

V.V. Minin, G.K. Krupnov, A.M. Grigoriev. New generation of floating drilling units for Russia. Pp. 8–24.

The paper sets out the necessity to create floating drilling units (FDU) for Russia caused, on the one hand, by the outlook for assumingly quite large scope of drilling activities, and on the other hand – by lack of modern FDU.

The results of analyzing the foreign experience in FDU creation are presented and on its basis, with respect to the Russian shelf specific conditions, the requirements to basic characteristics of new generation FDU are formulated.

The results of design studies for jack-up FDU intended for operation at 100 m water depth with drilling wells of 9000 m borehole length, and semi-submersible unit with combined (mooring and dynamic) positioning system at 3000 m water depth with 9000 m borehole length are presented.

The results of design study for converting the nuclear lighter-*aboard* ship «Sevmorput» into drilling vessel for operation in the Arctic are also presented. The basic advantages of such vessel are as follows:

- Capability of independent all-the-year-round navigation in the Arctic.
- Practically unlimited endurance in terms of fuel stores.
- Relatively small expenses of cash resources for conversion.
- Short term of conversion.
- Availability of prepared ship personnel.

The conclusion is drawn that the design studies performed with regard to experience in creation of foreign FDU and particularities of the Russian shelf have made it possible to determine the basic characteristics for jack-up and semi-submersible FDU of new generation for operation in the marginal seas of the Russian Federations, the most promising for development, i.e. the Barents Sea and the Sea of Okhotsk, and also for the converted drilling vessel to be operated in the Kara Sea and other seas of the Russian Arctic.

V.V. Minin, G.K. Krupnov, A.M. Grigoriev. Methodology of evaluating the basic characteristics of pileless offshore ice-resistant oil and gas production platforms. Pp. 25–40.

The paper sets out the necessity to develop the methodology of evaluating the basic characteristics of pileless offshore ice-resistant oil and gas production platforms caused by variety of environment, first of all, by ice and water depths, and also by relation of reservoirs, produced product characteristics, production volumes and other parameters, as well as by multi-variant approach to studies required at early design stages.

The scope of use and the algorithm of carried out calculations using the technique, the list of input data required for calculation are presented.

The advantages of the technique are underlined, which is a complex one, taking into account the quality of the platform as a floating and hydraulic engineering structure, and also provides for obtaining the initial data for solving one of the major problems of tanker transport system – what should be rational cargo capacity of the tanker with regard to its influence on oil storage volume, and, accordingly, on the platform cost.

The basic areas for improving the technique are presented.

S.V. Verbitsky, L.N. Podgorny, N.G. Popov. Offshore structures steel and reinforced concrete substructure design philosophy. Pp. 41–46.

The offshore structures steel and reinforced concrete substructure design philosophy is presented. On the basis of existing experience the substructure conceptual design algorithm is suggested, allowing the principal problems of structural design to be solved and weights estimation based on specific indices to be carried out. The correctness and effectiveness of the algorithm is confirmed.

S.V. Verbitsky. The analysis of normative documentation providing for structural design of offshore ice-resistant structures. Pp. 47–63.

The national and foreign normative documentation providing for structural design of offshore ice-resistant facilities is considered. The comparative analysis of requirements with regard to the general principles of design is carried out. The principal differences and uniformity in the normative base are revealed. The conclusion on expediency of regulating and harmonizing the Russian normative documents is substantiated.

S.V. Verbitsky, O.V. Shinkarenko. Comparison of RMRS rules and DNV standards requirements to determination of local hydrodynamic loads on floating structures. Pp. 64–69.

The comparison of the RMRS Rules and DNV standards requirements to determination of local hydrodynamic loads on floating structures is performed. The pressure fluctuations with reference to semisubmersible drilling units, loading buoy are considered and their analysis is carried out. The conclusions are made on possible ranges of the formulas application. Correctness of approach realized in the RMRS Rules with the reference to local wave-induced loads determination is confirmed.

V.A. Belyashov, V.V. Minin, E.U. Mironov. **Ice technical problems of technical means creation for development of the Northern Caspian Sea.** Pp. 70–83.

Nowadays the intensive works on development of the Caspian Sea shelf are carried out. Most intensively they are developed in Kazakhstan and Azerbaijan. Researches on preparation of practical works on hydrocarbons production in the Russian water areas of the Middle and Northern Caspian Sea are conducted in Russia as well.

Creation of shelf development means of the specified region becomes urgent. However the use for this purpose the standard technical decisions approved in other water areas, not always is possible because of the region environment specificity, first of all, shallow water and ice conditions. The mentioned questions play a decisive role at selection of conceptual decisions at design of shelf development means.

The description of environment features of the Northern Caspian Sea and their influence on operation methods for field development and the arrangement circuits are given in the report. The brief description of perspective variants of the Northern Caspian Sea development means is given, including ice-resistance platforms and special vessels, first of all icebreaking type.

With reference to these elements of shelf development means the basic problem issues determining a selection of their shape and basic design decisions are considered.

V.V. Minin, G.G. Filipchenko, G.K. Krupnov, A.M. Grigoriev. **The concept of floating drilling unit with air cushion facility – comprehensive approach to solving the problem of prospect drilling in super shallow waters.** Pp. 84–91.

The paper sets out the necessity to create and the concept of the floating drilling unit with air cushion facility,

It is pointed out that in addition to floating drilling unit the prospect drilling in super shallow waters will require a complex of air cushion vessels for supply operations.

The means to be used in «dry» method of rescue are analyzed.

The basic trends in developing technical equipment for rescuing submariners are considered.

V.V. Minin, Yu.I. Obidin, A.M. Grigoriev, G.K. Krupnov. **The results of researches and development of the project of submerged floating drilling unit «Obskaya» scouring protection at current and waves impact.** Pp. 92–104.

The article describes the researches carried out in the Institute that are directed on creation of scouring protection methods for submerged floating drilling unit «Obskaya».

Substantiations have been given for need of a Safeguard construction based on the SFDU features and environment of the region where drilling works are carried out.

Some variants of a Safeguard have been analyzed, including final variant that shown maximum efficiency which has been accepted by the customer and realized.

For optimization of further marine operations the concept of «Obskiy-1» objects integration in the whole structure due to usage of common mat has been proposed.

D.M. Jakovlev. **The state-of-the-art review of information on design of riser technologies for oil and gas production.** Pp. 105–113.

This article contains the analytical review of riser technologies. It considers the basic types of risers, which were applied in recent years and attention is paid to some characteristics of risers.

Also here is considered the mooring system of risers to production unit (by the example FPDSO) by means of turret, the equipment of mooring system briefly is re-viewed.

At the end of the article the recommendations on installation of riser systems on oil & gas fields are presented.

A.V. Kobzar. **Support of marine operations planning by calculations.** Pp. 114–124.

The need of calculations for support of marine operations realization is presented in the article.

The information concerning main kinds of marine operations, such as transportation (tow afloat, tow with loading on non-self-propelled barges and docks, transportation on special-purpose self-propelled vessels), installation (bottom mounting, mooring), offshore pipelines laying, is given.

The analysis of domestic and foreign normative base used at marine operations planning is given.

The information concerning basic calculations fulfilled at development of the project documentation on tow and installation is given.

The conclusion is done, that the most part of calculations connected with designing and marine operations realization, has the reliable software allowing quickly and effectively to solve the main tasks. First of all it concerns to the most complex and labour-consuming tasks such as calculation of stability, floodability, motions and strength.

Yu.D. Dehteruk. **Particularities and experience of developing the transport-economic models of liquid hydrocarbons transportation by sea.** Pp. 125–133.

Features of liquid hydrocarbon sea transportation, connected with transportations in northern seas and division of freight traffic on markets are considered in the report. Base development positions of technical and economic models of sea transport systems are presented. The typical circuit of transport-economic model and its main

positions, including calculation of «equitable» charter rates on used vessels are described. Experience of such models use in a number of the works executed by the Institute on liquid hydrocarbon sea transportations is given.

Yu.D. Dehteruk. The analysis of investment outlay for offshore hydrocarbon fields construction in the Arctic. Pp. 134–139.

The relative estimation of investment expenses for oil and gas production platforms is given in the article. The comparative estimation of investment expenses for Arctic and not Arctic fields development has been done, the various ways of the organization of sea transport system for Arctic fields have been considered.

A.B. Kartishev. Typical economic model of construction and commercial exploitation of offshore oil fields. Pp. 140–148.

The article contains a list of calculated economic and investment parameters for offshore oil fields construction and commercial operation, the typical structure of production – transport system components, as well as the description of main blocks composing the model are provided. The model was proved in a number of studies performed by the Institute on substantiation of investments into offshore oil fields construction and commercial operation.

V.A. Beljashov, V.M. Vorobev, O.P. Orlov, Yu.A. Simonov, A.P. Tumashik, Yu.V. Shvarev, E.M. Appolonov. Problem questions of developing the multi-purpose nuclear icebreaker of new generation. Pp. 149–164.

The nuclear-powered icebreaking fleet is a base of national safety of Russia in the Arctic regions and acts the main part in providing all-the-year-round navigation along the Northern marine way. Therefore a mainstream of the country's nuclear-powered fleet progress for the near-term outlook is creation of high-power nuclear-powered icebreakers with ice going capability up to 3.0 m which will ensure the secure navigation in the Western area of the Arctic regions. Performance of these basic requirements should be realized by a new multipurpose nuclear-powered icebreaker which development under the general management of OAO «CDB «Iceberg» is carried out now a number of leading organizations of Russia having experience of creation of nuclear-powered icebreakers of previous generation.

Distinctive features of new icebreaker include unprecedented high ice going capability as well as adaptation to work in significantly various operational conditions distinguishing with immensely great range of water areas depths changing and as a result of this the range of vessel draft changing. It follows that main requirements at development of a nuclear-powered icebreaker of new generation are: reduce of ice resistance by optimization of hull configuration; providing of possibility of transition from deep draft to small one for icebreaking works on shallow water sites; ensuring time regulated pilotage of perspective vessels, first of all, supertankers and gas carriers; maximal effective utilization of propulsion plant power by achievement of maximal pull of propulsion complex; providing of enhanced maneuverability and parameters of astern running in ice conditions; providing of required seagoing capacities.

The difficulties caused by these requirements as well as ways and methods of their overcoming used at development of the project are considered in present work.

V.I. Shlyachkov, V.A. Belyashov, V.N. Kireev, V.A. Matskevich. Design and construction of the new diesel-electric ice breaker for the Baltic Sea. Pp. 165–175.

The necessity of creation of the new diesel-electric ice breaker for the Baltic Sea is stated in the article.

Data on its purpose, opportunity of additional usage during the summer period are also presented.

There is the brief description of the ice breaker project executed by Krylov Shipbuilding Research Institute, its branch – «Baltudoproekt» design bureau, and «Baltiysky Zavod» shipbuilding enterprise.

There are data on area and endurance of navigation, Register class, main characteristics, sea-keeping qualities, ice going capabilities, make-up of the main equipment, systems, devices and other data.

Ya.B. Mogutin, E.S. Bylinovich, A.M. Grigoriev, M.C. Rudenko. Concept of the research-expedition vessel for the Russian Antarctic expedition. Pp. 176–194.

The project of a new research-expedition vessel, developed to the order from the Federal Hydrometeorology and Environmental Monitoring Service is presented in the article. The wide range of requirements to the vessel leads to the necessity of searching for trade-off design solutions concerning the vessel arrangement, structure of power plant, fuel type, hull material, etc. In the given article only some of them are considered.

Multiversion studies of design solutions and the wide range of model tests carried out in Krylov Shipbuilding Research Institute's model tanks have given an opportunity to develop the vessel with high operational parameters and capable to solve effectively tasks of maintenance of the Russian Antarctic expedition.

V.V. Minin. Progress trend of underwater engineering tools for both World Ocean and continental shelf studying and developing (UET). Pp. 195–218.

Current state and progress trends in the field of underwater and technical works are given in the article.

Data on submersibles for oil-and-gas technologies are included.

The basic tendencies in development of manned and unmanned submersibles, and also engineering tools for maintenance of underwater and technical and diving works are stated.

Necessity of preparation for industrial development of oil and gas fields on a shelf of east sector of the Russian Arctic regions where practically all-the-year-round the water area is covered with ice, development of pilot projects for a complex of engineering tools, including nuclear power unit for the underwater and subglacial fields organization is proved.

The conclusion is drawn, that now in Russia, due to researches carried out by Krylov Shipbuilding Research Institute, CDB «Lazurit», CDB «Rubin», CDB «Malakhit» in different years with financial support from the State and OAO «Gazprom», scientific and technical reserve on many elements of such complex is accumulated.

It is marked, that, certainly, creation of such complex is a future prospect, a complicated scientific and technical problem, which is expedient to be solved in a stage by stage way within the framework of wide international cooperation.

V.V. Minin. Rescue systems for submariners. Pp. 219–221.

Evolution of rescue manned submersibles subclass, having the longest history of development, is considered in the article.

Alongside with the elementary «wet» rescue method with its obvious lacks, «dry» methods developments are worthy of notice. Life saving systems, independent saving devices and rescue bells were created for solving this problem.

Within the framework of rescue system perfection, creation of the universal life saving systems adapted for rescue of any emergency objects is offered as the basic direction.