

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Impact of Organizational and Environmental Mechanism on the Hydrocarbon Production in the Arctic

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ABSTRACT

The paper deals with the possible factors of affecting the Arctic ecosphere at the beginning of broad hydrocarbon production in this region. The aim of the paper is to review the factors which are denoted as prevailing and associated with the dangers of economic and environmental impact on the Arctic. The authors represented the existing technologies of the oil spills response and their disadvantages in the conditions of the Arctic latitudes. They also reviewed the environmental problems not connected with the force major situations.

Keywords: production of hydrocarbon (oil, gas), the Arctic, geopolitics, geo-economics, climate, biotechnologies, ecology, oil spill, international law, oil spills response, components of drilling fluids, system analysis.

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INTRODUCTION

The information about presence of discovered and still unknown hydrocarbon deposits in the Arctic exists for a rather long time, though only in the recent decade the possibility of transfer to the large-scale development of the Arctic oil and gas has begun to be discussed. Reclamation of the oil and gas deposits in the Arctic has become possible due to the development of the technologies and the global climate change, and in connection with it the hydrocarbon production in the Arctic and its transportation including along the Northern Sea Route to the countries of Asia and Europe has become economically viable.

PROBLEM DEFINITION

The research of the American and Danish geologists in 2009 showed that under the ice of the Arctic there are about 83 billion of oil barrels, which amounts about 13 % of the world reserves. This volume is enough to meet the demand of the world for oil for three years at the annual mean size of oil consumption equal to about 30 billion barrels. Though, the major part in the structure of the Arctic hydrocarbon is composed of natural gas rather than oil. The gas reserves in the Arctic, according to the scientists, are equal to 1,550 trillion cubic meters (which is enough to meet the world demand for gas for 14 years) [14].

Although despite the hugeness of the mineral resources there are two serious obstacles for economically feasible production of oil and gas in the territory of the Arctic. First, the production cost in the Arctic is significantly higher than the similar implications for the onshore production both due to the difference in the temperatures and the necessity of ensuring the conditions and the infrastructure for the employees and due to the production technologies – in the Arctic the submarine production platforms are mostly used for mineral production. Second, the production technology preconditions another important factor: oil and gas production can potentially damage the ecological situation of this world region.

The Arctic is a planet region which is least of all exposed to the industrial pollution [4]. Although as any other region it is inextricably connected with the other parts of the planet and due to it the pollution reaches the Arctic from the neighboring air, marine and river flows. According to the estimates of the ecologists, only within the territory of the Russian Arctic there are over hundred points the pollution of which exceeds the permissible values by several times [25]. Some of them, e.g. the Gulf of Ob or the Kandalaksha Gulf, are contaminated directly due to the proximity of the oil and gas production complexes.

MATERIALS AND METHODS

The authors used statistical, accounting and scientific publications, acts of the international law and national legislative acts of the Arctic nations. They also applied the methods of the systematic approach, the historical method, analysis, synthesis, analogy and generalization.

RESULTS AND DISCUSSION

By the end of the 20th century the balance of the exhaustible energy sources consumption changed to the increase in the consumption of hydrocarbons – oil and natural gas.

And this importance of the hydrocarbons as the energy resources continued to grow in the early 21st century, but that time it already competed with the renewable energy sources.

The traditional drilling fluids applied at drilling of the oil and gas wells in the Arctic are inefficient due to low temperatures and complicated soil rheology, in particular, at drilling of the horizontal wells. Notably, there are especially high environmental requirements to the applied materials in the Arctic area. Application of freeze proof and biodegradable compositions of the drilling fluids based on the biopolymers and animal fat will be the most reasonable there.

Drilling in the Arctic, especially in the shelf area, is highly dangerous: there is no reliable technology in the world for oil spills damage control. Cleaning of the water surface from the oil film with the application of the existing technology is a highly complicated task, and in the conditions of the Arctic latitudes is becomes absolutely infeasible: according to the experts' estimates, at the oil spills response in the conditions of the

Arctic it is possible to gather only 10-15 % of the initial spilled oil volume. If the marine environment is covered with ice at least by 10 %, there is no use in the application of the mechanical gathering means. But the Arctic is covered with significantly more ice [23]. At extremely low Arctic temperatures the oil thickens which can obstruct the work of the pumping equipment and the other mechanical means applied at the oil spills response. The way of mitigation of oil spills which makes the oil decompose under the exposure of the natural factors is also inappropriate in the conditions of the extreme cold – the oil remains in almost the same state under the influence of low temperatures. Another applied method of the oil spills response which is oil combustion, can be ineffective due to the remoteness of the platform: the necessary equipment should be delivered to the accident site in 50 hours, because later the spilled oil becomes inadequate for combustion. At last, the technologies requiring the application of the bacteria for oil decomposition without special technical means, so called ‘open biodegradation’ is also inappropriate for this situation as there is currently no bred bacteria strains capable of functioning in the conditions of the Arctic, and at the same time successfully managing the set task of the oil decomposition [8]. Except for the extremely low temperatures the low level of illumination of the region for most of the year as well as the remoteness of the search and rescue services – all this makes any oil spills response extremely infeasible in practice.

Oil spill leads to degradation of the soil quality, radically decreases the quality of fresh water and air, leads to the unrecoverable climate disbalance of the region, seriously damages the river and sea ecosystems [12].

After oil has spilled within the territory of the Arctic it does not sink in one place, but spreads within the entire region and even beyond. Toxic precipitation with water and air flows goes to Eurasia and North America, causing irreparable damage to the ecosystem. Sticking to feathers and skin of animals and birds oil decreases the efficiency of their natural protection from cold and hinders the birds from flying [2].

A promising solution for oil spills response on the water in the Arctic conditions is the application of the autonomous closed floating units for biological utilization of crude oil and petroleum product pollution [26, 27]. The floating unit for biological oil spills treatment at the same time plays the role of an incubator the stable ‘live’ system of which ensures the viability of the microorganisms in the cold water, does not require the excess of the biological culture and does not allow the microorganisms to change their ration from hydrocarbons to the local flora and fauna. In the process of treatment the water environment covered with the oil film is provided with the necessary amount of oxygen and interacts with the culture of the microorganisms, which ensures the transformation of the pollution into the cell biomass suitable for nutrition of organisms.

The stage of oil transportation along the Arctic by means of transfer pipelines and tankers is also dangerous for the environment.

According to the experts, at erection of a transfer pipeline 500 ha of the areas damaged as a result of the pollution account for each 100 km of the route. Year after year the area exposed to pollution grows by 10.000 ha. At this the speed of recovery of the floral ecosystems in the Arctic due to the climatic peculiarities is significantly less than it is in the southern regions, while the technologies of restoration of the land sites polluted with the oil products are ineffective. Additionally, in practice the restoration is performed only in the areas of the laid routs and does not cover the territories which are quite distant from the sites bordering on the routes. Moreover, it is often not restoration of the sites that is performed but its imitation: the sites exposed to oil are being covered with sand, and after it the oil leaks into the soil level, getting into the soil water and the water reservoirs with fresh water and then to the Arctic Ocean.

For oil spills response at the land sites it is promising to use the mobile autonomous units for high temperature treatment of the polluted soils with the processing of the hydrocarbons through pyrolysis.

Although transportation of oil by means of tankers adds another problem: the Arctic ecosystem is of such nature that at transportation of large carriers there is a high risk of collapse with big mammals, inhabiting this region. It may lead to both the death of the animals and to possible oil spill as a result of the collapse with, for example, a whale [24].

We should single out the problem of oil spills response due to its extreme significance, acuteness and a special status of the natural Arctic area. Oil spills response (OSR) in the conditions of the freezing seas,

especially in the Arctic latitudes, is a specially complicated, multifaceted, and structural task at the confluence of many disciplines.

The polluted sea site is an unstable dynamic ecosystem which represents a hierarchic complex of highly integrated biotic and abiotic subsystems, functionally connected with each other.

There are the following factors that complicate the task of the OSR with their special functional connections: anthropogenic impact, conditions of logistics, geographical location, meteorological conditions etc.

That's why the methods for solution at the oil spills response generally, and in the conditions of the freezing seas particularly require application of the systematic scientific approach.

Systems ecology as a cutting-edge direction of the environmental science was formed on the basis of the principles of systems analysis of complicated dynamic tasks, successfully applied in aerospace and engineering studies. This approach allowed incorporating the most innovative technologies in these fields, currently used by our civilization.

The methods of systems ecology are the systems analysis, mathematic methods of modeling and information system development of bio systems of different levels.

Methodology of systems analysis is represented as follows [28]:

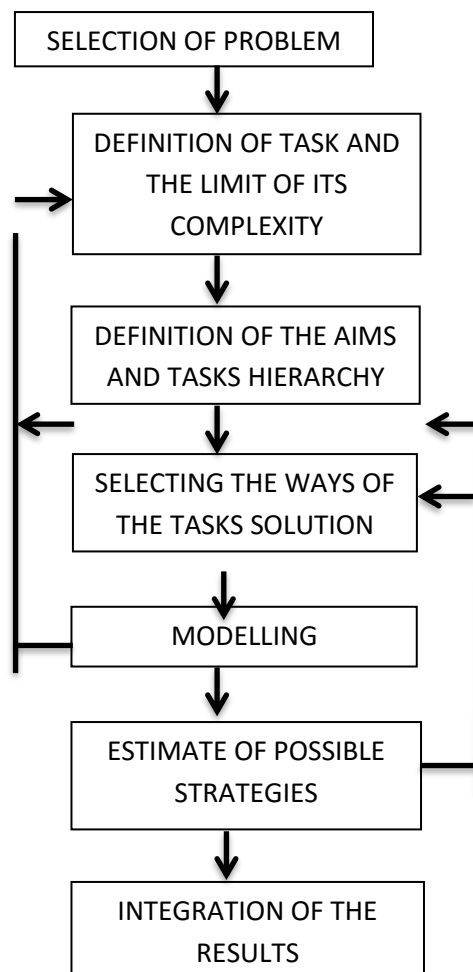


Figure 1. Stages of Systems Analysis and their Interconnection

Environmental societies with their numerous and sometimes almost imperceptible interaction between separate kinds of resources, species and populations are extremely complicated by their nature [29]. For example, interaction of microorganisms with the oil film in sea environment is very complicated: it is necessary to consider the temperature of the environment, the water salinity, type of oil, thickness and dispergation of oil film, presence of ice etc. Ecologists create the models of complicated ecosystems based on assumption of diverse interaction between the components of these systems. Using the factual material on the influence of each component of the ecosystem on the rest, they try to create realistic models of ecosystems where possible in order to forecast their response to some or other implications.

At the modern stage in the context of implementation of the international Arctic oil spills response technology joint industry programmes, scientific and research works were performed, which were significant not only for their laboratory-based but also for their large field experiments in the Norwegian Barents Sea.

The final report [31] contains the analysis of application of the modern means of mechanical gathering, combustion and dispergation of oil spills in the waters covered with ice. The innovative technologies were tested, such as: new structures of oil gathering vessels (skimmers), types of surface-active agents (SAA) – gatherers of oil for concentrating in the place of the combusted oil film localization, methods of dispergation of oil in ice, remote detection of oil in ice.

This industry programme ('Oil in Ice') is divided into 9 projects [31]:

- fate of oil;
- combustion of oil;
- mechanical gathering;
- dispersants;
- remote detection;
- instructions on mitigation of oil spills consequences;
- the programme management;
- field experiments;
- expansion of oil and bioaccessibility.

The sponsors of the programme are the Research Council of Norway and six oil and gas companies: Statoil, Shell, Conoco Phillips, Chevron, AgipKCO, Total.

The knowledge gained in the course of the 'Oil in Ice' project improves the understanding of the oil spills response in ice, while the experience and the results allow checking the existing technologies and do the groundwork for the future improvements.

Also based on the experience and the results of the Russian emergency response teams actions during the OSR works in the conditions of the freezing seas of Russia, analytical works were performed in the 'Gazprom' Information and Publicity Center, 'Lukoil' OJSC, 'Neftegaz' OJSC, 'Rosneft' Gas Company, 'VNIIGAZ' LLC etc.

'Analysis of Technical Requirements to the Oil Spills Response Systems in the Conditions of Freezing Seas' paper [30] and the other papers it is underlined that provision of safety of oil production and transportation in the Russian freezing seas requires solution of many technical and technological problems and scientific and technical tasks, while the existing state of powers, means, equipment and the scientific and technical level of the OSR systems does not meet the growing level of threats.

That's why the task of modernizing the OSR systems correspondent to the growing volumes of oil transportations is a rather acute one.

On the other hand, it is notable that the works performed in accordance with the international industry programme in Norway (mentioned above) despite their large scale are not of a rather complex nature and do not reveal the principles of the modern systems scientific approach to the environmental researches. For example, at the systems approach at the stage of defining the aims and tasks hierarchy, 'Oil Combustion' project loses its priority due to the following factors: harmful environmental impact of the oil pollution

combustion products, impossibility of application due to the zonation of the oil spills, harmful action of the surface active agents (SAA-gatherers), priority in usage of the processed oil cleared out of water for life support and the floatability of the systems, illumination in the conditions of short daylight hours in polar environment and the other factors. At systems approach it is necessary to include into the list of the priority projects of the general researches programme such directions as:

- 1) utilization and processing of oil products for the OSR systems life support;
- 2) mobile technologies for processing of important oil products into the electric energy, heat, and light liquid hydrocarbons (diesel fuel);
- 3) efficient highly-productive marine systems of separation of oil from the sea water.

There are also enough reasons to doubt in the efficiency of the dispersive technologies in the conditions of the Arctic seas and localization of oil spills through oil-spill booms. Consideration of a local Arctic sea site with an oil spill as a hierarchic system of interconnected physical, chemical and biological processes will allow estimating the degree of efficiency of the existing OSR methods more fundamentally. Systems approach will allow comparing these ways of marine oil spills response with the methods based on biotechnologies, for example, the technologies with autonomous 'living systems', inoculation of microorganisms, and the processes with active oxygen.

Speaking about fauna of the Arctic, it is necessary to consider another problem. As it was said above, construction of infrastructure inevitably affects the land sites with major pipelines, routes and the other elements of infrastructure. Although even the presence of such objects can negatively influence the existing ways of the animals' migration paths, even shift separate groups of animals from their habitats, potentially increasing the risk of extinction of separate species.

Another possible factor affecting the ecosystem is in the fact that oil and gas fields at the Arctic shelf are quite often located near the areas having high value for fishing industry. The 'Prirazlomnaya' platform in the RF starting its operation in April 2014, for example, is located in about 100 km from the Nenets Nature Reserve and a series of federal nature reserves, the sea and coastal areas of which will be inevitably polluted in case of some significant oil spill.

Another important risk factor at oil production is icebergs, the collapse of platforms and tankers with which can be fatal for the latter. At that the suggested ways of struggle with them seem unserious in comparison with the potential consequences of this danger. For liquidation of the icebergs it is suggested to use fire vessels [21].

Besides, in the process of the oil products separation so called associated petroleum gas (APG) is being emitted, the major part of which at the existing technological process either goes directly to the atmosphere or is being burnt [15]. The associated petroleum gas consists of methane, which is a dangerous greenhouse gas, and due to this the today's absence of efficiently operating system of the APG utilization leads not only to the toxic pollution of the atmosphere but also to the global warming.

Today a half of the APG is being burnt, which causes large emissions of carbon dioxide to the atmosphere which consequently aggravates the greenhouse effect. As a result mean air temperature in the region increases and the icebergs begin to melt also due to this factor. Oil production business has the task to achieve the level of 95 % utilization of the APG, and it was set a long time ago, but its solution is still challenging [22].

Today the problem has been solved only by several Russian oil-producing companies, for example, 'Surgutneftegaz', while the state-owned companies have rather lackluster performance. According to the data of Nina Pusenkova from the Institute of World Economy and International Relations, the level of the APG utilization of 'Gazpromneft' is currently equal to 55,2 %, and 'Rosneft' has even smaller – 48,6 %. But it is exactly the state-owned companies that will reclaim the Arctic [19]. They should first pay attention to the existing innovative developments in the sphere of oil and natural gas production.

Warming within the Arctic goes twice as faster than generally in the world. Approximately for the last three decades from the beginning of monitoring of the ice state in the Arctic, the ice area decreased by 12%

per decade. Melting of the ice led to the lowest registered levels of summer ice which undoubtedly allowed using the region in business the most actively, but is a troubling sign for the climate of the planet.

The Arctic has always been greatly important for the humanity due to its special remoteness, natural and climatic position, but was paid a special attention thanks to the discoveries of large deposits of hydrocarbons at the Arctic shelf. Alongside with it the opportunity of creating new trade routes for shipping companies appeared. Possible negative influence of the industrial activities on the state of the environment and the living conditions of the indigenous peoples transferred the environmental problems from the local to the planetary scale. The geopolitical value of the Arctic has increased.

In connection with it, the most important for the efficient usage of the Arctic resources is the regulatedness of interaction between all the actors in the territory of the Arctic according to the standards of the international law. As a result, the issues on the delimitation of the Arctic shelf and the problems of applicability of the international Law of the Sea in the Arctic turned to the most important issues of the world politics [11].

When the Arctic was not included into the global processes for a long time being a kind of a periphery in the international relations, this region attracted only researchers, fishermen, hunters and a small number of entrepreneurs. The Arctic was the environment for calm living of the indigenous peoples of the North.

Arctic nations, economic infrastructure and interests of the population of which in many aspects are connected with the special and resourceful potential of the Extreme North for decades exerted themselves for property, cultural and other development of the Arctic, its defense, reservation of ecology and natural resources. This region was considered to be the center of political, legal, economic, military, strategic, environmental and social interests. Exactly these interests influenced the adoption by the Arctic nations of the legislative and other regulatory acts and the treaties concluded between them regulating the legal status of the Arctic territories. So, the historical process of acquiring the territories of the Arctic was accompanied with the legal implementation by the Arctic nations of the continent parts, lands, isles, archipelagos, and sea areas of the Arctic Ocean belonging to them, which they had initially had only de-facto. Remoteness of the Arctic from the center of the civilization, tough climatic conditions, and insufficient technical progress for a long time made this region unavailable for reaching by the vessels of the other countries which eliminated any possibility of claiming by the latter of their territorial demands relating to the Arctic territories with a certain specifics. So, the polar territories were considered as the regions where the coastal states had special interests and rights coming from the practice of acquiring the Arctic by these states [10].

In the conditions of the geopolitical rivalry between the states of the Arctic a great attention is paid exactly to the issues of finding the best model of formation of legal relations in this territory. In 19th-20th centuries various opinions about legal status of the Arctic were expressed in the legal science. Generally they are narrowed to the following provisions: this region belongs to nobody and is used jointly. The others say that the Arctic is a concurrent dominion, which is in the each country's possession. Alongside with it there is also a system of sectorial division of the Arctic territories between the Arctic nations [20]. Generally, due to the specifics of the geographical and geopolitical position of the Arctic, the scientific society and the governmental circles has for a long time been developing the international legal concept based on the definition of a special responsibility and provision of exclusive rights which would consider legal interests of the Arctic nations.

In the 19th century the international lawyers and diplomats searching the ways of the best legal status for the use of the Arctic territories formulated three principally important directions for formation of the legal standards regulating the development and use of the Arctic resources:

- The Arctic is a unique space which is jointly used by the world community;
- perception of the Arctic in the legal sense as a world concurrent dominion which relates to the joint possession of the states;
- scientific approach to the Arctic as to the space divided into sectors, each one falling within the scope of influence of the corresponding state bordering with the coast of the Arctic.

Thus, the approach to the use of the Arctic became practical, as to the territory divided into sectors. Though, not all the states share and approve this principle of division and alongside with it run geopolitical rivalry for the external boundaries of the continental shelf.

Canada and Russia being the largest Arctic nations adhere to the sectorial concept for protection of their interests in the Arctic. As early as in 1925 Canada adopted several legislative acts based on the sectorial concept. According to these laws the sovereignty of Canada is spread over the lands and isles within the sector with the North Pole at the top. The Canadian legislation stipulated nothing about the sea area within the sector. Some Canadian politics and lawyers began interpreting the provisions of the legislation extensively and including the sea areas to the Canadian Arctic sector. The Soviet Union followed the example of Canada and in 1926 adopted the provision that all the lands and isles which were discovered or could be discovered within the Soviet sector were claimed the territory of the USSR [18].

The Arctic has currently been transformed to the zone of increased focus of the whole world society. Increase of attention on the part of the political and military strategists caused the fact that the Arctic has thus far been in the focus of the attention of many countries.

Three countries are currently aspiring to the Arctic shelf – Canada, Russia and Dania. The USA does not still participate in the UN Convention on the Law of the Sea and cannot aspire to the expansion of the continental shelf. But the US tries to acquire the territories and the water of the Arctic through different ways. So, the concern of the USA about the solution of the Arctic problems in general was proved in the Ilulissat Declaration (2008) adopted by the five Arctic nations (Russia, USA, Canada, Norway, and Denmark). It particularly declared that the states should regulate their territorial claims in the context of the international law as it was reflected in the UN Convention on the Law of the Sea, 1982: The Declaration proved that the regulatory and legal framework is provided by the UN Convention, which is enough for control over the Arctic Ocean and there is no necessity in development of a new international legal regime of the Arctic. Thus, the Arctic waters were accepted having the same status as any other waters of the globe with the same rights at the continental shelf, archipelagos, isles, inner seas and the corresponding middle grounds connected with the ships journey through the sovereign sea waters [13].

The United States is currently in a rather beneficial position. Not being a principal member of the UN Convention on the Law of the Sea, 1982, the USA, on one hand, has to remain in the rearguard of the processes of control over the Arctic, while, on the other hand, it has certain privileges, because at formation of the national policy on the Arctic it is to the least extent limited by the international obligations. Even in case of joining the UN Convention, 1982 it has an opportunity to declare the priority of its national legislation over any conventional standards. Particularly, it relates to application of article 76 of the UN Convention, 1982 stipulating introduction of certain special and financial limitation in regard to the boundaries of the continental shelf and the development of its resources.

The USA has not supported the Canadian and Russian positions on the Arctic. The United States is unalterably against the Arctic sectorial concept. Norway adheres to the same approach. Both states consider that in the sea area of the Arctic, along the external boundary of the territorial waters, all the freedoms of the open see should be applied. Denmark as the sovereign of Greenland supports this position on the Arctic.

Despite the set standards a series of states continue to defend their right for some or other sections in the Arctic latitudes. The most well-known regarding its large territory is the Lomonosov Ridge discovered in 1948 by the Soviet expeditions. Russia made official submissions to the UN Commission on the Limits of the Continental Shelf for several times and suggested setting the new boundaries of the continental shelf of the Russian Federation on the basis of the conducted researches of the Lomonosov and the Mendeleev ridges, but in 2002 the Commission only recommended continuing the researches, which led to the fight over expansion of the economic zones by the other states [17].

So, the pace to the negotiations of the Arctic nations on the issue of the international legal regime of the Arctic is set by the discussions about the terms of development of the oil and gas deposits at the shelf of the Arctic seas. At this, notably, the effective development of the Arctic deposits is impossible without precise definition of the external boundary of the shelf. This presentation of the problem points at the technical unpreparedness of the majority of the states to the development of the Arctic deposits. In this aspect,

agreeing with the necessity of defining the boundaries of the Arctic spaces it is necessary to be aware of the fact that this process will be time and money consuming.

But despite this fact the first state joining the fight over Arctic was Denmark having begun the research of the North Atlantic in 2004. Apparently, the aim of the Danish expeditions was obtaining the evidence of the Lomonosov Ridge's belonging to Greenland. Nevertheless in 2007 Russia conducted new research which afforded the grounds to claim that the ridge is the prolongation of the continental shelf of Russia. But the alliance of the western states was not going to give up. Canada came into the arena, having spent before 2013 approximately 200 mln USD on the corresponding research. As the Lomonosov Ridge is prolonged to the Canadian Arctic Archipelago, then Canada, despite the previous results of the researches, claimed that the ridge belonged to its territory. Naturally, all the states do not accept the claims of each other and intend to keep on disputing their rights in the UN.

The Arctic which is extremely vulnerable but rich in natural resources, is protected by the fundamental Treaty between Russia, USA, Canada, Denmark and Norway on regulation of the legal relations in this region [7].

According the UN Convention on the Law of the Sea, 1982 the 12-mile area of the territorial sea is included to the territory of the Arctic. The international Law of the Sea provides each state with the right to declare 200-mile economic zone. Sovereign rights for the continental shelf automatically belong to each state. Besides, each state may claim the rights for the other sections of the sea bottom beyond the 200 sea miles if it can prove that it is the prolongation of its continental shelf.

Alongside with it each Arctic country tries to claim exclusive rights for the Arctic territories and enshrine it in its legislation [3]. And at the same time each state supports the idea of transformation of the Arctic to the zone of peace and cooperation, ensuring ecological safety, and further development of cooperation between the Arctic nations and the states which are located rather remotely from this region on the basis of the international law standards.

Today one of the most important components of the international legal regime of the Arctic is the dogmatic substantiation by the Arctic nations of their territorial claims for their rights at using the spaces and resources of this region [1].

Each state has developed its own geostrategy regarding the Arctic stimulating the growth of the geopolitical rivalry. The Arctic problems obviously show the necessity of establishment of a new legal regime for the Arctic in general, and in special spheres in particular. The process of establishment of a new legal regime requires more coordinated actions on the part of the Arctic nations, which should not only dispute and chase the new Arctic territories but also establish the international legal regime in the Arctic that would satisfy not only one state but all the international actors [16].

An important aspect at using the foreign recommendations and experience at oil spills on water is the fact of significant difference in regulatory and legal framework of the RF and the other states. For example, application of the equipment for oil combustion in the Russian seas is not stipulated in the existing standards, while for possible application it requires independent agreements in the inspection and administrative authorities. That's why for efficient application of this method the development of operative methods of agreement is principally necessary as well as their check in practice. Also application of the method of dispergation is not stipulated by the current Russian standards, because toxic reagents add additional pollution to the water environment.

The most promising international institution is the Arctic Council founded in 1996 upon the initiative of Canada, which by analogy with the OSCE may be the instrument for consensual decision making and public diplomacy. Although unlike the OSCE the Arctic Council has up to now been a complicated structure aimed at uniting the efforts of the governments, indigenous peoples, local administrations and representatives of non-Arctic nations concerned about sustainable development of the Arctic. Who and how will be able to define the international and legal regime in the Arctic for ensuring peaceful and harmonious development of this important region of the Earth still remains an open question. The solution of these issues is complicated by the events that will probably take place against the background of the growing geopolitical rivalry of the states in

the Arctic in the context of the fight over the resource potential in the conditions of the tough pressing of rivalry for provision of reliable access to the oil and gas deposits [5].

In 2010 Scottish company Cairn Energy started drilling with the purpose of exploratory survey at the shelf near the Western coast of Greenland. By the moment this paper was being prepared they had not managed to discover oil, nevertheless if the exploratory works by the English company is successful, the oil giants like EXXON and Shell will rush to the Arctic. Some of them have already submitted for development of the shelf deposits near the coast of Greenland.

Almost all the sea deposits of the Russian Arctic have already been distributed between the Russian oil producing organizations [4].

There are the following most relevant tasks for the RF on improvement of the Arctic hydrocarbons development mechanisms:

- For modernization of the Russian OSR emergency system in the Arctic and ice-covered waters it is necessary to develop a special state scientific and practical programme of researches in this sphere with involvement of the concerned international partners.
- For processing, adaptation and expertise of the technologies studied in the course of the programme implementation it is necessary to create 'Special Verification Center of the OSR Technologies Research' with the involvement of the producing and transporting companies and allocation of special sectors in the Arctic sea sector for the field experiments.
- The scientific base of the research programme and development of the technologies of the hydrocarbon production and OSR should be based on the principles of the systems analysis and have a complex specialized approach at the 4th level of the technological paradigm.

Among the specialists on the considered issues we may note both foreign and Russian specialists. One of the acutest and contradictory foreign policy challenges in the modern development of the Arctic, considered in the works of the specialists is the technological and ecological accents and the regulation of its international and legal status. For the past decades the scientists achieved significant success in this issue.

The work by D. A. Sivakov is notable, who highlighted the modern relevant problems of use and protection of the Arctic zone in his scientific research. Also the author considered legal prospects of development and production of mineral resources in this territory [9]. Studying this issue one may conclude that the Russian legislation is far behind the legislative framework of Canada on the point of the legal regulation of the issues regarding the stimulation of the sea, fishing and the other Arctic activities.

At studying this issue we would like to note the work by M. N. Kopylov, Doctor of Legal Sciences who analyzes the last tendencies in formation of the Arctic legal regime caused by the adoption of new national laws by the Arctic states and regional international agreements [6]. The scientist provides the chronology of entrenchment in the international and national legislation of the sectorial theory regarding the Arctic and shares his opinion on the future of the theory of the Arctic internationalization.

The main traits of the international legal regime of the Arctic in the new geopolitical conditions were considered by scientist L. Timchenko. Doctor of Legal Sciences gives recommendations on improvement of the legal field based on the historical analysis. In his opinion, the Arctic problems obviously show the necessity of establishment of a new legal regime for the Arctic in general, and in special spheres particularly. The author concludes that the process of establishment of the new legal regime requires presence of the leader state or the leader organization as the instrument for decision-making on the basis of consensus in the public diplomacy.

CONCLUSION

The modern world economy and particularly its energetic branch are extremely dependent on oil and natural gas and due to it the oil and gas companies continue their extensive expansion to the uncultivated spaces of the Arctic in search of new deposits instead of the exhausted, not considering the threats of the oil and gas deposits development to the fragile Arctic nature. Thus, despite the rich natural deposits of mineral

resources the beginning of the wide-scale production of hydrocarbons there should be preceded by the legal confirmation of the Arctic development procedure, development of the economically reasonable strategy and the production technology. Development of the deposits in the Arctic latitudes by ordinary methods may lead to the serious environmental problems for the currently purest part of the Earth.

Although, today these problems are not being solved at the level of the world cooperation, the producing companies start working by ordinary methods, not considering the application of innovative materials in practice. The geopolitical rivalry between the states in the Arctic is currently a rather active process.

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