Three Dimensional Shear Data to Design Effective Completions in Unconventional Reservoir

Jim Bray[1], Eli Menendez[2], and Charles H. Smith[2]
[1]Halliburton, Denver, CO.
[2]Halliburton, Oklahoma City, OK.

Unconventional reservoirs require an effective system of completion. A major difference between unconventional and conventional reservoirs is the plastic nature of the rock itself. Within a very short period of time, certain portions of the reservoir will flow, sealing off the productive mechanism and capacity of the formation. Complicating matters even more is the near universality of horizontal drilling in these reservoirs.

Dipole Sonic logs have been used for many years to establish rock mechanical properties for conventional formations. The usage of Young's Modulus and Poisson's ratio in frac design is well established. This same relationship exists in the unconventional world, but the complication of plasticity in the formation makes the relationship more difficult to understand. Traditional two-dimensional models have not been able to adequately identify intervals of the horizontal reservoir that could maintain the fracture treatment.

The calculation of three-dimensional rock mechanical properties has been advanced as a way to overcome this difficulty. This paper presents the application of this advancement in unconventional reservoirs. This paper will also discuss the differences in two-dimensional and three-dimensional data and the effects of ignoring this information.