowest on right. Source: SPE 170743 "Minimizing Over-Flush Volumes at the End of Fracture-Stimulation Stages - An Eagle Ford Case Study"

The results

The modeled data was used to calculate flush volume on-the-fly in more than 250 fracture stages, recording a 100% success rate in achieving targeted setting depths. Over-flush volumes were reduced from 20 bbl to nearly 0 bbl without any incidence of plugs sticking during plug-and-gun tool string operations. While the theory does not quantitatively assess the effect of over-flushing on eventual production, the outlined procedures provide valuable insight for use in completion and stimulation design strategies, including fluid type, to enhance proppant pack-wellbore continuity and, ideally, fracture performance. Furthermore, its widespread application promises to conserve tremendous volumes of increasingly limited freshwater supplies. The strategy likewise opens the door for future investigation into whether minimizing over-flushing can increase production.

Contact

Wadhah Al-Tailji

Wadhah.Al-Tailji@stratagen-engineering.com

Talk to STRATAGEN to find out how we can help you enhance your production.

stratagenconsulting.com