Direction of Geological Exploration for Oil and Gas in the Astrakhan Region and Northeast Part of the Kalmuk ASSR


The territory of the Astrakhan Region and northeast part of the Kalmuk ASSR has not been studied uniformly. Geophysical work and deep drilling, which have been carried out in large volume during recent years, have been concentrated predominantly in the southern regions near the Karpenskiy swell. A result of these investigations was the discovery within the Astrakhan region of a small gas field at Promyslovoye; in the adjacent regions of the Kalmuk ASSR the Oleynikov, Tengutin, and Tsibuk gas-oil and gas fields were discovered; and commercial oil has been found in the region of the village of Kaspiyskiy. These fields occur in structures along the crest of the Karpenskiy swell and its south flank.

The territory of the Volga-Sarpin divide and the left bank area of the Volga to the north of the Karpinskiy swell have been studied but little. At the surface it is covered by a layer of horizontal or gently deformed Pliocene and Quaternary rocks. The thickness of this cover is measured in hundreds of meters and only at two points at Lake Baskunchak and at Kamenny Yar does it decrease to zero. At the first of these points, rocks of the Permian, Triassic, and Cretaceous crop out; at the second–Paleogene and Pliocene.

Study of this territory is possible only by drilling and geophysical methods (largely seismic). Gravity surveys cover the entire territory; detailed seismic work has been carried out only in a few areas–Solenoye Zaymishche, Voropaye, Nikol, Zam’yanyakh, Polynom, Vladimirovka, Yenotayevka, etc. Within the area of the Volga-Sarpin divide, VNIGNI has drilled more than 30 profile structural wells.

Prospecting in the vicinity of Astrakhan has not yet yielded positive results, although five structures have already been drilled (Raznochinovka, Kirikili, Krasnyy Yar, Zam’yany, and Azau). However, the region still appears to be favorable. For example, testing of the Jurassic sediments in well 3 (Tinaki) and Lower Cretaceous sediments in well 6 (Raznochinovka) yielded flows of oil with water. Oil and gas showings have also been found in other wells.

A structural feature of this region is the deep occurrence of the basement, which consists of crystalline Precambrian on the north and Paleozoics on the south. The following tectonic zones are recognized in the area: 1) Astrakhan uplifts, 2) salt anticlines, 3) transition zone, and 4) salt domes. See Fig. 1.

The zone of the Astrakhan uplifts is located on the flank of the Hercynian foreland downwarp. Only the Raznochinovka and Kirikili structures have been studied in the Mesozoic sediments here. Seismic surveying indicates the presence here of uplifts in the Dalan-Aldyn, Berkul’tin, Talovka, and Beshkul areas. It must be emphasized, however, that in this zone seismic surveying does not yield unambiguous results because of the great thickness of the elastic deposits of the Jurassic, Lower Cretaceous, and Paleocene, as well as the great thickness and gentle attitude of the Upper Cretaceous carbonate units. Analysis of deep and structural drilling data indicates the presence of local uplifts between Tinaki and Raznochinovka (See Figs. 2 and 3) and between Raznochinovka, Zam’yana, and Talovka.

To the north of the zone of the Astrakhan uplifts, geophysical surveying and drilling have located several salt structures. On the gravity maps these uplifts tend to coincide with regional gravity maxima or to the zone of a gravity step. These structures are small in area (60-100 sq km), the thickness of the salt in them does not exceed 1-2 km, and faulting is less intense than in typical salt domes. These structures have been combined by V. I. Mal’tsev and L. V. Sharapov into a so-called zone of salt anticlines, although typical salt anticlines have not yet been found here.

In the vicinity of Astrakhan, the Krasnyy Yar salt structure has been studied by drilling. At Krasnyy Yar the trend of the uplift has been determined as close to east-west, and three faults have been established.

The structures found in this zone in recent years by seismic work (Kharbin, Polyn, Agarkin, Vladimirovka Yenotayev, etc.) have been studied but little. (The seismic survey was on a scale of 1:200,000 and the distance between profiles was 4 km).

The problem of the development of the salt anticlines also requires study. It is possible that the cupolas at Krasnyy Yar and Vladimirovka Yenotayev occur at a distance from the boundaries of the salt basin and that weakly faulted or underdeveloped structures will be found to the south of them.

The transitional tectonic zone has been studied very inadequately. Several large (up to 1000-1200 sq km) gravity maxima are