Fracture Attribute Calculation Based on Diagenetic-Structural Analysis: Application in Naturally Fractured Reservoirs from Southeastern Mexico

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ABSTRACT

Characterization studies of naturally fractured reservoirs (NFR) generally omit the impact of the diagenetic processes that affect fracture systems, giving, as a result, fracture attributes and distributions not calibrated with hard data. This work presents the results of the application of the Structural-Diagenetic Petrographic Analysis methodology for calculation of fracture attributes. The objective is to identify and to characterize fracture sets controlling hydrocarbon flow, based on the relationship between fracturing and diagenesis. To demonstrate the application of this methodology, two carbonate oil and gas reservoirs from southeastern Mexico were selected: the first, in limestones with porosity exclusively due to fractures; and the second, in dolostones with dual-porosity. Thirty-eight oriented thin sections from cores and 920 cutting samples from 10 wells were analyzed. In both reservoirs, five fracture sets were identified. In the first reservoir, four sets are conductive, with high connectivity: set 1 (105°/83°), set 3 (55°/77°), set 4 (03°/79°), and set 5 (140°/80°). In the second reservoir, two sets are conductive: set 4 (48°/88°) and set 5 (86°/87°), with good matrix-fracture connectivity. The first reservoir presents better fracture attributes than does the second, including density, porosity, connectivity, and conductive quality. These differences are reflected in the productivity of the reservoirs. Main fluid flow directions were corroborated with reservoir dynamic data.

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