Characterization and Geomechanics-Based Modeling of Natural Fractures: Impact in Unconventional Plays

Rene Manceda[1], Ramiro López[1], and Damian Hryb[1]

[1] YPF

ABSTRACT

Understanding the natural fracture system is important for unconventional reservoirs because of their potential impact on permeability and their interaction with the hydraulic fracturing. This workflow involves two main elements. The first is fracture characterization, which involves describing fractures in terms of measurements such as height, length, aperture, cement type and percentage and spacing. The second is fracture modeling, which involves developing a field scale understanding of fracture intensity and orientation.

When characterizing a naturally fractured system, the fractures observed in subsurface (image logs, cores, etc.), represent one of the most important data sets. In cores and analogue outcrops, detailed fracture cement studies and analytical methodologies such as SEM, cathodoluminescence, and fluid inclusions, could give good information about the genesis and timing of fracture sets.

To generate a discrete fracture model, an end-member of a fracture model, we recommend a 3D geomechanical tectonic modeling that considers the deformation events that occurred throughout geological history. This modeling allows us to determine the stress distribution all over the field that results from the interaction between remote stresses and faults

We applied this methodology to several multi-phase deformation system plays, successfully comparing them with fracture data obtained in the wells. This methodology allows us to recognize the impact of certain tectonic events in terms of natural fracturing for a specific area while validating the structural model itself.