

**THE REVIEW OF THE MONOGRAPH
“TRANSPORT: TECHNOLOGIES, ECONOMY, ENVIRONMENT, HEALTH”***

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From the first sight the improvement of transport technologies seems to be simple replacement of old transport means/vehicles by new ones. However, even if the most advanced transport means are purchased, they may be used absolutely inefficiently. Therefore, besides transport means it is necessary to improve the entire technological process of transportation. For this purpose many kinds of research have to be carried out, such as: the identification of freight and passenger flows, their constant monitoring and forecasting, the optimisation of the road network and transport flows in it, the optimisation of freight origin and distribution places, etc. Abroad there are many publications concerning the optimisation of long distance transport network and transportation of goods weighing 20–40 tons. However, actually there is no research of such cases when the weight of freight is 50–1500 kg and the transport network is in a small scale region, let us say in a town, under the conditions of congestion of the road network and ecological restrictions. It was attempted to propose certain solutions in this field: 1) the methodology of statistical analysis of freight flows and forecasting was proposed; 2) the problem of information storage is usually encountered in using statistical information on freight flows, for this purpose relevant algorithms for the solution of this problem are proposed.

The topological structure synthesis of a load transport regional (urban) system has been carried out and the optimisation-simulation procedure of topological structure has been proposed.

The theory of freight flows is supplemented by experimental freight flow research: a) for flows of most freight in general; b) for flows of most freight with common goods forwarded; c) maximising of flows by minimising their transportation distance; d) flows of most freight with the least transportation cost. By theoretical research relevant theorems have been demonstrated and the research was grounded by concrete practical examples.

The scientific work deals with the concept and theoretical principles of the creation of information system for transport of dangerous goods. The main aspects of safe transport of dangerous goods are presented there. Foreign exper-

ience in the creation of information systems is presented here. There is also the analysis of conditions, preconditions and the necessity of the creation of information system in Lithuania.

The model of the identification of the safest routes for the transportation of dangerous goods using the mathematical modelling of the transport process is presented. The methodology is further improved by the identification of probability of road accidents, by the search of optimal parameters for all and every element of the transportation process, the routes of transportation of dangerous goods. For the practical implementation of the methods of the identification of road accident probability the parameters impacting the probability of road accident have been defined and classified.

The principles and methods of restructuring and modelling of the ADR and RID regulations serving as the data bank for the transport of dangerous goods have been presented. A draft project of information system for the transport of dangerous goods is presented.

Transit transport has a great influence on Lithuanian economy. The revenues would enable the modernisation of a transport system thus making it more efficient and competitive in the international market. Employment in the transport sector could be increased.

In the light of the perspectives of Lithuanian transport sector the approach of multimodality is applied, i. e. the priority should be given to the complex development of transport infrastructure, technologies and transport services in all transport branches and especially in the international transit transport corridors. There is no legal basis in Lithuania, which could allow efficient and unhampered control of transit transport of goods through the Republic of Lithuania. Therefore it is necessary to improve the laws regulating transit procedures, to speed up the formalities of documentation, the simplification of guaranty systems, the liberalisation of transit business, the simplification of inspection of goods, the storage and transportation formalities in the territory of the whole country.

Transport infrastructure is one of the most important elements of transport activities and it covers roads, railways,

* TRANSPORT: TECHNOLOGIES, ECONOMY, ENVIRONMENT, HEALTH. Monograph. Vilnius: Technika, 2003. 875 p. ISBN 9986-05-640-3

port quays, channels, airports, landing paths, pipelines, etc.

Sustainability of transport infrastructure is an essential element of the development of the infrastructure. In the development of transport infrastructure certain principal restrictions, such as the railway gauge, the height of bridges and viaducts, the maximum allowable road pavement loading have to be observed. In this aspect the maritime transport is the least limited and the infrastructure of ports is developed on the basis of transport means, i. e. differently than in the railway and road transport.

The optimisation of transport infrastructure basing on technical possibilities, organisational structure and legal basis is an important objective of scientific research. New technologies, materials and technique enable not only the optimisation and sustainability of transport infrastructure, but also allow decreasing of investment amounts, the construction time and the improvement of operational conditions.

The main objectives of the scientific research of the development of transport infrastructure are the following: to rectify deficiencies, to apply new materials and technologies, to improve the quality and possibilities of transport infrastructure.

In the scientific work the directions for the creation of the system for the evaluation and control of ageing of Lithuanian air, rail, road, maritime transport and fuel traffic networks have been drawn. This system should meet the international standards and requirements. There is no such system in Lithuania. Lithuania has inherited the transport economy from the former Soviet Union and it has acquired many old transport means/vehicles from the European and other countries in the world. At present a vast number of problems concerning the ageing control and management has to be solved.

The problems of ageing of road vehicles, air and railway transport means, ships and pipes have been analysed. The evaluation of age, number of failures and their intensity is given. The failures are classified according to the mode of transport means and their age, whereas the ageing of different transport means and their spare parts depends not only on operational factors. Numerous spare parts are subject to the natural ageing substances, i. e. they are subject to corrosion and to sheathing materials, which is inevitable within the time course.

The importance of evaluation of ageing processes of structural details has been stressed, which is vital in the determination of safe operation requirements. Also the reasons causing various kinds of decay are indicated. Methods and ways of controlling the decay of structures are presented as well.

The failures risk methodology has been presented, which is applied for the evaluation of ageing. The presented mathematical model of ageing process gives the evaluation of the risk of the element as well as of the whole system regarding the age of the structure, the number of failures or their intensity.

The methodology of ageing control and its cost deter-

mination has been also given which is based on the statistical and probability concept. The analysis is given that the probability of failure of separate components depends on the frequency of control. The quality of control becomes important in the calculation of the costs of one control and in the evaluation of the control frequency.

The feasibility analysis of the application of traffic flow theories for the evaluation of operation conditions shows that the models of flows digress from the analysis of the sub-systems 'road – vehicle', 'vehicle – driver' and 'road – vehicle' underlining the joint summarising characteristics. Therefore a complex model of the sub-system 'vehicle – road' has been created, which is maximum adjusted to real traffic conditions, and regarding the interaction of road and vehicle on the macro- and micro-profiles levels and vehicles traffic restrictions in accordance with the criteria of safety and economy.

After the research a model of a vehicle enabling the digital modelling of typical situations and forecasting basic operational criteria was obtained. It enables the forecasting of the efficiency of the vehicle under the changing traffic/movement conditions also allowing modelling of the changes in the transport system.

Concerning the problem of the vehicle collision with obstacles general notions of the solution of the problem, the aims of research, the methods of research, its objects, data bank and mathematical models have been presented.

A dynamic vehicle model evaluating the vehicle inert characteristics, suspension features, brake system with and without ABS, interaction with road pavement has been created. The vehicle is modelled by concentrated masses interconnected with complex elements and having intense and dissipate connections.

Regarding the interaction of the vehicle and obstacles a vehicle geometric model has been created. The movement of the vehicle during the time of interaction with the obstacle and after it depends on its speed, on the solidity of the vehicle and the obstacle, on the coefficient of mechanical energy blocking, and on the frictional forces.

The pipeline transport is one of the transport means used for long distance transportation of oil and its products. Having been a technical system of narrow specialisation barely a few decades before, the pipeline transport nowadays has developed into a large-scale transport branch.

Regardless of all the advantages of the pipeline transport, as well as in other fields of transport, numerous technical problems occur during the operation course of magisterial oil pipelines. There are emergency disturbances and oil spillage because of various reasons, such as, for example, pipe corrosion, operation regime disturbances, pipe welding defects, manufacturing spoilage of pipes, etc. Oil spillage also occurs because of unauthorised accession to the magisterial oil pipelines. Oil spillage causes great environmental catastrophes, as, for example, one meter of pipe with the diameter of 720 mm contains about 400 l of oil, thus impending in case of accident heavy environmental damages and significant economic losses. At present for cleaning and diagnostics of

magistral pipelines special equipment moving inside the pipes by pressure dynamics is used.

New research methods of dynamic processes in magistral and technological pipelines have been proposed. The methods enable the determination of work regime of magistral pipelines and allow the identification of ways of unauthorised oil spillage.

After the analysis of the amounts of fuel and energy required for consuming by all branches of Lithuanian economy it was defined that more than 27 % of all the energy is used in transport. The largest share of energy consumed by a transport sector falls to the road transport (about 88–90 %).

The purpose of this scientific work is to give the efficiency evaluation of energy consumption in Lithuanian transport and to foresee measures increasing the efficiency of energy consumption in transport.

One criterion from the criteria selected for the evaluation of fuel consumption in transport consists of comparative fuel input per unit of work of transport. According to multiannual data accumulated in Lithuania on transport carriage and fuel consumption, as well as basing on research, the average comparative fuel input amounts for the transportation of passengers and goods were defined.

Also factors influencing the efficiency of fuel consumption were defined.

Whereas Lithuania imports almost all the oil, therefore it is important for our country to use renewable energy resources. The bio-fuel obtained from the biomass is one of the most adequate options of alternative fuel for the natural and economic conditions of our country.

Therefore a thorough research has been performed into the assessment of possibilities of bio-fuel use in internal-combustion in energetic, ecological and economic aspects.

In this scientific work three topics related to passenger transport are presented.

Technologies of transportation by all transport modes – road, rail, air, maritime and inland water have been analysed, and the proposals for the modernisation of passenger transport technologies and for the implementation of new technologies have been prepared. The analysis of passenger transport has been carried out and the forecast of volumes of this transport has been presented. The research of railway network use efficiency has been accomplished. The model of costs and gains of passenger railway transport has been created. Measures ensuring equal competition conditions between the road and railway transport were designed. Measures for the development of the interaction between the road and railway transport were prepared. Perspective road and railway markets have been defined. Proposals for the renewal of transport means/vehicles have been suggested.

The principles of the formation of cohesive urban transport system have been analysed and special attention has been paid to environmental harmonisation. On the basis of inhabitants' traffic exploration the urban transport selection

possibilities were identified for new localisation of citizens and working places in urban territories after passing to market economy. Much attention is paid to non-motor traffic actors, such as passengers, cyclists and their needs. On the basis of geographic information systems digital data banks of the following towns have been formed: Vilnius, Kaunas, Ulauliai and Alytus.

At present in the biggest Lithuanian towns a particular attention has to be focused on the solution of the car parking problem by applying modern technologies. The formation principles of the car parking data bank have been created. The research methods have been founded on the basis of the selective natural investigation technical regulation recommendations for short- and long-time car parking at various places of attraction have been prepared.

Following the results of the research, it is necessary to improve the Vilnius public urban transport system in three directions: 1) the improvement of the quality of the functioning route traffic transport system; 2) ticketing system modernisation and tariff improvement; 3) the improvement of integration of suburban service public transport into the internal system of urban transport. These are priority programme tasks related to the socio-economic needs of passengers with the aim of realisation of common objectives of the improvement of urban public transport system.

The chapter of the scientific work titled "Environmental evaluation of the transport system" is devoted to the complex research of transport environmental pollution in different ecosystems, as well as to the analysis. In the work a systemic analysis of environment pollution impact factors and the analysis of transport sector environmental pollution have been carried out. Transport system consists of the following sectors: road transport, railway transport, water transport and air transport. Whereas in Lithuania the road transport and railway transport sectors are mostly developed, a deeper analysis of these two transport sectors was carried out. The physical pollution has been analysed: the level of noise emitted from the transport system, the atmospheric pollution by monoxides and by aerosol particles, soil pollution by heavy metals and oil products and water pollution by oil products. A thorough processing of statistical data has been accomplished. In the scientific work a detailed analysis of environmental pollution digital modelling programmes is presented and it is furnished with the modelling examples of concretely investigated locations. Legal, organisational and technical measures of environment safety are also presented on the basis of which the trends and strategy of transport development will be corrected. The conclusions are presented and concrete measures for reducing the pollution are proposed. They may be valuable for the solution of environmental problems.

Chapter 14 is devoted to the investigation of transport workers' health. In 2001-2002, in four public urban transport enterprises of Kaunas, employing 2200 people, the examination of hygiene and ergonomic conditions, of the life style of the working people, of psycho-social factors and health was carried out.

In the examined enterprises 85,4 % of employed people were men and 14,6 % were women. Absolute quantity – 86,0 % of staff were people of young and middle age. The working experience of 54,0 % workers was 10-29 years.

The examination of the life style of the workers demonstrated that 46,0 % of people proved to be smokers, 83,8 % drink alcohol, 52,8 % lack physical activity, 82,5 % have inadequate nourishment regime, 27,0 % every day undergo stress at work. Harmful working conditions and ergonomic factors are as follows: low atmospheric temperature, draughts, noise, vibration, contacts with diesel and refrigeration liquids, long working hours, great attention intensity and tension of skeleton and muscles. Diseases of respiratory system, traumatism, illnesses of peripheral nerve system, cardio-vascular diseases, skeleton and muscular system ailments prevail among the illnesses causing the issuing of sick-leaves. The mathematical statistical analysis of the data demonstrated that the health of transport workers and their morbidity with certain diseases is closely related to the age of workers, their

profession, the peculiarities of their life style and unduly conditions of work hygiene and ergonomics.

In general, the reviewed monograph presents complete original investigation. The main objective of the monograph is the research of freight and passenger transport technologies, proposal of new ones able to guarantee the rational freight and passenger transportation as well as to reduce the negative environmental impact.

The research of transport problems is continually changing, with the structure and trends of investigation not being definitely outlined. In this respect the effort of the authors to present their original view of the problems is of great interest.

The book may be recommended for researchers involved in system analysis of transport and for decision-makers, determining the strategies and policies of transport development.

The monograph may also be useful for undergraduates and doctoral students of transport specialities in universities and institutes of the above profile.

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REVIEW OF THE MANUAL “TRANSPORT ECONOMY”*

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The manual prepared by the lecturers of the Transport Management Department of Vilnius Gediminas Technical University is intended for students of transport. The manual will be useful to the students of Transport management and economy, as well as to the postgraduates studying the subjects of the following modules: TITVB 05010 - Transport economy, TITVM 03059 – Transport enterprise economy, TITVB 06025 – Road transport economy, TITVB 08027 - Air transport economy, TITVB 08027 - Water transport economy, TITVB 07026 – Railway transport economy, TITVB 6007 – Economy of international transport services, TITVB 5002 – Commercial operation of railway transport. The manual may also serve the needs of students of other transport specialities in preparing an individual course or final papers.

The book is intended for students of various levels of transport studies and for specialists of transport enterprises. The manual may be used also by the students of related specialities, senior managers of enterprises and trainees of courses on staff management. The book is suitable for use to the students of Kaunas Technology University, Klaipėda University and Vilnius University.

The book contains common issues of economy of a transport system, as well as the issues of transport economy of separate transport modes – road, railway, air and water

transport. In each case the issues of infrastructure economy and enterprise business economy are analysed separately. The issues of transport tariffs are analysed in a separate chapter.

The chapter on the common economy of a transport system covers the application of the theory of macro economy and micro economy in the transport sector, the proportion of supply and demand, the state's role in the regulation of transport market, the competitiveness of transport enterprises. Financial regulation, redistribution of the state's costs/expenses and transport management, international co-operation – these are the issues analysed in the chapter.

The chapter on the road transport economy comprises the following issues: road transport production, competitiveness of transport services, types of enterprises, road transport enterprise property, financial results of enterprise activities, remuneration of work in road transport enterprises.

The chapter on the railway transport economy covers the planning of transportation, the planning of transport means operation, the economic efficiency of the development of material-technical basis in the railway transport, the planning of investments and major repairs, as well as the issues of railway transport circulating assets, running costs and prime costs of transportation.

* TRANSPORT ECONOMY. Vilnius: Technika, 2003. 479 p. ISBN 9986-05-649-7