
The Use of Seismic Impedance to Locate a Discovery Well, South of Ghawar Field

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A seismic impedance volume derived from seismic amplitude inversion was used as second order control, in conjunction with first order structural control, to assist the location of an oil discovery in Well 2, in Saudi Arabia. The impedance volume enabled us to locate vertically co-incident estimates of high porosity in the two target reservoirs, within the target structure. The upper target, the Jurassic Hanifa reservoir, flowed oil. The lower target was the Permo-Carboniferous Unayzah reservoir. The discovery well was a follow-up to a discovery in Well 1, in an independent structure about 10-15 km from Well 2. In Well 1, the Hanifa reservoir flowed oil and the Unayzah was wet. The impedance log from Well 1, and seismic horizons at the two reservoirs, were used to define the initial model for the inversion. Impedance attribute maps showed that the initially proposed Well 2 location did not fall within an impedance minimum. The impedance minimum is the ideal, given an inverse relationship between impedance and porosity. Due to the exploration nature of the well, structural considerations played the primary role in its location. Structure maps at both targets showed that there was freedom to move the proposed location to the final location, into an estimated impedance minimum at both reservoirs, and stay at the same structural position. A comparison of the predicted impedance from seismic, with the impedance from Well 2, shows that the inversion did a good job of predicting the impedance at the discovery well, in both the Hanifa and Unayzah reservoirs.
