

Predicting reservoir sand body distribution in a complex stratigraphic controlled trapping system; The BC Field, Dnieper-Donets Basin, Eastern Ukraine Case Study

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The Bilousivksko-Chornukhinska (BC) field of the Dnieper-Donets (DD) basin is located in the eastern part of Ukraine. This inter-cratonic basin is a narrow, elongate basin that trends in a NW-SE direction and straddles present day Ukraine and Russia. The boundary of the basin is defined by the Voronech high of the Russian craton in the northeast as well as the Ukrainian shield in the southwest. The basin is principally a Late Devonian rift that is overlain by a Carboniferous to Early Permian post-rift sag. The basins' sedimentary succession is characterized by four tectono-stratigraphic sequences namely: the pre-rift platform sequence, Upper Devonian syn-rift sequence, post-rift and the post-rift platform sequence. In general, the basin consists of a single total petroleum system across the entire sedimentary succession. Hydrocarbon resources/reserves are known to occur in the Lower Permian rocks below the salt seal as well as in the Lower Carboniferous sequences. The source rocks are in the gas-generation window over most of the basin, however, both gas and oil reserves have been discovered.

The main productive interval in the BC Field is within the post-rift sag and the post-rift platform sequences. The former consists of Carboniferous and Lower Permian clastic marine and alluvial deltaic rock. The Lower Permian interval also includes a salt formation that is known to be an important regional seal for oil and gas fields. The post-rift platform sequence comprises of Triassic through Tertiary rocks that were deposited in a shallow platform depression that extended far beyond the Dnieper-Donets basin boundaries.

3D seismic and core data exist in the BC field. 29 wells have penetrated the above sequences. Although the BC Field has been producing gas since 1977, the factors controlling the distribution of hydrocarbon in the field is still not fully understood. This is due to the sparsity, poor quality and age of the data combined with a complex stratigraphic trapping mechanism. On the western flank of the BC field, where no wells have been drilled to date, sand fairways are predicted from the seismic. The location of these fairways appears to be controlled by small anticlines aligned in a north-west to south-east direction.

Integration of seismic, core and well log data has been used to construct the sequence stratigraphic framework of the field. This paper documents the approach used to predict the distribution, geometry and orientation of productive reservoir bodies. The result has been used to develop a robust and optimum depletion strategy of the undeveloped reserves in the BC field.