Quantitative Measurement of Porosity Reduction Around Deformation Bands in a Porous and Permeable Sandstone

Thompson, Laird B.,[1] Evans, James P.,[1] and Wallace, James P.[2]

[1]Utah State University, Logan, Utah

[2]Hunt, Wallace & Associates, Dallas, Texas

Abstract

Many industry "fractured reservoir" characterizations focus on examples where faults and fractures in the petroleum system serve as porosity enhancing elements. These examples usually occur in rock that has little or no matrix porosity, and the faults and fractures may serve as the only effective plumbing system in the reservoir. Another class of "fractured reservoirs," however, occurs where a porous and permeable rock matrix has been adversely affected by faults and fractures that negatively impact producibility. Recognizing deformation bands and faults that are filled with crushed grains or gouge is commonly done with conventional cores and image logs. Quantifying the amount of porosity reduction and it's impact on producibility is more difficult. We present a method whereby these negative reservoir elements can be recognized and quantified by integrating the analysis of borehole image logs and probabilistic modeling of standard petrophysical logs that have been calibrated by careful conventional core analysis. By identifying these reservoir elements and understanding their proper mechanical and kinematic relationships in the reservoir, one can begin to build a predictive model of their occurrence and help optimize reservoir management.