

Fault seal analysis to identify sealing potential of a fault: A case study of Badin Area, Lower Indus Basin, Pakistan

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Abstract

Most of the hydrocarbon plays in fault bounded structural traps are associated with faults, these faults may be sealing or supporting the flow of liquid through them. The properties that are associated with sealing capacity and leakage of the fault are estimated by using algorithms. These algorithms are based upon juxtaposition of reservoir against sealing lithologies, Deformation during displacement subsequent evolution and present stage of stress in fault relative to leakage (Yeilding 2001). The present study focuses on such types of seals or leakages in lower Goru Formation of Badin area. The time and depth contour maps represent a half graben structure representing unidirectional force in the area. This unidirectional force is one of the causes of leakage through the upper reservoirs of lower Goru i.e. Sand A, Sand B and Sand C and thus made good seal for Basal sand. The Allan diagram depicted a sand-sand juxtaposition for sand A and juxtaposition of sand A with sand B thus eliminating any chances of seal. The similar diagram confirmed shale-sand juxtaposition for sand C and Basal sand thus making them zone of interest for further studies. The juxtaposition diagram referred to an increase in Shale Gouge Ratio (SGR) values from sand A to Basal sand with maximum values at Basal sand thus classifying Basal sand as a good seal. It is approximated that sealing capacity of the fault (F2) increases from Sand A (poor seal) where SGR = (0.44 % – 0.9 %) and Shale Smear Factor (SSF) = (0.23 – 1) to Basal sand (moderate seal) where SGR = (10 % – 44 %) and SSF = (0.05 – 0.22) which mean Basal sand is more sealed than any other sands in the study area.