Using Granular Hydrocarbon Profiling to Augment Reservoir Understandings of Hydrocarbon Sources, Seals, Porosity, Water Saturation and Lateral Placement: an Eagle Ford Case Study

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Abstract

A variety of logging technologies provide information during drilling as to the presence of hydrocarbons. However, these logging technologies do not measure hydrocarbons directly, but rather measure hydrocarbon proxies and infer hydro-carbon presence and phase based on this data. These technologies, while sophisticated can lack specificity and sensitivity when trying to accurately identify hydrocarbons Additionally, some new technologies can monitor hydrocarbons from n-C1 (methane) to n-C8 (octane) and expand the scope of hydrocarbon detection. These new technologies can clearly detect gas range organics and can infer light oils and condensates. However, all of these technologies lack the ability to measure the heart of the oil or liquid hydrocarbon fingerprint of n-C7 (heptane) to n-C15 (pentadecane). As such, these limitations negatively impact the ability of companies to properly assess and evaluate plays like the Eagleford that have numerous stacked liquid pays.

However, advances in well logging technology now provide the ability to analyze downhole cutting samples to directly characterize the composition of hydrocarbons vertically through the prospective section. This provides the unique ability to look at a broad compound range from C2 to C20. The result is the ability to not only characterize gas and condensate range hydrocarbons, but also characterization multiple liquid or oil phase hydrocarbons contained in the stratigraphic intervals.

The Amplified Geochemical Logging data was able to:

- Identify the most prolific hydrocarbon bearing zones
- Serve as a porosity proxy in both the vertical and lateral well
- Clearly distinguish between various hydrocarbon phases
- Distinguish multiple oil signatures
- Identify a zone with a high degree of water saturation
- Imply seals in vertical well sections
- Track the drill bit in the lateral section
- Imply natural fractures in the lateral section that could impact fracing plans

Additionally, the Downhole Geochemical Logging data was used to create a granular hydrocarbon profile throughout the well. This enabled identification of optimum selection for placement of the horizontal well. Additionally, cutting analysis from the lateral well enabled identification of lateral sweet spots containing higher porosity and hydrocarbon intensity as opposed to areas with limited porosity and lower

hydrocarbon content. The data was also able to aid the client in determining the optimum number of frac stages required for the lateral resulting in a savings of approximately $600,000 while maintaining similar production.