A. P. Pronin, F. M. Kuanyshev, N.E. Kuantaev.

URAL - VOLGA INTERFLUVE AND SOUTHERN EMBA. STRUCTURE OF TRIASSIC DEPOSITS AND CONDITIONS OF RESERVOIR ROCKS SEDIMENTATION

Discovery of oil fields Northern Kotyrtas and Southwestern Novobogatinskoye associated with Triassic deposits demonstrated once again favourable perspectives of post-salt deposits development in the Ural - Volga interfluve and Southern Emba. At the same time many wells drilled in Triassic deposits gave negative results and that is related mostly to inadequate information as to the Triassic deposits structure.

To delineate the boundary between Lower and Middle Triassic the angular unconformity between these deposits is used. Lower Triassic deposits located immediately to the salt dome have steep bedding. Angles of rocks dip 0-20 ° to the core axis in the part of the section below the overhang were determined in the wells on the fields Eastern Dossor, Southern Dossor, Makat, Karashkazgan, Eastern Zhanatalap, Southwestern Novobogatinskoye, Northern Kotyrtas, Eastern Ongar.

In troughs similar steep angles of bedding dip (20 ° to the core axis) are encountered in the wells on the fields Oryskazgan, Shugul, Kirikmultuk. In the wells of the fields Dossor, Tanatar Dangar, Sagyz, Kulsary, Beraly, Matip, Zharbas, Northern Kotyrtas, Myrsaly, Eastern Ongar, Kemerkol Kozha located 2-3 km away from steep slope, the steeply dipping beds have the angles of dip 15 - 45 ° to the core axis.

In the Lower Triassic the flatenning of bedding angles from vertical to horizontal occurs in a direction from the dome to the trough on a distance of about 5 kilometers. It is related to the dome growth as the dome uplifts the Lower Triassic deposits 1-2 kilometers thick to form anticlinal fold.

Steep bedding angles of Lower Triassic deposits reflected by the core materials are confirmed by the dipmetering data obtained from the wells of Northern Kotyrtas field where they are as follows: 2153 - 2285 meters interval, dip azimuth 250 - 270°, angle of dip 20 - 40°; 2285 - 2237 meters interval, dip azimuth 250 - 270°, angle of dip 0°; 2637 - 3200 meters interval, dip azimuth 65°, angle of dip 0 - 25°.

Analysis of geological and geophysical materials established that in a number of areas current Lower Triassic deposits are the anticlinal folds formed in the course of salt dome growth and subsequent washout of Lower Triassic deposits. Lower Triassic deposits are represented by interbedded red sandstones, aleurolites, argillites, and argillite type clays. Upwards the section they are overlaid by the subhorizontal deposits (60 - 90° to the core axis) of two member structure: their lower part has red color but terrigenous composition, upper part is terrigenous plus carbonate and has sundry colours.

Red color terrigenous deposits have thickness of 100 - 150 meters and classified as lower part of Middle Triassic (Inderian horizon). Sundry color terrigenous plus carbonate deposits is represented by the alternating terrigenous and carbonate rocks of red, red brown, gray and black colors. Their thickness varies from 400 to 800 meters and reaches 1500 meters in the trough central part.

As a rule, all type rocks have rich set of organic remains: Ostracoda, worms, charophytes, myarian, gastropods, fish remnants.

On a basis of Ostracoda, charophytes, and palinocomplexes the deposits are classified to belong to Inderian horizon of Middle Triassic. Occasionally encountered within the Middle Triassic are palinocomplexes, Ostracodes and charophytes typical for Lower Triassic. Most probably, they were redeposited and associated with addition of Lower Triassic deposit fragments into Middle Triassic sedimentation basin. Salt dome as it grows dislocates Lower Triassic deposits but the latter balance its pressure with their weight and prevent the breakthrough.

Upon Lower Triassic deposits outcrop and their disintegration the Middle Triassic sedimentation starts.

Denudation of Lower Triassic deposits occurs in irregular fashion. First to be disintegrated are deposits located in the areas with broken bedding. In the dome part on the flexure bends, where Lower Triassic deposit tend to thin, salt breaks through. Salt outcropping to the surface fills up the closed negative structures of paleotopography - valleys in front of cuestas. Part of outcropped salt becomes liquefied changing the hydrochemical conditions of the basin. If the dome has a shape close to rectangular, cuestas will be formed along its longer sides and that is also where the salt overhangs should be expected to form.

Further transgression of Middle Triassic sea causes the marine deposits to overlap the salt overhang (Inderian horizon). These marine deposits are formed as the result of Lower Triassic deposits washout occurring on the domes. Washout of deposits with horizontal bedding occurs at a slower rate. Presence of sandstones as more erosion-resistant rocks leads to the formation of cuesta topography. The most complete Middle Triassic type sections occur in the trough central parts which also typically have the most complete Lower Triassic type sections.

Within Middle Triassic terrigenous deposits in a direction towards the dome the marine deposits are replaced with continental ones having inconsistent lithological composition. In front of cuesta cliffs the belt type "filling deposits" are formed to follow the valley outlines. Its composition usually includes interbedded sandstone and argillaceous rocks with the former prevailing.

Southwestern Novobogatinskoye field as well as oil show in the Eastern Zhanatap area are confined to "such filling deposits" of cuesta paleotopography overlapped with salt overhang.

Complete washout of Lower Triassic deposits coincides in terms of time with completion of Middle Triassic terrigenous and carbonate sedimentation. On the day surface there was a formation of crust of weathering composed of insoluble minerals. Reflecting horizon VI is confined to such crust of weathering. On the salt necks, where salt mass uplift was less intensive, Lower Triassic deposits survive in the form of remnants, while Middle Triassic deposits are developed in their peripheral parts (Kirikmultyk area is an example).

Distinctive features of Triassic deposits structure are reflected in their seismic characteristics. Plane boundaries between the salt dome and Lower Triassic deposits would coincide with the line of reflecting horizon VI loss. Flattening of Lower Triassic bedding angles in a direction from the dome (0-60° to the core axis) to the trough (60 - 90° to the core axis) leads to the appearance of clear seismic reflections. Area of development of Lower Triassic deposits with broken bedding (5 km away from the dome) on a seismic maps will coincide with the zone of no reflections which follows the dome contours. Middle Triassic deposits have clearly displayed layering, i.e. interbedding of argillaceous and carbonate rocks and traceability of reflecting areas. The most clearly reflecting horizons V-1, V-2 and others are confined to the sandstone beds. Closer to the dome it can be seen that reflecting areas have the wedge type shape. Increase of Middle Triassic thickness from the dome towards the trough is predetermined by the section accretion both from the top and bottom. Lower part of Middle Triassic deposits have the transgressive bedding. So, on seismics the boundary of Lower and Middle Triassic does not coincide with any reflecting horizon and is determined by the boundary between the two types of seismic reflection sections - chaotic and layered. This plane boundary is clearly seen so that it becomes practical to do various structure mapping on its surface.

Most part of fields in the pre-Jurassic deposits is associated with the Middle Triassic. Paleographically it is possible to delimit the zone of salt dome uplift corresponding to the dry land, the zone of steady bowing (troughs) corresponding to the marine basin and transition zone between them - coastal zone with 0 - 400 meters thick deposits. Coastal zone within which there are reservoir beds with 20-25 % porosity exist around the dome in the form of belt not wider than one kilometer. Reservoir beds wedging out in the proximity of the dome leads to the formation of anticlinal traps. Oryskazgan type of pools discovered on the field under the same name is associated with such traps. Slightly different type of pools called Kotyrtass is formed on the salt overhangs being stable tectonic elements within which the coastal zone width increases to 2 kilometers. Most Southern Emba fields are associated with Triassic deposits of the coastal zones. Among those fields are: Northern Kotyrtas, Iskine, Masabay, Sagiz, Southern Kemerkol-Kozha and others. Around each dome might be the zones of terrigenous reservoirs having the narrow belt shape and following the dome plane contours. Identification of such reservoir zones is the primary task of exploration works which should be performed in the areas of proven presence of oil and gas in Triassic and Jurassic-Cretaceous deposits. Also promising are the reservoir zones associated with deposits located below the overhangs. They have local development and complex reservoir bedding.