Ice Conditions as a Main Criteria When Choosing an Alternative of Oil and Gas Unloading from Offshore Fields of Sakhalin Island

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INTRODUCTION

The total area of the Sakhalin offshore which is the more investigated and oil and gas perspective part of the Russian territory in the Far East region constitutes about twenty thousand square kilometers.

Exploratory drilling on the Sakhalin offshore has been conducted since 1975. As a result of many exploration several oil and gas as well as gas condensate fields are discovered the largest of which are located on the offshore of the north-eastern Sakhalin coast.

The total hydrocarbon resources of the north-eastern part of Sakhalin island are estimated at about 1 billion tons for oil and condensate and 1.2 trillion of cubic meters for gas (Bogdanchikov, Astafiev, 1997).

High level of procedure and reliability when estimating these reserves should be noted moreover, the fact that the reliable base of resources on the Sakhalin offshore has been prepared for development should also be stated.

The potential oil and gas consumers in domestic market are the Russian regions in the Far East which at present are acute short of fuel (about 10 M tons of reference fuel in volume) (Bogdanchikov, Astafiev, 1997).

In foreign market the main hydrocarbon consumers are first of all the parties of the Asia-Pacific ocean region.

As to the “Sakhalin-2” project the first crude delivery from the block of offshore fields is planned in 1999 and under the “Sakhalin-1” project it is planned in 2001.

Under the “Sakhalin-1” and “Sakhalin-2” projects fields will be developed in accordance with the Federal law of the Sharing Production Agreements (Federal..., 1995). In this case each partner of the particular project will have a right for independent using its share of the produced resources.

At present several alternatives of produced production unloading to consumers are being discussed. As ice cover is observed on the total water area of the Sakhalin offshore the most complicated conditions for crude shipping will be in ice period so this paper represents the comparison analysis for several alternatives and some water areas where unloading terminals are supposed to be arranged.

There are two alternative ways for unloading produced resources from a platform:

- loading into special ice class tankers;
- supply to the coast using offshore pipelines.

For the second way of crude transportation the schemes of crude supply to different ports of the island or the continent with pipeline crossing through the Nevelskoy strait (Fig.1) are discussed.

1. TRANSPORT OPERATIONS IN ICE PERIOD IN THE NORTHERN SAKHALIN OFFSHORE

Crude transport when tankers are loaded from a production platform is surely the cheapest way of transport. But in arctic seas the special types of tankers should be used which can navigate freely and with assured safety.

The Okhotsk sea is classified as an arctic sea and the cyclonic type of water-mass circulation results in transport of drift ice from the northern and north-western regions of the sea to the offshore of the northern Sakhalin. When reaching the northern Sakhalin offshore the characteristics of ice are maximum from February to April (Polomoshnov, Astafiev, 1997).

The peculiarity of ice cover evolution on the north-eastern Sakhalin offshore is that the fast ice followed by polynya and then by a strip of drift ice is observed along the shore in the period from February to April (Fig.2). Ice conditions are very unsteady in the course of changing fast ice, polynya and ice strip spatial characteristics. It should be noted that in total mass of drift ice there is a belt of “heavy” ice characterized by its maximum values (Polomoshnov, Astafiev, 1997).

Sailing routes being planned in this region can be divided into 2 parts (Fig.2):

- movement of ships from the regions of open ice to a platform through the ice strip and back (supply ships, tankers, ice breakers); (movement of ships from a platform to the shore and back (supply ships, ice breakers, oil skimmers and others).

Drift ice of local origin appears on water area of fields in November and disappears usually in June or July. At this period movement of ships only of ice classes is possible in the area of fields.

The most complicated ice conditions for shipping are from March to April but sometimes in early May.

Some expeditions conducted in this area with using ice-breakers showed that even LL2 class ice breakers (CAC-2 class of Canadian classification) underwent some difficulties and could not