

# **Seismic-Stratigraphic Interpretation and Geological Model of the Carboniferous Reservoir of Karachaganak Field - Kazakhstan**

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## **Abstract**

A seismic and sequence stratigraphic analysis of the Carboniferous reservoir in the Karachaganak Field has been carried out with the main objective to review the existing geological model based on the availability of a new seismic and of long cored intervals from recent wells. The reservoir geometry was investigated through an extensive full field horizon interpretation and mapping, supported by the well-to-seismic-tie on the key wells covering both the Western (WBU) and the Main Build-ups (MBU) of Karachaganak Field. The overall aggradation to progradation trend, already detected by former interpretation, is confirmed by a clear lateral shift of the slope location and by the relevant shift of depocentral areas within the seismic build-up. The consistency between seismic geometry and depositional facies investigated by wells was accomplished. For instance, in the platform interior setting the transition from aggradation to progradation is marked by a facies shift from moderately deep water crinoid-rich bioclastic grainstones and packstones to very shallow water algal-rich skeletal grainstones and packstones. The slope setting is marked by the presence of microbial-dominated deposits, and the main boundaries are characterised by the reworking of shallow water grains. The Carboniferous reservoir of KGK was sub-divided into stratigraphic intervals according to the main growth stages of the carbonate build ups (Main Build-up & Western Build-up). The MBU & WBU start to develop vertically and laterally with a multi-phase Aggradation Stage from Late Viséan (C9) to Early Serpukhovian, then a Progradation Stage occurred from Early Serpukhovian to Late Serpukhovian. The end of the Progradation Stage is marked on top by the Intra-Late Serpukhovian Unconformity (ILS), which sub-aerially eroded part of the clinoforms of the carbonate prograding. Finally, a Transgressive Stage occurred in Late Serpukhovian (ILS-C1) indicating the final growth phase of the build ups. The workflow for each sedimentary facies map building involved the use of a considerable number of geological and geophysical data, such as: seismic attributes, horizon stacks, core & log data. This allowed a further detailed subdivision into “8 reservoir intervals” between C9-C1, which were described and mapped throughout the field. In summary, detailed facies mapping showed that KGK evolved in Early Serpukovian from bioherme dominated, enucleating in the central/SE part, towards a bank interior in the central/Western part at the end of the Aggradation Phase. Then the build ups (slope, bank margin, bank interior) continued to grow laterally (Progradation Stage) into different prograding steps starting from the North. In Late Serpukhovian KGK underwent subaerial erosion (ILS), then the carbonates continued to grow during the last Transgression Phase (ILS-C1).