Borehole electrical Imagery, a power full tool in Complex Reservoir Characterization.

Martínez, R.*, Nieves, I.*, Frass, M. **, Piedrahita. J *, Rincón. C**
WEATHERFORD Colombia *, WEATHERFORD Houston **, ECOPETROL S.A***

ABSTRACT

Characterizing a reservoir requires a description of the reservoir structure and geometry, and a definition of its static and dynamic properties. The principal source of information on the static and dynamic properties is well data, while the reservoir structure and geometry are usually defined by surface seismic data, geological studies and the correlation of features between wells. Another important factor is the link between the fine scale reservoir properties available from the well and the large scale information used to define reservoir structure and geometry.

Borehole images have broad applications in geological, petrophysical, and geomechanical studies. The advent of the small diameter memory resistivity micro imaging tool improves operational efficiency in a broad range of well conditions. In spite of the tool's small size and weight, its design provides coverage and image quality that matches or exceeds that of previous generation imaging tool.

Vertical wells in PETROLEA field, Colombia were logged using the compact micro imaging tool, providing essential data for the description of fractured reservoirs and the best place to locate the double packer sample pressure tool. These data include the detection of fractures, their frequency, orientation, morphology, origin and attributes to locate the best place to locate the test pressure interval in open, enhanced and partially open fractures. These results can then be used to understand the fracture processes in the field and help predict, the optimum locations and orientations for new wells.

Evaluating fractured reservoirs requires a lot of data in order to properly develop and optimally drain it. The data provided by cores, Borehole Electrical Imagery, open hole logs, and well testing must be integrated, to better understand and model the fracture system. Other than oriented cores and Borehole Electrical Imagery, most other logging approaches are only fracture indicators with no capability for any geometrical analysis. Even then, the detection of fractures depends on the vertical resolution of the logging tool. The technique of measuring the gain or loss of mud depends on a difference between mud hydrostatic pressure and formation pressure and the fracture type: open, partially open, enhance or close fractures.

Among such a variety of tools, the borehole image can detect fractures of a wide range of apertures, from healed fracture to large open fractures.