Fault seal analysis of the Thatta-Badin Block

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Thatta-Badin Block is situated in the lower Indus basin. The dominant feature of the area is extensional tectonics, the traps are normal faults in all oil, gas and condensate fields. Early Cretaceous Sembar shale is the source rock, whereas the overlying lower Goru sands, having up to 25% porosity act as reservoir rock. Further up, the Late Cretaceous upper Goru shale provides excellent seals. Being extensional regime there is normal faulting which at depth, as observed in this work, converts into listric faults striking towards northwest-southwest. In clastic (sand/shale) sequences, fault sealing capacity is broadly predictable. Juxtaposition pattern of the units at the fault is of prime interest. In many traps, juxtaposition seal of shale against sand is a main component of the trap geometry. However, areas of sand against sand can also contribute to the trap because of the presence of fault rocks which impede fluid flow. The generation of fault rock is intimately linked to the sliding of different lithologies past one another (Yielding et al., 1997). In an area like Thatta-Badin Block, where fault bounded structures are to be explored, fault seal analysis gains a lot of importance. This analysis provides information about whether or not a fault is providing a good seal to the reservoir units. A number of techniques have been introduced to do this analysis like juxtaposition diagram and Allan diagram (Allan 1989); both of which tells about the juxtaposition of various units in the foot wall across the fault against the hanging wall, besides some algorithms have also been introduced of which the most important ones are Shale Smear Factor (SSF; Lindsay et al., 1993), Shale-Gouge Ratio (SGR; Bouvier et al., 1989; G., Yielding et al., 1997) and Clay Smear Factor (CSP: Bouvier et al., 1989; Fulljames et al., 1997). The SSF provides information regarding reservoir-reservoir juxtaposition across the faults in terms of sealing, whereas SGR provides information about the sealing capacity of the fault rock type. These two factors have been calculated at every point on the fault plane of the F1 fault and this analysis has been carried out and zones of good sealing have been found.

Fault seal analysis of Thatta-Badin Block is carried out manually by mapping the fault, and various reservoir and shale beds precisely that constitutes the Lower Goru Formation. There are zones both vertically and laterally where the fault is not proving a good seal. Fault sealing analysis is of vital importance in now day exploration activities while exploring an extentional regime with clastic reservoir.

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