III INTERNATIONAL CONFERENCE
TRANSPORT SYSTEMS TELEMATICS TST'03

ZESZYTY NAUKOWE
POLITECHNIKI ŚLĄSKIEJ 2003
TRANSPORT z.51, nr kol. 1608

railway transport,
optimisation of transport processes,
mathematical modelling, new technologies,
transportations markets, information system

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THE SOLUTION OF CUSTOMS POST MANAGEMENT PROBLEMS AND THE IMPLEMENTATION OF NEW CARRIAGE TECHNOLOGIES IN THE LITHUANIAN RAILWAY TRANSPORT

This article provides the analysis of the possibilities to instil new technologies in the Lithuanian railways – building of high speed railway line I in Kreta corridor. It is advisable to project this line as a mixed one, i.e. intended for path passenger and goods traffic.

The Identification and solution of transportation problems related to customs posts at railway border stations enable successful functioning of international freight transport, thus guaranteeing its reliability, punctuality and high quality. Perfection of the complex work is necessary in order to meet the requirements as well as to preserve goods during their transportation process. For the solution of the problems at the stations it is important to analyse fundamental principles, to assess an environmental impact, to formulate and evaluate the issues of wagon management by means of complicated technical systems, and to optimise the process of problems on the basis of research methods.

This article examines types of informational technologies application problems, shows their scheme, observes basic data structures of technological problems, principles and methods of modeling these structures. It is noted that the solution of transport technology problems is based on the improvement of technological supply, the rational usage of informational modeling methodology of the whole transportation process.

ROZWIĄZANIE PROBLEMÓW ZARZĄDZANIA STANOWISKIEM ODPRAWY CELNEJ I WPROWADZANIE W ŻYCIE NOWYCH TECHNOLOGII PRZEWOZU NA KOLEJACH LITEWSKICH

Artykuł zawiera analizę prawdopodobieństwa niezbędną do rozpoczęcia prac nad wdrożeniem nowych technologii na kolejach litewskich takich jak budowa szybkiej linii kolejowej w I korytarzu Kreta. Wskazane jest, aby nowa linia kolejowa została zaprojektowana jako połączenie dwóch w jednym:

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linii pasażerskiej i towarowej. Identyfikacja i rozwiązanie problemów transportowych powiązanych z punktem odprawy celnej na granicy umożliwia funkcjonowanie z powodzeniem frachtu transportowego, a więc zagwarantowanie solidności, niezawodności, punktualności oraz wysokiej jakości usług transportowych. W tym celu niezbędny jest odpowiedni porządek prac kompleksowych po to, by sprostać wymaganiom transportu dóbr materialnych. Aby rozwiązać problemy stacji ważna jest umiejętność analizy podstawowych zasad pracy, szacowania wpływu środowiska, formułowania i oceny kwestii zarządzania wagonami oraz optymalizowania podstawowych problemów występujących w procesach transportowych przy wykorzystaniu metod badawczych.

Artykuł analizuje typy technicznych problemów informacyjnych, przedstawia ich plan, zwraca uwagę na podstawowe struktury problemów technicznych wraz z zasadami ich modelowania. Autorzy zauważają, że rozwiązywanie problemów technicznych w transporcie jest oparte na ulepszaniu zapasów technologicznych oraz racjonalnym użyciu informacyjnych metod modelowania w całym procesie.

1. INTRODUCTION

Railway transport, white competing with road and air transport in the transportation market, was also impairing – there was increasing the transportation speed, its comfortability and safety. Thus a technologically new railway kind evolved – high speed railway intended for passengers' transportation. In the beginning trains travel at 160 km/h speed, however, such a speed was too slaw in a competitive shuggle with other kinds of transport, especially with air transport. Thus, there emerged a necessity to increase the speed. Nowadays high speed line trains travel at 260 km/h speed and even at o greater speed [1, 2].

At together there are 5,000 km new high speed railway lines in the world and more than 11,000 km of the railway which has been reconstructed into high speed lines. In the period between 1964–2001 the high speed railways transported more than 6 billion passengers. There travel more than 1.2 thousand high speed trains all aver the world twenty-four hours long every day [3].

With the growth of international freight transportation by rail the main attention should be focused on the functions of railway border stations, where the arriving trains are disbanded and new trains are arranged according to the train formation plan. Such operations as the formation of incoming, outgoing and transit goods, freight admission, export, redistribution, freight preservation, storage, clearance of freight and wagon documentation are going on. It is at these stations that customs formalities are proceeded, based on the identification of transportation problems, on the optimisation of ongoing operations and customs process management technologies. This allows successful functioning of international freight transportation, thus guaranteeing its reliability, punctuality and high quality.

For the solution of transportation problems occurring at the customs posts at railway border stations the main objective is to identify the reasons of their occurrence, their basic principles, the assessment of environmental impact, the formulation and evaluation of tasks for wagon management by complex technical systems, the optimisation of problems process, based on the scientific research methods.

2. THE IMPLEMENTATION OF NEW TRANSPORTATION TECHNOLOGIES IN THE LITHUANIAN RAILWAY TRANSPORT

The author put forward the idea of implementation of high speed railways in Lithuania as 1988. Due to the fast that two Kreta corridors extend all over our country (I – north – south and IX – west – east) there is a possibility for the Lithuanian railways to join the European transport network of high speed railways. One of most important ways of joining it is building of the European track for a high speed railway line in I Kreta corridor.

The research carried out by the author [8–10] shows that it is possible to build such high speed railways in Lithuania. That waild also such extend in I Kreta corridor aver Poland, Latvia, Estonia and Russia. In 1997 the was built a high speed railway line to Berlin. Its further track should be sheteked from Berlin via Warsaw, Setokai, Kaunas or Vilnius, Šiauliai, Riga, Tallinn with a branch to St. Petersburg. Therefire, this project has to be conducted all Baltic states and Poland as well Russia which should be sheteking the lanch to St. Petersburg. The length of the international I Kreta corridor Warsaw – Sestokai – Kaunas – Riga – Tallinn in Lithuania is 332.7 km (it costs of 191.9 km single-way road districts and 140.8 two-way road shetckes).

The author suggests that the railway extending along I Kreta corridor across Lithuania should not be used only for passengers' transportation. The density of population in Lithuania is mach lower than in Western Europe. Besides Lithuania itself is not big, that is why ire people there do not have a great need to travel long distances. As a result there will not form considerable flours of passengers, tihich would ensure the pay-off of the funds sfend on building that line. Thus, we should follow and Germany's example, where the recoupment of the part of new lines is guaranteed only then, when there are exploited cargo trains of a certain category, which can travel up to 160 km/h speed. An increase in speed of cargo trains sorts them the third place in the cargo carriage market. Bearing in mind the example of foreign countries, the author suggests that there should be build a mixed type high speed railway line in I Kreta corridor, i.e. intended for both passengers and goods traffic. Cargo trains should be included into integrated into the scheme of passengers transportation carried out by high speed trains by identifying the so-called "windows" in the traffic schedule. Moreover the author proposes the following ideas [4, 5]:

– As Lithuania will not be able to finance the implementation of such a project, it is necessary to attract foreign capital as well as private the basic source of financing is EU structural funds. One of the possible variants to finance the remaining part of the project is granting concessions to foreign partners.

– The carried out analysis has demonstrated that it is expedient in the high speed railway line being analysed to use trains with lurching carriages according to the example a Swedish X2000 and Italian pendolino high speed trains.

– The construction of the line for the traffic of "lurching hull trains" would enable us to spore some funs for building.

Hawing applied formalized models of road transport and having compared railway and air transport it has ascertained that:

– while travelling up to 300 km, there dominates road transport,
– if the distance is bigger than 1400 km, there dominates air transport,
– high speed railways prevail when distances fluctuate from 900–1400 km.

Despite a considerably high cost of the construction of the above-mentioned high speed railway track route, Lithuania as well as other Baltic states – Latvia, Estonia as well as

adjacent Poland cannot remain aside white developing the global transport system. The construction of the high speed railway line in Lithuania will create favourable conditions for the country's integration into the European transport network as well as encourage the development of the entire country's economy. Any delay in the implementation of technologies in terms of there, especially in transport, will lead to great economic and social losses.

The introduction of high speed railway lines in trance has proved to be very profitable passengers transportations. The trench railways are now collecting halt of their income from passengers' transportations. That demonstrates haw economical high speed railways are.

3. THE THEORY AND ANALYSIS OF MANAGEMENT BY COMPLEX TECHNICAL SYSTEMS

Principles of the theory of management. For the analysis of the origin of transportation problems at customs posts at railway border stations it is necessary to identify the basic principles of the occurrence of the problems and to define their environmental impact.

For the evaluation of transportation problems of customs posts at railway border stations it is necessary to gauge their volume, also the impact of various preconditions causing their occurrence, their structure and groups.

Transportation problems are the problems arising from unsafe transportation of freight, inadequate sorting, handling, filling in the documentation, sealing, and low quality delivery to the consignees.

For the assorting of transportation problems it is necessary to evaluate the following criteria:

1. the criterion of physical state;
2. the criterion of the method of wagon loading;
3. the criterion of possibility of generalisation of transportation problems.

In the course of the analysis of the origin of transportation problems at customs posts at railway border stations it is possible to find the ways of their elimination.

This analysis is based on the creation of the evaluation algorithm [6].

The scope of transport problems comprises the prime cost analysis, which has been vastly used by Taylor for analysing problems of this type. Thus named Taylor's system is determined by the costs of arrangement of operation methods and management of production processes (by the way of selection and organisation of labour force improving the standards of activities) [7].

Analysis of management of complex technical systems. Management problems are very acute. Based on scientific research and complex approach the solution and versatility of wagon management by complex technical systems are peculiar to railway border stations.

Wagon management by complex technical systems is improved basing on various measures.

However, a theory of management of customs posts at railway border stations does not exist. Also the problems and their solutions in the management of customs control facilities are not identified.

To start the solution of these issues great efforts are necessary as well as an indispensable unified programme comprising all the work starting with projecting to the practical realisation. It is important to apply the mathematical calculation methods that would

enable the identification of technical capacities of customs control posts at railway border stations, which would allow the growth of international freight volumes.

Under real conditions the qualitative formulation of a production and operational process of complex technical systems is influenced by various factors. Deficiencies of theoretical research make a significant share of these factors influencing the quality of complex technical systems.

For the determination of the quality standards it is necessary to gauge them. Positive results in management field make a positive influence on the stability and rhythm of transportation process, the accurateness of technological discipline and the implementation of organisation of scientific research activities.

The management of the quality of complex technical systems in correspondence to the general theory of the station management presents a uniform versatile process and consists of the following operations: analysis of management programme, planning of transportation quality improvement (transportation safety, transported goods safety/preservation, handling of documentation transported), obtaining and analysing of the information on the state of objects participating in the transportation process.

The quality management of a complex technology system corresponds to the general theory of station management and embodies a uniform multiplan process consisting of the following operations:

- creation of management programmes;
- planning of the improvement of transportation quality (transportation safety, freight safety, documentation handling, etc.);
- obtaining and analysing of the data about all the hauliers participating in freight transportation;
- giving orders and analysing of the information obtained.

Thus the management or technology of complex technical system quality is the implementation, service and generalising of measures. The main principles of technology management are: sistematics/organisation, identification of tasks, adaptation, dynamics, quality norms, standardisation.

Optimal attainments of technology quality standards are identified on the basis of cost price of organisational-technical and economical measures which are commercially interrelated and have an influence on corresponding factors and conditions. The Creation of the model of customs posts at railway border stations starts with the analysis of the modelling subject by the application of mathematical formulae and generation of information. This is done with the aim of qualitative co-ordination in an experimental way and the fulfilment of a task, as well as for the analysis, correction of the model by additional solutions and eventually, to make the final verification of the model. Only after these operations the model may be transferred to information system for use and implementation of the tasks [6].

The analysis of the subject must give a full view of the system modelled and its modelling possibilities.

The mathematical system formulation will determine the future efficiency of the system. The mathematical formulation of the system is the modelling of the entire process, i.e. the description of economical processes and mathematical-economical actions of the model. The aim of modelling is the possibility to manage and control a concrete process [7].

Several mathematical methods are used for the organisation of the process:

- Optimal programming: linear, non-linear, discrete, block, etc.;
- Network methods of management and planning;
- Theory of mass service, etc.

Mathematical model may be generally expressed as follows:

$$z = f(x_1, x_2, ..., x_n) \rightarrow \max(\min) \quad (1)$$

$$\varphi_i = (x_1, x_2, ..., x_n) \leq b_i \ (i = 1, 2, ..., m_1) \quad (2)$$

$$\varphi_i = (x_1, x_2, ..., x_n) = b_i \ (i = m + 1, m_1 + 2, ..., m_2) \quad (3)$$

$$\varphi_i = (x_1, x_2, ..., x_n) \geq b_i \ (i = m_2 + 1, m_2 + 2, ..., m) \quad (4)$$

$$x_j \geq 0 \ (j = 1, 2, ..., n_1) \quad (5)$$

$$x_j \ (j = n_1 + 1, n_2 + 2, ...) \quad (6)$$

$$x_j \leq 0 \ (j = n_2 + 1, n_2 + 2, ..., n) \quad (7)$$

where (1) is the aim function; (2)–(7) – system of limitations; $b_i \geq$ free members of the limitations $(l = 1, 2, ..., m)$.

The purpose of the system is to demonstrate the system condition, which should be reached in the process of management. The application of the methodological foundation for the creation of technological management would be able to satisfy all the market needs and requirements.

The efficiency of the technological process is evaluated by the only economical criteria – the national income growth in respect of production costs or resources used for production under the conditions of the optimal proportion of consumption and accumulation funds.

All national economical criteria by their content may be attributed to one of the three types:

- to the maximum economic effect under fixed costs;
- to the minimum costs under fixed effect;
- to the maximum economic effect with the use of available resources.

Given a concrete task the economic criteria should correspond to the following requirements:

- to reflect objective national needs for service system;
- to reflect the necessity of this service for the national economical system;
- to express costs and results;
- to forecast the scientific progress of services of this field.

Quite often the selection of the optimal criterion causes certain difficulties and problems, which can not be solved unambiguously. The issue of a complex technical system criterion most often undergoes versatile analysis so that to avoid future errors of the solution of the problems. Most often the criteria depend on the management parameters (x_j). The variable value changes depend on the quantity of variation possibilities. Most characteristic ones are in the tasks carried out by the application of various technologies. Often not only corresponding technologies are included into the model, but indices defining the parameters of the system economical parameters as well.

4. INVESTIGATION OF INFORMATIONAL TECHNOLOGIES IN FREIGHT FORWARDING

As a planning and management object transport is a complicated system, which state is defined by the number of external and internal factors. That's why it is necessary to apply informational technologies and to choose certain organizational peculiarities of transportation for each different transport mode.

While preparing transport development scheme of the republic as well as extending transport development program, it is necessary to try the newest achievements of the informational technology application and mathematical modeling sphere. The basis of the new transport development strategy should become journey and fright formation as well as the creation of criteria distribution models.

Having examined the basic transport system data processing conformity with the law and algorithms of procedures, it is possible rationally to create flexible and effective transport system specific tasks projects. Many theoretical transport system questions are tied very closely because investigating and summarizing transport technologies peculiarities create them.

There are operational, strategic problems in transport technology, and other types of problems that can't be related to any of these. Each particular task is a certain transportation system data manipulation by the functional data property. Each separate transport mode technological operation can be described by the fields of allowable meanings of incoming and outcoming parameters that are the foundation of a model. Each model, having defined suitable operation limits, has to describe a certain part of factors that influence the certain system. The use of a computer becomes a very important factor when there is a big amount of processing information. Informational technologies combine computers, connecting systems, data and knowledge basis [8].

The application of informational technologies allows to solve freight forwarding, loading terminals, "traffic jams" places, loading-unloading mechanisms overuse, predicting, the dynamic of amount of freight according to transport branches and other tasks. Informational technologies are used to maintain the certain amount of stock, for increasing the effectiveness and work efficiency in transport. With the growing number of orders for freight, a necessity for using high standard informational technologies occurred, which are the basis for the creation of a complicated informational system. The following examples can be offered:

- computerized regulation system for transport orders;
- passenger service information system (passenger registration, automated issue of tickets as well as reservation of seating places, luggage processing improvement);
- transported cargo operational managing automated system (railway transport);
- automated managing system of the railway distribution station, etc.

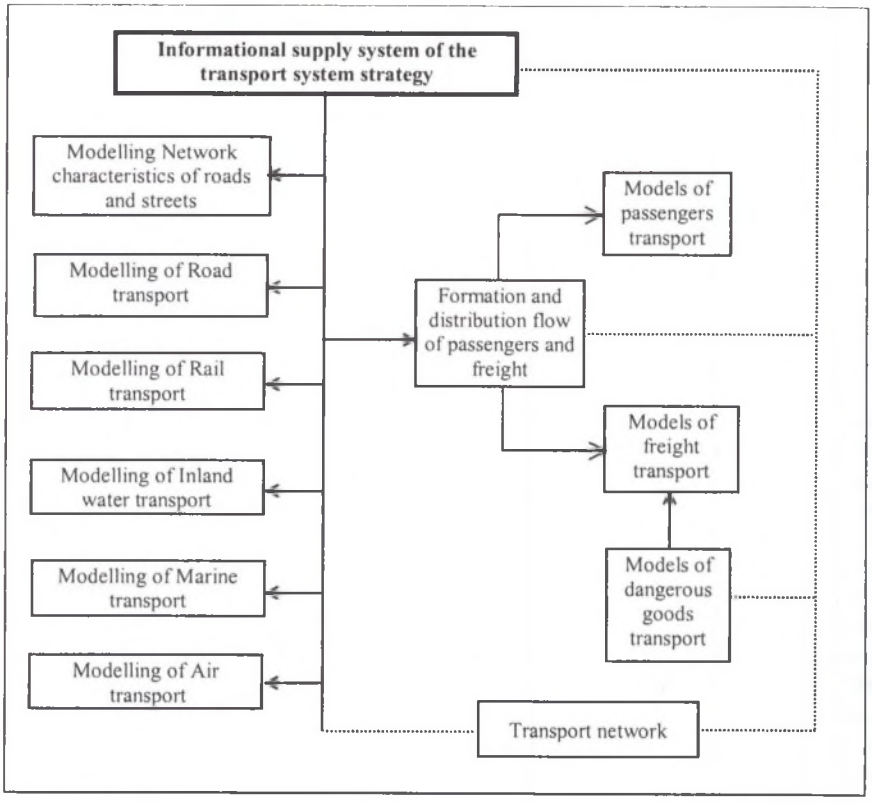

Fig.1. Informational supply system scheme of the transport system strategy

Figure 1 shows an informational supply system of the transport system strategy that can directly influence the development of the transport system in the whole country.

Storing data in database allows also solving the imitation tasks, by creating and adding to the database artificial transport system units. Therefore, looking at the transport system future, it can be predicted, where new roads, terminals will be needed and where it is a place for disturbances.

Because of the present transport development strategy it is necessary to combine all the forwarding types into a united transport network that is carried out through the mutual connection of freight and transporting regions. Freight forwarding analysis system includes vehicles, their routes with the evaluation of loading, freight flows and freight traction stations. The problems of how to use transport in the most effective way are also studied [9–11].

The tasks shown are used to be the fundamental basis, which allows creating new tasks, to form and to solve them using data modeling mechanisms.

5. CONCLUSIONS

1. The main way for the Lithuanian railway integration into the European network of high speed railways, is the construction of the European track for the high speed railway line in Kreta I corridor.

2. The high speed railway line would extend from Berlin via Warsaw up to Tallinn with a branch to St. Petersburg.

3. It is expedient to design a mixed high speed railway line, i.e. intended for both passengers and goods traffic.

4. In the present wick there have been identified prospective railway and road markets for local, intercity and international transportations.

5. Aiming at the optimal use of opportunities for international railway transportation it is necessary to analyse the problems of customs posts at railway border stations.

6. The solution of the problems has to be based on the consideration of the reasons of the occurrence of these problems, together the environmental impact of the optimisation of transportation process problems on the basis of scientific research work has to be evaluated.

7. The creation of the model of customs posts at the railway border stations and such operations as the analysis of the modelled object, mathematical-economical acts of the model, the accumulation of information, the efficiency of model verification – the performance of all these operations would enable successful management and control of in-coming, out-going and transit freight flows.

8. The mathematical calculation on the basis of the theory of mass service/handling would enable the determination of the technical capacities of customs posts at railway border stations.

9. Informational – technological modelling turns the continuous freight forwarding process unity to the informational system object.

10. Informational technologies allow influencing the development of the transportation process as well as its directions and the motivation of the most important tasks.

11. The informational transport network has to provide the automated change of information for all the forwarding process participants.

12. Improving the informational technologies application strategy it is required to improve the passenger and freight transportation models in such a way as to make it possible to characterize the transportation distribution among the separate transport modes.

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