How to Engineer Transverse Hydraulic Fractures from Horizontal Wells in Reverse-Faulting Stressed Environments

Andreas Michael
University of North Dakota (UND)

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Andreas Michael is an Assistant Professor at the University of North Dakota (UND). The topic is "*How to Engineer Transverse Hydraulic Fractures from Horizontal Wells in Reverse-Faulting Stressed Environments*".

His seminar will take place at **12:30 p.m. Central Time** on Thursday, September 18, 2025.

Abstract

Hydraulic fracture (HF) orientation impacts the well deliverability from hydrocarbon reservoirs. Completions efficiency and stimulated-well productivity from such low-permeability ("tight") formations like shales is significantly improved having multiple HFs oriented transversely rather than longitudinally in relation to a horizontal well's lateral. Nevertheless, transverse-HF initiation from horizontal wells drilled in reverse-faulting stressed environments is challenging, as the in-situ stress field naturally promotes unfavorable longitudinal ("pancake-like") HFs.

This presentation overviews a method for inducing transverse-HF initiation from these reverse-faulting stress states by smart use of

stress shadows from previously-initiated HFs. The proposed method involves initiating two longitudinal HFs whose growth will stop at a level sufficient for the stress shadowing triggered by their widths to alter the stress state in their surrounding vicinities, such that when a third HF initiation is attempted in the region in-between them, it will result to a transverse-HF initiation.

Laboratory-scale experiments on transparent gelatin blocks are used for validation purposes with a specially-designed manifold enabling non-simultaneous injection at different regions (“frac stages”) from the same fluid source, mimicking a multistage-HF treatment on a horizontal well. Variations of this method are possible, including alternative forms where two transverse HFs are promoted from a single longitudinal HF initiated *a-priori*.

Biography

Andreas Michael is an Assistant Professor at the University of North Dakota (UND), serving also as the faculty advisor of the local SPE Student Chapter. His research interests span across all petroleum engineering subdisciplines and is engaged in projects of analytical, numerical, and experimental nature. He has authored 18 peer-reviewed journal articles (7 first-authored, 5 single-authored), 36 conference papers, and 18 magazine articles. At UND he teaches courses on drilling engineering, geomechanics, well completions, and advanced stimulation techniques. He previously was a Postdoctoral Research Fellow at Colorado School of Mines, researching the stability of underground tunnel intersections.

A Greek Cypriot, Dr. Michael holds bachelor's and master’s degrees from The University of Texas at Austin and a doctorate from Louisiana State University (LSU), all in petroleum engineering. His PhD dissertation, titled, "Fluid-Driven Fracture Initiation from Oil and Gas Wells Considering Lifetime Stresses" received LSU’s Distinguished Dissertation of the Year Award for STEM in 2020. In 2020-21, he served as the Managing Editor (de facto Editor-in-Chief) of The Way Ahead, SPE’s magazine for Young Professionals.