

Application of Petroleum Exploration Concepts to Differentiate Between Source Rocks and Unconventional Reservoirs

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ABSTRACT

Source rocks occur in many basins of the world, however differentiating which are suitable unconventional reservoirs requires the application of sound petroleum exploration concepts. Unconventional exploration concepts, although similar to conventional exploration, have many niche techniques. Utilizing these concepts properly can reduce upfront and development risk.

Often the assumption that source rocks are de-facto unconventional reservoirs causes costly mistakes. A multi-stage process is discussed here to provide the framework explorationists need to evaluate the potential of varied source rock types.

This discussion will review the first early attempts to quantify source rock units and then move to the most up to date processes. It provides not only a history of techniques but the ability to modify techniques to suit an individual workflow.

Worldwide source rock data is extensive and far reaching given the lengths to which conventional exploration has come. The explorationist is tasked with the challenge of deciphering what source rocks are suitable unconventional resource targets. The many attributes of source rocks can make this a daunting task with widely published thresholds confusing the problem.

In fact, source rock attributes appear to be so varied from play to play that a conclusion of no two plays match, results. The answer ultimately lies in workflows that group co-dependent attributes together. Co-dependency is in many cases provenance and/or tectonically driven. What appears to be a broad scorecard with no similarity begins to simplify when workflows focus on co-dependent variables and arrive at a higher tier of independent variables. One then develops a short list of drivers simplifying the process.

Many times however, the explorationist will be required to supplement his knowledge base of source rocks by transforming existing data into new formats. Without a knowledge base of unconventional concepts and techniques, it may often appear that additional data is required to finalize an analysis. Existing data can be alternatively reformatted to provide an adequate resource for the workflow. As example, simple mechanical lab testing of drill cuttings or core can be an excellent replacement for costly newly acquired log suites.

In conclusion, this discussion will attempt to demonstrate that a high degree of preparation is needed before the drilling evaluation phase of any unconventional resource play is attempted. Too often the drilling program commences before identifying if the source rock in question will serve as an unconventional reservoir. The attitude of “just frac it” has led to many disappointing and confusing efforts. If proper upfront planning and execution is performed many drill programs can score higher commercial value.