

OIL AND GAS GEOLOGY

Oil and gas bearing capacity of Paleocene carbonate formations of the southern oil and gas bearing region

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According to the results of exploration work the industrial gas content of Palaeocene formation in the southern oil and gas bearing region is found within the western regions of plain Crimea and the northwest shelf of the Black Sea. Favorable conditions for non-anticlinal traps were also found associated primarily with cutting-in of collectors. 64.5 million toe in the off-shore and 21.5 million toe of hydrocarbons on land remain unexplored.

Industrial gas content of Palaeocene formation is proved at the Tarkhankout peninsula and adjacent areas of the Black Sea. Gas condensate and gas deposits on land opened mainly in 1960-63, at sea - in 1975 - '87. Gas bearing capacity of Palaeocene formations of the Bezymiannyi altitude opened only in 1996.

For today the territory of the North Crimea and adjacent areas of the Black Sea are covered by different types of geophysical surveyes of unequal degree of detail and accuracy. Paleocene carbonate formation was studied by seismic works through the wave reflection method (WRM), mostly in the first phase of oil and gas prospecting works (up to 1964). At this time also studied the general features of their structure, found and prepared for drilling local rising of shallow ground carbonate sediments of the Paleocene formation. Their structural plan clearly characterized by horizon reflection IIIa, dedicated to cover the carbonate strata of early Paleocene formation.

Within the water area Paleocene carbonate sediments that lie at depths of up to 3 km, mostly studied through seismic works WRM, and then more complicated modification of the method of wave reflection - a common depth point (WRM - CDP) in the first stage of geological and geophysical studies of marine areas to Ukraine early 70th centuries. Specifying the general features of the geological structure in comparison with the adjacent land of the North Crimea, where they were widely drilled. It showed local risings and prepare for exploratory drilling.

All within Crimea were conducted drilling operations on Paleocene horizons of 22 structures. In addition, these formations were studied in 69 areas where deep wells were drilled on Upper and Lower Cretaceous deposits. It was open seven gas and condensate fields. Success factor is 0,32.

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In the Northern Black Sea Paleocene carbonate rocks were studied using wells that are drilled on Lower Cretaceous deposits.

In the north-western shelf of the Black Sea prospecting works in Palaeocene rocks were performed at six structures. In addition, such formation was studied in seven sites where wells drilled on Lower Cretaceous deposits. Drilled out Palaeocene deposit is 2.90 m/km². Six gas and gas-condensate fields were opened, three of which are in size of shown reserves belong to medium (Golitsyno, Odessa and Stormove).

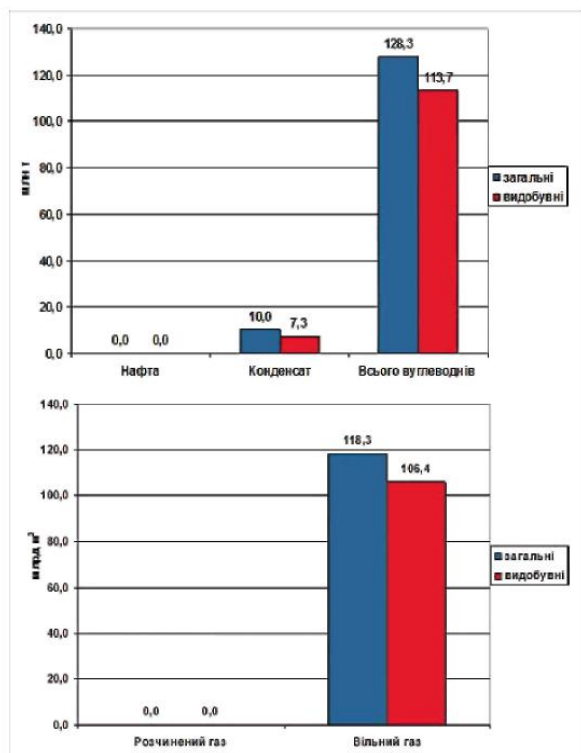


Fig. 1. The initial hydrocarbon life of Palaeocene complex in Karkinitzky-Pivnichnokryi deflection within the Ukrainian sector of the northwestern shelf of the Black Sea as of 01.01.2012.

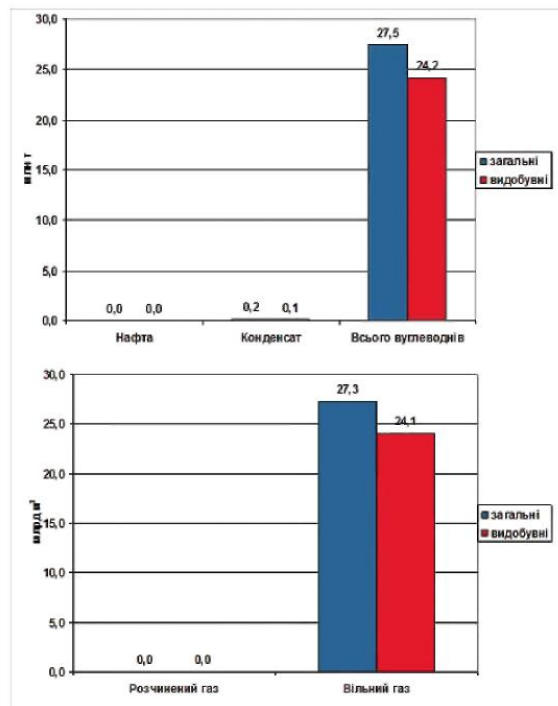


Fig. 3. The initial hydrocarbon life of Palaeocene complex in Karkinitzky-Pivnichnokryi deflection within the land as of 01.01.2012.

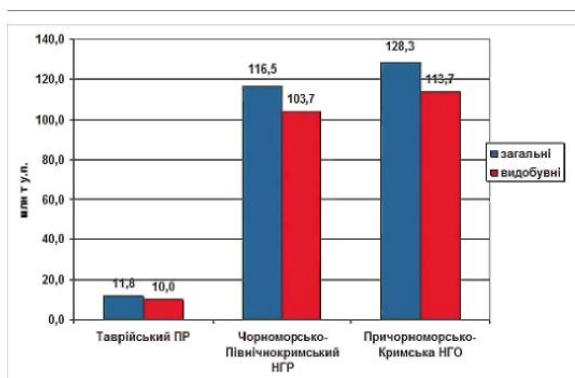


Fig. 2. The initial hydrocarbon life of Palaeocene complex in Karkinitzky-Pivnichnokryi deflection within the Ukrainian sector of the northwestern shelf of the Black Sea according to the elements of oil and gas geological zonation

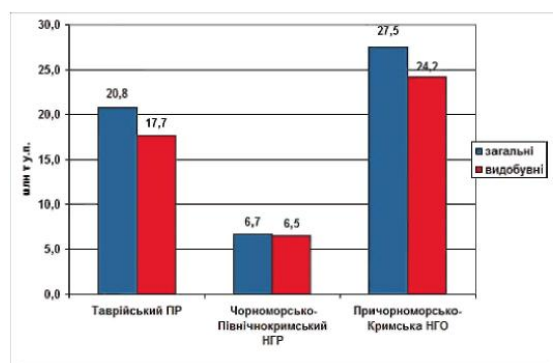


Fig. 4. The initial hydrocarbon life of Palaeocene complex within the land according to the elements of oil and gas geological zonation

In general, at the study area and water area success coefficient is 0,46.

Among the 13 fields area with productive Paleocene-term horizons is one produced, which is used for gas storage (Hlibivske), two - under development (Golitsyno and Stormove).

Krasnopolyansk gas condensate accumulations is prepared for development, and Olenevsk is in operation and maintenance phase. Odessa, Bezimenne, Chernomorske, Karlavske, Kirov, Zadornenske– are preserved. On two fields (Archangelske and Shmidtivske) an estimation of Paleocene gas bearing capacity is not actually completed.

Therefore it is defined the industrial gas content of Palaeocene formation within the northwest regions of plain Crimea and the northwest shelf of the Black Sea. It's also found favorable conditions of non-anticline trap associated primarily with reservoir pinchout (Zahidnopolitsynsk area) [1–3].

The share of researched reserves of natural gas and condensate Palaeocene deposits is 65.4% (or 47,480 tons) of the total initial resources of the Crimean Black Sea oil and gas bearing area. Paleocene reserve has 170 thousand tons of Odessa Eocene deposit.

In general, in size of shown reserves Paleocene formations are dominant among oil and gas complexes in southern Ukraine (more than 45% of their initial geological deposits in the region).

The initial hydrocarbon life of Palaeocene complex within the Ukrainian sector of the northwestern shelf of the Black Sea in Karkinitzky-Pivnichnokryi deflection as for 01.01.2012 are given in Table 1 and 2 and Fig. 1 and 2.

Table 1

The initial hydrocarbon life of Palaeocene complex within the Ukrainian sector of the northwestern shelf of the Black Sea in Karkinitzky-Pivnichnokryi deflection as for 01.01.2012

| Hydrocarbon rank | Resources | |
|--|-----------|-----------|
| | General | harvested |
| Total mil tones | 128,3 | 113,7 |
| oil mil tones | – | – |
| condensate, mil tones | 10,0 | 7,3 |
| non-associated gas, bil m ³ | 118,3 | 106,4 |
| dissolved gas, bil m ³ | – | – |

Table 2

The initial hydrocarbon life of Palaeocene complex of the northwestern shelf of the Black Sea according to the elements of oil and gas geological zonation

| Elements of oil-gas geological zonation | Resources, mil tones | |
|--|----------------------|-----------|
| | General | harvested |
| Crimean - Black Sea petroleum area | 128,3 | 113,7 |
| Tavriyska PR | 11,8 | 10,0 |
| Black Sea northern Crimea -oil and gas field | 116,5 | 103,7 |

Table. 3 and 4 and Fig. 3 and 4 represents condition of the initial hydrocarbon life of Palaeocene complex in Karkinitzky-Pivnichnokryi deflection within the land.

Table 3

Initial hydrocarbon life of Palaeocene complex in Karkinitzky-Pivnichnokryi deflection within the land as for 01.01.2012

| Hydrocarbon rank | Resources | |
|------------------|-----------|-----------|
| | General | harvested |
| Total mil tones | 27,5 | 24,2 |

| | | |
|--|------|------|
| oil mil tones | – | – |
| condensate, mil tones | 0,2 | 0,1 |
| non-associated gas, bil m ³ | 27,3 | 24,1 |
| dissolved gas, bil m ³ | – | – |

Table 4

Initial hydrocarbon life of Palaeocene complex within the land according to the elements of oil and gas geological zonation

| Elements of oil-gas geological zonation | Resources, mil.tones | |
|--|----------------------|-----------|
| | General | harvested |
| Crimean - Black Sea petroleum area | 27,5 | 24,2 |
| Tavriyska PR | 20,8 | 17,7 |
| Black Sea northern Crimea -oil and gas field | 6,7 | 6,5 |

Thus, the degree of development of initial resources in the waters is 49.7%, i.e. there are still 64.5 million tons of undiscovered resources, on land their degree of development reached up to 21.8%, there are 21.5 million tons of still undiscovered hydrocarbons.

Prospective areas on land is 21.45 km² on land - 1.04 km². The density of resources in the waters - 4.8 tons /km², on land - 2.2 tons/km². These data suggest the need to focus exploration of hydrocarbons Palaeocene complex primarily in the depths of the northwestern Black Sea shelf.

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