

2-D Seismic Interpretation, evaluation of reservoir characteristics and reserve estimation of Bhangali-01 Well, Potwar Sub-basin, Pakistan



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ABSTRACT

Bhangali oilfield is located approximately 50 km south-east of Islamabad in Gujjarkhan District, Rawalpindi. Bhangali field was discovered in 1989 and started production from Bhangali-01 in October 1989. The purpose of this dissertation is to evaluate the reserve potential of Bhangali -01 well through integrated approach of petrophysical, rock physics and seismic structural analysis. The well and seismic data of Bhangali-01 are used in the present research to evaluate petrophysical and mechanical properties, volumetric estimation of reservoir and to understand subsurface structural style. For petrophysical analysis, Chorgali formation is marked as the zone of interest (ZOI) because of its lithology and productivity of hydrocarbon in the surrounding oil fields. Neuralog software is used for calibrating the logs and accurate determination of log (Gamma ray, Neutron, Density, Resistivity, Spontaneous potential and Sonic) values. The parameters calculated using these logs are effective porosity 18%, saturation of water (S_w) 17% and saturation of hydrocarbon (S_h) 83% for Bhangali-01 well. Sonic log is used for calculating Bulk modulus, Shear modulus and Young's modulus to evaluate the mechanical properties of zone of interest. The trends of values of all the modulus shows a positive relation with petrophysical parameters. In the zone of interest the values of Bulk modulus, Shear modulus and Young's modulus decreases shows an inverse relation with the petrophysical parameters and provides an evidence of the presence of a fluid in the zone of interest. The sub-surface structural style interpreted from the seismic data shows that the deformation in the area is the result of thrust tectonics. Forethrust breaking foreland ward are present in the sub-surface. Back thrust are emanating from there forethrust forming a pop-up structures. Bhangali oil field is interpreted as a pop-up structure bounded between forethrust and backthrust making it favorable for the exploitation of hydrocarbon. Time and Depth contour maps are generated for the Chorgali (ZOI) formation to interpret its three dimensional geometry in sub-surface and its integration with petrophysical parameters for the reserve estimation. The area of ZOI is calculated by using manual techniques on Depth contour map which 2965.2 acres and the total net pay is of 40 ft are used for the calculation of reserves which comes out as 4.74 mmbbl. The calculated reserve values for the reservoir are sufficient enough to make it commercially exploitable.

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