Problems of Environmental and Technogenic Safety Regulation in the Arctic Region: Oil Spills

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Abstract. The article analyzes the changes in the regulatory and legal framework related to the development of the main document on oil spill response planning. the key points of the regulatory and methodological framework applied until January 1, 2021, which should have been given special attention, are highlighted. The second part of the article analyzes the updated regulatory and legal framework for preventing and responding to spills. the third part provides a comparative analysis of the old and new legislation governing the development of oil and petroleum product spill prevention and response plan, and also discusses some methodological aspects. The results of the analysis are formulated in the conclusion. It is noted that despite innovations, scientific and methodological support of development remains insufficient.

1 Introduction

Accidents and emergencies (ES) associated with oil and petroleum product spills (hereinafter - ES(O)) continue to be topical for the Arctic zone of the Russian Federation (AZRF). Thus, according to the report of the Ministry of Natural Resources and Environment of the Russian Federation [1], 2,629 oil spills were registered in federal districts, which include Arctic regions, in 2018, while the total number of registered pollutions in the Russian Federation is 3,053. The total area of these pollutions was 58 hectares, and the volume of oil products that entered the environment was 1,054 m3. More than half of the reported accidents were caused by corrosion of pipeline metal. One of the dangerous consequences of oil spills can be contamination of nearby water bodies. These consequences can be much more dangerous if oil products get into rivers. For example, in 2019, about 193,000 tons of oil products flowed into rivers in the Arctic Ocean basin [1].

It is worth mentioning the largest emergency of 2020 in the Arctic zone of the Russian Federation - at one of production facilities of PAONorilsk Nickel, more than 20 thousand tons of oil products spilled into water bodies and rivers. Rosprirodnadzor estimated the damage caused to the environment at 146 billion rubles. These funds were recovered from Norilsk Nickel through court proceedings [2].

It is obvious that the issues of emergency risk management do not lose their relevance. Since January 1, 2021 there have been significant changes in the legislation in this area. These changes are considered on the example of the key document – the plan for the prevention of and response to oil and petroleum product spills (OSRP).

This article reviews the methodologies for developing OSRP used before January 1, 2021; the main normative acts regulating this process; and mentions the key points that need to be given special attention to when developing OSRP. The second part of the article analyzes the updated regulatory framework. The third part presents a comparative analysis of the old and new legislation regulating the development of OSRP. the conclusion is based on the comparison of the old and new regulatory and methodological framework.

The purpose of the work is to analyze changes in the legislation regulating oil spill prevention and response, and to assess the impact of the new requirements on the effectiveness of ES(O) risk management.

2 Development of the OSRP by January 1, 2021

The previous (until 2021) regulatory and methodological support for the development of OSRP is considered in [3, 4]. Let's touch on some points.

The main regulatory document was the Order of the EMERCOM [5], which approves the Rules for development and approval of OSRP on the territory of the Russian Federation. The rules contain definitions of the terms used. The notion of OSRP coverage area was introduced, which became null and void in 2012. The main planning tasks were named, including:

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substantiation of the level of a possible emergency situation

definition of the interaction procedure

substantiation of the sufficient number of forces and means for emergency liquidation

drawing up a situational schedule of the emergency response operation.

The OSRP level was determined in accordance with the Government decree [6] and the Order of the Ministry of Natural Resources of Russia [7]. Spills not covered by the ES(O) classification were identified, for which internal regulations should be developed in accordance with [5].

The process of approval and concordance depends on the level of the OSRP. In this case, the whole OSRP and the Schedule have separate approval and concordance sheets.

Appendix 1 to the Regulation [5] contains a rather detailed example of the OSRP structure described in [3, 4]. The OSRP includes, in particular, the following elements:

description of technological processes with oil products

volumes and areas of spills, boundaries of emergency zones, risk assessment

scenarios of possible ESs at different levels

determination of sufficient composition of forces and means for emergency response, as well as firefighting units (in case of fire)

levels of response, areas of responsibility.

The operational part of the OSRP includes, among other things, algorithms of operations and technologies used in emergency response, firefighting action planning, technologies for collecting spilled oil products, and waste storage.

Appendix No. 2 to the Rules [5] contains a sample Schedule of operational activities for the events of threat and emergency.

An OSRP examination was a complex and costly stage, usually requiring several iterations, the order of which was determined by the level of the OSRP. However, in 2012, the examination was canceled.

The OSRP is valid for three to five years, depending on the level. the OSRP is subject to adjustment (revision) upon expiry of its validity or in case of significant (affecting the level) change in the initial data.

There are annexes to the OSRP - mandatory and recommended. The mandatory ones include:

diagram of the facility with the boundaries high-risk zones and priority protection areas

maps, scenarios and consequences of emergencies at different levels

schedules and regulations

calculation of sufficiency of forces and means

contracts, certificates, licenses.

The Decree of the Government [6] approved the Basic Requirements for the development of the OSRP. In particular, for different objects (vessel, terminal, tank, train, pipeline, stationary tank) the maximum possible spill volumes are defined. So, for stationary facilities, this is 100% of the volume of the largest reservoir (tank). Possible spill volumes and areas define emergency categories - from local to federal (as amended by the Decree [8]).

The Order of the Ministry of Natural Resources of Russia [7] approved the Instructions on determining the lower level of a spill to classify a spill as an emergency situation. Thus, onshore, the minimum values are specified depending on the source and type of the spill, as well as the type of territory. For example, for large stationary storage facilities, for light oil products and an industrial site without cover, the lower level of a spill is 7 tons.

Resolution [8] approved the Rules for the organization of the events provided by the OSRP. In particular, the maximum permissible time of localization is s specified: 4 hours - for water area, 6 hours - for territory.

The Acts [5-8] provide the basis for the development of the OSRP. However, in fact, dozens and hundreds of documents and materials of various levels are needed to fill all sections of the OSRP. The Ministry of Emergency Situations of Russia is the main agency that supervises the development and approval of the OSRP. Let us note insufficient methodological support of the development. Not a single methodological manual has appeared at the federal level.

In conclusion, the OSRP was supposed to provide an analysis of the risks both oil spills and explosions and\or fires. Depending on the level, the OSRP was subject to coordination and approval by various departments. sections of the OSRP were interconnected, duplicative, and required annexes and copies of various valid certificates, contracts, etc. As a result, the OSRP was comparable to a security declaration. numerous legal requirements were difficult to comply with in practice. The region might have lacked resources for the collection and disposal of oil waste, emergency rescue teams (ERTs) with the necessary scope of certification and equipment, which made it impossible to organize the fight against the maximum category of emergency at the site, and involvement of ERTs from other regions did not ensure the containment of the spill within the required time, etc.

3 Updated requirements for the development of the OSCR

Let's give a brief description of the changes.

The Decree of the Government [9] canceled the Order of the EMERCOM [5]. The Decree of the Government [10] declared documents [6, 8] null and void from January 1, 2021. By the Resolution of the Government Resolution [11], the document [7] was abolished.

New the requirements for the development of the OSRP are contained in [10, 12].

The Resolution [10] approved the Rules, which contain, among other things, definitions of the concepts of containment and response to a spill, as well as requirements for the content of an OSRP. The rules comply with the Federal Law [12] (Article 46).

The criterion for identifying facilities (for which, among other things, the development of an OSRP is required) on land is the maximum estimated volume of spills - 3 tons or more.

An OSRP should contain the following data:

- general information about operations with petroleum products
- possible initiating events of spills
- volumes of maximum spills
- possible areas of spills and consequences for the environment, population and life support systems (taking into account the characteristics of the area);
- priority actions of personnel on spill events
- estimated time to contain and eliminate the maximum spill
- calculation of sufficiency of forces and means to eliminate the maximum spill, taking into account technologies, as well as calculation of spill containment time from the moment of detection or receipt of information (in case of a spill on water bodies within 4 hours, on land - within 6 hours)
- composition and procedure of forces action and use of equipment
- organization of additional resources attraction in case of spills exceeding the maximum ones
- control and communication schemes
- organization of temporary storage, transportation and disposal of the collected oil;
- cost of the OSRP operations (own expenses)
- schedule for response to maximum spills (containment, spill collection, disposal of collected oil).

Copies of documents on emergency services and groups, as well as license copies of contractors' licenses for waste transportation are attached to the OSCR.

The maximum estimated spill volumes for different objects (ships, barges, wells, train, terminals, pipelines, warehouses) are specified. So, for oil product warehouses this is 100 percent of the volume of the largest container.

Further [10] describes the procedure for conducting integrated exercises, the procedure for issuing an opinion on the organization's readiness for containment and response to spills (based on the results of the exercises), the procedure for notification on approval of the OSRP, the procedure for reporting a spill, and the procedure for attracting additional forces and means.

Article 46 of the Federal Law [12] contains, in particular, information about an OSRP. It is noted that it is necessary to conduct an OSRP when carrying out activities related to hydrocarbons. The OSRP is approved by the organization if there is an opinion on readiness and coordination with the environmental supervision. The procedure for amending the OSRP is described. The operating organization is obliged to comply with the OSRP and have adequate financial support. In the event of a spill, the organization shall be obliged to provide notification of the fact of the spill, ensure conducting works in accordance with the OSRP, apply in in accordance with the established procedure for engaging additional forces and means, carry out reclamation and other recovery works after the spill liquidation, fully compensate the damage and additional costs.

Now let's compare the OSRP requirements before and after the changes in the legislation.

4 Comparative analysis and discussion of changes in the regulatory and methodological framework

First, we note the main similar components, elements of an OSRP developed by the operating organization:

- general information about the organization, basic operations with oil products
- possible sources of spills
- maximum volumes of spills
- areas of spills, possible consequences for the environment, population, life support

systems (taking into account the characteristics of surrounding area)
- priority actions of personnel in the event of a spill
- terms for containment and elimination of the maximum spill, in particular, the time for containment of a spill on land should not exceed 6 hours
- calculation of forces and means sufficient to eliminate the maximum spill
- composition and procedure for the actions of forces and the use of equipment
- schemes of control and communication
- information about oil waste storage, transportation and disposal
- schedules for maximum-size of spill
- contracts with emergency rescue teams, certification, licenses of contractors.

- Now, let's list the significant differences between the new legislation and the previous one:
- regulatory framework - a number of documents have been abolished, instead of them it is required to be guided by the Rules [10];
- there is no concept of the level and term of validity of OSCR. However, the Rules [10] have a clear validity period - from January 1, 2021 to January 1, 2027. This can lead to the fact that in 2027 there will be a need to update the existing OSRP, quite possibly - according to the updated rules
- spills with a volume of less than 3 tons are not considered
- there is no indication of the need to assess risk (probability)
- there is no mention of such accident scenarios as fires and explosions (in the old OSRP, significant attention was paid to possible fires);
- possible accident scenarios are not mentioned
- there are no levels of response and issues of transfer of control
- there is no mention of an emergency committee
- the time of spill containment from the moment of detection or information receipt in the event of a spill on water bodies (including their water protection zones - previously this note did not exist) - within 4 hours
- the procedure for approval of an OSRP has been changed - one of the most significant changes in the new rules for developing plans;
- the concept of a spill that exceeds than the maximum design spill ("beyond the design basis") and the associated involvement of additional (not provided for in the OSRP) forces and resources has appeared
- information about the scope and cost of work (own costs) is required, in the previous OSRP there was a concept of reserves of material and financial resources
- Rosprirodnadzor appears as the supervising agency coordinating the OSRP, while previously the EMERCOM of Russia acted in this role.

5 Conclusion

Climate changes, aging of equipment, and other factors increase the urgency of oil spill prevention and response issues in the Arctic zone of the Russian Federation. An important aspect of combating ES(O) is the legislative framework, which has undergone significant changes at the turn of 2020-2021. Therefore, a comparative analysis of the introduced changes is important and timely.

In general, at first glance, the procedure for the development and approval of OSRP has been significantly simplified. Instead of a detailed (albeit approximate) table of contents, general guidelines are provided. A number of concepts and provisions are excluded.

The process of preventing oil spills has been substantially revised: whereas previously accidental spill drills were conducted in parallel with the development and approval of an OSRP and, in general, did not depend on each other, from 2021 onwards successful exercises have become a key stage in the development of the oil spill response plan. Moreover, if the exercises reveal that the organization is not prepared to deal with an emergency, approval of the OSRP by the supervisory authorities becomes impossible.

On the one hand, simplification of the process of developing and approving a OSRP is a positive thing: the administrative burden on the operating organizations is reduced, resources for the development and approval of planning documents are saved. On the other hand, the main focus is on assessing the readiness of the organization to respond to an ES(O) This approach, undoubtedly, allows to minimize damage from emergencies, but it overlooks the prevention of oil spills as such.

At the same time, the phenomenon of possible oil spills and related accidents and emergencies has

not become simpler, protected and secured. Scientific and methodological support for the development of an OSRP is still insufficient. This raises serious concerns about the risk of an ES.

As part of further research it is planned to analyze the practice of applying the new regulatory framework for the regulation of EC(O) in the Arctic regions of the Russian Federation.

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References

1. State report "On the state and protection of the environment of the Russian Federation", Ministry of Natural Resources and Ecology of the Russian Federation Available online: http://www.mnr.gov.ru/upload/iblock/cf1/07_09_2020_M_P_O%20(1).pdf (2019)
2. Norilsk Nickel fully paid for the damage caused to environment in connection with the fuel spill at CHPP-3. Available online: https://www.nornickel.ru/news-and-media/press-releases-and-news/nornikel-polnostyu-oplatil-ushcherb-nanesennyy-okruzhayushchey-srede-v-svyazi-s-razlivom-topliva-na-tets-3/type = releases
3. S.Yu. Yakovlev, et al., Development of plans for prevention and response of oil spills for territorial objects, *Modeling and analysis of safety and risk in complex systems: Proceedings of the International Scientific School MA BR-2010,* St. Petersburg, July 6-10, 2010, (St. Petersburg, SUAI), pp.447 – 452 (2010)
4. S.Yu. Yakovlev, A.S. Shemyakin, and A.G. Oleinik, Information and analytical support for the safety of the Arctic industrial and natural complexes (in press).
5. Order of EMERCOM dated 28.12.2004 No. 621 "On Approval of the Rules for the Development and Coordination of Plans for the Prevention and Response of Oil and Oil Products Spills in the Territory of the Russian Federation (2004)
6. Decree of the Russian Federation Government dated August 21, 2000 No. 613 "On urgent measures to prevent and eliminate emergency oil and oil products spills" (2000)
7. Order of the Ministry of Natural Resources of Russia dated 03.03.2003 No. 156 "On approval of the Instructions for determining the lower level of an oil and oil product spill for classifying an accidental spill as an emergency"(2003)
8. Decree of the Government of the Russian Federation dated 15.04.2002 No. 240 "On the procedure for organizing measures to prevent and eliminate emergency oil and oil products spills on the territory of the Russian Federation"(2002)
9. Decree of the Government of the Russian Federation dated 11.07.2020 No. 1034 “On invalidating regulatory legal acts and certain provisions of regulatory legal acts of the Russian Federation, on the abolition of acts of federal executive bodies containing mandatory requirements, compliance with which is assessed when carrying out control measures for implementation of federal state fire supervision and licensing control in the field of fire safety, federal state supervision in the field of protecting the population and territories from natural and man-made emergencies, state supervision over the use of small boats, bases (structures) for their parking in internal waters and the territorial sea Russian Federation" (2020)
10. Decree of the Government of the Russian Federation dated December 31, 2020 No. 2451 "On approval of the Rules for organizing measures to prevent and respond to oil and oil products spills on the territory of the Russian Federation, with the exception of the internal sea waters of the Russian Federation and the territorial sea of the Russian Federation, as well as on the recognition as invalid some acts of the Government of the Russian Federation " (2020)
11. Decree of the Government of the Russian Federation dated August 06, 2020 No. 1192 "On recognizing as invalid some normative legal acts and certain provisions of normative legal acts of the Government of the Russian Federation, on the abolition of some normative legal acts and certain provisions of normative legal acts of federal executive bodies containing mandatory the requirements, compliance with which is assessed when carrying out control measures in the implementation of federal state supervision in the field of industrial safety and state mining supervision, and the recognition of the Instruction on observation of deformations of sides, slopes of benches and dumps in open pits and the development of measures to ensure that their stability, approved by the State Committee for Supervision of Safe Operations in Industry and Mining Supervision under the Council of Ministers of the USSR on July 21, 1970 " (2020)
12. Federal Law No. 7-FZ dated 10.01.2002 "On Environmental Protection" (as amended on 30.12.2020) (2020)