

**PRESENT ARCTIC TRANSPORT SITUATION AND CREATION OF  
ECOLOGICALLY SAFE MARINE TRANSPORT SYSTEMS FOR HYDROCARBON  
EXPORT FROM THE RUSSIAN ARCTIC OFFSHORE**

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The aim of this work is to show present situation with arctic oil-and-gas transport and give full plan of creation of ecologically safe marine transport system for hydrocarbon export from the Russian arctic offshore.

Only a few companies in Russia have special ships which can deal with ice in Arctic Ocean. Double acting ship (or DAS) is a type of icebreaking ship designed to run ahead in open water and thin ice, but turn around and proceed astern (backwards) in heavy ice conditions. Such ships can operate independently in severe ice conditions without icebreaker assistance but retain better open water performance than traditional icebreaking vessels. Russian fleet has one of the biggest amount of double acting ships in the world. Some of these ships were built in Japan and South Korea and are used now for «Rosneft» and «Norilsk Nickel ». This amount of ships is not enough for export from Arctic offshore. We analyzed that point during our research.

The Arctic holds the world's largest remaining untapped gas reserves and some of its largest undeveloped oil reserves. A significant proportion of these reserves lie offshore, in the Arctic's shallow and biologically productive shelf seas. According to the oil industry, the Arctic is the final frontier for petroleum development.

We concentrated on few certain points while planning ecologically safe marine transport system.

Development of oil-and-gas fields on the shelf of the Russian northern territories is connected with creation of transport-technological complexes (TTC) comprising offshore platforms and terminals, icebreakers, technical fleet, support and supply vessels, shuttle and open-water tankers, gas-carriers, oil storages, offshore transshipment complexes, etc.

Specific climatic conditions, light day duration, pattern of the ocean surface heat exchange with the underlying layers and the atmosphere, spatial distribution of the Earth magnetic fields, bottom contour, types of coast and shallow tides essentially reduce natural self-regulation of environment. In this connection, development of intensive navigation and creation of offshore industrial facilities in this region requires special attention to securing of ecological safety.

The basic areas of research and studies in MTS design are:

- Developing the state strategy and policy in creation of offshore technical and transport facilities and vessels, construction programs preparation;
- Developing the normative base for offshore facilities and vessels design, technical regulations, standards and rules;
- Developing the normative - technical documentation, methodical materials for offshore structures design,
- Design of new high technology vessels and facilities;
- Design of modern oil carriers of various displacement;
- Design of specialized rescue ships and ecological safety control vessels (oil and oil product spill response, oil skimmers, ecological control vessels etc);
- Environmental impact assessment of transport-technological systems;

- Definition of design type and optimum characteristics of offshore facilities of transport-technological systems, based on the problem to be solved, allowable environmental impact, maintenance of optimum habitability conditions with regard to minimum expenses on their creation and operation;
- Research and design-experimental support to design activities;
- Developing the techniques and programs for the control of habitability conditions and ecological safety on TTC facilities;
- Control over realization of normalized habitability conditions during design, construction and operation of TTC facilities by the Medical-technical center of hygiene of shipbuilding facilities, offshore structures and transport
- Evaluating the occupational risks on TTC facilities and developing measures to reduce

Ecological safety of the region when exporting hydrocarbons from the Arctic offshore can be provided only through the complex of interrelated legislative, technical and organizational measures developed with respect to specificity of TTC operation conditions.

The legislative measures include development of legislative and normative technical documentation (laws, governmental decrees, technical regulations, rules and standards).

Among technical measures are:

- Design and use of vessels meeting the international and rational requirements to Arctic operation conditions;
- Use of modern ecologically safe transport facilities and transport operations support vessels;
- Providing facilities with modern ecological equipment, water surface survey aids;
- Organizational - technical safety of cargo handling activities;
- Improving reliability and ecological safety of hydrocarbon transport systems;
- Expedient selection of means for prompt oil and other hydrocarbon spill recovery, allocation of means, equipment and oil spill response vessels.

Organizational measures include:

- Technical-hygienic monitoring of transport systems;
- Arranging local and regional ecological monitoring of water area and atmospheric air
- Arranging the operations of warning, spill survey, localizations and recovery;
- Training the personnel to act in emergencies and their examination;
- Preparation of qualified personnel, certification of TTC;
- Providing hygienically allowable conditions and labor regimes for TTC personnel and ships' crews;
- Carrying out medical examinations and developing the TTC personnel and ships crew rehabilitation system;
- Developing the measures to reduce role of human factor as a cause of emergencies;
- Developing the facility's oil spill response plans and contingency planning.

The issues of reducing negative influence of physical, chemical and psychosocial factors on shipboard personnel have acquired significant importance in solving the problems of environment protection in hydrocarbon transport, along with such issues as introduction of modern sewage treatment and disposal systems, garbage and wastes disposal systems, **air** purification systems.

For good safety functioning of Arctic marine transport systems infrastructures are necessary for developing also:

- a complex of normative requirements regarding more strict regulation of pollutants emissions (flying organic compounds, inert gases etc.) and waste disposal and effluent discharging into the Arctic environment;

- informational - analytical system for estimation of risk and safety of marine operations and of marine oil transportation around the shelf of Russia;
- a concept of ecological monitoring of oil/oil products spills on export oil routes.  
(few statements about present transport situation).