UDC 621.311

Mammadyarova Taravat, student 185m-21z-1 FNST
Supervisor: Pashchenko O.A., Associate Professor at the Oil-and-Gas Engineering and Drilling Department
(Dnipro University of Technology, Dnipro city, Ukraine)

OIL AND GAS INDUSTRY HYDROTECHNICAL STRUCTURES DESIGN

The gradual depletion of oil and gas reserves on land and the aggravation of the global energy crisis necessitated the ever wider development of the oil and gas resources of the seabed, which contains almost three times more oil and gas than on land.

Offshore oil and gas production projects will be actively developed in the coming years, given the clear global need for large volumes of fossil fuels, as evidenced by the ongoing energy crisis in Europe and shortages in the markets.

About 22% of the area of the world ocean (approximately 80.6 million square kilometers) is occupied by the water periphery of the continents, which consists of three zones: the shelf, the continental slope, and the foot. Of the total area of the bottom of the seas and oceans, about 75 million square kilometers (approximately 21%) are promising for oil and gas, including 19.3 million square kilometers on the shelf, 20.4 million square kilometers on the continental slope and within the continental foothills - 35 million square kilometers. The shelf area is the most accessible.

During the development of the main principles of the development of oil and gas deposits of the shelf, only the main hydrometeorological factors of the sea area are taken into account, allowing to choose the basic types of technical means and facilities for exploration and exploitation works. For this, it is enough to have data on the depth of the sea, the duration of the interglacial period, as well as the depth of drilling exploratory wells. The basic types of facilities for arranging and operating offshore oil and gas fields, including oil and gas industry hydrotechnical structures, depend on the depth of the sea and ice conditions. In addition, the presence of coastal infrastructures is taken into account for the manufacture of structural elements and the construction of appropriate structures.

A review of a number of literary sources [1-3] made it possible to develop a number of recommendations for the design of oil and gas industry hydraulic structures. In particular, the need to analyze the horizontal and vertical loads acting on the foundations of the platforms depending on the external conditions of the environment and the depth of their installation. With the selected overall dimensions of the upper part of the platform in plan and shear forces, the magnitudes of external and vertical loads on the base of the platform are determined, as well as the dependence of the permissible total loads when changing the number of supports and cemented piles at different depths and a predetermined safety margin. On the basis of the latter, nomograms are built that determine the limits of permissible loads on the basis of marine platforms during year-round or seasonal operation. Moreover, on the basis of nomograms that determine the limits of permissible loads on the basis of the marine platform, the choice of a trapezoidal or prismatic design of the base of the platform is carried out, as well as the need to use artificial gravity or the use of pontoon devices. After the analysis, the arrangement scheme of the technological complex is determined. At the same time, in order to effectively counteract external loads, each base of the platform is rigidly connected to the bottom plate. The base plate is attached to the solid ground with the help of cemented piles. An upper deck is installed on the supports of the base of the platform, where the mouthpiece equipment of the technological wells is located, and technological modules are installed on top.

The supports of the base are made in the form of modules, the rigid connection of which is carried out with the help of connecting elements.

To increase the reliability of the work of the marine platform, the base is made with artificial gravity, in which tension elements are used, which are placed between the upper deck and the bottom plate of the base, while the number of tension elements is determined by calculation based on the required tension force, which together with the weight of the base and the weight of the self-propelled of a specialized technological module provides resistance to previously permissible external loads - overturning moment and/or shear resistance.

To simplify the installation and dismantling of the marine platform, cemented piles are connected to the bottom plate, bottom plate to the base, tension elements to the bottom plate using appropriate bayonet connections.

To increase reliability, a hydraulic system for equalizing loads on tension elements is placed on the upper deck, which includes a system of hydraulic cylinders, the bodies of which are hydraulically interconnected by a closed pipeline and rigidly connected to the upper deck, and the plungers interact through a wedge connection with the corresponding tension an element

To ensure the necessary stability of the marine platform at increased depths, the base is made with pontoons that are additionally installed, the lifting force of which is determined according to the depth of the platform installation by calculation, taking into account the weight of the platform base and the water tonnage of the self-propelled technological module.

To increase the stability of the platform, the base of the marine platform is additionally supplied with a cable system, one end of each cable is attached to the upper part of the base, and the other - to the cemented peripheral pile.

In addition, the construction of each marine platform is carried out with the help of pontoon vehicles or with the use of lifting equipment installed on a special floating vehicle, in the form of a catamaran, by the top-down method at the place of installation of the foundation until the height of the foundation and the bottom plate is reached in advance at a predetermined level, after which it is produced installation of cemented piles and their rigid connection with the bottom plate of the platform base.

In this way, a number of recommendations were formulated that can be taken into account when designing oil and gas industry hydraulic structures.

References:

1. Majevsky B.Y. Prediction, search and exploration of hydrocarbon deposits / B.Y. Majevskyi, O.E. Lozinskyi, V.V., Gladun, P.M. Irpin - K.: Naukova dumka, 2004. – 446 p.

2. Boyko V.S. Development and exploitation of oil fields. - K.: Real-Print, 2004. – 695 p.

3. Suyarko V.G. Prediction, search and exploration of hydrocarbon deposits. Kharkiv: Folio. 2015. – 413 p.