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The Methodic For Determining the Structure of the Park of Refuelers for Transport Divisions in the Pipeline Industry.

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ABSTRACT

The article deals with the problem of planning the demand for fuel for transport and technological machines in the repair of oil pipelines. The analysis of the factors influencing the demand for fuel. Determined regression model based fuel demand from industrial and technological factors. A mathematical model for determining rational the number of refuelers for transport and technological machines used in the process of repair of oil pipelines in Western Siberia. Defined regulatory requirement in the structure of the park refuelers depending on the scope of work to repair the main oil pipelines.
Keywords: refuelers, maintenance and repair of vehicles, transport and technological machines, fuel supply , repair of oil pipelines

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INTRODUCTION

During repair of main oil pipelines (MOP) there is a need in the carriage of goods and passengers, and most importantly - the services of special equipment on the chassis of cars. Moving them over long distances for fuel filling works associated with an increased expenditure of time. Therefore, filling such a technique is performed on-site repair (MOP).

Therefore, comes to the fore smooth operation of special vehicles, as losses from the main production downtime due to lack of transport and technological machines disproportionately higher [1].

Increase park refuelers beyond what is necessary leads to increased costs for the purchase and maintenance of machines. Insufficient number of refuelers leads to idle crews repair the pipeline and primary production. Therefore the number of filling means must be such as to fully satisfy the needs of the park and to prevent machine downtime and, at the same time, the number of filling means should not be excessive.

Based on the analysis of literary sources, regulations and work experience found that the repair of the pipeline is a time-consuming process, which employs vehicles and special equipment on their base, stationary equipment and manpower. Repair of the pipeline is carried out by the following methods: cutting the repair area (replacement of "coil"), the installation of the coupling, welding, grinding. At the same time planning fuel requirements based on the principle "of achieved" that is, with the help of experimental and statistical methods based on previous periods of time; in determining the demand for fuel is not taken into account the parameters of the repaired section of the pipeline is not taken into account the amount of work to repair MN for the coming year.

An approach to the solution of the optimization problem of fuel supply special equipment [2]. Proposed to optimize the size of fuel in the park with the use of specialized equipment inventory management model. Building on this model, the method to minimize the total cost of the creation of reserves and the cost of storing them with the probability factor in the maintenance of equipment. The criterion in this method is to minimize total downtime points and machines requiring refueling. The input data for the calculation of the refueling point is the number of cars each species in the park, the capacity of one station refueling, time and cost of construction of the refueling point. However, this method of supplying fuel to special equipment like tankers, the work has not been addressed.

The problem of optimizing the car park there is in many industries, such as construction. The study of standard size of the fleet of construction machinery refers to the important tasks of an applied nature. Proper application of which will greatly improve the use of construction equipment, the whole impact on the efficiency of the construction companies or independent databases mechanization. To solve a problem Tukaeva Z. using simulations and criterion of a minimum of reduced expenditures for the execution of the annual volume of work [3].

In the work by Khovalyg, H-D. K. the basis adopted by multiple criteria model, which allows you to optimize the composition of the park for several objective functions, offering thus several options, depending on the tasks.

In the thesis, this method was further developed through the application of the developed models of the dynamics of the market price of cars, accounting reduced machine time, research results indicating recovery equipment during overhaul, taking into account the seasonality of the use of machines in the Republic of Tyva [4].

In the above proposed methods to optimize fleet of construction machinery does not reflect the impact of production and technological factors affecting the demand for equipment to perform the scope of work.

Found that in the previously conducted studies [5,6,7,8,9,10] no modern optimization techniques based on mathematical modeling and simulation on such areas as the definition of the structure of the park refuelers for transport divisions in the pipeline industry in the pipeline industry.

Thus, the development of techniques to optimize the structure of the park fueling facilities must take into account the working conditions of service vehicles: the climatic conditions during the repairs of the main oil pipelines, distance running technique from the main bases, the amount of work to repair the main oil pipelines, development of transport infrastructure and etc.

Based on the above, the creation of methodology to determine the structure of the park refuelers for transport divisions in the pipeline industry is an actual scientific task.

METHOD

The objective function

The purpose of research - improving the effectiveness of the fuel supply based on the determination of the structure of the park refuelers and patterns of production and the impact of technological factors of the repair of oil pipelines on need for fuel.

We used the theoretical and experimental research methods - system analysis, probability theory and mathematical statistics, the theory of risk, simulation.

To determine the regularities of the fuel needs a systematic approach was applied. According to him, the first step is to determine the performance criteria of the studied system [11].

In order to increase the efficiency of the system of departments of transport divisions in the pipeline industry is to ensure reliable operation of the objects of the linear part of trunk pipelines with the smallest total unit costs.

As a criterion for the effectiveness of the system under study, it is advisable to use the graduation rate cars on line [alpha]$_r$. Therefore, the objective function is given by:

$$\alpha_r = \frac{T_E}{T_E + T_{MR} + T_w} = \frac{\sum_{i=1}^{Ac}\sum_{m=1}^{4} Nrep_m \cdot Lrep_m^i}{\sum_{i=1}^{Ac}\sum_{m=1}^{4} Nrep_m \cdot Lrep_m^i + T_{TOuP} + (t_d + t_{zap}^i \cdot A_{zap} + t_{oj} + t_{dr})}, \quad (1)$$

$$\rightarrow \max$$

where T_E – mean residence time of vehicles in operation, h; T_{MR} – the average time spent in the vehicle maintenance and repair, h; T_w – the average waiting time of vehicles for organizational reasons, h; A_c – vehicles involved in the repair of the pipeline, units; m – pipeline repair method; N_{rep} – number of repairs pipeline, pieces; $L_{rep\,m}^{i}$ – while working on a car repair pipeline, h; t_d – time delivery of fuel oil to the place of repair, h; t_{zap}^{i} – while filling a piece of transport and technological machines, h; A_{zap} – vehicles requiring refueling, units.; t_{oj} – delivery time on point of delivery of fuel for refuelers, h; t_{dr} – downtime vehicles other organizational reasons (weekend, weather and climatic conditions, lack of staff), h.

At the same time, as a limitation of the objective function, the total unit cost ΣC on Fuel Supply vehicles must have a least:

$$\Sigma C = (C_{fc} + C_{del} + C_{st} + C_{im} + (C_{mh} \times \Sigma T_{mh}) + (C_{MOP} \times \Sigma T_{MOP})) / A_c \rightarrow \min, \quad (2)$$

where C_{fc} – fuel costs, ths. rub.; C_{del} – fuel delivery costs (operation refuelers), ths. rub.; C_{st} – the cost of storing fuel, ths. rub.; C_{im} – losses from the immobilization of funds in stocks, ths. rub.; C_{mh} – the cost of transport services, ths. rub ./h; T_{mh} – latency fuel for automotive technicians in the repair of oil pipelines, hour; C_{MOP} – loss of one hour of downtime oil pipelines, ths. rub .; T_{MOP} – pipeline downtime due to waiting for fuel for cars, hour;

Investigated system

In the first stage system "pipeline repair options - Need fuel" structured, determined interaction model elements and assembled model system [12]. The model is presented as a simulation.

Block-diagram of the fuel needs can be represented as follows (figure 1).

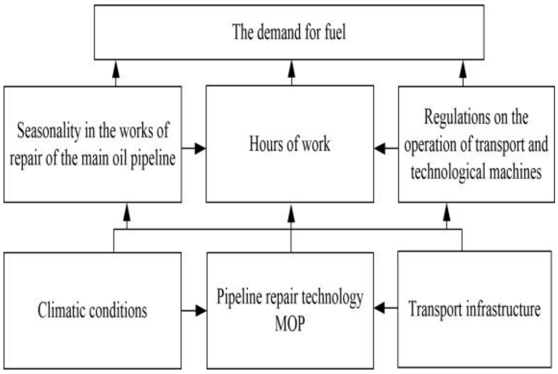


Fig.1. Block diagram of the formation of the fuel needs during the repair work on the pipeline

For the coming year is the schedule of repairs N_{rep}=(n_1, n_2, …, n_k) for each pipeline of regional administration of main oil pipelines (RAOP).

The parameters of the pipeline repair nk are random, ie, find out which parameters will repair the pipeline at each repair is not possible in the next year.

Consequently, the amount of work to repair the pipeline n_k will also be random in nature, which will depend on the type of defect of the pipeline and the method of its elimination M_p.

Fuel consumption by road when the scope of work to repair the pipeline increases with time. At every point in time implementation of fuel consumption by individual units of equipment are random. This is caused by the random nature of the influence of various factors.

To localize this structure analytically defined list of factors that significantly affect the elements of the system, which can be taken into account in the mathematical model of the formation of the fuel needs.

The determining factor in climatic conditions is the temperature, which is characterized by monthly average and varies throughout the year. Soil type T, the weather conditions (temperature t, rainfall Dos) have a direct impact on the seasonality of the work to repair the pipeline and automotive equipment operating time:

$$L = f(t, S_t, D_{os}).$$

The influence of climatic conditions on the fuel consumption of automotive engineering in the regulations is expressed as a regional factor correction, depending on the time of year T [13]:

$$D = f(T).$$

For the repair of trunk pipelines are different technology of repair, depending on many factors: the state and the parameters of the pipe (diameter d, the wall thickness S, the length of the repair area l_r), type of defect:

$$Tr = f(d, S, l_r)$$

Depending on the technology pipeline repair Tp change operation to eliminate the defects, repair team composition, duration, and scope of work Q [14]:

$Q = f (T_r, d, S, l_r)$.

Hours of automotive engineering L depends on many factors: the climatic conditions, the amount of work to repair Q, transport infrastructure of the area of work, which is characterized by the distances between the elements of the production base (PB) L_{PB}, types of roads R_t, speed of movement techniques V [15,16]:

$L = f(T_r, Q, L_{PB}, R_t, V, t, S_t, D_{os})$.

In general terms, the fuel requirement is [17]:

$Q_{tot} = f(L,T)$.

Mathematical model of the fuel needs for the repair of mail pipelines

The total fuel consumption Q_{tot} for repair work includes Q_{at} consumption of fuel for the transportation of goods by road, pipeline repairs special car Q_{sa} on the job site [18]:

$$Q_{tot} = Q_{at} + Q_{sa}, \quad (3)$$

Fuel requirement Qat determined by the type of rolling stock, range and volume of traffic:

$$Q_{at} = \sum_{i=1}^{K} \sum_{j=1}^{L} q_{H_{kl}} \cdot l_{kl}, \quad (4)$$

where K – the number of brands of cars involved in the transport operation, units; L – the number of cars the i-th brand, units; q_H – fuel consumption on a car running, l / 100 km; l_{kl} – mileage, km.

For special vehicles fuel requirement is divided into two parts - fuel consumption while driving and fuel consumption when operating attachments - and is given by:

$$Q_{sa} = \sum_{k=1}^{K} \sum_{l=1}^{L} H_k \cdot \frac{Q_k}{P_k} + q_{H_{kl}} \cdot l_{kl}, \quad (5)$$

where K – the number of brands of special cars involved in the transport operation, units; L – the number of cars the i-th brand, units; H_k – the rate of fuel consumption per unit of time k-th car brand, l / Moto-h; Q_k – scope of work (depends on the parameters of the pipeline) performed k-th car brands; P_k – operational performance of special vehicle k-th mark.

In the winter, technology, are expected to participate in operations to repair the pipeline, idling, as must be ready to perform work to maintain in working order and prevent freezing hydraulic machines. Fuel consumption at idle Q_{xx} is given by:

$$Q_{xx} = \sum_{k=1}^{K} \sum_{l=1}^{L} H_{xx.k} \cdot T_{xx.k}, \quad (6)$$

where $H_{xx.k.}$ – standard fuel consumption at the rate of one hour parking (idle) with the engine running, l / h; $T_{xx.k.}$ – when stationary (idle) with the engine running, h.

Due to the fact that the pattern of use changes in the operating conditions and time are described sufficiently complex models developed simulation model of fuel demand [19]. The algorithm model is shown in figure 2.

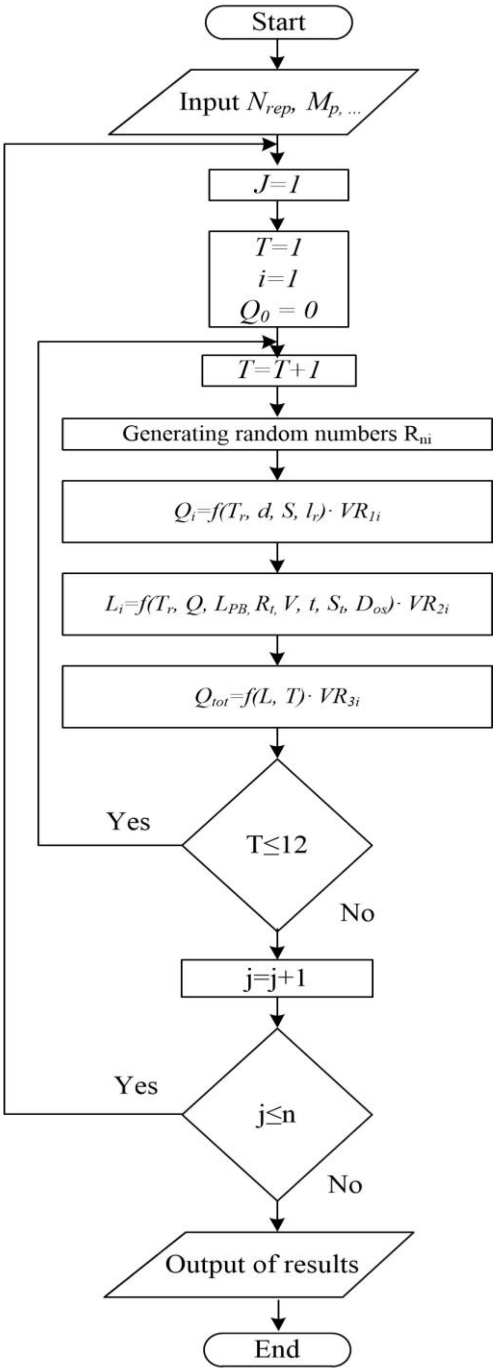


Fig.2. Algorithm simulation model of formation of the fuel needs

Based on analysis of previous studies hypothesized form of mathematical models of the impact of production and technological factors on the demand for fuel. It is assumed that the relationship of the total fuel flow is described by a linear model [20]:

$$Q_{tot} = a + b \cdot x, \quad (7)$$

where a, *b* – coefficients of the equation; *x* – production and technological factor.

In the case of simultaneous influence of several factors supposed to use additive models:

$$Q_{tot} = a_0 + a_1 \cdot x_1 + a_2 \cdot x_2 . \quad (8)$$

Check the type of dependence can be based on the experiment.

Method of determining the optimal number of refuelers in the repair of the main pipeline.

In determining the structure of the of the park refuelers should strive to increase the graduation rate *[alfa]$_r$* while minimizing the cost of their operation [21]:

$$C_{del} = A + W_d + C_{fl} + C_{MR} + C_{tax} \rightarrow \min , \qquad (9)$$

where C_{del} – total operating costs refueler s i-th size, rub.; A – depreciation, rub .; W_d – wages of drivers, rub .; C_{fl} – the cost of fuel and lubricants, rub .; C_{MR} – the costs of the service and repair, rub .; C_{tax} – tax on vehicle owners, rub.

In this condition must be satisfied:

$$T_{zp} \leq T_{fot} \cdot N_{TZ} , \quad (10)$$

where T_{zp} – while filling the entire machinery, h; $T_{fot.}$ – fund operating time of refuelers, h; N_{TZ} – the number of refueler s, units.

An analysis of existing techniques model was developed to determine the required number of mobile refueling facilities for vehicles involved in the repair of oil pipelines. This model takes into account the laws of formation of a car's fuel from the production and technological factors repairs of main pipeline.

When refueling equipment for pipeline repair is defined as:

$$T_{ztot} = \frac{Q_{tot}}{V_{ft.}} \cdot t_z , \qquad (11)$$

where Q_{tot} – Car fuel demand in the repair of the main oil pipeline, l; $V_{ft.}$ – the average size of the fuel tank, l; t_z – duration of filling one machine, h.

Fund operating time of the refueler is defined as:

$$T_{fot} = [T_w \cdot D_{rep} - (T_{z.tz} + T_{move.})] \cdot k_{tz} \cdot k_{em} , \quad (12)$$

where $T_{w.}$ – the duration of the work shift refueler, h; D_{rep} – during the repair work days; $T_{z.tz.}$ – when refueling refueler, h; $T_{move.}$ – time to move the refueler, h; K_{tz} – coefficient of use refueler's time; K_{em} – coefficient of use refueler's capacity.

Time refueler movement can be represented by the expression:

$$T_{move} = \frac{L_{PB}}{v_{tz}} \cdot 2n_{ez} + \frac{l_{b.rep.} \cdot (N_{rep} - 1)}{v_{tz}} \cdot n_{ez} , \qquad (13)$$

where L_{PB} – distance from base to the jobsite, km; $l_{b.rep.}$ – total distance between repairs, km; N_{rep} – the number of concurrent repair; v_{tz} – average operating speed refueler, km / h; n_{ez} – rider number of base to the place of work.

Number rider from base to the place of work is defined as:

$$n_{ez} = \frac{Q_{tot}}{Q_{tz} \cdot 1000}, \qquad (14)$$

where Q_{tz} – size refueler, m^3.

Algorithm for selecting the optimal number of refuelers is shown in figure 3. First you choose the number, types and duration of repairs, while those used in the calculation of their characteristics, the length of repairable items, the distance from the base to the nearest repair, repair and distance between the average rate of technical means filling. Next from the database of vehicles chosen a specific model or size refuelers, and one piece of equipment is calculated time refueling vehicles.

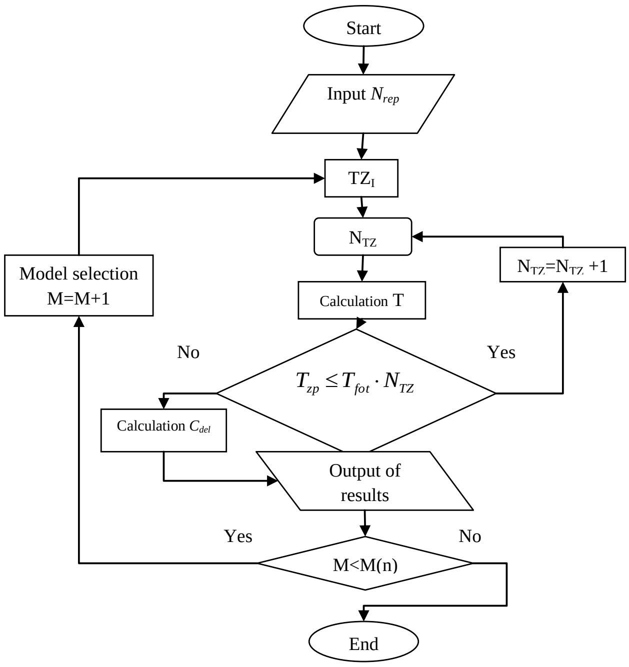


Fig.3. The algorithm for calculating the required number of tankers

If it is lower than desired, then the amount of refuelers incremented $N_{TZ} = N_{TZ} + 1$. Upon reaching fulfill the full range of works on refueling vehicles calculation is terminated, and the resulting amount of refuelers estimated operating costs.

Further, a similar calculation is repeated for the next model refueler. According to the results of calculations for all repairs shaped table quantitative composition refuelers each model, as well as operating costs.

RESULTS

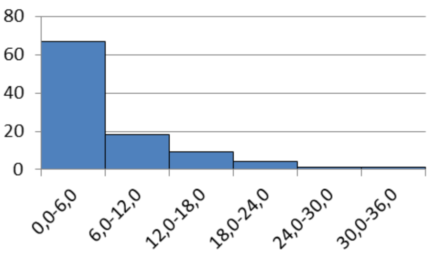
Experimental studies included the following steps:

- definition of industrial and technological factors pipeline repair affecting the demand for fuel for cars;
- verification hypotheses about the form of mathematical models depending on the fuel needs of the industrial and technological factors;
- determination of the numerical values of the parameters of mathematical models of the formation of a car's fuel needs in the repair of oil pipelines;
- simulation fuel vehicles in the repair of oil pipelines and tankers for determining the structure of the park for departments of transport divisions pipeline industry in order to verify their adequacy.

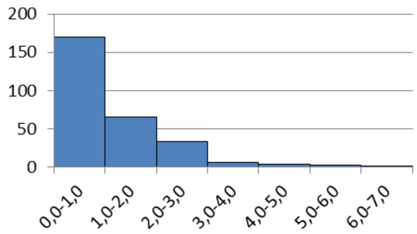
The type and parameters of distribution laws are used in the simulation model to simulate the fuel demand for cars in the repair of trunk pipelines

Analyzed about 600 repairs of main oil pipelines and estimated sample lengths repaired pipeline sections by different methods. Graphical view of the received laws is presented in figure 4. Similarly, estimated the actual distance from the sample database to the point of repair MOP (table 1). The data were obtained for 8 company which serves the oil pipelines in Western Siberia [22].

The findings were used in the experiment with the use of simulation to obtain data on the operating time of equipment and fuel consumption in the repair of the pipeline.



a)



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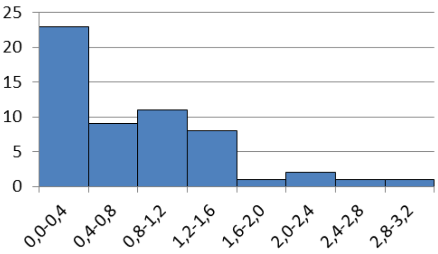

c)

Fig.4. Distribution of the length of the repair area Nizhnevartovsk RAOP:
a) when replacing the pipe section (V=1,08; M_x=5,50; l_{min}=1,53; l_{max}=33,30);
b) when installing the muff (V=1,01; M_x=1,25; l_{min}=0,30; l_{max}=6,10);
c) during grinding, welding (V=0,88; M_x=0,73; l_{min}=0,04; l_{max}=3,04).

Table 1: The laws of distribution of the distances from the base to the point of repair RAOP

RAOP	The number of bases in RAOP	The law of distribution of the actual distance	Coefficient correlation	Mean, km	Maximum value, km
Tobolsk RAOP	6	Normal	0,99	22,6	75
Nizhnevartovsk RAOP	4	Exponential	0,99	25,2	83
Tyumen RAOP	6	Gamma distribution	0,99	27,9	108

Determination of the list of factors affecting the demand for fuel in the repair of the pipeline network was carried out on the basis of correlation analysis of data obtained as a result of the experiment on the simulation model. Valuing the pair correlation coefficients for the t-test showed that a significant linear correlation with the total fuel requirements for various repairs of main pipelines have length of the repair area and the distance from the base of the work.

To confirm hypotheses about the form of mathematical models of influence factors on the demand for fuel in the repair of trunk pipelines and determine the numerical values of model parameters to conduct experiments on a simulation model based on established distributions. Pre-tested accuracy of the calculations obtained by the simulation model, according to JSC "Sibnefteprovod". The experiment showed that the level of significance of the model is 95%.

The initial data, according to the matrix of the experiment, sets the value of factors determines the fuel requirement for the various methods of repair of the pipeline and the seasons of the year.

Research vehicle fuel consumption at different methods of repair of the pipeline could establish Q_{tot} dependence of the form:

$$Q_{tot} = a_0 + a_1 \cdot l_r + a_2 \cdot L_{PB}, \quad (15)$$

where a_0, a_1, a_2 – coefficients of the equation taken depending on the method of repair of the pipeline; l_r – the length of the repair area of the pipeline, m; L_{PB} – the distance from the base to the place of repairs, km;

The value of the coefficients a_0, a_1, a_2 depending on the method of repair of the pipeline and the time of year determined to Nizhnevartovsk, Tobolsk, Tyumen (table 2) RAOP and the other of RAOP JSC "Sibnefteprovod".

Thus, the total fuel requirement Q_{tot} for N repair of various repair methods M_p for the period of time t in the general form is as follows:

$$Q_{tot} = \sum_{m=1}^{M_p} \sum_{n=1}^{N_t} (a_0 + a_1 \cdot l_r + a_2 \cdot L_{PB}). \quad (16)$$

Table 2: The value of the coefficients a_0, a_1, a_2 depending on the method of repair of the pipeline and the time of year

Period of work	Repair method								
	Replacement of a section pipes			Installing the muff			Grinding / welding		
	a_0	a_1	a_2	a_0	a_1	a_2	a_0	a_1	a_2
Nizhnevartovsk RAOP									
December-March	3788,2	31,6	22,9	910,8	50,8	14,8	587,3	38,4	11,8
April, November	1930,2	50,3	21,2	859,8	53,9	19,9	567,9	19,7	13,9
May-October	1343,3	44,5	19,6	573,1	49,2	14,8	395,1	43,4	11,4
Tobolsk RAOP									
December-March	3716,1	37,4	25,4	870,9	54,5	19,4	567,3	51,4	14,2
April, November	1942,1	47,6	22,1	911,3	45,1	15,7	598,8	44,5	12,0
May-October	1359,9	46,7	19,6	564,6	48,2	15,8	392,9	49,5	11,9
Tyumen RAOP									
December-March	3652,6	31,5	26,1	923,2	48,6	17,2	549,4	36,0	14,6
April, November	1954,9	48,2	20,0	896,8	46,0	15,4	588,5	54,0	11,3
May-October	1386,6	40,6	19,6	533,1	43,0	16,9	390,8	44,7	11,7

The value of the coefficients a_0, a_1, a_2 depending on the method of repair of the pipeline and the time of year also obtained for Ishim RAOP, Urai RAOP, Surgut RAOP, Nefteyugansk RAOP, Noyabrsk RAOP.

DISCUSSION

The resulting regression model allows us to predict the overall need for fuel vehicles as a specific number of repairs of the pipeline, and the calendar period of time taking into account the technology works and conditions of the area proleganiya pipeline.

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With the resulting simulation model can determine the size and number of refuelers as for the whole year, depending on the plan repairs MOP, and in particular repair of the pipeline taking into account the distance from the base, which has a fleet refuelers, to the place of work. For basic sizes tankers determine the radius of action in both of the 5, 10 and 15 MN repairs.

There are two options for determining the structure of the park refuellers in the repair of trunk pipelines.

The first option is the definition of the need for tanker depending on their size, the number of simultaneously running repairs and distances from base to the place of work on the repair of the pipeline using the calculated ratios. Simulation results are presented in table 3 [23].

Table 3: Regulatory requirements for mobile refueling equipment

Refueling equipment	The number of refueling equipments at L_{PB}, km											
	10	20	30	40	50	60	70	80	90	100	110	120
5 repairs												
Refuelers with a capacity of 4,9 m^3	1	1	1	1	1	1	2	3	4	-	-	-
Refuelers with a capacity of 6,5 m^3	1	1	1	1	1	1	1	2	2	3	3	-
Refuelers with a capacity of 7,5 m^3	1	1	1	1	1	1	1	2	2	2	3	4
Refuelers with a capacity of 10 m^3	1	1	1	1	1	1	1	1	1	2	2	2
Refuelers with a capacity of 12 m^3	1	1	1	1	1	1	1	1	1	1	2	2
Refuelers with a capacity of 15 m^3	1	1	1	1	1	1	1	1	1	1	1	1
Refuelers with a capacity of 17 m^3	1	1	1	1	1	1	1	1	1	1	1	1
10 repairs												
Refuelers with a capacity of 4,9 m^3	1	2	2	3	5	-	-	-	-	-	-	-
Refuelers with a capacity of 6,5 m^3	1	2	2	2	3	4	-	-	-	-	-	-
Refuelers with a capacity of 7,5 m^3	1	2	2	2	3	3	5	-	-	-	-	-
Refuelers with a capacity of 10 m^3	1	1	1	2	2	3	3	3	6	-	-	-
Refuelers with a capacity of 12 m^3	1	1	1	2	2	2	3	3	3	5	-	-
Refuelers with a capacity of 15 m^3	1	1	1	2	2	2	2	3	3	3	3	-
Refuelers with a capacity of 17 m^3	1	1	1	2	2	2	2	2	3	3	3	4
15 repairs												
Refuelers with a capacity of 4,9 m^3	3	3	-	-	-	-	-	-	-	-	-	-
Refuelers with a capacity of 6,5 m^3	2	3	3	5	-	-	-	-	-	-	-	-
Refuelers with a capacity of 7,5 m^3	2	3	3	4	-	-	-	-	-	-	-	-
Refuelers with a capacity of 10 m^3	2	2	3	3	3	6	-	-	-	-	-	-
Refuelers with a capacity of 12 m^3	2	2	3	3	3	4	4	-	-	-	-	-
Refuelers with a capacity of 15 m^3	2	2	2	3	3	3	3	4	-	-	-	-
Refuelers with a capacity of 17 m^3	2	2	2	2	3	3	3	3	4	-	-	-

Second option: using the program «Fuel Supply» as a workstation for a mechanical engineer, allowing for the implementation of the plan of repairs trunk pipeline to predict the need for fuel and fleet refuelers required for the effects of production and technological factors on the demand for fuel and sizes , brands and models refuelers, the cost of their operation.

The economic effect is 2328 rubles per month for a single piece of equipment by reducing the unit cost of fuel by providing objective planning fuel requirements, taking into account the amount of work to repair the main oil pipeline and optimize the number and size refuelers.

CONCLUSION

1. The need for fuel for departments of transport divisions pipeline industry depends on the production and technological factors repairs of main pipelines in Western Siberia. The revealed dependence is described by a linear additive regression model and allows an objective to plan fuel requirements, taking into account the amount of work to repair the pipeline network during their implementation, methods of execution pipeline repairs, lengths of repair areas, distances from the base to the place of work to repair MOP.

Confirmed experimentally determined value and the numerical values of the model the effect of production and technological factors repair the pipeline to the need for fuel.

2. Simulation model car fuel consumption and determine the structure of the park refuelers for departments of transport divisions pipeline industry, based on the identification of patterns of formation of fuel, mathematical models and algorithms for determining the number of mobile means filling a certain size. The result of the experiment on the simulation model are standards needs refuelers, depending on the size, the number of simultaneously running repairs on the section of the pipeline and the distance from the base, which has a fleet refuelers, to the place of work to repair the pipeline. For basic sizes refuelers defined maximum ranges while performing repairs 2-5 MOP: for 4,9 m^3 – 60 km, for 6,5 m^3 – 85 km, for 7,5 m^3 – 95 km, for 15,0 m^3 – 180 km.

3. Methods of determining the structure of the park road refuelers for departments of transport divisions pipeline industry implemented as a program «Fuel Supply» a workstation for a mechanical engineer, allows, in contrast to the known, to implement the plan of repairs trunk pipeline to predict the need for fuel and the necessary park refuelers, taking into account the impact of production and technological factors on the demand for fuel, as well as sizes, brands and models refuelers, the cost of their operation.

4. The results of the implementation of the developed technique in JSC "Evrakor" confirmed its practical significance: changes in the number and size refuelers and objective planning fuel requirements, taking into account the amount of work to repair the main oil pipeline, completed in accordance with the established procedure will improve the efficiency of fuel supply due to reducing the unit cost of fuel security. The economic effect amounted to 2328 rubles a month for one piece of equipment. Also, research results are used in the learning process in the preparation TSOGU engineers and bachelors for autotransport.

5. During the analyzes, it was found that substantially fuel requirement dependent on climatic and production process conditions. Therefore, from these same conditions and parameters should depend fuel inventory management. Since the replenishment can be performed at any time, you must first set the size of the safety stock, and then, taking into account the time for delivery, to determine the time of delivery. Therefore, it is necessary to solve the problem of determining the time at which should be performed replenishment of fuel to a certain level of security to ensure smooth operation of automotive engineering.

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