Oil-Gas Productivity of the North Margin of the Donets Basin

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The question of possible oil and gas in the Donets Basin came up long ago. Exploration in the north zone of minor folding was begun in 1975. The presence of oil and gas here has been suggested by oil-gas showings in various areas, largely in the lower part of the Middle Carboniferous and in part the Lower Carboniferous. Further analysis of this problem requires analysis of epigenetic alterations of rocks due to their deep subsidence and deformation.

The increase in temperature and pressure with subsidence has led to a regional-epigenetic zoning in the Carboniferous sediments of the Donets Basin. The zone of initial catagenesis includes the Carboniferous rocks of the flank of the Voronezh anticlize. In the section of the north zone of minor folding the appearance of signs of deep catagenesis is expected at depths of 2500-3000 m. To the south within the folded Donets Basin at the surface of the Carboniferous there is successive shift of zones of initial and deep catagenesis to the appearance of signs of initial metagenesis. With increase in degree of secondary alteration there is successive worsening of reservoir properties of detrital rocks. With the same degree of coalification (fatty coal, coke, and lean caking ranks) sandstones from the zone of deep catagenesis of the folded Donets Basin are marked by very low capacities and filtration properties in comparison with those regions where the Carboniferous rocks have not been subjected to substantial folding. Consequently, in the north zone of minor folding, granular reservoirs are possible at depths greater than 3500 m, whereas to the south in the folded Donets Basin their distribution is limited to areas of long-flame and gas coals (initial catagenesis).

The entire zone of minor folding and adjacent regions is divided into eight areas on a basis of favorability. See Fig. 1.

In the very interesting northeast area where Carboniferous sediments are overlapped by Meso-Cenozoic, seismic work is necessary to disclose closed structures and a parametric well should be drilled at Voroshilovgrad. If results are positive, then wildcats should be drilled in the Davydo-Nikol, Vostochno-Nadezhdin, and Almaz regions.

In the area of junction of the central and northwest sub-zones, drilling is recommended in the Zimogorov sector (above a supposed projection of the basement) on the large sub-thrust Mar’yev uplift (Fig. 2), and on the Kramator, Bezhanov, Karbonit, and Pervomay brachyanticlines (Fig. 3).