

Waterfrac Engineering

Sound engineering leads to proper candidate selection

FEATURES

- Select candidates.
- Optimize designs.
- Onsite engineering.
- Model calibration.

StrataGen engineers are at the forefront in using waterfracs as a viable stimulation technique for many reservoirs. Since the 1996 re-introduction of waterfracs to the Cotton Valley field in East Texas, StrataGen engineers have been involved onsite and as technical authors on virtually every major project around the world where waterfracs were performed. StrataGen has designed, pumped and evaluated more of these treatments than any other engineering company in some of the world's most geologically diverse environments.

Due diligence

Some reservoirs are unsuitable for waterfrac technology. Rigorous engineering is necessary to determine if a particular formation is a good candidate for a waterfrac. This integrated approach to the application of waterfrac technology is a capability unique to StrataGen Engineering, a company with extensive experience in the four technologies essential to successful waterfracs:

Fracture Engineering StrataGen performs the design, onsite direction, quality control and evaluation of waterfracs.

Reservoir Engineering StrataGen engineers routinely evaluate petrophysical, production and pressure transient data to characterize and compare waterfrac performance.

Fracture Modeling FracproPT is calibrated for waterfrac treatments in numerous reservoirs.

Rock Mechanics StrataGen scientists have led studies on waterfrac rock mechanics and conducted the first rock mechanical study to evaluate potential mechanisms and rock properties that lead to successful waterfracs.

Mechanisms identified as being critically important for the success of waterfracs include:

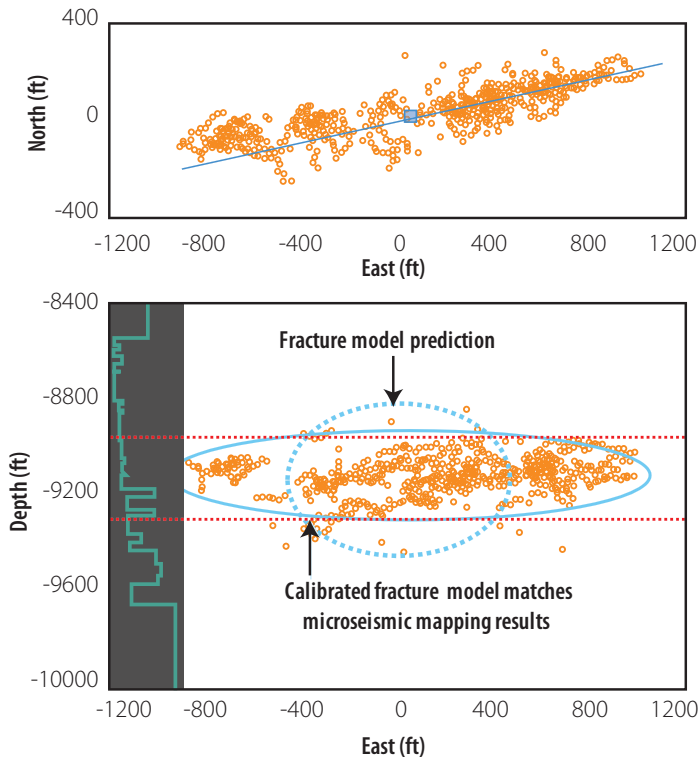
- Residual fracture opening due to rough fracture surface and shear displacements.
- Areas where cleanup problems are associated with conventional crosslinked fracturing fluids.
- Proppant settling in vertical fracture offsets. The accumulated proppant forms bridges acting as wedges, which keep the fracture open.
- Rock debris acting as a self-propping agent.
- Low fluid viscosity creating longer fractures.

Based on extensive experience StrataGen has developed general guidelines for the application of waterfracs:

- Apply waterfracs in the most marginal, lowest permeability areas first and then proceed to better, higher permeability areas. Some plays may only be economical if developed with waterfracs.
- Environments with high Young's modulus (very hard rock), normal stress and very low permeability appear to be the best candidates. However, waterfracs have been successful even at higher stresses, replacing expensive Bauxite fracture treatments. High deviatoric stresses may also contribute to fracture roughness and shear displacements.
- Low reservoir pressure and increased depletion may prohibit proper cleanup of conventional gel fracs. Waterfracs avoid gel damage and clean up faster.

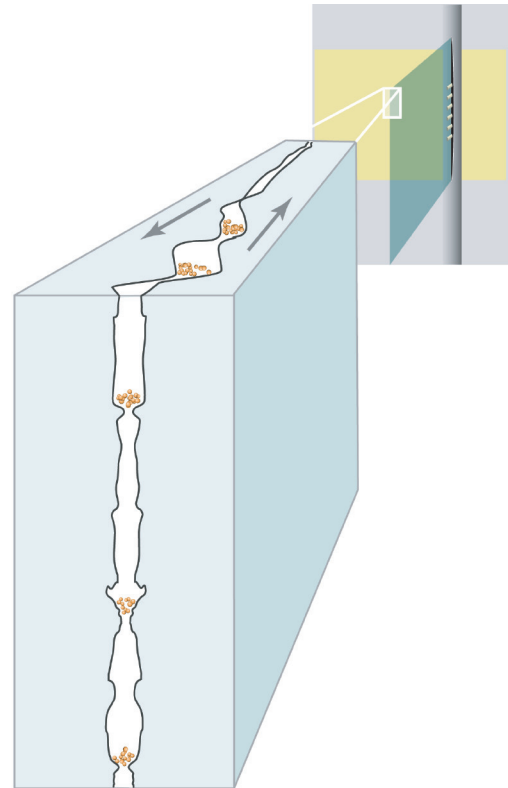


- Naturally fractured formations may be good candidates, especially where proppant placement is difficult.
- Optimization of fluid volume, injection rate, perforated intervals, pad size, proppant concentration, “sweeps” and proppant size should be treatment-specific.
- Higher injection rates and larger volumes are likely to achieve better fracture stimulation, but cost/benefit must be considered.
- It is desirable to have small increases in net pressure throughout the job and avoid “proppant banking”.



These figures demonstrate the ability to calibrate a frac model with mapping data to yield a valuable forecasting tool, an industry-leading service provided by StrataGen. Figure taken from SPE 74138

- Fracture diagnostic techniques that measure fracture geometry and evaluate fracture quality (e.g., pressure transient well tests and pressure transient analysis of injection falloff tests), proper production analysis and fracture modeling are instrumental in evaluating waterfracs.
- StrataGen’s innovative waterfrac team has the capability and experience to ensure the success of your waterfrac project, providing clients with waterfrac knowledge and technology that is unparalleled in the industry.



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