Effectiveness of Geological Exploration During the Seven Year Plan (1959-63) in Northeast Stavropol

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As a result of geological exploration during 1959-65 in the northeastern part of the Stavropol area, six oil fields were discovered: Kolodez, Pravoberezh, Maksimokum, Vostochnoye, Russkiy Khutor, Yuzhny, Povarkov, and Plavnin. The unique Russkiy Khutor Severnyy gas-condensate field was also discovered. As a result of the final outlining of the Velichayevsko field, two large lithologic pools were discovered in the Lower Cretaceous in its northeastern part.

All these discoveries, except for the Maksimokum, are multistrata and have medium to large reserves. They are very important for the development of the oil industry of Stavropol and the North Caucasus.

In 1966 a strong flow of gas with condensate was recovered from stratum II of the Lower Cretaceous in the Mirnen area. Pressure at the puffer was 180-190 atm, and the yield of gas through a 15 mm choke was about 300,000 m$^3$ per day.

The strong flow recovered in the Mirnen area from stratum II of the Lower Cretaceous and the close proximity of the large favorable Kucherly structure and other structures indicate that the explorationists of the Stavropol burneft have discovered a large new gas bearing Arzgiro-Mirnen region, which had been regarded as unfavorable by many up until recently. Predictions indicate considerable reserves here, similar to those of the Severo-Stavropol field.

During the seven year period 22 areas were under exploration. See Fig. 1. Deep drilling was carried out on 16 structures that had been outlined by seismic reflection surveys and on 6 areas that has been prepared by other methods.

The main objective in all the areas was clarification of the oil-gas productivity of the Cretaceous and Jurassic sediments. The depths of the prospecting wells were from 3150 to 3700-3800 m; individual wells reached 4000 m. The volume and results of the exploration operations during the seven years 1959-65 by the Stavropol `burneft are given in Table 1.

If these data are compared with those of the previous seven years, the volume of prospecting drilling has increased two fold, and reserves have increased three fold.

The high effectiveness during the last seven years can be attributed to the following causes. First, at the beginning of the period there was a large backlog of outlined structures. This made it possible to select the most favorable structures. Second, penetrative analysis of the accumulating material allowed individual areas to be drilled successfully without seismic surveys being made (Vostochnoye, Pravoberezh. Povarkov).

Third, detailed testing of all possible productive horizons in the initial wildcat wells also yielded positive results. Effectiveness of geological exploration was further increased by using formation testers during drilling. During the seven years about 300 such tests were made, resulting in discovery of four fields: Vostochnoye, Povarkov, Russkiy Khutor Severnyy, and Mirnen with nine oil and gas pools). Four oil pools were discovered in earlier known fields. Such testing effected economies of 1260 tons of steel casing and 680 tons of cement during the seven year period.

It should also be noted that during the last three years the organization of the drilling operations has improved considerably. Drilling techniques have improved, increasing the rate of drilling exploration wells.

Along with the good there is also the bad. The most glaring shortcoming is in core recovery. On the average, core recovery did not exceed 40% and was about 25% for the productive strata.

Another shortcoming is the absence of reliable procedures for interpreting geophysical logging data. These methods failed to detect the highly productive stratum IX in the Ozek-Suat area, stratum VIII1 in the Kolodez area, Jurassic stratum II in the Yuzbnyy Russkiy Khutor field; stratum II of the Lower Cretaceous of the Mirnen field showed up as water-bearing. Positive results were gained from testing, independently from the geophysical data.

The discovery of the favorable Mirnen region has raised the effectiveness of exploration operations here considerably. Further development here requires:

a. an increase in the depth of reliability of geophysical methods;