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REQUIREMENTS FOR WELL DESIGNS AT THE UMID FIELD

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Abstract. *The design of a well depends on the objectives, geological conditions, depth, drilling technique, field development method and other factors. In the process of drilling wells at the Umid field, complications are possible, such as the presence of a thick chemogenic strata of the Kimmeridgian Titon, which creates certain difficulties when drilling wells (coagulation of the drilling fluid, fluidity of salts, and in some cases, mineral deposits). This article discusses possible complications during the drilling process and requirements for well designs at the Umid field.*

Key words: *Field, massive, gas deposit, oil rim, gas cap, well, structure, brine-bearing zone, brine-safe zone.*

ТРЕБОВАНИЯ К ПРОЕКТАМ СКВАЖИН НА МЕСТОРОЖДЕНИИ УМИД

Аннотация. *Конструкция скважины зависит от целей, геологических условий, глубины, техники бурения, способа разработки месторождения и других факторов. В процессе бурения скважин на месторождении Умид возможны осложнения, такие как наличие мощной хемогенной толщи кимериджского титона, что создает определенные трудности при бурении скважин (коагуляция бурового раствора, текучесть солей и в некоторых случаи, месторождения полезных ископаемых). В данной статье рассматриваются возможные осложнения в процессе бурения и требования к конструкциям скважин на месторождении Умид.*

Ключевые слова: *Месторождение, массив, газовая залежь, нефтяная оторочка, газовая шапка, скважина, строение, рапоносная зона, рапобезопасная зона.*

Disturbances in the continuity of the technological process of construction (drilling for testing) of a well, subject to compliance with the technical design and rules of work, caused by phenomena of a mining and geological nature, such as absorption, oil and gas shows, emissions, landslides, jelly-like workings, bore curvatures, open flowing, as well as the consequences of natural disasters disasters are complications. Most of them are the result of a violation of technological discipline (technology), some are explained by insufficient knowledge of geological and physical conditions, especially in exploratory drilling, and a lack of understanding of the root causes of the phenomena that precede the complication.

During the process of drilling wells at the Umid field, the following complications are possible:

- screes and collapses of borehole walls in Paleogene deposits;
- absorption of washing liquid with loss of circulation in the Bukhara layers of the Paleocene;
- partial absorption of flushing fluid, screes and collapses of well walls, cavern formation, trenching in chalk deposits;
- the presence of a thick chemogenic strata of the Kimmeridgian Titon, which creates certain difficulties when drilling wells (coagulation of drilling fluid, fluidity of salts, in some cases, mineralization);

- absorption of washing liquid with loss of circulation in the callovian-oxfordian deposits of the Upper Jurassic;

- oil and gas water shows in the callovian-oxfordian productive horizons.

The design of wells must meet the following requirements:

- ensure mechanical stability of the wellbore walls and reliable separation of all (oil, gas, water) layers from each other, free access to the bottom of the wells for lowering equipment, and prevention of rock collapse in the wellbore;

- effective and reliable connection of the well bottom with the productive (oil or gas) formation;

- the possibility of sealing the wellhead and ensuring the direction of the extracted product into the system for collecting, preparing and transporting oil and gas or injecting an impact agent into the formation;

- the possibility of carrying out research work in wells, as well as various geological, technical and maintenance work.

Administratively, the Umid field is located within the Mirishkor district of the Kashkadarya region of the Republic of Uzbekistan. There are no populated areas on the territory of the deposit. The nearest settlements are: the city of Karaul-Bazar (65 km to the north), the city of Bukhara - the regional center (125 km to the east) and the city of Mubarek (55 km to the northeast). The BGO – Tashkent-Bishkek – Almaty gas pipeline runs 37 km to the north. The North Urtabulak oil field is located 10 km to the south.

The Umid deposit is located within the southeastern part of the Chardzhou tectonic stage. The main tectonic elements of the region under consideration are the Dengizkul and Ispanly-Chandyr uplifts. These two uplifts are separated by the eastern end of the Karakul (Kushab) trough. The Umid deposit is located in the junction zone of the Dengizkul uplift with the Kushab trough.

The Umid field is a massive gas reservoir with an underlying oil rim confined to the upper part of the reef massif. The total thickness of the oil rim is 10 m – 12 m, the gas cap – 110 m – 125 m. The initial positions of the GNK and VNK are, respectively, minus 2322 m and minus 2333 m

In the sulfate-halogen deposits of the Umid field there are brine-hazardous areas, the presence of brine-bearing deposits is confirmed by the results of drilling wells No. 7, No. 81. In protocol No. 6 dated July 17, 1996, it was stated that the boundaries of the zones of brine-hazardous areas were established on the basis of CDP seismic surveys.

One of the severe types of complications when drilling wells in oil and gas provinces in the presence of thick salt-bearing strata are brine manifestations, accompanied by the outflow of natural brines in a wide range of flow rates. As a rule, mineral accumulation zones have abnormally high reservoir pressures, reaching reservoir pressure gradients of up to 0.020 MPa/m or more.

Manifestations of highly mineralized waters from salt-bearing strata were encountered when drilling wells in the regions of the Dnieper-Donets Depression (DDV) in Ukraine and Central Asia. In Russia, this type of complication is widely represented in the Caspian basin (North Caucasus, Astrakhan, Volgograd, Saratov, Orenburg regions), as well as in a number of regions of Eastern Siberia. Abroad, this type of complication has been widely noted when drilling wells in the Mississippi Basin of the USA and a number of other regions.

Thermobaric conditions of mineralization zones are associated with the depths of their occurrence and temperature gradients in the regions.

In Central Asia, at depths of chemogenic deposits up to 3000 m, brine temperatures at the well exit reach 80 - 110°C with reservoir pressure gradients reaching 0.0235 MPa/m and flow rates from several tens to several thousand cubic meters per day, which additionally led to the precipitation of salts in the wellbores and significantly complicated the work to eliminate complications.

The appearance of brine is a very unpleasant phenomenon, which is one of the serious complications when drilling wells in oil and gas provinces in the presence of powerful salts. Rapa is a very saturated salt solution with a gel-like consistency. It is found not only in surface reservoirs, but also deep in the bowels of the earth, when layers of rock salt are in direct contact with layers of water-saturated rocks. Mineral manifestations greatly complicate the drilling process, since the drilling tool slips and goes off the trajectory.

A distinctive feature of the geological structure of the Umid field is the presence of poorly developed ore-bearing zones in the chemogenic sequence of the Kimmeridgian Tithonian of the Upper Jurassic. This circumstance dictates a differentiated approach to the choice of well design. The presence of brine zones predetermines the use of well designs that allow separate penetration of chalk deposits and chemogenic strata, while in wells without brine, drilling of salt-anhydrite strata is possible without prior covering of chalk deposits.

Tables 1 – 2 show well designs for both drilling zones with a design depth of 2650 m.

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Table 1 – Design of production wells for fire-safe areas

Column name	Column running interval, m	Diameter columns, mm	Diameter of the bit for drilling under the column, mm	Regulatory document on pipes	Threaded type connections	Strength group mm	HCV from mouth, mm	Purpose of casing columns and depth of running columns
Mine direction	0- 10	530	-	-	-	-	buto-concrete	Preventing erosion of the wellhead and creating circulation of drilling fluid
Conductor	0- 455	323,9	444,5	GOST 632 80	OTTM	D	0	Overlap of the Bukhara Paleogene layers, prone to absorption of washing liquid.
Intermediate column	0-2540	244,5	295,3	GOST 632-80 API 5CT	OTTM Buttress	D P-110	0	Overlap of permeable horizons of Cretaceous sediments and the Kimmeridgian -Tithonian salt-anhydrite sequence
Production column	0-2650	168,3	212,7	API 5CT	NEW-VAM	L-80	0	To exploit the productive horizon.

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Таблица 2 – Конструкция эксплуатационных скважин для рапоносных зон

Column name	Column running interval, m	Diameter columns, mm	Diameter of the bit for drilling under the column, mm	Regulatory document on pipes	Threaded type connections	Strength group mm	HCV from mouth, mm	Purpose of casing columns and depth of running columns
Mine direction	0-10	530	-	-	-	-	buto-concrete	Preventing erosion of the wellhead and creating circulation of drilling fluid
Conductor	0-455	323,9	444,5	GOST 632-80	OTTM	D	0	Overlap of the Bukhara Paleogene layers, prone to absorption of washing liquid.
Intermediate column	0-2180	244,5	295,3	GOST 632-80	OTTM	D	0	Covering permeable horizons of chalk deposits and the possibility of using heavy drilling fluid when drilling salt-anhydrite strata to eliminate possible mineralization and salt flow.
Shank	2080-2540	193,7	215,9	API 5CT	VAM-FJL	P-110	2080	Overlap of salt-bearing deposits of the Kimmeridgian-Tithonian, without overlapping of which it is impossible to excavate productive deposits
Production column	0-2030 2030-2650	168,3 139,7	165,1	API 5CT API 5CT	NEW-VAM VAM-FJL	L-80	0	To exploit the productive horizon