Some Regularities in the Formation of Oil and Gas Fields in the Southern Regions of the Volga-Ural District

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Within the USSR on January 1, 1960 there were 244 known gas fields, 201 of which (82.38%) are referred to the group of small (reserves up to 15 billion m$^3$) fields and contain only 8.65% of the gas reserves; 14 large and unique fields (reserves above 30 billion m$^3$) contain 73.83% of the gas reserves. Four unique fields (above 100 billion m$^3$) contain 51.11% of the reserves of the country.

The large and unique gas fields have an uneven distribution. Within the Volga-Ural district there is only the one unique Korobkov field, which occurs on the east flank of the Voronezh dome. In the Cis-Caucasus there is the unique Severo-Stavropol field and the large Maykop, Anastasiyevsko-Troitsk, Berezan, Leningradskoye, Staro-Minsk, and Takhta-Kugul'tin fields. In the Cis-Carpathians—the large Rudki and Bil’che-Volitsa fields. In the Dnieper-Donets depression—the unique Shebelinka field. In the Bukhara-Khiva district—the unique Gazli field and the large Yuzhnyy Mubarek field. In the southeast part of the Greater Caucasus—the large Karadag field.

Analysis of the distribution of the initial balanced oil and gas reserves in the fields of the southern regions of the Volga-Ural district (Volgograd, Saratov, Kuybyshev, and Orenburg areas) shows that the main commercial reserves of oil and gas (above 85%) are concentrated in 29 average, large, and unique fields.

These data emphasize the need to concentrate on finding large and unique oil and gas fields. Geological science should play a large role in this, seeking to reveal basic regularities in their distribution under various geological conditions in the Soviet Union.

An important factor in successful oil and gas exploration, particularly for the discovery of large and unique fields, is the study of the geology of favorable areas on a regional scale. Regional work makes it possible to determine the presence of large structural elements—domes, depressions, swells, downwarps, their interrelationship, the geologic history during individual periods, systematic variations in thickness and character of productive parts of the section, reservoirs, and types of cover strata. At the same time probable oil-source rocks and structural elements favorable for oil-gas formation and accumulation may possibly be found in the section.

Regional study of a territory may yield the information necessary for deducing the paleotectonic features of particular geologic times, and this in turn indicates the inclinations of beds at these times and thus the paths of migration of fluids. Also very important is the second stage of the investigations which includes preparation of a reserve of structures for subsequent exploration drilling.

Existing practice of preparing structures without taking into account their occurrence in a definite tectonic zone favorable for discovery of large and unique fields cannot be regarded as satisfactory. In the second stage it is necessary to create an adequate reservoir of structures in the most favorable regions.

With transfer of structures of favorable zones to commercial prospecting, consideration should be given to the dimensions, amplitude, probable thickness of the productive unit, time of formation of the folds, hydrogeologic conditions and other factors. The importance of these factors has been emphasized repeatedly.

During the second stage in preparation for prospecting drilling, special work should be carried out for finding different types of pools—lithologic, stratigraphic, etc.

Exploration for large accumulations of oil and gas is a complex problem, and its solution must also take into account the environment of formation of oil and gas fields within the known main tectonic elements.

All recommendations for exploration of large oil and gas accumulations at present consist basically of selection of traps located on the flanks of domes and borders of depressions. Nevertheless, under these structural conditions together with very productive, average, and small fields there are areas that are non-productive along the entire section of the sedimentary complex.

The absence of oil and gas pools in some areas (with otherwise favorable conditions) is explained by S. F. Fedorov, S. P. Maksimov, K. A. Mashkovich and others by the specific environment of formation of the field, the time of migration and formation...