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Brief Information About Drilling Wells on the Shelf of the Seas and Oceans

Olga Nikolaevna Shemelina, Vasily Pavlovich Ovchinnikov, Yulia Nikolaevna Pavelyeva, Sergey Sergeevich Shemelin

Department of Oil and Gas Well Drilling, Tyumen Industrial University, Tyumen, Russia

Email address:

onshemelina@mail.ru (O. N. Shemelina), burenieovp@rambler.ru (V. P. Ovchinnikov), pawjulia@mail.ru (Y. N. Pavelyeva), shemelinserge@yandex.ru (S. S. Shemelin)

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Abstract: The article presents brief information about drilling wells on the shelf of the seas and oceans. Wells for various purposes are distinguished in modern offshore drilling. The specificity of the construction of wells on the shelf of the seas and oceans (technical means, technologies) is considered, an attempt is made to generalize materials in this direction, in particular, the main trends and rational directions of development of equipment and technologies for drilling offshore wells for various purposes. The introduction provides brief information about the continental shelf, oil and gas wells on the shelf of the seas and oceans, the process of drilling wells and, in general, the importance of the development of world energy markets in the development of oil and gas resources. The materials and methods describe the main drilling rigs and methods of their operation. In modern offshore drilling, wells are distinguished by their geological targets. The results summarize the analysis of the main parameters in the drilling of oil and gas wells, where the process is influenced by natural, technical and technological factors. In conclusion, the results of the analytical work carried out are summarized. The conclusion is made about the economic feasibility of drilling offshore wells for oil and gas.

Keywords: Off-shore Drilling, Hydrocarbons, Offshore Platform, Field, Well

1. Introduction

Well drilling is a fairly capital-intensive process, which can be accompanied by the occurrence of dangerous complications, such as oil and gas seepages, losses, stuck, etc. Successful implementation of the goals and objectives depends on the timely and correct decision-making on their prevention and elimination. Sometimes it is necessary to liquidate a well, the cost of which amounts to hundreds of millions of rubles. And if we take into account the presence in the composition of formation fluids of various aggressive compounds, such as hydrogen sulfide, carbon dioxide, etc., the damage to the environment may be irreparable [1].

The foregoing necessitates close attention to the progress of drilling, as well as constant improvement of the process of training highly qualified, professionally trained personnel for drilling enterprises, continuous improvement of the qualifications of already existing employees, conducting master classes, symposia, meetings on specific problems, well drilling cycles. And in this, a significant role is assigned to educational and methodological complexes - textbooks, teaching aids, methodological instructions, etc. [2].

The development of world energy markets, a significant increase in demand and prices for energy carriers, new facets of international energy cooperation and the internal Russian problems of the development of the mineral resource base of hydrocarbons stimulate the intensive study and development of oil and gas resources of domestic water areas [3].

2. Materials and Methods

The study of the oil and gas content of water areas in Russia began in the 70s. last century. The first geological exploration works completed are characterized by rather significant results - resources have been estimated, including

the technically accessible part; a significant number of traps have been identified; 45 offshore and coastal (mostly) large oil and gas fields were discovered and the main areas for further hydrocarbon exploration were substantiated.

The explored and preliminary estimated oil and gas reserves of offshore and coastal-offshore fields in Russia amount to 10.5 billion tons [4].

Most of the fields and main hydrocarbon reserves are established on the North Sakhalin shelf, on the open shelf of the South Kara water area, in the bays and bays of the Pechora Sea and in the central parts of the Barents Sea shelf, in the Russian water area of the Caspian Sea. Here are concentrated almost 1 billion tons of recoverable oil reserves and about 7.5 trillion. m^3 of gas. The same areas, identified as the most favorable for further growth of hydrocarbon reserves, have the necessary fund of prepared structures and a significant share of effective resources. The work carried out has created the minimum necessary base for the initial stage of the development of the oil and gas potential of domestic water areas. The assessment of the hydrocarbon potential of the shelf suggests that by 2020-2030 the share of offshore oil and gas in the volume of hydrocarbons produced in Russia may be up to 15%. Naturally, this level will be achieved only under the condition of accelerated development of offshore hydrocarbon fields [5].

Offshore drilling or, more simply, offshore drilling (off-shore drilling; Meeresbohren, Offshorebohren; forage en mer, forage off-shore; perforacion maritime, sondeo maritime, perforacion de mar), in general, is a type of drilling operations performed in the waters of the World Ocean and inland seas for prospecting, exploration and development of oil, gas and other minerals, as well as engineering and geological surveys and scientific research [6].

In modern offshore drilling, wells are distinguished for the following purposes:

1. exploration and well operation of oil and gas fields;
2. study of the geological structure and mapping of underwater areas of the sea;
3. search and exploration of placer deposits of precious metals and stones, deposits of coal and nonmetallic materials (sand, gravel and pebbles, shell rock, etc.);
4. borehole overburden development of offshore buried deposits of solid minerals by geotechnical methods;
5. engineering and geological surveys for the design and construction of various structures at sea;
6. technical wells for burial of radioactive waste, for support piles during the construction of bridges, dams, drilling bases, etc. [7].

3. Results

The process of drilling offshore fields is influenced by natural, technical and technological factors (Figure 1).

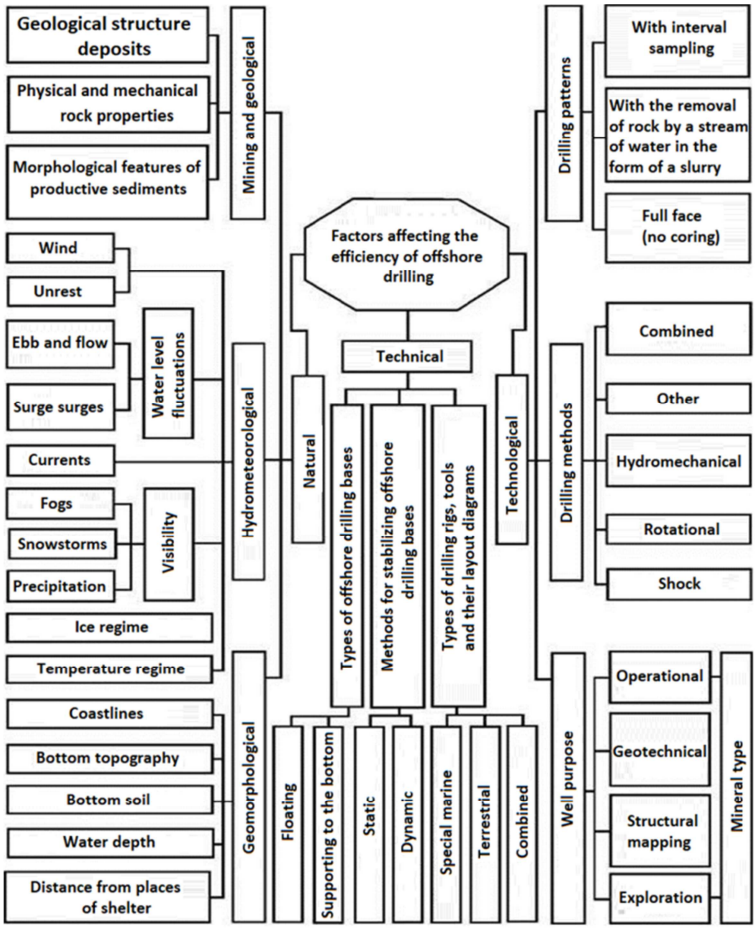

Figure 1. *Factors affecting the efficiency of well drilling on the shelf of the seas.*

The greatest influence is exerted by natural factors that determine the organization of work, the design of technical means, its cost, geological information content about the state of the section, etc. These include hydrometeorological, geomorphological and mining and geological conditions [8].

Hydrometeorological - are characterized by sea waves, its ice and temperature regimes, fluctuations in the water level (tides - ebbs, surges - surges) and the speed of water flow, visibility (fogs, low clouds, snowstorms, precipitation) [9].

For most of the seas washing the shores of Russia (Japanese, Okhotsk, Beringovo, White, Tatar Strait), the following average frequency of wave heights is characteristic,%: up to 1.25 m (3 points) - 57; 1.25 - 2.0 m (4 points) - 16; 2.0 - 3.0 m (5 points) - 12.7; 3.0 - 5.0 (6 points) - 10. The average frequency of wave heights up to 3.0 m in the Baltic, Caspian and Black Seas is 93%, 3.0 ÷ 5.0 m - 5% [10].

The coastal zone of the Arctic seas is covered with stationary fast ice for most of the year. Navigation here is possible only 2 - 2.5 months a year. In severe winters, drilling from ice and ice fast ice is possible in closed bays and bays of the Arctic seas. This is especially typical for the Kara, Laptev, East Siberian and Chukchi seas - here the average frequency of wave heights up to 3 m is 92%, 3 ÷ 5 m - 6.5% [11].

For drilling in water areas, negative air temperatures are dangerous, causing icing of the drilling base and equipment and requiring a lot of time and labor to bring the power equipment to readiness after sludge [12].

Reduced visibility, which is more often observed during the night and morning hours during the ice-free period, also limits the drilling time at sea. The impact of reduced visibility on offshore drilling can be mitigated by using state-of-the-art radar guidance and radio communications on the rig and onshore [13].

Drilling foundations are exposed in the sea to currents associated with wind, tidal and general water circulation. The speed of currents in some seas reaches high values (for example, in the Sea of Okhotsk up to 5 m/s). The impact of currents changes in time, in speed and direction, which requires constant monitoring of the position of the floating drilling rig and even the rearrangement of its anchors. Operation at currents exceeding 1 m/s is possible only with reinforced anchor devices and means of their delivery [14].

In the zone of high tides and low tides, the bottom of a large part of the coastal water area is exposed and the so-called zone of inaccessibility increases sharply, into which drilling ships cannot deliver rigs. The height of the tides, even in adjacent seas and their sections is different. In the northern part of the Sea of Okhotsk, the tides reach 9-11 m, forming many kilometers of strips of the exposed bottom at low tide, while in the Sea of Japan the tides are practically imperceptible [15].

4. Conclusion

Geomorphological conditions are determined by the outlines and structure of the banks, topography and bottom soil, the remoteness of wells from land and equipped ports, etc. The shelves of almost all seas are characterized by small slopes of the bottom. Isobaths with an elevation of 5 m are located at a distance of 300-1500 m from the coast, and those with an elevation of 200 m - 20-60 km. However, there are gutters, valleys, depressions, banks.

The bottom soil, even in small areas, is heterogeneous. Sand, clay, silt alternate with accumulations of shells, gravel, pebbles, boulders, and sometimes with rock outcrops in the form of reefs and individual stones.

At the first stage of development of offshore fields, the main object of geological study is areas in coastal areas with water depths of up to 50 m. This is explained by the lower cost of exploration and development of deposits at shallower depths and a fairly large shelf area with depths of up to 50 m. depth up to 100 m [6].

5. Recommendations

This article is devoted to the construction of offshore wells. Scientific work is recommended for students of oil and gas business in the direction of drilling oil and gas wells.

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