Case Study for Hydraulic Fracture Propagation in a Low Permeability Zone in the Anadarko Basin using Surface-Based Controlled Source Electromagnetics

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Deep Imaging

ABSTRACT

The exploration and development of low permeability unconventional reservoirs have become the focus of the oil & gas industry. Wellbore spacing, along with hydraulic fracturing optimization, are continually studied and evaluated by operators in their effort to maximize reservoir performance and estimated ultimate recovery (EUR). Surfaced-based Controlled-Source Electromagnetic (CSEM) imaging has been successfully used to map the lateral extent of fluid and proppant emplacement during each stage of hydraulic fracture operations and flowback. This imaging is achieved without the use of tracers or modification of the client's hydraulic fracture fluids. CSEM imaging is possible due to the changes in reservoir conductivity caused by the injected fluid stream, properties of the hydraulic fracture network, as well as mutual inductance between the injection fluid and well casings. Changes in the electromagnetic response, presented as images and video, show the lateral extent and azimuth of the resulting reservoir stimulation. Additionally, CSEM imaging can be used to identify reservoir heterogeneities which could create a barrier to fluid emplacement and movement. In this poster we will highlight current CSEM technology and present imaging results of fluid and proppant emplacement during a hydraulic fracture operation in the Anadarko basin. By utilizing CSEM, the operator was able to evaluate the effectiveness of the fluid injection for stimulating the desired reservoir and, concurrently monitor an offset well which had been previously affected by nearby hydraulic fracture operations.

Elsbury, K., M. S. Hickey, S. Trevino III, J. Oberle, O. Vasquez, and D. Jones, 2019, Case study for hydraulic fracture propagation in a low permeability zone in the Anadarko Basin using surface-based controlled source electromagnetics: GeoGulf Transactions, v. 69, p. 493.