How the Shadow Effect of a Strong Reflector was Resolved to Identify a Stratigraphic Trap

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Abstract

In the Middle Indus basin of Pakistan many successful wells has been drilled based on structural cum stratigraphic traps. For the stratigraphic traps, generally the prediction of the reservoir quality and trap definition is based upon seismic amplitude. To establish the stratigraphic traps and the reservoir quality, usually a linear relation can be established between seismic amplitude and porosity of the reservoir, if the thickness is within the seismic resolution. This paper deals with a stratigraphic trap purely defined based on bright and dim seismic amplitudes, identified in the Intra G sand of Lower Goru formation of Cretaceous age. Few wells have already been drilled in this formation but the relation between seismic amplitude and porosity could not be established due to unexpectedly low seismic amplitude on some of the good porosity wells. To resolve this anomaly the seismic data was reviewed in detail and it appeared that a very strong shallower seismic reflector was masking the deeper reservoir reflector on some of the wells. The strong seismic reflector was of limited extent and was covering only the anomalous wells while on other wells it was not present. It was envisaged that because of this strong shallower reflector a major part of the energy was reflected back and comparatively less energy could penetrate to the deeper reservoir reflector at the anomalous wells, which resulted as weak amplitude as compare to the areas without this masking reflector. To resolve this anomaly, acoustic impedance of the reservoir sand was calculated on all wells by using the well data and plotted against porosity, which made a clear trend. However, inversion was not available on the area of the prospect. Then it was established that the amplitude is directly related to acoustic impedance by plotting the acoustic impedance VS amplitude on existing wells without the masking reflector. Now, as it was established that (1) the acoustic impedance is directly related to porosity and (2) that the acoustic impedance is directly related to amplitude on wells without masking reflector so was concluded that there exist a direct relation between seismic amplitude and porosity where the masking reflector is not present. On this basis, the anomaly was resolved and was concluded that the bright amplitude represent good reservoir and dim amplitude provide the lateral seal. On this basis, a well was drilled which proved to be a great success and opened a new horizon in the area.