

Field Focused Velocity Model Building and Imaging in Complex Setting in the Sultanate of Oman

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Abstract

In PDO typical Seismic processing projects are in excess of 4000km² and encompass Geological targets over multiple stratigraphic levels across the dataset. While such large projects are good for regional exploration work, we have recently seen the tremendous value added when executing more 'field focused' reprocessing projects. This has recently and repeatedly demonstrated value of addressing specific field development challenges. In this paper we will be presenting 2 very recent field focused projects. Qalah field located within the Maradi fault system in North of Oman was discovered in 1980. The hydrocarbon accumulations of Natih A, C, D & E reside in a narrow structure formed by tectonic events that resulted in a complex pop-up structure with many intersecting faults. Development plans of Qalah comprised of drilling 4 vertical wells between 2018-2020. The drilling results concluded that mapping subtle faults were critical at Qalah's structural settings. A recommendation was formed to verify drilling plans following a focused 240km² Pre-Stack Depth Migration reprocessing of the seismic targeting the juxtaposition of high velocity reservoir rocks against overlying and lateral slow velocity shales and fault imaging. A step change imaging uplift has now been achieved for the field structure from this focused reprocessing. The key enablers to this success were: a sonic log derived velocity model for the model update stage, combined with accurate horizons, high-definition tomography and dense processing/imaging on a 12.5 x 12.5m grid (usually a 25x25m is utilized). This reprocessing effort has resulted in a dramatic improvement in the imaging at target level, with intra structure faults resolved clearly in relation to the legacy image, enabling the FDP to commence. Furthermore, the clear uplift in deeper formations of the Maradi system will aid future Exploration studies. Following the Success of Qalah project and the dramatic improvement achieved in the deeper target, a new 450km² field focused project (Ibtikar) has kicked off. Ibtikar field is within the same fault system as Qalah with very complex geology and strongly varying velocity field. The main objectives of this project are to improve the shallow velocity model and proper incorporation of the velocity contrasts using horizons/faults in the model, hence leading to a better imaging at the deeper target level where interpreters are facing difficulty in mapping the new opportunities due to the enormous distortion in the image. The lessons learnt and results of Qalah and Ibtikar projects, business added value, challenges faced and collaborative effort between the imaging and interpretation to deliver this project will be presented and reviewed.