

The Value Proposition with Microseismic Imaging of Hydraulic Fractures

S.C. Maxwell (IMaGe)

Summary

Despite the extension application of microseismic monitoring of hydraulic fracturing, questions are often raised about the value of the data. Microseismic observations have certainly led to a paradigm shift across geoscience and engineering towards the concept of complex hydraulic fracture networks. Ultimately, microseismic is the key technology to map fracture dimensions and has led to fundamental concepts, such as stimulated reservoir volume. Critical reservoir knowledge can be gained about hydraulic reservoir contact and diagnosis of possible operational issues, such that certain operators plan well pads to collect microseismic on as many wells as possible. Nevertheless, microseismic value of information questions are often framed around specific hydraulic fracture or completion improvements: “We collected microseismic and didn’t change anything on the engineering design and so what is the value?”. Published case studies show examples that directly address this question, where microseismic projects are designed before the treatment to monitor operational changes and enable specific recommendations to improve the engineering design.

Microseismic fundamentally represents the geomechanical response of the reservoir to the hydraulic fracture, although most microseismic projects are only interpreted qualitatively or perhaps determining hydraulic fracture dimensions. Quantitative interpretation is possible through a predictive microseismic geomechanical model that can be validated with the observed microseismic, reconciling the injection with the geomechanical response to define the effective propped fracture. Once the model is calibrated, different engineering designs can be evaluated and used to reduce operational costs or optimize the propped reservoir contact. In this way, informed operational decisions can be made guided by the microseismic, in terms of improved stage, well, pad or even field design. The microseismic geomechanics workflow can also be used to mitigate induced seismicity hazard. The presentation will highlight various case studies that demonstrate the value proposition of microseismic.