5249 A Diagenetic Trap in Southwest Onshore Abu Dhabi

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Most of the giant and simple domal, anticlinal structural traps have already been discovered in Abu Dhabi and most of the other places of the world. The exploration activities need to be focused on other, less obvious plays and subtler trap styles. The diagenetic trap could be considered an example of such an unconventional trapping style.

The diagenetic trapping scenario, which assumes up-dip sealing by cementation is much riskier than the structural trapping scenario, but has large up-side potential. Oil accumulations in diagenetic traps represent an equilibrium state between buoyancy forces trying to move oil through rocks and capillary pressures in the low permeable layer that resists this movement. The only requirement to develop a diagenetic trap is that the displacement (capillary) pressure is greater than the migration (buoyancy) force. Smaller pore throat sizes will greatly enhance the seal capacity, especially for the larger oil molecules expelled during early oil migration, resulting in longer oil columns.

Such a diagenetic trapping style is the most likely scenario for a hydrocarbon accumulation found in the Mishrif Formation in the southwestern part of onshore Abu Dhabi. The potential of this particular prospect was assessed on the basis of regional analogs and a geological model was developed. The prospect was further matured by the acquisition of a 3D seismic survey in 2004, with the aim to delineate the limits of the stratigraphic trap. In addition, a detailed stratigraphic analysis was carried out and seismic and reservoir porosity maps were prepared. Seismic attribute cubes were generated with the aim to detect the fault/fracture patterns in this area.

The Mishrif stratigraphic trap in the southwest onshore Abu Dhabi is highly prospective since it is located adjacent to the mature Shilaif kitchen located in the Ghurab Syncline (Rub' al Khali Basin). The Shilaif source rock, which is time equivalent to the Mishrif shelf facies, was deposited in an anoxic environment with restricted water circulation. Basin modeling suggested that the timing of hydrocarbon charge from the kitchen into the Mishrif reservoir started as early as Late Miocene.

The Mishrif play prospectivity evaluation, including the detailed and integrated geological model and 3D seismic interpretation will guide future appraisal drilling. In addition, the knowledge gained from this study can serve as a basis for further exploration activities related to unconventional trapping styles in the Mishrif Formation.