# Perfect Pitch – The Use of Tuning in Reservoir Characterization in the Harweel Cluster, Oman

***Richard R. Terres***[1], *Ra'id Z. AL-Jamali*[2], *Ali Naamani*[3], *and Ahmed Helmi*[3]. *(1) EOR/Harweel, Petroleum Development Oman, PO Box 81, Muscat, PC 113, Oman, phone: 968-24675448, fax: 968-24673707, Richard.R.Terres@pdo.co.om, (2) Occidental of Oman, PO Box 532, Muscat, 113, Oman, (3) Exploration/Geophysics, Petroleum Development Oman, Po Box 81, Muscat, PC 113, Oman*

Seismic tuning is often considered to be an insidious effect that overprints and masks key reservoir information. However, in the Oman Harweel Cluster of nine oil and gas fields, we are using tuning effects to better define reservoir edges and structural geometry. In addition, our modeling suggests that caution must be applied to reservoir property inferences from acoustic impedance inversions when significant seismic tuning is present.

Recent drilling in the Harweel Cluster yielded a challenging result when a 100m thick carbonate reservoir was completely absent despite the appearance of simple structural continuity on the seismic data. The post-drilling analysis showed that noise, side-lobe effects and multiples contributed to the original illusion of continuity. However, modeling and seismic attribute analysis showed that tuning between the reservoir horizon and an overlying anhydrite unit (with intervening salt) could very precisely delineate the termination of the reservoir.

From this work, we now understand that tuning is one of the primary controls on the reservoir's seismic amplitude variations. And we use these anomalies to more precisely define pinch-outs, structural truncations, and thickness variations. Of particular value have been horizon amplitude ratios – using one horizon as a “reference” and one as a test horizon.

In addition, of interest to many inversion projects, our seismic modeling shows that standard acoustic impedance inversion may not adequately “de-tune” the seismic data and that amplitude artifacts may exist in the inversion volume. These artifacts, where not properly recognized, could easily be misinterpreted as reservoir property variations.