Delineation of Prospective Oil-Gas Targets on Monoclines of the Timan-Pechora Province

V. P. Sheptunov, N. A. Glotova

With the present price of oil and gas it is not profitable to produce a field in the Timan-Pechora province that is less than 10 sq km in area, unless it is near other production. The average area of newly delineated structures is steadily approaching this limit. See figure 1.

The answer to this problem is to re-orient exploration to non-anticlinal targets, which are only beginning to be considered. At the present time about 30 such targets are ready for deep drilling. This does not include reef traps. It is estimated that about 750 non-anticlinal traps with areas greater than 10 sq km are possibly present in the Timan-Pechora province. Their total area is estimated at 28,000 sq km. (This is an average of 37 sq km per structure. 1)

A significant part of the production from non-anticlinal traps on monoclines is from structural noses and terraces that have resulted from opening up of anticlinal traps by regional tilting. This is explained by the crests of anticlines generally having had better reservoir properties than the flanks. Oil remains in the trap after the tilting, or it subsequently enters.

Drilling and common depth point seismic surveys have delineated solitary Upper Devonian reef buildups on monoclines. On the seismic records they show up as “seismic wedges” (figure 2) or as chaotic or weak signals (figure 3). Such distinctive associated features as overdraping do not show up as well on reefs on monoclines because only small amounts of regional tilting “washes out” the closure.

Figure 4 is a structure map on a reflecting horizon in the Visean Stage of the Lower Carboniferous and also a map of local components. The regional component was calculated as the average arithmetical from depths taken at 24 points equally located on a square 6 km on an edge. The local component was determined as the difference between the regional component and the depth observed at the center of the square.

On a background of monoclinal dip of 3 degrees to the east are clearly outlined sectors where anticlinal structures have lost closure. Some of these correspond with drape structure above the Upper Devonian reefs. The Kozlayu chain of reefs shows up quite clearly. The large Kozlayu buildup has an area of 60 sq km. An oil pool has been discovered in the overlying draping Bobrikov clastics.

To the west of the Kozlayu chain of reefs is a large reef body designated here the Stepanoleg reef. It has an area of more than 100 sq km. See figure 4.

Well 2 drilled on the Lebyazh structure penetrated a water zone, due apparently to the pool being displaced hydrodynamically off structure.

Common depth point surveying has delineated a zone of pinchout of Bobrikov clastics 25 km west of the Kozlyu sector on the west border of the Verkhne-Pechora depression. See figures 5 and 6. In the Din’yu sector this line of pinchout makes a bend toward the updip, creating here conditions favorable for a pinchout trap 30 sq km in area. See figure 6. The prospects of the Din'yu structure are enhanced by virtue of its coinciding with the crest of an anticline that has lost closure; greater porosity can be expected there.