Ancient Lineaments and Cretaceous Thrusting onshore Sharjah. Insights from Structural Restoration.

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Abstract

The discovery of gas at Mahani in early 2020 significantly increased interest in the hydrocarbon potential of onshore Sharjah, UAE. This discovery has placed the Northern Emirates firmly in the spotlight for exploration.

Gas and condensate fields in Sharjah and Dubai form a roughly NNE-SSW chain from Sajaa in the north to Margham in the south. The fields all produce from Early Cretaceous Thamama Group reservoirs overlain by Late Cretaceous Aruma Group sediments. The location of the fields is related to basement lineaments which have influenced basin development, structural evolution, and sedimentation throughout geological time.

Integrated interpretation of 3D seismic data, re-processed legacy 2D data, well data, and potential fields interpretations has highlighted several geological challenges and underlined the requirement for a robust structural model. Our understanding of the tectonic and stratigraphic history of the Oman Mountains Fold Belt and foreland has been significantly improved by combining regional knowledge with structural restoration on a series of 2D transects.

The structural style is dominated by a series of widely spaced high-angle reverse faults with prominent back-thrusts. In common with existing models, disharmonic folding and thrusting has been observed between the Thamama and the Aruma Groups and a detachment or series of detachments within the Lower Aruma Group have been recognised.

The high-angle reverse faults result from Late Cretaceous transpression and were subject to further uplift in the Cenozoic. These structures acted as buttresses to the westward migration of the fold and thrust belt during the Cenozoic. Emplacement of the Semail Ophiolite during the Late Cretaceous was followed by imbrication, isoclinal folding and tectonic thickening of the Aruma Group immediately to the east of the thrust front. Deformation is observed to affect the lower sections of the Pabdeh Formation as well as the entire Aruma Group. Onlap surfaces and tectonically induced dipping of the Pabdeh and Fars Formations indicates that the area underwent further compressional reactivation in association with the Main Zagros deformation phase during the Miocene.

This study has resulted in a significant gain in understanding, through integration of structural geology, petroleum systems analysis and success-case prospect evaluation. The resulting reduction in uncertainty on charge access and trap timing relative to charge provides further positive evidence regarding the hydrocarbon potential of the Northern Emirates.