Characterization of Fracture-Fault Systems in an Early Cretaceous Reservoir, Offshore Abu Dhabi: Implications in Mature Field Development

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Within offshore Early Cretaceous reservoirs of Abu Dhabi matrix properties dominate fluid flow, however, fracturing is important as ‘diffuse' mechanical layer-related effects and as linear, through-going features: fracture corridors and fault zones. Integration of core and FMI-picked features provide means for characterizing such structural systems - a conceptual model presented incorporates these three dominant styles of deformation whose interaction at localized to field domain govern the heterogeneity of fluid flow:

1. Fractured layers: stratigraphical distribution of diffuse features clustered within mechanical layers and at strength contrast interfaces.

2. Fracture corridors: conduit paths of swarmed, sub-vertical, often through-going open features.

3. Fault zones: complex damage zones involving cementation, fault rock generation, visible offsets, fracturing and reactivation and highly variable permeability.

Examples of all three styles are presented, their core and FMI characteristics described. This paper elaborates on the first type, stratigraphically controlled microfracture systems. Emphasis on ‘diffuse fractured layers' is on account of their importance to water influx and possible sweep inefficiency in this specific carbonate reservoir. An important aspect of fractured layers is the different spacing, style and types of fractures within zones in dense intervals compared to the reservoir zones, and also the control on fracture nature, density and distribution by mechanical properties, layer/unit thickness, diagenesis/stylolitisation and oil-charge. A common feature is that such ‘fractured layers' occur at the top/base of reservoirs and associated with prominent cemented haloes to stylolitised surfaces. Prediction of these mechanically controlled fractures is an integral part of structural reservoir characterization in this mature offshore field, especially for fault-distal areas, allowing flank-to-crest diversity to be addressed.