Implementation of the greening process at oil and gas industry enterprises

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Abstract. This article provides an analysis of the main problems that affect the greening of products and their marketing systems, and considers international norms, rules and environmental standards in the field of marine fuel use. The effective solution of the problem and the development of related areas of improvement of the system of introduction of greening of fuel products and its further marketing, including external, information, technological and structural components, are proposed. The development of the market for the sale of liquefied natural gas, research on the creation of fuel with a reduced sulfur content, strengthening quality control in the organizational mechanism for the sale of finished products, as well as increasing the level of greening during transshipment, transportation and bunkering are considered as directions for implementing the goal of greening.

1. General information
The study of the regulatory framework for the sale and shipment of various types of marine fuel in the Russian market, the development of the main directions for increasing the efficiency of all stages of greening, as well as the development of an organizational mechanism for the greening of products and the system of its marketing is an integral part of the study.

Greening is a concept that reveals the process of penetration of the ecological approach, ecological principles into various types and spheres of human life.

In 2018, maritime transport accounted for about 5% of the global oil market, which is equivalent to about 5 million barrels per day [1]. Therefore, bunkering services for refueling ships with fuels and lubricants is an important and dynamically developing direction in the oil products market.

On January 1, 2020, a set of new requirements of the International Maritime Organization (IMO) came into force. According to these rules, the changes primarily affected the ecological component of bunkering. So, according to the new requirements, the sulfur content in the fuel should not exceed 0.5% (previously the permissible level was 3.5%) [2]. If these rules are not followed, the ship owners will be charged fines.

This trend leads to the improvement of the sales system towards the development of its environmental friendliness at all stages of bookkeeping, as well as the development of more environmentally friendly fuels [3]. This means that in the next few years, oil companies will actively work on the development of two areas:
transition to liquefied natural gas as a cleaner type of fuel;
improvement and development of fuel bunkering technologies at every stage (from extraction to direct shipment), allowing to reduce environmental pollution of the system.

2. Statement of tasks and solution of the investigated problems
The solution of these problems will subsequently determine the main directions for the development of the marine fuel industry.

Despite the sufficient development of the market, the diversity of the types of fuel provided and the significant regulatory and legal system that regulates the environmental and economic activities in the field of marine fuel, in modern conditions there are several global problems. They are international and inhibit the development of the marine fuel system as a whole. Their solution is a matter of time and costs incurred by companies. It is worth highlighting three main problems that directly affect the greening of products and their distribution systems:

• lack of global standards for technologies for the production of low-sulfur fuel;
• unavailability of the marine fuel and bunkering market for a partial transition to LNG; oil spills during bunkering; lack of guidelines for greening products;
• lack of guidelines for greening the sales system.

It is worth clarifying that these are not all of the problems that the marine fuel industry is currently facing. There are permanent tasks that change over time and require constant revision, insignificant modernization of production.

However, the above problems need to be resolved as quickly as possible, since in accordance with the IMO standard, which will come into force in 2020, the marine fuel market may not be able to cope with the production of the required amount of fuel. In the direction of solving the third problem, technologies have already been developed that can significantly reduce the number of oil spills. At the same time, it is not yet possible to completely eliminate the possibility of a fuel spill during bunkering.

It is possible to effectively solve these problems and develop related directions for improving the system of greening products and the system for selling them at an enterprise thanks to the introduction of an organizational mechanism.

Let's consider this mechanism in more detail. So, the first thing that directly affects the greening of products and their distribution systems is external regulation in the form of a legislative framework and international laws in the field of marine fuel circulation. A specialized unit at the Sudeten enterprise is responsible for maintaining the ecological culture at the enterprise, as well as for the creation and implementation of various technological measures. Also, this mechanism will process emerging legislation and timely regulate the operation of the enterprise in accordance with these norms. The result will be high quality products and a distribution system that meets all applicable green standards.

Consequently, the company will receive not only environmental, but also economic benefits.

The following can be deduced as the main directions for improving the greening system:

• development of the market for the sale of liquefied natural gas;
• derivation of a formula for creating fuel with a sulfur content of 0.5% in the volume required for the bunkering market;
• strengthening of quality control in the organizational mechanism in the implementation of the sale of finished products;
• improving the greening of the process of transshipment, transportation and bunkering in the SECA zones;
• creation of a separate department responsible for the greening system at the enterprise;
• increasing environmental education at the enterprise and developing an internal environmental culture.
The development of the LNG market and the sale of this type of fuel to foreign markets is a promising direction, since world bunkering standards are constantly being tightened and environmental requirements are imposed on shipowners, in which oil-based fuel gradually becomes unprofitable and leads to a steady increase in prices for transported other products [4]. Accordingly, in order to continue their activities, shipowners are forced to reduce the cost of transporting goods. Fuel costs represent a significant proportion of the total cost of maintaining a vessel. Therefore, the first thing to pay attention to shipowners, if necessary, to reduce the cost of maintaining the ship and transportation of goods, respectively, this is the fuel on which it runs.

Energy industry experts call natural gas the fuel of this century. The consumer properties and quality characteristics of this resource are superior to crude oil in several main parameters. Also, the price of LNG is now (and in the future) lower than the price of fuel based on oil products.

At the moment, the LNG market is most developed in Norway. About 70% of all LNG-powered ships and tankers operate in the waters of this country. Russia supplies only 5% of the world LNG production so far [5]. However, an action plan to increase production has already been developed and implemented.

The development of the production and marketing system for LNG at the oil and gas sector enterprises will proceed gradually, and include several stages:

- development of infrastructure for the LNG market in Russia;
- search for new sales markets throughout the world;
- development of its own network of LNG bunkering operators, as well as the development of stationary bunkering stations.

It is worth clarifying that for the successful development of LNG fuel in Russia, it is necessary not only to re-equip ships, but also to make their bunkering and maintenance simple and convenient. For this reason, it will be necessary to develop the complete infrastructure of the LNG market in Russia, from the fuel production and bunkering phase to the repair of LNG-fueled ships.

The second task that must be solved is the creation of ultra-low-sulfur fuel in the required volumes. In 2020, a law will come into force, on the basis of which the maximum sulfur content in fuels worldwide should not exceed 0.5%. Companies whose products do not meet these standards will be forced to cease their activities.

It should be noted that the fuel that meets these IMO requirements has already been created at Russian enterprises, this is TSU-80. However, it is produced in insufficient volume for the market. This is due to the fact that the fuel desulfurization technology is multistage, and the fuel production cycle increases.

As the third task to improve the greening system at the enterprise, one can consider increasing the greening of the sales system in the SECA zones. So, recently, Gazprom Neft PJSC developed a digital management system for the logistics system in the Arctic [6]. This system was originally created to ensure year-round transportation of produced oil from the Arctic fields. Thanks to the introduction of this system in 2018, the unit costs for the withdrawal of 1 ton of produced oil decreased by more than 10%.

The CAPITAN system makes the optimal route for the transportation of oil products based on external weather conditions, as well as due to the constant scanning and analysis of space images of the route the tanker will take [7].

If this system is changed to suit the specifics of bunkering activities in the SECA zone, then it will be possible to reduce the costs of bunkering by creating an optimal route from tanker to vessel. The required volume of bunkering fuel for vessels in close proximity to each other will also be taken into account. This will make it possible to carry out sequential bunkering during one tanker exit to the sea. Moreover, the weather conditions at sea will be predicted and taken into account, which will reduce tanker downtime.
One of the advantages of implementing this system is the fact that the logistics will be optimized. The opportunity to make a decision on bunkering will be formed within five minutes, taking into account all possible risks.

Also, one of the possible areas of greening is to strengthen quality control in the sales system of finished products. It is worth noting that currently the number of spills into the waters of the ocean and seas has significantly decreased, however, small fuel spills during bunkering remain. And they occur mainly due to the human factor, the hoses through which the ships are refueled are checked by third-party organizations once a year. Each hose has a diameter of at least 30 centimeters. Due to the large diameter, even minor damage to the integrity of the hose results in significant spill volumes. By changing some stages of the bunkering and distribution system as a whole, it is possible to bring the number of spills to zero. The solution to these problems should be approached comprehensively. Thus, the first step in the changes will be to reduce the time interval for checking bunker hoses. Conducting inspections once a quarter will allow early identification of the problem and prevent subsequent environmental problems.

In addition, it is necessary to optimize the work with the personnel working on the tanker. Since more than half of the bunkering operations take place abroad, each member of the crew is required to speak one of the international languages in order to avoid a language barrier. One of the important steps in spill prevention is also the need to regularly conduct educational seminars with crew members about the frequent problems that arise during bunkering and how to solve them. To optimize and organize this information, it will be possible to create guidelines that will be located on the walls of the tanker.

The next direction of greening is to increase environmental education at the enterprise and develop an internal environmental culture. This step is not direct management of the enterprise greening system, but indirect. However, if you create and maintain the environmental education of employees, then each member of the team will understand the importance of environmental protection, will be motivated and, as a result, his activities will become the most environmentally oriented.

The main measures to create an internal ecological culture can be [8]:

- an increase in the number of seminars and educational events;
- installation of special boxes for the collection of used batteries, as well as containers for separate collection of waste;
- introduction of the “zero waste” system into office activities.

3. Conclusions

Thus, thanks to the introduction of these innovations, oil and gas enterprises will be able to build a sustainable ecological system, as well as increase profits in the long term. This favorable situation for the company in the marine fuel market will become the most likely development scenario, since due to the introduction of strict environmental standards and an integrated greening system, the company will be resistant to environmental legal regulation. This will affect the company's image, which will have a positive effect on increasing the market share in Russia, and will also contribute to entering new world markets.

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References

[1] Knizhnikov A Y and Klimentiev A Y 2019 Conversion of the Arctic fleet from fuel oil to liquefied natural gas (LNG) Russia in the World Around Business Journal NEFTEGAZ.RU 8(92) 92-103

[2] MARPOL 73/78 Annex VI (revised) to the Convention "Rules for the Prevention of Air Pollution
from Ships"

[3] Prokopenkov S V and Knyazeva A E 2018 Problems of tax management in the field of environmental management in the Russian Federation Bulletin of the National Academy of Tourism 4(48) 75-7

[4] Kostylev I I 2018 Liquefied natural gas as marine fuel: problems and prospects for their solution Transport of the Russian Federation 2(75) 74-8

[5] Buyanov A S, Semenov V E and Reutskiy A A LNG bunkering. On the need to update the system of Russian standards Business journal NEFTEGAZ.RU 5(89) 48-55

[6] Kuznetsov V A 2019 Development of logistics in the Arctic Problems of the Arctic region (Apatity: Kola Scientific Center of the Russian Academy of Sciences) p 203-7

[7] Cherenkov V I, Klimovets O V and Tanichev A V 2020 Logistic infrastructure: from the formation of a concept to the construction of a research model for the development of the Arctic Fundamental research 3 142-51

[8] Prokopenkov S V and Kovalenko E O 2018 Management of changes in the system of regulation of environmental relations Financial Economics 8 493-5