References

1. Eckel I.E., Deily F.H., Ledgerw ood L.W. Development and testing of jet pump pellet impact drill bits // Transaction AIME. – Dallas, 1956. – Vol. 207. – p.15.
2. Kovalev A.V. Teoreticheskie i eksperimental'niye issledovaniya tekhnologicheskih protsessov sharostruynogo bureniya skvazhin: synopsis of diss. submitted for the degree of cand. of Eng. Sci. / A. V. Kovalev ; Tomsk Politech. Univ.- Tomsk, 2015. - 22 p.: ill. – Bibliogr.: p.21-22.
3. Pat. 417599 USSR, E 21 B 7/18. Sharosruyniy snaryad dlya bureniya skvazhin / A. B. Uvakov, V.V. Shtrasser. – № 1451266 ; filed 15.06.1970 ; published: 28.02.1974, bul. №8.
4. Uvakov A.B. Sharosruynoyue bureniye / A. B. Uvakov. – M.: Nedra, 1969. – 207p.
5. Zaurbekov S. A. Povysheniye effectivnosti prizaboynykh gidrodinamicheskikh protsessov pri sharostruynom burenii skvazhin: synopsis of diss. submitted for the degree of cand. of Phys. and Math. Sci. / S. A. Zaurbekov ; Kazakh national tech. Univ.– Almaty, 1995. – 18p.

DRILLING PROGRAM DIRECTIONAL WELL 191 POTYMSKO-INGINSKI L.A

O.A. Dzhabiyev
Scientific advisors associate professor A.V. Ezhova, associate professor I.A. Matveenko
National Research Tomsk Polytechnic University, Tomsk, Russia

Krasnoleninskoye oil and gas field is located in the Russian Federation in the western part of the Khanty-Mansi Autonomous District of the Tyumen region. Production centers are located in Nyagan. Krasnoleninsk group of fields contains several fields: Stone, Talinskoye, Em-Egovskoe, North Stone, Palyanovskoye, Inginskoe, East Inginskoe, Pottymsko-Inginskoe, Elizarovskaya swan. Oil-bearing Krasnoleninskoye field is associated with deposits of Jurassic age. The initial group of stocks is estimated 1.2 billion tons, the largest being Talinskoye [1].

The primary objective of well 191 is to produce oil at commercial rates from UK2 reservoirs. Drilling is performed by the drilling company PNG. Support is provided by drilling company Baker Hughes. This project was developed by the well drilling company Baker Hughes employees. Basic data on the well are shown in Table 1.

Table 1

Well details

Well data	
Field	Krasnoleninskoe
Pad	19
Well number	191
Well purpose	Production well
Type	Horizontal well
SURVEYING DATA	
Coordination System	Pulkovo 1942
MSL, m	41.6
North reference	Grid North
Wellhead coordinates	12371783.77m E, 6829042.68m N
GEOLOGICAL DATA	
Directional borehole TD	MD, m 4505
	TVD, m 2381.0
	TVD SS, m 230
TARGET CHARACTERISTICS	
Target reservoir name	UK 2
Target size, m	T1 – 50 m

In the process of project development the lithology of the area was considered. Lithological characteristics of the area are different. There are the following types: at the beginning of the section – sand, loamy sands, clays, green clays with thin siltstone lenses, calcareous. The productive horizon is represented by Bazhenovskaya suite and consists of Brownish black argillites, black bituminous argillites with interbeds of siltstone. The section of Paleozoic age completes basement which consist of micaceous quartz shales, chlorite quarts shales, clay sericite shales, basalt, amphibolites. [2]

During the project development 191 drilling models was built. The following submission of construction of the well (Fig. 1), the plan (Fig. 2), and the cross-section (Fig. 3) are shown [3].

As previously mentioned, in the course of drilling, the following types of telesystem AutoTrak and OnTrak are used. Below some information about these kinds of telesystems is presented. AutoTrak is based on the success of the most technologically advanced Rotary Closed Loop System (RCLS), the AutoTrak G3 is the latest stage of MWD/LWD development in a rugged modular design. This third generation system opens new opportunities in all aspects of directional drilling, including both geosteering and extended reach applications. Changes in well trajectory or other downhole programming are efficiently communicated from surface without interruption to the drilling process [2].

Casing OD	BitOD	Well design	Casing set depth MD /TVD	Fluid system
Размер колонны	Диаметр ство ла	Конструкция скважины	Интервал спуска, ствол/вертик., м	Система бурового раствора
324	393,7		**Conductor** / Направление 0-50 м	**Spud Mud** 1,14 гр/см³
245	295,3		**Surface hole** Кондуктор / 0-954 м/930 м	**New- Drill**™ Partially-Hydrolyzed polyacrylamide polymer (PHPA) Ингибированный полимер глинистый 1,14 гр/см³
178	220,7		**Production casing** Эксплуатационная колонна/ 0-3050 м/2357.5 м	**Per- Flex**™ High performance water-based system 1,14-1,20 гр/см³
114	155		**Liner** Хвостовик 3050-4505м / 2380.7м	**Per- Flex**™ High performance water-based system 1,10-1,12 гр/см³

Fig. 1. The construction of wells 191

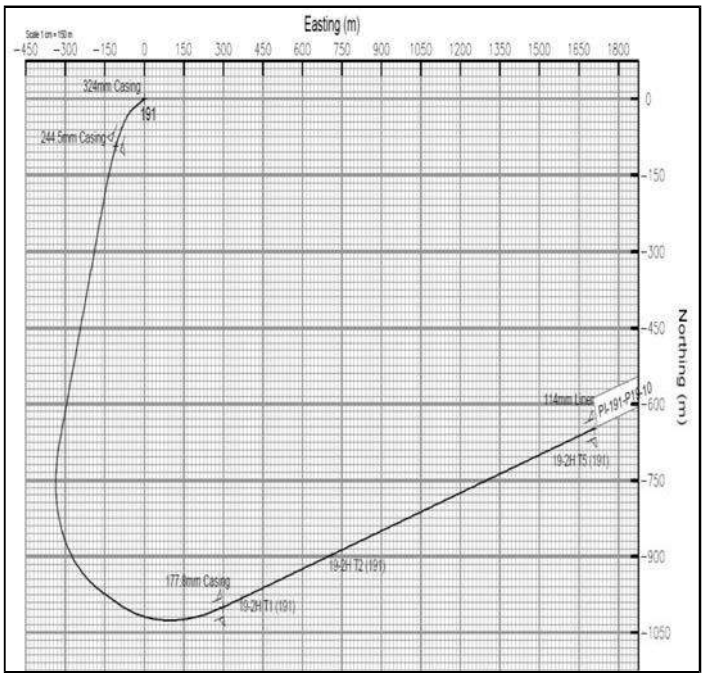

Fig. 2. Plan of wells 191

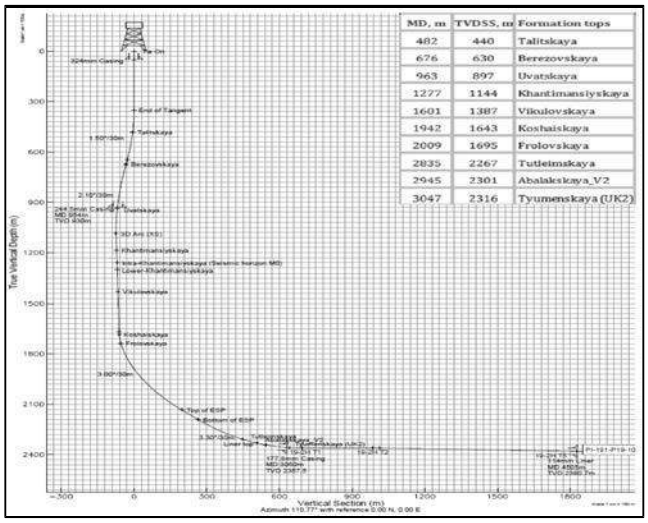

Fig. 3. Cross-section of wells 191

The drilling process consists of 4 stages, which are described below. Each of 4 sections has its own set of equipment and its drilling parameters [4].

a) Drilling (393.7 mm) x Casing (323.8 mm). Depth IN MD: 8.9 m, depth OUT MD 50 m. Drilling interval MD 50 m.

Drilling equipment	Baker Hughes drilling bit GTX-CG3	Drilling parameters
	SPRM 40-60 rev	SPRM 40-60 rev, Flow Rate 2400-3000 l/min, ROP 40 m/h

b) Drilling (295.3 mm) x Casing (244.5 mm). Depth IN MD: 50 m, depth OUT MD 954 m. Drilling interval MD 904 m.

Drilling equipment	Baker Hughes drilling bit DP605S, NaviTrak telesystem	Drilling parameters
		SPRM 1-7 rev , Flow Rate 3360-3600 l/min, WOB 1-7 tons

c) Drilling (220.7 mm) x Casing (177.8 mm). Depth IN MD: 954 m, depth OUT MD 3050 m. drilling interval MD 2096 m.

Drilling equipment	Baker Hughes drilling bit DP405S, AutoTrak, OnTrak telesystem	Drilling parameters
		PRM 100-120 rev, Flow Rate 2160-2400 l/min, WOB 8-10 tons, SPRM 1-7 rev

d) Drilling (155.6 mm) x Casing (114.3 mm). Depth IN MD: 3050 m, depth OUT MD 4505 m. Drilling interval MD 1455 m.

Drilling equipment	Baker Hughes drilling bit DP405S, AutoTrak, OnTrak telesystem	Drilling parameters
		SPRM 100-120 rev, Flow Rate 780-960 l/min, WOB 6.5 tons, SPRM 1-7 rev

Baker Hughes INTEQ's 6 3/4" OnTrakTM tool is a fully integrated master MWD/LWD platform providing real-time Directional, Azimuthal Gamma, MPR resistivity, Annular Pressure and Vibration measurements from a single sub. The OnTrak sub operates with the AdvantageSM surface system to achieve optimal directional control and formation evaluation, including reservoir navigation while drilling. Two gamma ray detectors (referenced to the toolface) provide an oriented image of the approaching bed boundaries. Monitoring of annular downhole pressures and stick-slip vibrations allow identifying quickly the hole cleaning problems, fluid influx in the wellbore, avoiding stuck pipe and reducing tool failures [2].

References

1. Basarygin Y.M., Bylatov A.I. Technology of drilling oil and gas wells. OOO Nedra, 2001. – 670p.
2. Baker Hughes Tech Data Sheets. Baker Hughes, 2014. – 365p.
3. Drilling ProgramPad 19 Well 191. Ruspetro/Baker Hughes, 2015. – 63 p.
4. Sereda N.G., Solov'ev E.M. Drilling oil and gas wells. Nedra, 1974. – 456p.

EFFECTIVENESS IMPROVEMENT OF FRINGE OIL ACCUMULATION DUE TO HYDRATED BARRIER IN OIL, GAS AND CONDENSATE FIELDS

G.M. Fakhhrutdinova, A.S. Evdokimova, I.A. Sincov
Scientific advisor associate professor I.A. Sincov
Tyumen State Oil and Gas University, Tyumen, Russia

The issue of oil segments reservoirs exploration in zones with gas cap is a challenging task, because there are possible high draw-down pressures in an operating oil well. In this case, depression zones occur close to production wells, therefore, gas cones evolve. Further on artificial lift becomes impossible, when gas-oil ration reaches 3000-5000 m^3/ton. To prevent gas breakthrough the barrier water flooding is applied while local screen are created between oil and gas segment of reservoir. To form these screens and barriers special injection wells are used or temporary pumping is implemented through production wells.

This research suggests a fundamentally new approach to field development, which can be applied in case of both oil and gas layers. For realizing this method of development the reservoir must have relevant characteristics and correspond to certain conditions. The correlation between pressure and temperature must lie in formation of hydrates zone for methane, because it is more spreading hydrocarbon gas. Oil path of deposit, which takes place in the interval located immediately below the gas cap, is drilled with applying horizontal wells. The method of mining and locations of wells are determined by reference to geological and physical features of reservoir and well fluid.

At the stage of drilling (Fig.), primarily the horizontal level section of well is drilled on boarder of gas-oil contact, which conforms to location and length of plan production well hole. The first well hole is uncased. Through this well the water is injected on frontier of gas-oil contact. Decline of injection capacity will be of evidence to beginning of hydrates formation in the reservoir. Pumping results in the formation of an elliptically contoured water screen in the reservoir. In the future it can interact with gas cap and, as a result, hydrates can be created. The established hydrates are impermeable not only for gas liquids, but also for oil. Then basic wellbore of production well is drilled directly under first well hole, but it can be located closer to bottom formation or water-oil contact.

After that production well begins to operate with bottom hole pressure, which matches to minimal pressure of hydrates formation zone at a fix temperature. As a result, hydrated screen will be preserved unless the necessity of pressure decline below decay pressure of hydrates disappears.