Methodology for Static Characterization of Natural Fractures: 
Implementation in Pemex Projects and its Application 
in Oil and Gas Field Development

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ABSTRACT

Development of computer programs for determination of fracture orientation and 
properties, using 3D seismic, has been intensified in recent years. Study of fractures in 
well logs and cores complement these studies. However, a good calibration is still need-
ed. This paper describes the methodology called Structural-Diagenetic Petrographic 
Study (SDPS), as a tool that complements, at micro-scale, the fracture characterization 
in a reservoir. The methodology focuses in the determination of families or ‘sets’ of con-
ductive fractures and the quantification of fracture attributes such as orientation, open-
ing, degree of cement, porosity, geometry, connectivity between fractures, and connectiv-
ity of matrix-fracture. This is performed by means of diagenetic and structural anal-
yses. These attributes provide hard data to calibrate other fracture studies at different 
scales.

The methodology is supported by the measurement and study of more than 16,500 
fractures in outcrops of Sierra Madre Oriental and Sierra de Chiapas, Mexico. With the 
established use of this methodology in Pemex, it has been recognized as a tool that has 
improved fracture models in several oil fields, e.g., Ku-Maloob-Zaap, Puerto Ceiba, Cos-
tero, and Cactus. Reservoir engineering data, such as production tests, tracers, PLTs, 
accumulated production, and interference testing, calibrate the final fracture model to 
support the reservoir simulation for development and exploitation.