Behavior of Seismic Amplitudes in Middle Indus Basin: a Tool to Predict Good Reservoir Porosity Zone

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Abstract

Middle Indus Basin of Pakistan has many successful wells which have been drilled on the basis of seismic amplitude in the past few years. In some of the areas a direct relation between porosity and seismic amplitudes was established. However for whole of the Middle Indus Basin this can be done only qualitatively, as the area has different acquisition and processing vintages. In this paper it has been established that in amplitude preserved data a linear relation between amplitude and porosity exists for the Lower Goru G and E- Sands (Eni nomenclature) in same vintage data. The Amplitude anomalies identified during the study were evaluated in detail, using the seismic and the well data. Several porosity versus amplitude cross plots were made using different processed data sets to find out the nature of the relationship between them. As the Lower Goru sands under review are low velocity as compared to the surrounding shales so by putting porosity in the sands the velocity of the sands decreases further. Therefore bright amplitudes are present where the porosity is good while the weak amplitudes encountered tight reservoirs. This relation can be explained as that due to induction of good porosity, the velocity and density will decrease, which will ultimately decrease the acoustic impedance. By this phenomenon the contrast of acoustic impedance between reservoir sands and above lying shales increases which result in increase of reflection coefficient. With the same token for the less porous layer the amplitudes become weak. Seismic inversion data, wherever available, is also incorporated in this study and the result is same that on inversion data the low acoustic impedance indicated good reservoir. It is concluded that there exists a direct relation between seismic amplitude and reservoir porosity in Lower Goru G and E-Sands. So during processing if the seismic amplitude is preserved then the amplitude can be used to predict good porosity zone.