Piceance Basin/Rulison Field Case Study

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Abstract

The presence of natural fractures is required for the economic development of low-permeability reservoirs. Technology for reliably locating natural fractures before drilling ranks as one of industry's top goals. This presentation discusses the geomechanical approach that allows for the prediction of natural fracture clusters that control reservoir permeability and describes a case study of the application at the Rulison field in the Piceance Basin, Colorado.

Fractured reservoirs often show characteristics indicating the presence of local natural fracture clusters which are a dense network of fractures that may differ in style and orientation from regional trends. Natural fracture clusters can be developed around local deformation events such as faulting or folding of the reservoir strata. Natural fracture clusters are generally responsible for zones of increased reservoir permeability beyond that caused by any uniformly distributed fracture system.

Geomechanical models provide the means to predict the occurrences and characteristics of natural fractures around faults and thus allow a semi-quantitative prediction of fracture-related reservoir "sweet spots." A geomechanical method can predict the location and orientations of fault-related natural fracture clusters. The approach approximates faults as surfaces of displacement discontinuity in an elastic material and employs a 3D numerical code to calculate regions of stress concentrations that cause the natural fracture clusters.

The case study is located in the Rulison field, Piceance basin, Colorado. There, production is from the tight-gas reservoir is the Cretaceous Williams Fork fluvial sands. The reservoir consists of massively stack fluvial sandstones with an average 12% porosity and permeability in the microdarcy range. The EUR ranges from .5 to 4.0 Bcf and can quickly change from a good to a sub-economic area in less than a mile. Using the geomechanical approach to delineate the area's "sweet spots," the predicted areas in the Rulison area are shown to correlate with regions of high permeability and significant EUR.