

Shale Maturity and Hydrocarbon Composition Impact on Hydraulic Stimulation Design

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Resource plays with mature geochemistry generating dry natural gas hydrocarbons around North America have spawned similar activity around the globe. Therefore, natural gas has been the primary focus of shale resource development. However, highly successful horizontal drilling and multi-stage completion technology has generated a very competitive “Gas-on Gas” marketplace through the abundance of natural gas reserves discovered in shale deposits. Natural gas prices have stabilized in the \$5/Mcf range which results in a net wellhead price of \$2.5 - \$3.5 Mcf and thereby has driven capital to the lowest cost shale gas regions for ongoing development. More attention is now being directed by small and large independents on shale deposits containing rich gas-condensate and oil reservoirs due to the attractive price premium placed on the liquids side of the energy business.

While many of the design parameters are similar across the spectrum of shale reservoirs, several key variables must be adjusted to maximize the effectiveness of the stimulation treatment for heavier hydrocarbon production. These factors affect the optimization of the completion design when the molecular flow stream changes from a dry gas to gas and condensate or especially an oil reservoir that is under-saturated. Rock mechanics, structural geologic attributes and stratigraphic features are critical to optimizing the well design and will also be addressed in the context of the well planning process. Special attention will be given to the specific design parameters required to address the more complex fluid flow in the rich gas and oil environment.