

Are Gas Shale and Tight Sands Really Unconventional from a Petroleum Systems View Point?

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Gas shale has advanced to an economic play thanks to a combination of high gas prices and new drilling /completion technologies that changed the perception of shale formations from an exclusive cap rock / source rock function to a reservoir rock. Much has been learned on how to produce gas from shale in the last decade. Did the lessons learned change the fundamentals of our understanding of the petroleum system? How much is the paradigm shifting? How much is the mindset evolving with the common practice of connecting lines of evidence for mitigating fluid accumulation risk?

Natural fractures and their network were believed to be an alternative to the pore scale properties of shale as appropriate drains to fluid if properly stimulated. This proved to be a concept exported from conventional exploration where porosity / permeability were heavily weighed. That idea fails completely when it comes to gas shale and tight sands where fractures indeed act as leak points to the system over geological time. Rock confinement becomes critical to the success of induced fractures.

Restricted porosity / permeability in fine grained sediments acting as top seal to petroleum accumulation is a requirement in most conventional prospects. Such down scale property reverses in presence of high organic content, typically distinctive organic matter such as ligno-humic (woody) and algal accumulated as planktonic snow fall (Tasmanites, coccoliths, diatoms, dinoflagellates...) in unconventional gas shale plays.

It seems obvious that what works in conventional hydrocarbon exploration (source, migration, trap, and reservoir) is present in all unconventional gas shale / tight sands. The dramatic achievement lies in the engineering and operating: drilling multilaterals from the same pad with multi-stage hydraulic fracture stimulations reduced the well cost and enhanced gas shale productivity.

The study will address some changes in the perception of petroleum systems associated with conventional plays versus unconventional plays, discuss some geochemical aspects that are common to most petroleum systems, and emphasize some specific attributes of gas shale / tight sands reservoir systems.