

Insights on Hydraulic Fracturing and Its Closure from Lab-scale Tests

Prof. Ahmad Ghassemi (OU) and Prof. Zhi Ye (SDSM&T)

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Prof. Ahmad Ghassemi is the McCasland Chair Professor in the Mewbourne School of Petroleum & Geological Engineering, Oklahoma University, and director of the Halliburton Rock Mechanics Laboratory. Prof. Zhi Ye is an Assistant Professor of Geological Engineering at South Dakota School of Mines & Technology (SDSM&T). Their presentation is at 9:00 Central Time on Thursday, September 21, 2023. The topic is “Insights on Hydraulic Fracturing and Its Closure from Lab-Scale Tests.”

Abstract

A reliable estimate of magnitude and orientation of the in-situ stress is critical to conducting engineering design activities in the subsurface, such as developing Enhanced Geothermal Systems (EGS) and unconventional petroleum resources. The magnitude of the minimum principal stress is generally found through diagnostic fracture injection tests (DFITs) or minifrac tests. Recently, the correct closure pressure interpretation technique has been the subject of some controversy and debate. Conventionally, the departure from a straight line drawn through the origin on the semi-log derivative of pressure with respect to G-time (GdP/dG) is used to detect fracture closure and to determine the fracture closure pressure. Alternatively, detecting the change in the system stiffness or compliance has been relied upon to determine the fracture closure pressure. In this talk, laboratory scale micro-frac tests are presented and used to describe various aspects of fracture closure process, and to assess the applicability of different conceptual models and approaches for determining the fracture closure pressure and Sh_{min} . In addition, time permitting, early results on the impact of rock cooling will be discussed.

Biographies



Ahmad Ghassemi is the McCasland Chair Professor in the Mewbourne School of Petroleum & Geological Engineering, OU and is the director of the Halliburton Rock Mechanics Laboratory. He has a Ph.D. in Geological Engineering and specializes in energy geomechanics with emphasis on unconventional geothermal & petroleum reservoir development. He has been working on reservoir geomechanics R&D for over 25 years with emphasis on modeling of multiple hydraulic fractures, coupled geomechanics/fluid flow modeling in naturally fractured reservoirs, wellbore stability analysis, induced seismicity, and experimental determination of reservoir rock properties. His teaching interests include reservoir geomechanics, numerical modeling, petrophysics, and stimulation.



Zhi Ye is an Assistant Professor of Geological Engineering at South Dakota School of Mines & Technology (SDSM&T). He received his Ph.D. degree in Petroleum Engineering from the University of Oklahoma, where he conducted geomechanics and geothermal research with Dr. Ahmad Ghassemi. His research interests primarily focus on reservoir geomechanics and experimental rock deformation, with applications on geo-energy recovery and storage. Over the past decade, he has been involved in various aspects of reservoir geomechanics, including rock deformation under HPHT conditions, hydraulic fracturing, in-situ stress determination, induced seismicity, and frictional fracture slip by fluid injection.