Сырая нефть: $С_{хр}$ = ((116198100,00+13943772,00) – 255· (500774,40)) /35769,60 = 68,34 руб.

Согласно расчету стоимости $С_{хр}$ в терминале более предпочтительным при перевозке мазута топочного и дизельного топлива становится второй маршрут перевозки, а для сырой нефти – первый маршрут. При стабильном грузопотоке жидкого топлива в нефтяные терминалы и росте инфляции 7% годовых приведены графики (рис. 3, 4) по первому и второму маршрутам по стоимости хранения жидкого топлива в течение пяти лет.

Далее представлен расчет окупаемости постройки резервуарного парка согласно выражению (2) для данной задачи.

Для первого маршрута:

Мазут: 129763300,00+15571596,00 = 280·500774,40+122,64·41 731,20, то есть 145334896,00=145334896,00 руб.;

Дизельное топливо: 215039770,00+25804772,40 = 233·1001548,80+119,55·62596,80, то есть 240844542,40=240844542,40 руб.;

Сырая нефть: 135434600,00+16252152,00 = 255·584236,80+64,85·41731,20, то есть 151686752,00=151686752,00 руб.

Для второго маршрута:

Мазут: 110032612,00+13203913,44 = 280·429235,20+85,29·35769,60, то есть 123236525,44=123236525,44 руб.;

Дизельное топливо: 184035670,00+22084280,40 = 233·858470,40 + 113,62·53654,40, то есть 206119950,40=206119950,40 руб.;

Сырая нефть: 116198100,00+13943772,00 = 255·500774,40+68,34·35769,60, то есть 130141872,00=130141872,00 руб.

Согласно проведенным расчетам можно констатировать, что для каждого варианта резервуарного парка при названных тарифах окупаемость стальных резервуаров без учета стоимости причальной инфраструктуры и арендованной или выкупленной земли произойдет в первый год эксплуатации.

ЗАКЛЮЧЕНИЕ

С учетом возможных путей и результатов развития терминального нефтяного комплекса проанализированы некоторые показатели терминалов российской береговой линии. Выбор того или иного из них для включения звеном в логистическую цепь поставки определяется меньшими затратами и сроками на доставку жидкого топлива.

Новизна ожидаемых решений с помощью предлагаемых подходов заключается в определении рациональных объемов терминалов, окупаемости средств при создании и эксплуатации хранилищ жидкого топлива. Показан пример оптимального по стоимостным показателям маршрута доставки груза из пункта А в пункт В в зависимости от существующих грузопотоков, сроков транспортировки и хранения жидкого топлива в терминальных резервуарах береговой зоны.

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SELECTION OF COASTAL TERMINALS FOR STORAGE OF LIQUID FUEL

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ABSTRACT

The article provides an analysis of costs of liquid fuel storage at port and coastal terminals involved in freight transportation. Among other things, it gives estimation of selection of tanks' rational volumes, payback period of buffer tanks construction, cost of storage for one ton of crude oil, fuel oil, diesel fuel per day, transportation of such goods in autumn-winter and spring-summer periods on certain routes. Moreover, on the basis of indicators of terminals of Russian coastline most appropriate criteria and their operating conditions are named by adding as a link in the supply chain, which is based on lower costs and delivery period.

ENGLISH SUMMARY

Background.

When choosing cargo transportation company transport quality criteria are ranked in the following order, depending on their importance: price, timely delivery of cargo, possible delivery «from door to door».

The need for combined freight transportation is in demand if it is required to deliver cargo to the destination place directly. For example, if there are no special access routes to the destination from railway station, river or sea port. The most important is to identify key criteria: rational scheme and route traffic, time and location of transshipment of liquid fuel, prices, and terms. The intensity of cargo handling depends on uneven arrival of vehicles, cargo volumes, and harmonization of transport parties, which leads to expediency of storage of goods at terminals.

Objective.

The author aims at providing calculation for optimal storage of liquid fuel in coastal terminal complexes.

Methods.

The author uses mathematical methods.

Results.

In the transport system great attention should be given to the terminals, since the efficiency of the system and the possibility of its functioning (because of different traffic and delivery capacity) depends on the location and functions of terminals in the transport system, which is able to smoothen capacity of freight flows. The specifications and rationality of terminals' placement determines the level of efficiency and quality of the entire system of freight transportation system. In turn, the main characteristic of the oil terminal is the tank farm. With the increasing volume of reservoirs the number of daily costly delays of tank wagons reduces due to unacceptance and losses suffered by transport companies, turning railway rolling stock in the warehouse on wheels.

The author selected the following indicators as factors affecting the development of terminals:

Choice of rational tank volume is calculated by the formula:

$$V = (\sum_{k=i_1}^{i_N} N_1 * 0{,}92 * \sum_{k=i_1}^{i_N} T_1 / 30) - (\sum_{k=i_1}^{i_N} N_2 * 0{,}92 * \sum_{k=i_1}^{i_N} T_2 / 30), \quad (1)$$

N_1 *– freight flow coming into the port, t.;*

N_2 *– freight flow, leaving the port just in time (taken as 70% of the flow coming into the port), t.;*

T- *travel time on the road i, days;*

As 0.92 an assumption is taken that the average delay of cargo is 2 hours in transit.

Payback of buffer tanks' construction in the terminal:

It is taken into account that, costs affecting the construction and operation of an oil terminal include:

C *– construction costs (investments), rub.;*

Эn*– operating costs, rubles / day, (n- number of days).*

Income factor depends on the handling and storage of liquid fuel:

$C_т$ *– transshipment cost of liquid fuels, rub / ton;*

Tn*– quantity of transshipped cargo, tons, (n- number of days);*

$T_п$ *– constant amount of tons per tank (assumed to be 75% of the volume of the tank);*

$C_{хр}$ *– cost of fuel storage, rub / ton per day.*

Payback formula of buffer tanks' construction in the terminal will be:

$$C+Эn= C_T Tn+C_{хр} T_П n \quad (2)$$

For a decision on the definition of storage cost of 1 ton of fuel per day in the terminal (calculated as designated payback period of the terminal), it is assumed that the full cost of the terminal have to be paid back for the «n» days after its launch. For this reason cost of storage of 1 ton of fuel per day $C_{хр}$ is determined by the expression:

$$C_{хр} = \frac{C + Эn - C_T Tn}{T_П n}. \quad (3)$$

Conclusion.

To illustrate the possible ways and results of development of oil terminal complex some indicators of Russian coastline terminals have been analyzed. The choice of the oil terminal to be included as a link in the logistics supply chain is determined by lower costs and deadlines for delivery of liquid fuel. The novelty of the alleged solution is to use the method of objective assessments, as well as a methodical approach to determine the choice of a rational volume of a terminal, its payback and cost of storage of 1 ton of fuel in the terminal. A practical example of the rational choice of the route of delivery of liquid fuel from point A to point B has been shown. The data on the rational choice of the tank volume, depending on traffic and time of delivery of goods are given. The cost of storage of liquid fuel in the tank is shown as a function of the cost for the construction of reservoirs and their operation.

Keywords: *logistics, economics, transportation, fuel, seaport, coastal terminal, storage, costs, costing, payback.*

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