New Applications and Techniques for Open Hole Logging Evaluations: Methodology to Unravel the Complexities of Unconventional, Naturally Fractured and Carbonate Reservoir Systems

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Over the past few years, we have witnessed a resurgence in activity in the Permian Basin that has been centered on the recognition and exploitation of "new" reservoirs. One of the keys to the continued development and growth of these plays (as well as the identification of new plays) will be the ability to expand upon the vast wealth of geotechnical information that is already present within the basin in the form of historical logs, core data and test results and subsequently extract more detailed data as to untapped or under exploited reservoirs.

NuLook Shale Vision is a core based and texturally sensitive petrophysical model that has been successfully applied to unconventional reservoir systems not just in the Permian Basin but around the world. The ability of this technique to consistently extract the petrophysical properties of these nano-reservoirs allows this tool to be an excellent method of analyzing reservoir quality and hydrocarbon storage capacity as well as a system's heterogeneity across both local and widespread areas. The results of this analysis are also key in the identification of optimum lateral locations, key geomechanical properties and subsequent fracture stimulation models.

Fracture Intensity Vision (FIV) allows one to better evaluate the presence and extent of natural fractures without the use of conventional imaging logs. In a Permian Basin system that contains numerous geomechanically brittle formations, the effective identification of natu-

ral fractures can be a key methodology in exploiting untapped reserves. Multiple applications of this technique will be shown that will demonstrate how standard open hole logging suites have been utilized to recognize naturally fractured reservoir systems using FIV analysis.

Despite all the historical advances in petrophysical evaluation, carbonate systems still remain as one of the most complex and difficult to understand reservoirs. Much of this complexity is tied to the multi-modal porosity systems that can be present within these sequences. Complex Vision can effectively take open hole logging data and more effectively analyze and model these complicated P&P systems (e.g. m and n) so as to better identify movable hydrocarbons as well as areas of movable and bound water.

Although all these applications can be used on new logs from recent wells, they can equally be utilized to evaluate the vast historical open hole logging data base that is present within the Permian Basin.