Oil and Gas Pools of the North Border of the North Caspian Regional Low

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Most of the fields in the sub-salt carbonate rocks of the north border area of the North Caspian depression are gas and gas-condensate; more rarely are they oil. They occur in a narrow east-west zone. See Fig. 1.

The gas and gas-condensate pools with oil rings occur in sub-salt Lower Permian carbonates, and the oil pools are in Bashkirian carbonates. The pools are in anticlinal traps.

The rocks that compose the productive horizons of the Artinskian and Bashkirian stages have a wide range in reservoir properties. Thin beds (0.5-3 m) with good properties alternate with thicker beds that are impermeable. The latter form local seals. Several types of traps are present. See Fig. 2.

Anticlinal traps with massive pools are found in Artinskian sub-salt sediments in the Borodin and Kuznetsov areas (Fig. 2A). These are reef buildups. In the Ural’sk area a reef is bounded on the flanks by impermeable rocks. Only the crest well (of four) was productive here. The Artinskian pools generally have an oil ring, and where reservoir properties are good, as in the Zapadno-Teplov field, the oil ring is continuous. See Fig. 2C. In Orenburg field the reservoir properties are uneven, and consequently the oil ring is not continuous. See Fig. 2D.

In the Berdyan field reservoir rocks account for not more than 20-25 percent of the section. Dense limestones 15 m thick divide the pool into two parts, upper condensate and lower oil. See Fig. 2E. The condensate pool has a small oil ring on the east limb of the structure. The upper part of the trap was originally filled by oil; however, gas migrating from west to east dispelled the oil from the trap, leaving only the small ring on the east.

In the Chernigov gas-condensate field the trap was filled originally by oil, but gas later expelled all this oil except for some on the southeast flank. See Fig. 2F.

In the Severo-Kopan field the gas pay is in Artinskian sediments directly beneath the regional seal. Hypsometrically lower in a dense carbonate unit are isolated lenses of oil-bearing limestone. The pool seems massive but is actually a series of oil-gas-bearing beds with common gas-water and oil-water contacts. See Fig. 2G.

The Nagumanov field is an example of where a pool formed in a massive limestone with poor reservoir properties. See Fig. 2H. Only 11-13 percent of the section of the pool has satisfactory reservoir properties. There is no water beneath the pool here.

The oil and gas pools of the Bashkirian Stage have less complicated structure. Most are massive and the reservoirs are good. Such pools are known in the Kopan, Severo-Kopan (oil), and other fields. See Fig. 2I. The Bashkirian pool of the Berdyan field is more complicated. Six wells drilled on the crest yielded water, whereas those on the flanks yielded oil at 40-65 tons per day. See Fig. 2J. This structure appears to have been cut by erosional channels.

The characteristics of the pools here in the north border area of the North Caspian depression contrast with those of the Volga-Ural province just to the north.