Integrating Borehole Imaging and Full Waveform Dipole Sonic Data to Estimate Fracture Porosity in Tight Formations: A Workflow for Accurate Characterization of Natural Fractures

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Abstract

This paper presents a workflow that integrates high-resolution electrical borehole imaging and full waveform dipole sonic data to estimate fracture porosity in tight formations. The workflow was applied in the Cambro-Ordovician tight sand reservoir in the Central Ahnet basin, Algeria, and was implemented in 3 wells. Initially, natural fractures were identified and evaluated using FMI images, resulting in the identification of 498 fractures. The integration of Sonic Scanner enabled the reclassification of fractures into 267 open and 231 closed fractures, based on anisotropy dispersion curves obtained from the three wells. An advanced processing workflow was then executed to estimate the kinematic and hydraulic aperture of the open fractures, which was used to characterize fracture porosity. Based on orientations and apertures, three sets of open natural fractures were identified. The results highlight the significance of accurate fracture characterization in optimizing production and recovery in fractured reservoirs. The study indicates that the presented workflow is applicable for predicting the porosity of fractures.