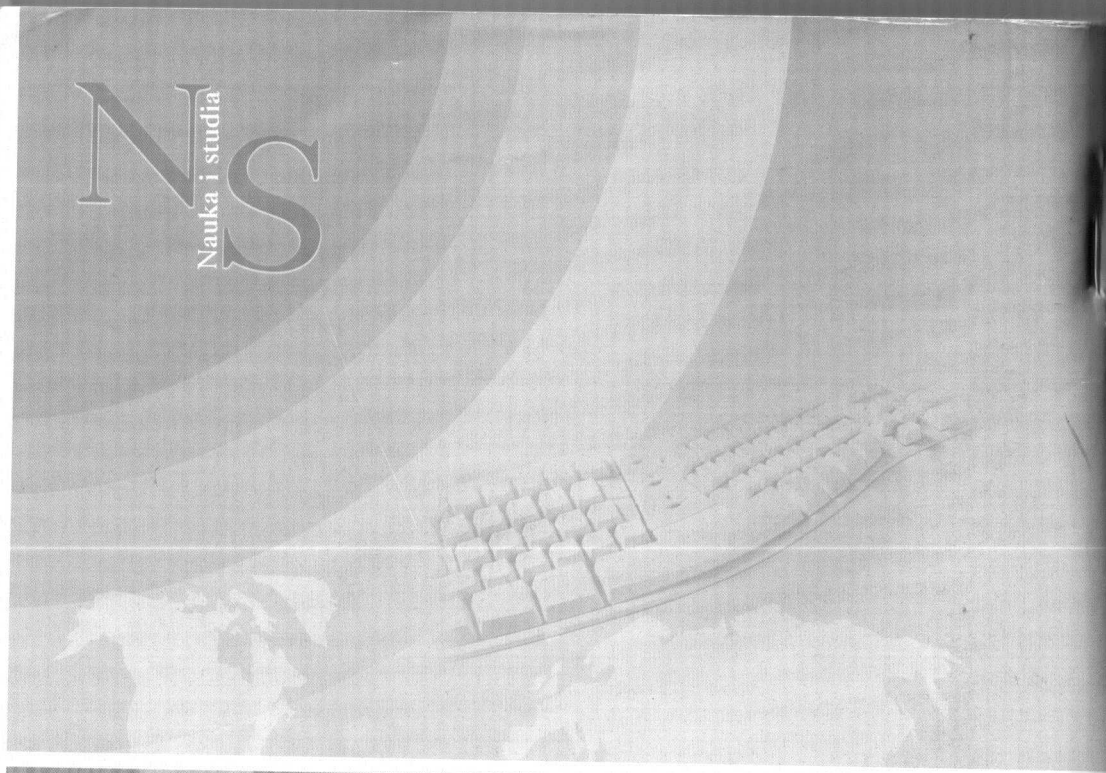

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TREŚĆ

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AN APPROACH TO RATIONAL VEHICLES NUMBER FOR TRANSPORTATION MATERIALS FLOWS WITH VARIABLE PARAMETERS

Abstract. *The material flow parameters variations during the transportation service period have to fit demand requirements. The technological, economical and other customers' requirements have to be satisfied by transporter in the contract conditions. The further requirements for transport services characterized by: increasing goods range and delivery conditions, irregular transportation due and volume which depend from market demand. Different material flows can be carried by one type of vehicles. In order to select the vehicle should be taken into consideration not only accounting costs, but also an economic costs in possible alternative investments projects.*

Keywords *the transporter, vehicles, investments, project, service*

I Introduction

The further requirements for transportation services characterized by: increasing goods range and delivery conditions, irregular transportation due and volume which depend from market demand. The material flow parameters variations during the transportation service period have to fit demand requirements.

According to the references many scientists works initiate to transportation services [Roslavtcev 2010, Vaselevskyy et. al. 2008, Laktyonova 2002, Dibskaya et. al. 2008, Velmozhin et. al. 2006, Andreev 2007]. Considering of these references we may concluded the scientific ideas development on this issue. The authors characterize transportation services from different angles, using with it the various methods: analytical, statistical, and mathematical economics, logistics and others. References

show that there is: the technological, economical and other customers' requirements have to be satisfied by transporter in the contract conditions, from one side. Different material flows can be carried by one vehicle type. But any material flow parameters changing can lead to variations in transportation technology. On the other sided increasing the vehicles number for material flow transportation in selected periods leads to inefficiency overall use. These remarks lead to the following questions: How to effectively perform material flows transportation services with variable parameters? What is the efficiency criterion need to choose?

II. Formulation of the problem.

The aim is to purpose an approach to rational vehicles number for transportation materials flows with variable parameters.

III. The Results

Consider the material flow parameters: [Laktyonova 2002, Dibskaya et. al. 2008, Chuhray 2007]:

- The products Nomenclature, range and number;
- Overall characteristics (volume, area, linear dimensions);
- Weight characteristics (total weight, gross weight, net weight);
- The goods physic-chemical characteristics;
- The packaging characteristics (packing);
- The contract sale conditions (transfer of property, supplies);
- The transportation and assurance Terms;
- Financial (cost) characteristics;
- Subject to the other physical distribution operations involving the movement of goods.

The material flow transportation conditions will be considered in detail. One of the transportation conditions is – temperature. To provide material flow keeping and avoid wastages during goods transportation need to use different vehicles types: isothermal, tilts, refrigerator trucks or other. We'll simulate material flow conditions for transportation servicing. Consider the conventional material flow with fixed temperature range in which is possible to transport the goods without damage and losses. Figure 1 shows demand for transportation service with several material flows and temperature mode for almost for a year research. Material flows, which was transporting at this period has different parameters. As you can see from the chart there is some correlation between day temperature and transport volumes. A different marks type shows, that is used different vehicles body type: tilt and isothermal in different periods of time.

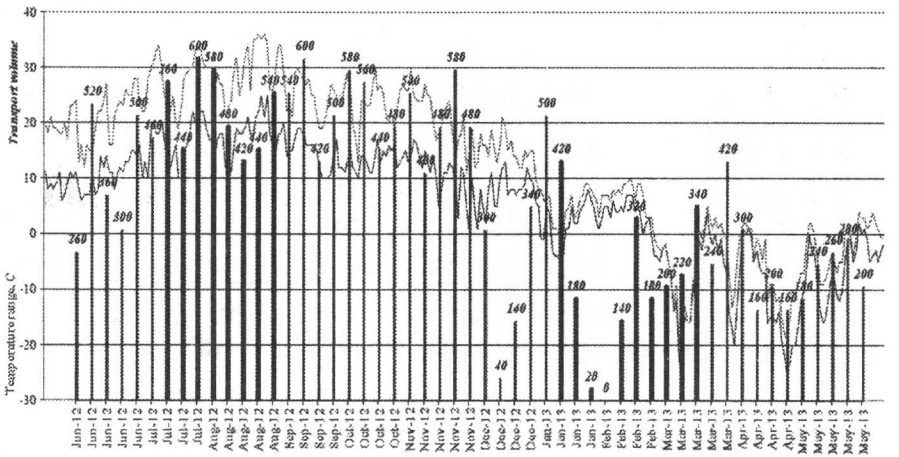

Fig. 1. Demand for transport services, depending on the temperature mode from 01.06.10 till 31.05.13.

In which:

– the average daily temperature for the day

- average night temperatures for the day;

– transport volume by tilt motor vehicle;

– transport volume by isothermal motor vehicle.

Seasonal changes in ambient temperature is very volatile and full predict them is not possible. That's why the transporter even at constant material flow volumes should be scope for vehicles variation to provide the flexibility and adaptability of its activities to changing temperature. Exclude vehicles from one material flow transportation in any time period can be used for other material flows transpiration this time period. According from the transportation volumes vehicles estimation number chart was made for different body types: tilt and isothermal Figure 2,3.

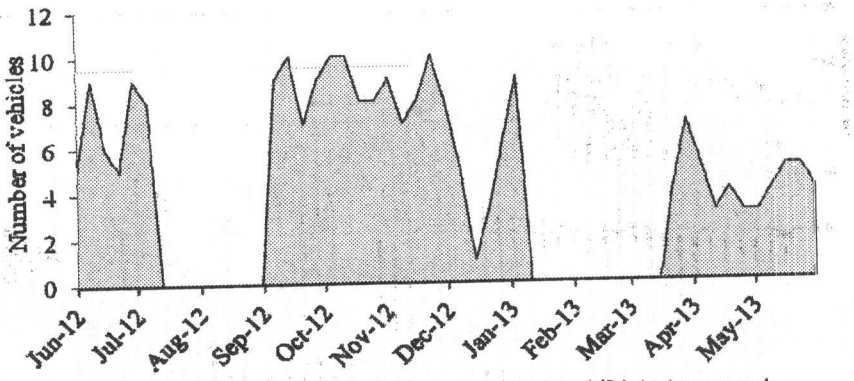

Fig. 2. First type vehicles estimated number (tilt) to transport examination material flow

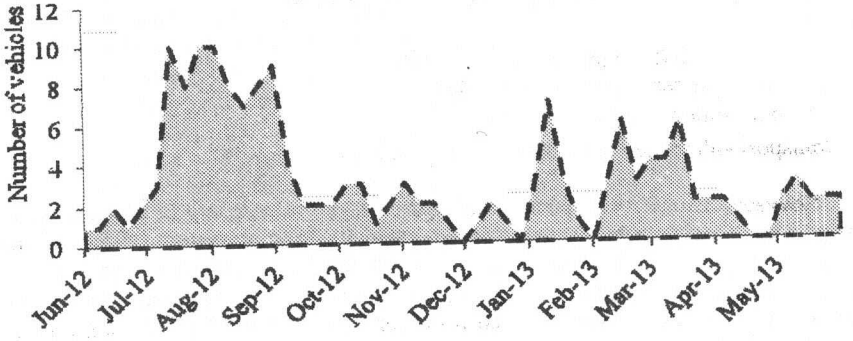

Fig. 3. Second type vehicles estimated number (isothermal) to transport examination material flow

Aliasing this two charts together we obtain combined graph which shows regular using of vehicles. For the rational solution of this problem necessary to use different semitrailer or swap vehicles bodies, figure 4.

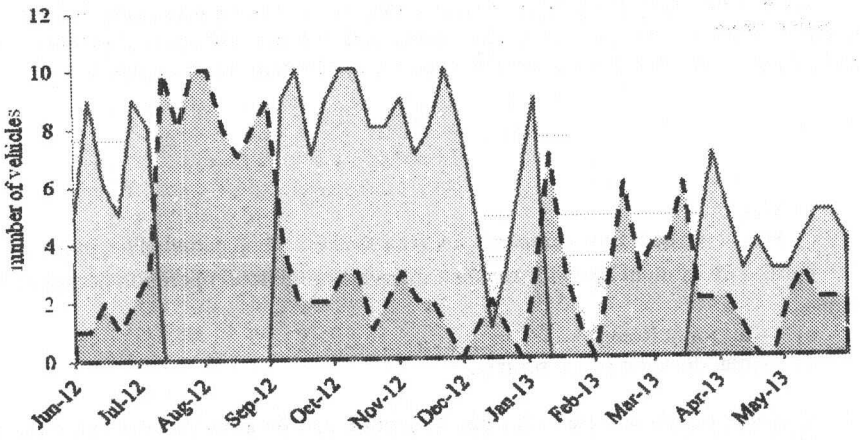

Fig. 4. Estimated number of two different types of vehicles (tilt, isothermal) for transportation of examination material flow

The choice problem is that the different vehicles can carry same cargo with different efficiency. The transporter while making decision should take into account investments: inflation risks, the discounts, the cost of credit, and so on. The costs composition and structure determined by the specifics of the enterprise (rental, purchase, lease, etc.). Not only accounting costs should be taken into account, but also the economic cost of possible alternative projects. The «alternative business» selection criterion [Sobolev 2008, Vorkut 2002], based on the desire to use investments with more effective results. This represents the project cost, estimated in terms of «lost or missed opportunities» to engage other available alternative activities that require the same time or the same resources [Nozdrina et. al. 2011]. Alternative income shows that it costs for the project among all the other will show the greatest economic benefit by fixed resource and time. This is particularly important when the project participants are limited in money, time and other resources, and there is a question of selection criteria's the most efficient design. The transportation service performance criteria can be selected from commercial investment criteria in the «long run» project: [Sobolev 2008, Nozdrina et. Al. 2011, Sharpe et. Al. 1998, Whitty and Schulz 2006]:

1) Net income;
2) The net present value (NPV);
3) The internal rate of return;
4) The profitability index
5) The payback period
6) Financial indicators;
7) The need for additional funding.

As a result, using the project analysis methodology can be simulating different alternative projects with different performances and different efficiency. For the conditions of the system, the most appropriate measure can be considered as indicator NPV:

$$NPV = \sum_{1}^{t} \frac{NCF_i}{(1+d)^i} - \sum_{1}^{t} \frac{IC_i}{(1+d)^i} \quad (1)$$

In which:

a) NCF_i – net cash flow at separate intervals total operation period of the project;

b) IC_i – investment costs for separate intervals of the total operation period of the project;

c) d – discount Rate;

d) t – total duration of the project.

In this case, the vehicle efficiency formation can be a net present value for all possible variants fleet during the project lifetime. While the project existence depends in turn on: the material flows lifetime or the transportation contract maturity.

$$NPV_i = \max\left[NPV_1', NPV_2', \ldots, NPV_i'\right] \quad (2)$$

In which:

NPV_i – Net present value of the i-th project;

$NPV_1', NPV_2', \ldots, NPV_n'$ – the net present value of alternative projects;

max - Function which selects the maximum value.

IV. Conclusions

V.

However the transportation material flows with variable parameters has to base on commercial investment criteria in the «long run» project. Different vehicles types select approach in the long term with variable material flow parameters has been proposed. A further developed project analysis methods in determining alternative using projects options was presented. The proposed approach allows to take into account change the material flow parameters while transportation services organization.

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