Study of Sub-Salt Sediments in the Bayram-Ali Gas Region

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The gas fields of Southeast Turkmenia are associated with sandstones of the Hauteriv stage and are concentrated in the Mary-Bayram-Ali region. These fields were discovered in areas that had been studied by seismic reflection surveys in 1958-65. The structure maps for the Paleogene and Cretaceous (supra-salt) sediments were in good agreement with the drilling data. The seismic evidence also suggested a direct correspondence between the supra-salt and sub-salt structural plans and the absence of any marked vertical shift in fold axes. Drilling targeted on the Callovian-Oxfordian sediments in the Bayram-Ali area was planned on a basis of this assumption. However, no productive horizons were found in the sub-salt sediments.

A different method was needed to trace the reflected waves from the sub-salt interfaces. Borehole seismic observations combined with common depth point measurements at the surface were used. This program was successful.

The upper boundaries within the sandy-carbonate (supra-salt) sediments and at the top of the salt showed up with the same configuration as had been found earlier by the reflection method. The new data, however, showed that in the sub-salt the fold is much flatter or absent altogether. See Figs. 1 and 2.

There is a definite reduction in thickness of the salt-bearing sediments to the east and west. The area of greatest thickness of salt-bearing sediments corresponds with the flexure on the top of the salt. This part of the section has a complex structure, which is reflected in the wave picture (worsening of correlation, attenuation of waves, variation in the period of their oscillation, etc). Fig. 2 shows that introduction of a velocity gradient changes the configuration of the sub-salt interfaces, particularly in the crest area.

These results show that the deep wells in the Bayram-Ali area were not placed in the best locations; this explains why no gas showings were found.