An Integrated Workflow to Map Out the Seal and Reduce Exploration Uncertainties

Hadi Balhareth[1], Qamar Bukhamseen[1], Sean Rahati[1], Fawaz Mohammal[1], Monirah Dossary[1], and Wang Ruixiang[1]

[1]Saudi Aramco, Dhahran, Saudi Arabia.

ABSTRACT

The seal presence is one of the major risk elements in oil and gas exploration. The ability to map out the overlying seal for a prospect often influences the decision to drill the well. Therefore, it is important to utilize seismic data to address this issue in the context of the known geological setting. A multidisciplinary approach is implemented to successfully map out the seal in the Wasia formation of the Rub Al Khali. The integrated multidisciplinary team consists of members from several disciplines such as processing, interpretation, rock/petro physics and seismic inversion. The optimum solution to identify the seal in the area of interest is pre-stack inversion in order to differentiate between the clastic seal, tight carbonates and the porous carbonate reservoirs. For a reliable elastic inversion, the seismic data are AVO-friendly processed and carefully conditioned. Well logs are used to model the seismic gathers and to benchmark the processing/conditioning of the data. After several iterations of conditioning and modeling, the optimum seismic quality is achieved – the AVO signature is preserved and events are aligned for better inversion results. The well logs (Vp, Vs, density) are conditioned by both rock and petro physicists. Furthermore, the rock physicist performs a feasibility study to obtain the best seismic attributes for mapping out the seal. An AVO simultaneous inversion scheme is performed on the pre-stack seismic data. Then, a seal (shale) volume was derived by applying a rock-physics transform on the elastic inversion results (VpVs, and AI). In conclusion, the integrated team effort improves significantly the mapping of the seal, reduces uncertainties of the risk element of the prospect and enables the prospect to move forward for drilling.