SOCAR Proceedings

Well drilling

journal home page: http://proceedings.socar.az

CHOOSING THE PROFILE OF AN INCLINED – DIRECTIONAL WELL IN THE CASPIAN SEA AREA OF TURKMENISTAN

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ABSTRACT

This paper aims to design a profile for a directional and production-appraisal well, specifically Well No. 707 in the West Cheleken field, situated in the Caspian Sea coastal water area. In the context of rapid changes in the energy sector, this study holds significance, offering economic benefits and contributing significantly to the energy security of the region and the global energy market. The main objective of this study is to optimise directional drilling for exploration wells in the Caspian Sea area of Turkmenistan, specifically focusing on improving efficiency and reducing environmental impact. To achieve this research objective, the author proposes designing a profile for a directional and production-appraisal well, utilising materials from geophysical surveys of previously drilled wells. This approach aims to avoid accidents and complications during the drilling process. Both the Close Approach software and safety regulations in the oil and gas production industry are employed to prevent collisions of wellbores. In conclusion, this research contributes innovative solutions to optimise directional drilling processes for exploration wells. It addresses potential complications in open wells and, importantly, mitigates the risk of wellbore collisions.

Keywords: wellbore collision; complication; stabilization; accident; Apsheron; Akchagil; curvature; displacement.

Introduction

The study of directional drilling for exploration wells in Turkmenistan is a crucial aspect of strategic planning in the energy sector. This study is vital given the ongoing changes in the energy industry and the imperative to guarantee the sustainability of energy supplies. The development of innovative technologies and the optimisation of drilling processes contribute not only to improving the efficiency of hydrocarbon production but also to reducing adverse environmental impacts. Understanding these processes provides not just economic benefits, but also plays a pivotal role in ensuring the energy security of the region and the global energy market within an ever-evolving energy paradigm. This integrated approach not only enhances the technical readiness of energy projects in the region but also upholds high standards of environmental sustainability, which is an essential element in contemporary energy management.

Turkmenistan's oil industry currently grapples with the challenge of actively developing hard-to-recover oil reserves, predominantly situated in low-permeable reservoirs. The necessity of addressing this issue arises from the depletion of reserves in long-operated oil field areas, accompanied by a significant decline in well productivity.

Drilling the lower tested zone of a directional well can be challenging, especially if the preceding sections were drilled without design profile calculations. The curves in the upper parts of the wellbore can increase torque on the rock-drilling tool, causing high resistance in the directional section's drilling. Correction of the wellbore profile may become impossible at certain torque values. Therefore, to avoid over-drilling the well, it is crucial to control the trajectory of the upper zone and adhere to the design profile data of directional wells. Deviations from the design profile could lead to well loss [1].

When designing the profiles of directional wells in producing fields, it is essential to assess the risk of intersections with previously drilled wellbores, a factor closely tied to drilling technology.

The directional well profile is influenced by the structural characteristics of the productive zone and fluid saturation. To create an accurate profile, it is essential to define the drilling rig's location, the starting point for zenith angle configuration, curvature radius, the number and zenith angle directed tangentially to the movement trajectory in sections, the length of the directional wellbore, and permissible deviations.

Given the context outlined above, this study undertakes an exploration into the drilling profile design for directional production and appraisal well No. 707 in the West Cheleken field. The aim is to evaluate the risk and prevent intersections with wellbores from previously drilled wells.

Previous studies in the domain of profile selection and trajectory control during the construction of directional wells in productive areas, with the goal of preventing intersections with previously drilled wells, indicate that the initial crucial step should centre on formulating a precise design profile for the borehole trajectory. This precision is vital to ensuring the

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http://dx.doi.org/10.5510/OGP20240100937

successful attainment of the designated depth [2].

The control trajectory of the wellbore with the design profile significantly influences nearly all processes and indicators. Therefore, they are deemed as crucial as the significant components in directional drilling.

The drilling of directional and horizontal wells is widely employed in foreign practices, successfully achieving a reduction in oil production costs and an increase in the extraction rate of hydrocarbons.

Over the years, global drilling experiences in various countries have highlighted key prerequisites for successful and cost-effective drilling:

- Highly qualified engineering personnel
- Accessible and reliable geological data needed for the design and drilling of a specific well
- Development, production, and application of special devices and equipment
- Utilisation of advanced software
- Application of specific drilling muds in certain cases
- Adoption of new technologies and devices for well completion.

The development of oil and gas areas necessitates a concentrated development spacing, achieved through the employment of cluster drilling, acknowledged as the most cost-effective method. In pad drilling, 90 percent of wells are directional with close surface spacing, leading to an elevated risk of wellbore intersections.

O. Schneising reported that the analysis of practical data from well drilling with a complex profile revealed significant deviations between the actual trajectory and the design profile in many cases. This variance presents challenges in advancing the drilling tool along the borehole, leading to discrepancies between the required set and zenith angle entry by interval zones and the design profile [3].

The primary requirement in directional drilling research is for the bottom of the drilling tool to enter the target area as indicated in the technical specification. Simultaneously, it is essential to construct a profile model that facilitates the creation of design performance indicators for the drilling technique [4, 5].

T. Vromen observed that the entry of the bottomhole drilling tool assembly into the target area is a crucial factor in calculating the length and intensity of the zenith angle set. This forms the basis for determining the permissible radius of curved intervals in the well profile trajectory [6].

O. Fayemi highlighted that drilling with a significant deviation from the vertical direction results in the existence of complex design profiles. These profiles comprise interval zones limited by the radius of curvature or inclined-straight-line intervals with considerable length, necessitating drilling with the use of advanced high-tech downhole and surface equipment. The application of such equipment plays a crucial role in enhancing the efficiency of directional well drilling [7].

As indicated by studies [8-10], to avert the most common complications and accidents during the construction of directional wells, it is essential to employ high-quality drilling fluids that align with the mining and geological conditions of well drilling. Given that the rheological properties of drilling fluids impact all drilling processes, they are deemed as crucial elements.

V. C. Kelessidis observed that insights gained from research on directional drilling can be applied not only in oil and gas but also in geothermal and geological exploration, significantly expanding the prospects of this technology across various industry sectors. Sharing this knowledge helps optimise the use of available expertise and resources in different fields [11]. T. Ma highlighted that collaboration between the scientific community and the industry in this field can expedite innovation and enhance practical aspects of directional drilling, fostering stable growth and development in the oil and gas sector. This synergy between science and industry becomes a key factor in improving the efficiency and sustainability of the oil and gas industry [12].

The aim of this analysis is to develop a design profile for directional wells in operational fields and evaluate the risk of wellbore intersections with those drilled previously, employing a thorough analysis and evaluation of relevant aspects.

Task setting and solution method

Drilling in open uncased hole annulus wells, with varying deviations in both new and late-phase oil and gas areas, involves the use of warping mechanisms and depth telesystems. The drilling direction is controlled through a dedicated software application.

The most cost-effective technology must be selected with available data on productive formations, which is determined by the target objective set by the producing company, the formation properties and the drilling conditions during the work implementation. Engineering process planning delivered with advanced technology is the most important factor for any project. In order to avoid undesirable consequences due to poor planning, it is necessary to use specialists' knowledge in the engineering processes.

The precise selection of the well profile plays a pivotal role in directional drilling. It is essential to choose a profile that facilitates the design of well depth efficiently, avoiding complications, and achieving quality suitable for long-term operation at minimal time and cost.

A thoughtfully selected profile minimises the need for deviator intervention, ensuring the required bottom-hole displacement and permissible curvature angle set. It also facilitates the unhindered movement of downhole elements in the drilling tool. The chosen profile should enable the operation of the well with downhole equipment and various pump types, while preventing the wear and breakage of casing pipes in the well [13, 14].

To choose the appropriate profile type, it is crucial to consider the drilling's objectives and tasks, the rock strength properties in the drilling field, changes in the borehole trajectory of deviated wellbores due to the drill string assemblies used during penetration, and the methods and technical-economic approaches employed during production (well operation). The selected well profile should not only fulfil its intended purpose but also impose minimal strain on the drilling rig's lifting mechanism during TLO (tripping and lifting operations) of the drill string (downhole equipment).

The directional well penetration process should be efficient in terms of time and cost. The directional well construction project should encompass the justification for selecting the profile configuration, calculation and construction of the profile, and determination of allowable deviations of the wellbore from the project. The directional well profile should ensure both speed and quality in drilling, featuring a minimal number of bends while remaining technically feasible and cost-effective [15, 16].

There are two types of profiles: conventional and spatial. Regular profiles are curved lines situated in a single vertical plane, while spatial profiles are three-dimensional curved lines.

Research analysis and results

Directional production and appraisal well No. 707 in the West Cheleken area was drilled with a designed vertical depth of 2620 meters (2764.37 meters downhole). The objective was to evaluate hydrocarbon reserves and enhance oil production by employing advanced technologies from foreign companies. Additionally, the project aimed to restart oil and gas production from the previously mothballed field [17, 18].

The construction plan for productive-appraisal well No. 707, with a depth of 2620 m (vertical) and 2764 m (drillhole) in the designated area, was devised based on the combined pressure graph in the drilled wells and borehole trajectory calculations. In the actual field setting, a Ø708 mm diameter directional shaft was extended to a depth of 7 m (vertical) and secured with butcrete. Following this, an extended 508 mm diameter directional shaft was inserted to a depth of 50 m to cover loosely cemented sandstones. A Ø = 339.7 mm diameter conductor was then lowered to a depth of 800 m, addressing the unstable formations of the Apsheron, Akchagil, and unstable water formations, as well as potential gas formations in the upper part of the red-colored horizon. The technical string, boasting a Ø = 244.5 mm diameter, was run to a depth of 2100 m vertically and 2119 m downhole, managing water and potential gas formations in the middle and lower horizons of the red-colored strata. Additionally, it served the purpose of controlling the blowout prevention equipment in the event of potential gas and oil-water spills. Lastly, the production string, with a Ø=139.7 mm diameter, was lowered to a depth of 2620 m vertically and 2764 m downhole.

The steps of the profile design procedure are outlined as follows:

1. Thoroughly analyse data from previously drilled wells to discern patterns of borehole curvature, changes in azimuth, and the impact of various factors on curvature angle and azimuth.
2. Utilize a structural map indicating the position of the wellhead and bottom hole of the projected well to determine initial data for profile calculation, including the vertical and horizontal projections of the borehole and azimuth deviation.
3. Choose the type of profile in accordance with the penetration conditions;
4. Set the length of vertical sections;
5. Choose the bottomhole assembly and determine the intensity of drift angle changing (or the other direction);
6. Determine radii based on the intensity of drift angle change, comparing them with the minimum permissible values; the rate of drift angle decrease is determined from practice data.
7. Establish the maximum borehole inclination angle and projections of all sections on horizontal and vertical planes. If the borehole's drift angle is specified, determine the drift radius and intensity.
8. Build the design profile of the wellbore on the basis of the calculated data [19-22].
9. Upon completing the profile calculation, sketch horizontal and vertical projections on millimeter paper using the following scales: for the horizontal projection, opt for 1:200, 1:400, or 1:500; for the vertical projection, choose between 1:1000 or 1:2000.

A five-interval profile (comprising vertical section, curvature parameter set section, drift set section, stabilization section) was chosen for the designed directional production and appraisal well No. 707 in the West Cheleken area.

The profile's design data for production and appraisal well No. 707 of the West Cheleken area are given in table 1.

Wellbore intersections exert a significant impact on well design and trajectory complexity, potentially leading to accidents and increased financial costs. Identifying the risk of wellbore intersection during the well construction design phase is crucial.

There are three main stages of risk reduction:

1. Risk analysis and assessment;
2. Risk management;
3. Demonstrating the results of the process with reduced risks.

During the well profile design process, the risk of a new directional wellbore colliding with previously drilled wells was analysed. Various well profile design methods were considered, including the minimum curvature method, tangent method, balanced tangent method, average angle method, and radius of curvature method.

Upon analysing all methods, Schlumberger's Close Approach software was utilised to obtain more accurate data regarding wellbore collision avoidance. This proximity analysis software calculates the minimum well spacing based on coordinates for a given adjacent factor, incorporating a separation factor parameter to evaluate the risk of convergence and the likelihood of wellbore intersections. Uncertainty ellipses are generated, their size correlated with the measurement error of zenith and azimuth angles. The software module necessitates the following data from previously drilled wells for a precise assessment and to avert the risk of wellbore intersections:

- Well pad distribution pattern
- Accurate data on bordering (adjacent) well coordinates and altitudes
- Used coordinate system
- Complete inclinometry information for all bordering wells, for a qualitative analysis of wellbore intersection risk
- Gyroscope measurements if selected
- Accurate geographical reference to the North, specifying the type of azimuth measured (magnetic, geographic, mapping);
- Location of all bordering wells.

Statistical analysis is the ratio of the center-to-center distance between wells and the sum of the radii (major semi-axes) of the uncertainty ellipsoids around the analyzed well and bordering wells to be scanned at any target point [23].

Schlumberger's Close Approach software indicators for determining wellbore collision avoidance are as follows:

- If OSF>5, and in addition to minimum separation (MAS)>80% of the allowable deviation from the ADP plan, drilling is permitted.
- If 5>OSF>1.5, and in addition to minimum separation (MAS)>80% of the permissible deviation from the ADP plan, drilling is permitted.

Table 1

Profile's design data for production and appraisal well No. 707 of the West Cheleken field

Note	Depth along the hole (m)	Zenith angle (deg)	Azimuth (deg)	Vertical depth, (m)	Shifting (m)	North/ South (m)	East/West (m)	Zenith angle set (deg/30m)	Azimuth of the angle set (°)
Wellhead - SHL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N/A	250M
Marker MudLine	9.00	0.00	250.00	9.00	0.00	0.00	0.00	0.00	250M
Intermediate column №1 -13 3.8″ Casing Shoe	800.00	0.00	250.00	800.00	0.00	0.00	0.00	0.00	250M
Starting point of the angle set - KOR	1650.00	0.00	250.00	1650.00	0.00	0.00	0.00	0	250M
	1680.00	1.80	250.00	1680.00	0.47	-0.16	-044	1.80	250M
	1710.00	3.60	250.00	1709.96	1.88	-0.64	-1.77	1.80	250M
	1740.00	5.40	250.00	1739.87	4.22	-1.45	-3.98	1.80	HS
	1770.00	7.20	250.00	1769.68	7.50	-2.58	-7.08	1.80	HS
	1800.00	9.00	250.00	1799.38	11.71	-4.02	-11.05	1.80	HS
	1830.00	10.80	250.00	1828.94	16.85	-5.79	-15.89	1.80	HS
	1860.00	12.60	250.00	1858.31	22.91	-7.87	-21.61	1.80	HS
	1890.00	14.40	250.00	1887.48	29.89	-10.26	-28.19	1.80	HS
	1920.00	16.20	250.00	1916.42	37.77	-12.97	-35.63	1.80	HS
	19500.0	18.00	250.00	1945.09	46.56	-15.99	-43.92	1.80	HS
	1980.00	19.80	250.00	1973.47	56.24	-19.31	-53.05	1.80	HS
	2010.00	21.80	250.00	2001.53	66.80	-22.94	-63.01	1.80	HS
	2040.00	23.40	250.00	2029.25	78.24	-26.86	-73.80	1.80	HS
	2070.00	25.20	250.00	2056.59	90.54	-31.08	-85.40	1.80	HS
Angle Stabilization - EOC	2100.00	27.00	250.00	2083.53	103.69	-35.60	-97.80	1.80	HS
Intermediate column №2 -9 5.8″ Casing Shoe	2118.49	27.00	250.00	2100.00	112.05	-38.47	-105.69	0.00	HS
Starting point of the angle set - KOR	2150.00	27.00	250.00	2128.08	126.30	-43.36	-119.13	0.00	28.73R
	2160.00	27.48	250.57	2136.97	130.86	-44.91	-123.44	1.65	28.22R
	2190.00	28.95	252.19	2163.40	145.01	-49.43	-136.89	1.65	26.79R
	2220.00	30.43	253.66	2189.47	159.86	-53.79	-151.09	1.65	25.52R
	2250.00	31.93	255.00	2215.13	175.39	-57.98	-166.05	1.65	24.36 R
	2280.00	33.44	256.24	2240.38	191.59	-62.00	-181.74	1.65	23.32R
	2310.00	34.96	257.38	2265.19	208.45	-65.84	-198.16	1.65	22.38R
	2340.00	36.50	258.44	2289.54	225.94	-69.51	-215.29	1.65	21.52R
	2370.00	38.04	259.42	2313.42	244.07	-72.99	-233.12	1.65	20.74R
Angle Stabilization - EOC	2388.64	39.00	260.00	2328.00	255.63	-75.07	-244.54	1.65	HS
Roof of the formation	2700.04	39.00	260.00	2570.00	450.86	-109.10	-437.53	0.00	HS
Total depth -TD	2764.37	39.00	260.00	2620.00	491.19	-116.13	-477.40	0.00	

- If OSF<1.0 or minimum separation (MAS)<80% of the permissible deviation from the ADP plan - intersection (Major risk zone), stop drilling or drill with special permission (exemption) [24].
- Additionally, in the event of a bordering well, it should be plugged, and measurements for the well being drilled should be taken with a more accurate tool or with special resolution (exemption).

Schlumberger's Close Approach conclusion for preventing collision of wellbore # 707 in the West Cheleken area with previously drilled wellbores is presented in table 1. Table 2 shows the folowing Close Approach data for wellbore intersection risk assessment:

- Distances of wellbores as a function of depth in meters (well binding based on the well spacing scheme).
- Measurement uncertainty, including wellhead, measurement point, ellipse of uncertainty, cone of uncertainty (borehole application cylinder).
- Permissible deviation, indicating possible offset of the borehole in meters.
- Oriented separation coefficients, detailing the distance between the centers of two wellbores and the sum of the long semi-axes of two wells. The center-

Table 2

Data from the Close Approach program for wellbore intersection risk assessment

Bordering wells	Separation		Permissible deviation (m)	Oriented separation coefficients	Depth (m)		Risk degree			Status
	Distance (m)	Uncertainty			Along borehole	Vertically	Notification	Low	High	
Cheleken well No. 217										Minor malfunction
	187.26	186.67	177.26	N/A	0.00	0.00				
	185.64	148.08	129.54	4.99	1983.00	1976.00	OSF<5.0			
	59.88	19.48	-0.48	1.49	2454.00	2378.79		OSF<1.50		
	50.92	7.26	-14.33	1.17	2505.00	2418.00				
	51.13	6.89	-14.99	1.16	2514.00	2425.42				
	51.32	6.92	-15.03	1.16	2517.00	2427.76				
	66.77	21.60	-0.75	1.48	2580.00	2476.72		OSF>1.50		
Cheleken well No. 524										Minor malfunction
	89.77	89.17	79.77	N/A	0.00	0.00				
	247.38	197.32	172.53	4.98	2310.00	2265.19	OSF<5.0			
	94.41	30.90	-0.57	1.49	2640.00	2523.34		OSF<1.50		
	86.19	17.12	-17.17	1.25	2703.00	2572.30				
	86.49	16.74	-17.90	1.24	2715.00	2581.63				
	86.67	16.77	-17.94	1.24	2718.00	2583.96				
	94.88	25.22	-9.36	1.36	2764.37	2620.00				
Cheleken well No. 429										Alarm
	108.27	107.67	98.27	N/A	0.00	0.00				
	264.58	211.23	184.79	5.00	2475.00	2395.11	OSF<5.0			
	223.36	153.25	118.44	3.20	2764.37	2620.00				

to-center distance is defined as the distance between the planned well and an adjacent well.

- Wellbore and vertical well depths.
- Risk level, divided into three intervals by the software. If the risk level OSF<1.50 is determined, it is necessary to cease drilling the bordering well. The well being drilled is then measured with a more accurate instrument.
- In 1991, the West Cheleken field experienced flooding due to Caspian Sea tides. As a result, all active wells were temporarily suspended and inactive for environmental purposes to prevent pollution of the sea area. To ensure precise wellbore trajectory determination during drilling, LWD logging equipment, a 214 mm Telescope 675 NF, and PD 900 rotary steerable system were utilised.

All calculations for shaft intersection risk (collision) consistently employ the northern reference point to determine the direction of the curvature angle (azimuthal angle) [25, 26].

Versadril, an oil-based drilling mud, was employed from a depth of 800 meters. Versadril drilling mud stands out as the optimal drilling fluid for deep wells facing complex mining and geological conditions, particularly in clay drilling where borehole stability is a primary consideration. Moreover, this flushing fluid demonstrates stable performance at elevated bottomhole temperatures up to 190 °C, exhibiting high resilience and flowability. The Versadril-type drilling fluid is characterised by an exceptionally low water loss rate [27-30].

The objective of directional drilling is to reach the predetermined target point of the production formation at the final bottom hole. Typically, this point is positioned at the top of the production formation, serving as the central point of the target area [31, 32]. Attaining this target area signifies the successful completion of the design task. Depending on diverse mining and geological conditions, well functionality, and vertical depth, the radius of the target area may range from 15 to 60 m.

The project encompasses the following objectives and tasks for the well: azimuth angle - 260°±10°; zenith angle - 39°; maximum deviation of zenith angle degree/10 m - 0.6°; vertical depth of the productive formation roof - 2570 m; displacement from the vertical at the entrance of the roof project oil pool - 450.86 ± 25 m.

The maximum deviation of the bottom hole from the vertical when reaching the well's design depth was 491.19 m at a magnetic azimuth of 260°, with the maximum curvature angle (zenith angle) reaching 39.0° at a depth of 2764 m.

The development of the productive formation yielded a flow with a maximum total flow rate of 30 tons/day.

Directional and production-appraisal well No. 707 in the West Cheleken area successfully achieved its goal, confirming the oil and gas-bearing capacity of this field without additional costs.

The wellbore profile of directional and production-appraisal well No. 707 in the West Cheleken area is depicted in the figure below.

The installation of directional wells on the seabed of the Caspian Sea encapsulates a theme where the vision for the future and the indication of the potential for hydrocarbon production are consistently focused. This technological algorithm plays a crucial role in achieving the objective of enhancing oil production for Turkmenistan, which is striving to augment recoverable reserves from beneath the earth's surface.

Turkmenistan possesses substantial hydrocarbon reserves in the Caspian Sea. The establishment of directional wells provides a distinctive advantage, ensuring optimal results with minimal time and resource expenditure. This method facilitates the extraction of oil and gas resources by drilling from the designated land area, resulting in heightened productivity, protection against marine pollution, and an enhancement of the country's energy stability.

To wire directional wells successfully, innovative modern technologies and engineering ideas are essential. Employing advanced profiling methods and geological/geophysical exploration techniques will enhance the accuracy of reaching the wellbore at the projected point of productive formations, thereby eliminating potential emergencies. Utilizing contemporary profiling programs in directional well construction not only mitigates the risk of emergencies but also minimizes the chances of a new wellbore intersecting with those of previously drilled wells.

Unlike other known methods to enhance hydrocarbon extraction efficiency from the subsurface, particularly in the late and final stages when actively developing undrained and poorly drained reserves, technologies relying on systems or individual wells with a directional wellbore end are employed. In the realm of drilling directional wells, the primary emphasis has been on developing technical tools and technologies for opening and developing productive formations.

One of the key tasks in developing complex deposits through directional wells is determining their direction and understanding the hydrodynamic effects during drilling. This process is contingent upon the geological structure of the deposit, necessitating a comprehensive study

In drilling, it is crucial to ensure stability, preserve the barrel part, and maintain the filtration properties of the bottomhole zone while accessing a productive reservoir. The resolution of these tasks is highly dependent on the geological and technological conditions of drilling.

When drilling to greater depths, the expense of incorporating specialized elements marginally increases. The reduction of these costs is achievable through the utilization of the most efficient technical means for directional drilling, as well as the enhancement of conditions for the construction of deep wells.

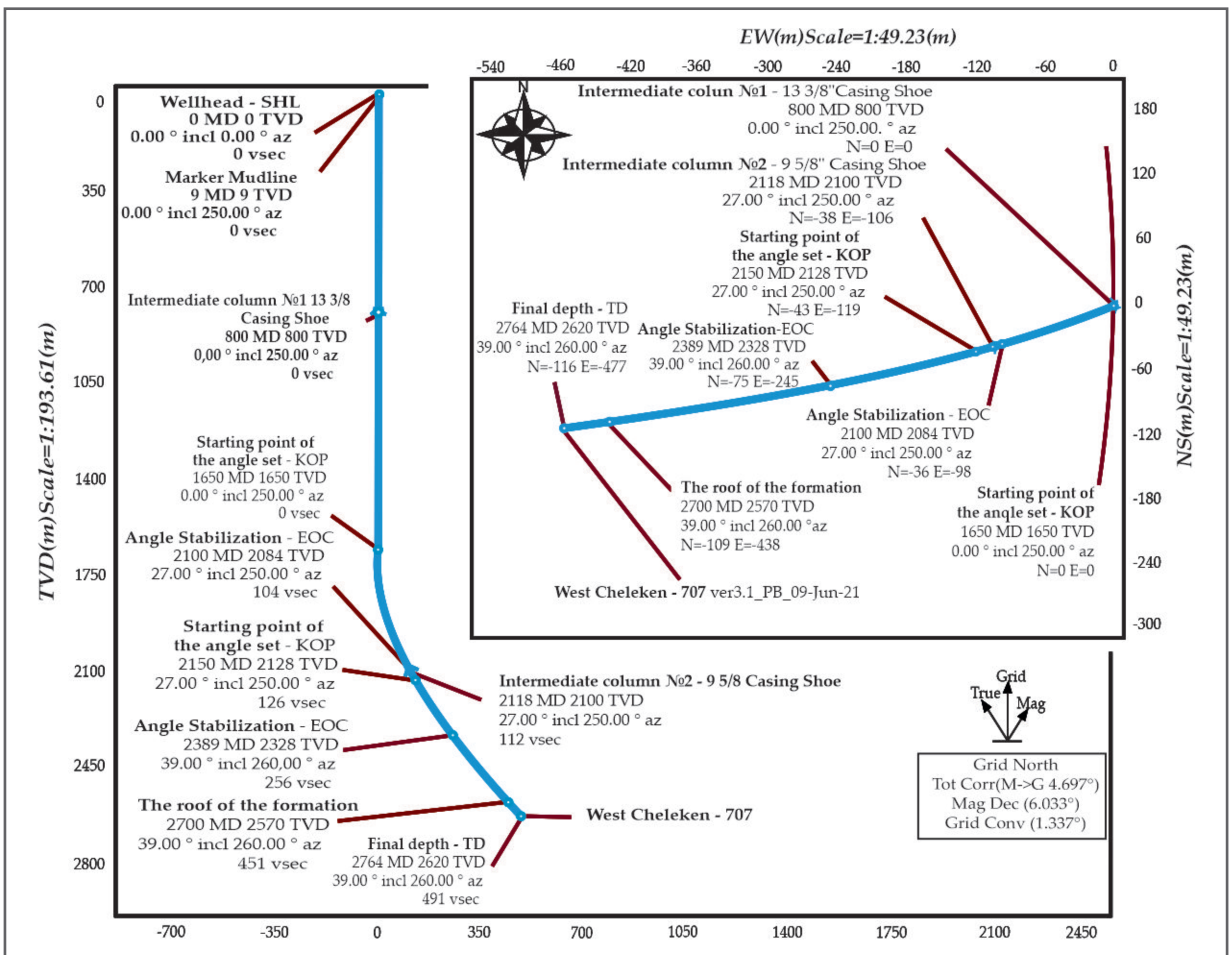

Fig. Borehole profile of the directional and production-appraisal wells No. 707 of the West Cheleken field

Conclusions

1. Quantitative estimates related to well profiles were acquired through the study of well profile design using various methods (minimum curvature method, tangential method, balanced tangential method, average angle method, and radius of curvature method) to evaluate the risk of preventing the intersection of the new wellbore with previously drilled ones. Given the complex drilling conditions, this study aided in selecting the most suitable drilling trajectory, ensuring a precise assessment and optimal choice. The risk assessment for avoiding the new wellbore's intersection with previously drilled ones was qualitatively and positively evaluated using the Close Approach software application.
2. Application of advanced downhole equipment for real-time trajectory control during drilling, considering both qualitative and quantitative criteria for profile trajectory evaluation, facilitated the identification of minimal deviations from the parameters of the design profile. This process helped determine acceptable drilling conditions, completely eliminating the risk of intersection of the new borehole with previously drilled wells, utilizing the Close Approach software.
3. The use of the Close Approach software, along with tools to control the geometric parameters of the wellbore and the deviation device position, in addition to telemetry systems, contributed to the successful completion of the directional and production-appraisal well. The well fully achieved its aim and task.
4. The risk of wellbore collision was averted in the newly compiled profile through accurate analysis of the wellbore trajectory concerning previously drilled wellbores using the Close Approach software.
5. The findings affirm the universality of directional well placement with a precisely defined profile when developing fields under long-term conservation in coastal zones of marine areas. This approach is not only technically and economically justified but also safeguards the marine environment from pollution. The study results demonstrate economically viable new methods that enhance oil and gas production, decrease capital expenditures, and mitigate negative environmental impacts. This research underscores not only the imperative to address innovative technical and technological challenges in the fuel and energy industry but also their crucial role in ensuring stable progress and the functioning and development of the country's fuel and energy complex and its regions.

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