Simple Evaluation of a Critical Risk: Seal Effectiveness and Seal Effectiveness Timing

Tom Levy[1]

[1]Schlumberger

Abstract

Seal thickness is not seal effectiveness. Mapping seal thickness indicates the chance that seal will be present, which is not seal effectiveness. Confusing seal thickness for seal effectiveness leads to dry holes. Regardless of how thick the seal unit is, until the base of the seal is compacted to a level where it will hold sufficient hydrocarbons, the structure is not a Trap.

Understanding the timing relationship between the migration of hydrocarbons and the formation of the trap structure is not enough. The other essential element is the timing of seal effectiveness.

In the past, geoscientists have not been able to easily evaluate seal effectiveness and timing, so seal has been lumped with structure and structure timing and called "Trap and Seal." We were actually abdicating on any real seal evaluation and defaulting to seal presence as the seal risk. Seal effectiveness was specialist evaluation beyond the reach of most geoscientists. We were saying that, although we could risk seal presence and structure, we were just hoping the seal would work.

Petroleum System 1D modeling gives us a tool to test and demonstrate, not only if a seal has been sufficiently compacted to hold hydrocarbons, but also how much gas or oil it might hold and when the seal reached a level of compaction to start holding hydrocarbons.

Geoscientists have looked at Petroleum System 1D modeling only for its value to predict Charge. We have been missing the valuable information on seal effectiveness that PS1D analysis could have always been giving us. We have been ignoring this tool at the prospect level "because the petroleum system is already proven."

PS1D tools are now readily available and easy for a geoscientist to use to do evaluation of seal effectiveness and seal effectiveness timing. The key displays, which are easy to derive from PS1D analysis, can be used to analyze and demonstrate the Seal Risk on each and every lead and prospect.