

OIL AND GAS GEOLOGY

Priority areas of development of resources of hydrocarbons of Hlynskyi and Solokhivskyi oil and gas region of Dnipro and Donetsk basin

УДК 553.98.04 (477.5)

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The resource potential of the Hlynsko-Solokhivskyi oil and gas region, selected area of oil and gas accumulation (OGA) was described. By means of graphical analysis the extent of the area resource potential development and selected areas of OGA was defined. The analysis of non-discovered resources (including localized) in areas, promising and producing complexes and deeps was made. The most promising areas were determined. The appropriate recommendations on further geology exploration for the purpose of improving the efficiency on oil and gas were given.

In terms of oil-and-gas Hlynskyi and Solokhivskyi oil and gas region (OGR) is one of the most promising on the territory of Dnipro and Donetsk basin today. Among 15 oil and gas and promising districts of the region within the terms of primary total resources (PTR) of hydrocarbons (1403 millions of tons of oil equivalent (OE) or 26 % of all primary hydrocarbon resources of Dnipro and Donetsk basin) Hlynskyi and Solokhivskyi oil and gas region ranks next to Mashivskyi and Shebelynskyi oil and gas region. However, taking into account the considerable realization of resources of hydrocarbons in Mashivskyi and Shebelynskyi oil and gas region Hlynskyi and Solokhivskyi oil and gas region (690,5 million tons of oil equivalent) ranks first within the terms of size of the unexplored part of resources. So within the terms of this factor its territory has the priority for exploration in the region.

According to the complex of geological criteria that include the tectonic one has the leading priority, within the territory of Hlynskyi and Solokhivskyi oil and gas region 4 areas of oil and gas accumulation (OGA) are emphasized: (figure. 1): Sribnenska, Vasylivska and Matviivska, Yablunivska and Abazivska, Chornukhinska and Sahaidatska. These zones have certain differences in geologic aspects, stratigraphical diapason of oil-and-gas content and conditions of formation of explosives traps, which influences first of all their resource potential.

According to the level of development of resource potential of oil and gas accumulation area of Hlynskyi and Solokhivskyi oil and gas region differs substantially. With the purpose of analysis of level of development of resource potential of the reserved areas of oil and gas accumulation and Hlynskyi and Solokhivskyi oil and gas region in general the method of graphic analysis of the structure of total in-situ resources (TIR) offered by V. P. Orlov in 1991 on the ground of analysis of big volumes of the materials on development of resource base of USSR was used*. On triangular diagram (figure 2) the stages of balanced PSR state are emphasized: the initial exploration, development, maturity, exhaustion and elimination. Deviation from the stages of balanced state are explained by delays or advances of certain stages of geological exploratory works.

Analysis of state of resource base of Hlynskyi and Solokhivskyi oil and gas region with the usage of the above-stated diagram evidences about this. In general Hlynskyi and Solokhivskyi oil and gas region is on the stage of delay of preparation of the objects to searching and exploration drilling. We see the similar characteristics also in connection with Vasylivska and Matviivska oil and gas accumulation area. For Sribnenska oil and gas accumulation area the considerable delay of preparation of the objects, advance of exploration stage and possibly the searching stage are characteristic. Yablunivska and Abazivska oil and gas accumulation area is on the border between exhaustion areas and delay of preparation of objects. In general Hlynskyi and Solokhivskyi oil and gas accumulation areas and the above-mentioned oil and gas accumulation areas (in particular it refers to Vasylivska and Matviivska and Sribnenska areas) are characterized with non-balanced PSR state. The only completely balanced in terms of PSR state there is Chornukhinska and Sahaidatska oil and gas accumulation area, but it is only at the stage of initial exploration.

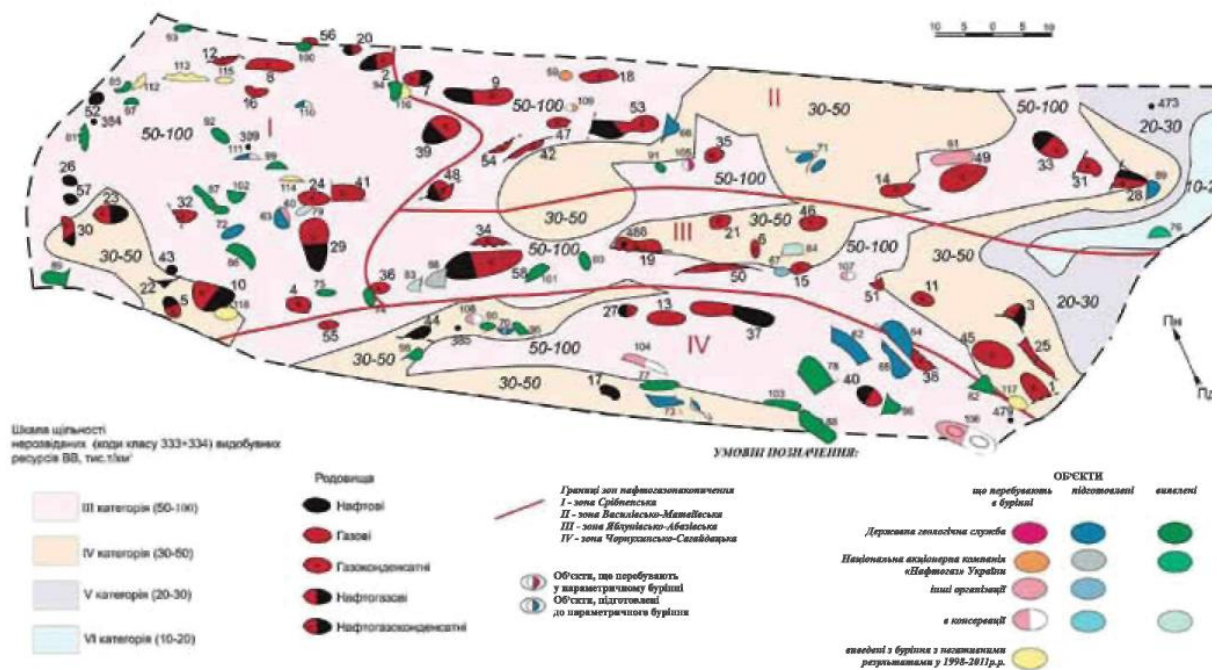


Figure 1. Map of prospects of oil and gas content of Hlynska and Solokhivska oil and gas accumulation region of Eastern region according to the consistence of unexplored resources (codes of 333+334 class) up to 7 km depth (mid-Carboniferous, Serpukhovskiy, up-Visean, low-Visean and Tournaisian and Devonian complexes) (according to the materials of T. M. Pryharina and others, 2012)

Due to the available PSR for Hlynska and Solokhivska oil and gas accumulation area the amount of reserves and resources of codes of 122+333 classes for balanced PSR state shall be about 42 % of PSR (now it is 21 %). Accordingly for Sribnenska area of oil and gas accumulation the amount of codes of 122+333 classes for balanced PSR state shall be about 42 % of PSR (now it is 18 %), for Vasylivska and Matviivska area of oil and gas accumulation it shall be about 38 % (now 23 %), Yablunivska and Abazivska – about 34 % (about 21 %). Concerning Chornukhinska and Sahaidatska oil and gas accumulation area, it is on the stage of initial exploration, which first of all requires intensification of exploration works.

In general subsoil assets of the district contain 690,5 millions tons of suspended materials resources of residual (unexplored) potential. The priority one is 5-7 km interval, which accumulated 392,8 millions tons of UP (57 % of residual resource potential), and according to the complexes – up-Visean with 315,7 millions tons of UP (46 %) resources.

Among oil accumulation areas the area of first priority development is Vasylivska and Matviivska area with unexplored resources (codes of 333+334 classes) – 220,3 millions tons of UP (about 32 % of unexplored resources of the region). The main promising complex is up-Visean one with 45 % of residual resources of VV area, the second rank belongs to low-Visean and Tournaisian, the third ranks belongs to Serpukhiv one. In general resource potential of mega-

complex of low Carbon is 92 %. About 81 % of unexplored resources are located at big depths (5–7 km). Only 11% are connected with little depths of 3–4 km.

Table: Distribution of prepared and revealed structures and resources of VV of Hlynskyi and Solokhivskiy oil and gas accumulation region (as of 01.01.2012).

Oil and gas accumulation areas	Prepared					Revealed		
	Amount	Code of 333 class		Code of 334 class		Amount	Code of 334 class	
		Oil, millions tons	Gas, billions m ³	Oil, millions tons	Gas, billions m ³		Oil, millions tons	Gas, billions m ³
Sribnenska	2	–	3,314	–	–	14	6,75	12,27
Vasylivska and Matviivska	3	–	7,073	–	–	3	–	6,574
Yablunivska and Abazivska	2	1,371	4,4	–	–	4	–	4,4
Chornukhynska and	5	–	9,528	0,653	1,107	9	0,32	7,081
In total	12	1,371	24,315	0,653	1,107	30	7,07	30,325

The second rank in the region according to the level of prospectivity belongs to Sribnenska oil and accumulation area, in which subsoil assets there are 31% of residual resource potential of VV region.

The main play is up-Visean one with 60% of residual resources of VV area, the second rank belongs to low-Visean and Tournaisian (22%), the third rank belongs to Serpukhiv one (10%). In total resource potential of megalithic complex of low Carbon is, like in previous area, 92 %. On the depths of 5-7 km 54% of unexplored resources of VV area are concentrated, but in comparison with the previous are the amount of unexplored resources is considerably higher also on less depths: on the depth of 4-5 km it is 28%; on the depth of 3-4 km it is 16%.

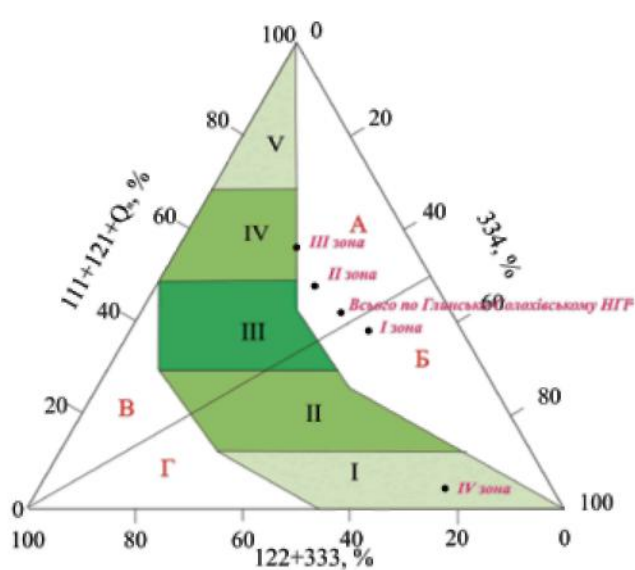
The third one according to the amount of the residual resource potential in the region is Chornukhynska and Sahaidatska oil and gas accumulation area with 20% of unexplored resources with 20% of unexplored resources of VV region. In this area, unlike two previous ones, the priority belongs to low-Visean and Tournaisian complex with 42% of unexplored resources of VV area, the second place belongs to up-Visean complex (34 third - to Devonian (14 the First place after the depths of mastering in this zone belongs to the interval 3-4 kilometres (53 second - to the depths to 3 kilometres (23 Thus, it is an only zone in a district with priorities of small depths.

The fourth place according to the degree of prospectivity belongs to Yablunivska and Abazivska oil and gas bearing zone with 17% of unexplored resources of district. According to this index it abates a little to Chornukhynska- Sahaidatska oil and gas bearing zone because of comparatively higher degree of development of underground resources. At the terms of distribution of unexplored resources of VV according to the productive complexes this zone practically does not differ from two first zones with 35 % of resources (basic part) concentrated in up-Visean complex and in total 78 % in megalithic complex of low Carbon. According to depths priorities are concentrated on deep horizons with interval of 5-7 kilometres (74% of resources) and only 16% of resources of VV concentrated on depths of 4-5 km.

For today Hlynska and Solokhivska oil bearing district has certain resource potential of prepared and educed local structures. Thus, as of 01.01.2012 within its borders 12 prepared structures are located with the total resources of oil of category C3(code of class 333) 1,371 million tons, categories of D1loc (code of class 334) 0,653 million tons, gas of category C3 (code of class 333) 24,315 milliards m³, categories of D1loc (code of class 334) 1,107 milliards m³ and 30 educed structures with resources of oil of category D1loc (code of class 334) 7,07 million tons, gas of category of D1loc (code of class 334) 30,325 milliards of m³(table).

Localized resources of separate structures (codes of classes 333 and 334) within the limits of Hlynska and Solokhivska oil and gas bearing district are distributed unevenly. In Sribnenska and Chornukhynska-Sahaidatska zones of oil accumulation there are accordingly about 34 and 29 % of localized resources of district. Within the limits of the first zone 16% of the revealed and prepared structures are concentrated, in the second zone – 14%. Resources of structures of

Vasylivska-Matviivska and Yablunivska-Abazivska oil and gas bearing zones are about 21 and 16% accordingly from the amount of total localized resources of the district.



Notation conventions

Stages of state of underground resources: I – initial research. II – development, III – maturity, IV – exhaustion, VI – withdrawal, A – delays of preparation of objects, B- considerable delays of preparation of objects, advance of stage of research and possibly of research stage, B – delay of stage of research and partial advance of stage of preparation of the objects, H – advance of the stage of preparation of objects and partial delay of the stage of research

Figure.2. Hlynska-Solokhivska oil-and-gas bearing district. Degrees of development of resource base (as of 1.01.2011)

Localized resources of hydrocarbons today constitute small part of the total amount of unexplored resources of Hlynska-Solokhivska oil and gas bearing district. In general the total resources of revealed and prepared structures are 64,841 million tons of UP, which is 9,4% of total unexplored resources of the district. In separate zones shares of oil accumulation part of localized resources in total unexplored resources of the respective zone are: Sribnenska - 10,4%, Vasylivska-Matviivska - 6,2%, Yablunivska-Abazivska - 8,5% and Chornukhynsko-Sahaidatska - 13,74%. Due to greater part of localized resources of VV comparing with other zones Chornukhynsko-Sahaidatska oil and gas bearing zone is characterized by relatively balanced state of underground resources.

Thus, within the borders of Hlynska-Solokhivska oil and bearing zone for today there is certain potential (prepared structures) for realization of the searching-reconnaissance boring drilling, however it is insufficient for the full development of resource potential of the district. Necessity of activation of realization of geological survey works, in particular seismic measurements, for preparation of new objects is one of near-term tasks to industry. It is needed to note that certain reserve of resources is concentrated in the fund of the educed structures of the district, that is why works need to be concentrated also at the additional search of the educed structures and their transition to the prepared ones.

The conducted analysis of the state of resource base of hydrocarbons of Hlynska-Solokhivska oil and gas bearing district gave an opportunity to make such conclusions.

Hlynska-Solokhivska oil and gas bearing district has considerable resource potential and is most perspective in Dnipro-Donetsk cavity.

According to the complex of geological criteria within the limits of district four zones of oil and gas accumulation are distinguished: Sribnenska, Vasylivska-Matviivska, Yablunivska-Abazivska and Chornukhynska-Sahaidatska.

The distinguished zones have certain differences in a geological structure, stratum range of oil and gas bearing, terms of forming of traps of VV, degree of development of resource

potential, amount of the prepared and educed structures and their resources.

Within the borders of Hlynska-Solokhivska oil and gas bearing zone it is necessary to intensify work in preparation of structures for conduction of the deep boring drilling, in particular transformation of the revealed structures into prepared ones.

It is necessary considerably to activate realization of geologic reconnaissance works within the borders of Chornukhynska-Sahaidatska zone of oil and gas accumulation.

The following ones are defined as the basic productive complexes: in Sribnenska, Vasylivska-Matviivska and Yablunivska-Abazivska zones – up-Visean, in Chornukhynska-Sahaidatska zone – low-Visean and Tournaisian.

Priority depths for the concentration of oil and gas search works are: in Vasylivska-Matviivska, Yablunivska-Abazivska and Sribnenska zones - 5-7 kilometres with 81, 74 and 54% of unexplored resources of VV respectively; in Chornukhynsko-Sahaidatska zone - 3-4 kilometres with 53% of unexplored resources of VV.

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News

Russia and Denmark signed an agreement on expansion of "Northern Stream" gas pipeline

President of Russian Federation V.V. Putin and prime-minister of Denmark Helle Torning-Shmidt during meeting in Copenhagen were present at signing of agreement about intentions in relation to expansion of gas pipeline the "Northern stream" to Netherlands and potentially to Great Britain. Heads of companies "Gazprom" and Gasunie O. Miller and P. Van Helder signed corresponding documents. This agreement is component part of the wide program of building of new export gas pipelines, that together with existent capacities considerably would exceed the prognosed export capacities of Russia to Europe or any prognoses of European demands in Russian gas. Russia will stop the use of Ukrainian gas-transport system eventually

The offered expansion of gas pipeline "Northern stream" would add the third and fourth lines to existing two, laid on the bottom of the Baltic sea from Russia to Germany; these two lines would attain Netherlands, a fourth line would serve for the supply of gas to Great Britain with the use of existent gas pipeline on the bottom of the North sea. The third and fourth lines are planned with an annual capacity of 27,5 milliards of m3 each, id est by power equal to existent two lines of the Northern stream. The total productivity of the system of gas pipelines would increase from 55 to 110 milliards of m3 per year.

"Gazprom" OJSC has ambitions plans concerning increase of supply of gas to Great Britain up to 40 milliards m3 per year with use of the fourth line of Northern stream. For realization of such plans Gazprom strives for long-term contracts, and not the spot market agreements.

Pipeline & Gas Journal / June 2013, p. 16