The Structure of the Salt-Anhydrite Complex of the Chardzhou Step and Determination of Effective Exploration Directions

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Most of the geophysical investigations and deep drilling of the last two decades in the northeast of the Ama-Dar’ya depression has been in areas of the Chardzhou tectonic step. The most satisfactory exploration method has been common depth point surveying.

The main problem in exploration for traps here is the planning strategy for the seismic work. The surface of the sub-salt carbonate complex has not been mapped reliably. Only marker horizons within the salt-anhydrite seal have been traced: a boundary close to the top of the lower anhydrite member (T₅), the boundary of the intermediate anhydrite member (T₄), and the top of the salt-anhydrite unit (T₃). None of these correspond with the geometry of the underlying carbonate complex because the relief due to the reefs of this complex was smoothed out by the salt-anhydrite.

Under the geologic conditions of the Chardzhou step the most effective exploration strategy is to analyze the spatial variations in thickness of the salt-anhydrite seal which fills the irregularities of the paleo-relief of the surface of the carbonate unit. This can be done only by deep drilling. The common depth point surveys give information only on the structure within the salt-anhydrite.

Fig. 1 shows results of compilation of maps of thickness of the salt-anhydrite sediments for the central and southeast regions of the Chardzhou step based on seismic surveying and deep drilling. The isopachs reflect the variation in thickness of the rocks of the seal between reflecting horizons T₃ and T₅. Sectors where the seal rocks are relatively thin are combined into zones within which is observed or predicted a high concentration of positive forms on the paleo-relief of the surface of the carbonates.

Eleven zones of reduced thickness of the salt-anhydrite sediments and of concentration of highs are recognized. Within eight of these have already been found ten gas condensate and gas condensate-oil fields. Within these zones, except for I and V, seismic surveys have disclosed more than twenty highs which are similar geologically to traps that contain petroleum. Most of the highs are concentrated in zones II, III, IV, and VI. The Shurtan-Zafar zone is particularly interesting where traps may be associated with reefs.

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