Practical method of identification of presence of natural fracture - including mature field

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Presence of natural fractures seem to be common phenomenon in shale gas/oil plays. Shale reservoir almost always have two different storage volumes for hydrocarbons, the rock matrix and the natural fractures. Thenatural fracture is one of the most critical factors in defining an economic or prospective and to the stimulation treatment of shale gas/oil play. These natural fractures are isolated or closed due to pressure of the overburden rock. Consequently their very low permeability makes it impossible to produce hydrocarbon at the surface. Therefore, almost every well in a shale reservoir must be hydraulically stimulated with multi-stage hydraulic fracturing of long horizontal wells to achieve economical and commercial production.

Natural fractures can reactivate during hydraulic fracture stimulation and interact with the hydraulic fractures producing a complex and highly productive natural-hydraulic fracture network. These hydraulic fractures reconnect the natural fracture networks.

If a hydraulic fracture intersects a natural fracture, the fracturing fluid enters the natural fractures, increasing pore pressure and decreasing the effective normal stress on the fracture plane. If the effective normal stress becomes low enough, the natural fracture may slip and dilate, resulting in increased aperture and hydraulic conductivity.

Since the existence of natural fractures is very important to the stimulation treatment -we will discuss one of the modern and effective tool -the diagnostic fracture injection test (DFIT) to help identify the presence of the natural fracture both qualitatively and quantitatively. And the pressure dependent leak-off mechanisms followed by determination of pore pressure and permeability which will eventually benefit the shale gas/oil reservoir recovery.

G-function analysis is an integral part for identification and tracing the presence of the natural fracture.

Typical G-function analysis plots are attached with this abstract.

Typical *G* – Function Derivative Analysis