

Models of Stations with Functionality of Prototypes of Physical and Technological Processes

Golovnich A. K.

Pp 6 – 13

Possibilities of model reconstructions of railway stations of different complexity level with the reproduction of technology of their operation on the basis of algorithms of correct physics of processes are considered. Realistic construction of models is emphasized by a 3D interpretation of the results of computational procedures, with the help of which a visual image is formed, an ersatz structure of the station is created, and the meaningful properties of the prototyped objects are copied. At the same time, the space-time changes accompanying the modeling correlate with a set of nonlinear phenomena and a multitude of factors of a systemic and nonsystemic nature.

Keywords: system, 3D station model, prototype, technology, physical processes, nonlinear phenomena, failure prediction.

Engineering and Modelling of Optimal Maneuvering of Ships with Vortex Propulsion Units

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Pp 14 – 27

The paper proposes a schematic diagram of an additional device for vortex propulsion units of vessels and algorithms for computer simulation of their use for various maneuvering options. The paper describes the advantages of vessels with propulsion units in the form of generators of vortex pairs, including toroidal vortices (thermals), the efficiency of propulsion units of which increases with the increase in their dimensions. A comprehensive analysis of the specifics of maneuvering of such vessels is presented. Practical inapplicability of traditional vessels' devices for changing the course of the vessel and unacceptable duration of reaching steady-state modes and the stopping process when using only regular vortex generators are shown. A sequence of actions with vortex generators is described for the main types of maneuvers. In the paper, a schematic diagram of an additional device (with an estimation of its physical dimensions) is proposed to the vortex propulsion units of vessels, which ensures unwinding or braking of the «attached» mass for a predetermined time with minimal loss of power. Algorithms for computer simulation of the change in the nature of the flow in the closed flow region are developed using

the proposed additional acceleration device. It is shown that the algorithms implemented in the work can be used in the control of a real vessel.

Keywords: water transport, water vessels and aircraft with vortex propulsion units, surface and underwater (toroidal) vessels, flow in the vicinity of the vortex pair, drag, steady and transient modes, attached mass of water, blade, rotor

Parameterization of Actuating Elements of Pumping Electromechanical Converters

Kim K. K., Prosolovich A. A., Koloshenko Yu. B.

Pp 28 – 43

The question of validity of the choice of an actuating element of heat-generating pumping devices with blade structures is considered. These devices are characterized by low hydraulic resistance of a working channel, absence of support and sealing parts, a wide range of design modifications of increased efficiency. Their feature is that the supporting element is not the traditional shaft, but the outer surface of the actuating element. The article shows what parameters of the elements used ensure modeling and control of heat transfer processes.

Keywords: transport power system, heat-generating transfer device, actuating element, parameters, 3D model, independent control.

Rail Corrugation in the Process of Braking

Kargapoltsev S. K. Novoseltsev P. V., Kuptsov Yu. A.

Pp 46 – 53

It was found in the course of the study that oscillations of the vehicle wheelset's angular velocity during braking should be recognized as the principal cause of rail corrugation. Over a single period, two alternating events occur: an elastic interaction between the wheel and the rail, and their slipping relative to each other causing friction and formation of a valley. The wavelength of corrugation wear increases with the increase of the train speed and the value of the braking torque. In order to reduce the intensity of wear, the track stiffness should be increased, the braking torque reduced, and the suspension's parameters optimized.

Keywords: railway, rail corrugation wear, wheelset, adhesion coefficient, braking torque, track longitudinal stiffness, angular velocity, wheel slip, friction.

Optimization of Bridge Transition Zones on High-Speed Railways (HSR)

Polyakov V. Yu.

Pp 54 – 67

The author studies issues of track service life and rail profile stability on bridges and bridge approaches, as well as safety issues on these sections at train

speeds of up to 400 km/h. The optimal control theory of dynamic processes in the bridge-track-vehicle system makes it possible to synthesize structures that exert comparatively uniform impact on the sleepers (or other rail supports) in the bridge zone while maintaining the loads on the ballast closest to their design values. Optimal designs ensure a sufficient force of the wheel-rail contact thus substantially improving traffic safety.

Keywords: railway bridge, train-bridge interaction, HSR, traffic safety, track stability.

A Comparative Study of Service Quality in Delivering Self-Unloading Containers

Ryabov I. M., Gorina V. V.

Pp 68 – 74

Containers offer cost-cutting opportunities in cargo transportation, loading/unloading operations, improving the efficiency of machinery and equipment utilization. This leads to continued growth in the volume of containerized cargo transportation; however, this growth is held back by the limited number of container terminals where containers are transferred to automotive transport that delivers them to the end receiver. To address this problem, the authors have developed a technology to deliver containers without the use of container terminals (cf.: World of Transport and Transportation, Vol. 14, 2016, Iss. 4). This article assesses the quality of transportation services provided by the old conventional technology in comparison with the suggested one that relies on the use of the selfunloading container.

Keywords: automotive transport, transportable container, transportation technology, jack posts, container terminals, container yards, service quality assessment.

Regenerative Braking Energy: to Store or to Exchange?

Veselov P. A.

Pp 76 – 84

This article reviews methods of using the energy of regenerative braking in metro, offers an analysis of surplus energy in inter-train exchange, and presents the results of simulation modeling. Priority focus is given to correlations between various forms of surplus energy, and to the conditions under which inter-train exchange of energy or energy storage devices can have comparative advantages over each other.

Keywords: regenerative braking, metro system, energy storage system, inter-train exchange.

Reliability Functions of Electromechanical Power Steering

Denisov I. V., Smirnov A. A.

Pp 86 – 96

The vast majority of new automobiles are equipped with electromechanical power steering systems (EPS). These systems have clear advantages over hydraulic or pneumatic designs. At the same time, the service life of the EPS has not been fully studied. The EPS is a combination of electronic and mechanical subsystems, which puts certain limits on the application of existing diagnostic methods and tools typically used to monitor the performance and current health of a motor vehicle. This situation adds urgency to the development of standards for managing the health of motor vehicles based on diagnostic information, to organizing research results in this area into a system, and generally addressing the problem of improving the operational reliability of EPS systems. The results of the study should be helpful in developing a methodology for managing EPS reliability and faultfree operation. The background of the problem, objectives and methods are described in Part 1 of the article published in *World of Transport and Transportation*, Vol. 15, 2017, Iss. 4.

Keywords: automobile, steering system, electromechanical power steering, equipment health management, reliability, operation.

Transport, Economic Growth and Public Well-Being

Macheret D. A.

Pp 98 – 105

The article considers different aspects of the impact of the transport on economic growth and on increasing public well-being. The author argues that historical retrospective analysis proves the relationship between transport and transportation developments and economic and demographic situation. The developed graph model also can be used as a proof of positive influence of transport on economic development of countries and societies, in the growth of populations' well-being thanks to extended customer choice. The author highlights the evident contributions of both passenger and freight transportation.

Keywords: transport, economic growth, well-being, exchanges, diversification, differentiation, customer choice, innovation.

Analysis of Components of the Cost of Construction Products

Solovyov V. V.

Pp 106 – 117

The existing situation in the system of estimated pricing determines the need to find methods for assessing the accuracy of standards and their compliance with actual

costs. In the article the issues of the functional analysis of corrections in the structure of the estimated cost of construction products that occur due to changes in the requirements of the system of estimated valuations are considered. Methodical approaches to determination of the functional state of expenditures by types of construction using private factor-dependent relationships are proposed.

Keywords: transport infrastructure, construction objects, norms, estimated cost, analysis, profit, overhead expenses.

Macroeconomic Approach to Justification of Transport Projects

Frolova O. N.

Pp 118 – 129

The article examines approaches to justification of transport projects in advanced economies, provides assessment models used in the analysis of investments in the development of transport infrastructure. The advantages of inland waterway transport (low costs for transportation of bulk cargoes, low expenses for maintenance and repair of infrastructure, environmental friendliness, safety) are actualized in the justification of the expediency of transferring part of the cargo flows from bulk cargoes to land transport. The results of calculations of the multiplicative effect are presented on the example of the project of the development of water transport in the river basins of the European part of Russia are given.

Keywords: water transport, transport project evaluation models, macroeconomic substantiation, multiplicative effect.

Principles for Assessing the Investment Attractiveness of Infrastructure Projects

Palkina E. S., Morozova E. I.

Pp 130 – 136

To attract private investment in the innovative development of the transport system, the researchers believe, it is necessary to improve the methodological basis for assessing the investment attractiveness of capital projects. The article considers the principles that, in the opinion of the authors, should be guided in solving the related problems, and first of all those of them that relate to the infrastructure sphere, transparency and formalization of economic results, payback of financial investments from the state and business.

Keywords: economy, innovative project, transport infrastructure, evaluation principle, investment attractiveness.

Instrumentation of Dynamic Programming in Optimization of a Regional Transport System

Shramko A. P.

Pp 138 – 145

Optimized approaches to modeling of a region's transport system based on the principles of dynamic programming are compared with correlation of the volumes of cargo flows with the transport system's capabilities and the definition of an optimal route of movement for transportation of goods. A methodological tool for modernizing the regional transport system is proposed.

Keywords: water transport, auto enterprises, railway, regional transport system, dynamic programming, modeling, international transit.

Information, Quality Management, Engineering Management: Common Tasks and Solutions

Azarov V. N., Boitsov B. V., Maiboroda V. P.

Pp 146 – 157

The principal aspects of existing approaches to management of organization, dominants of its sustainable development, allowing to form new additional competences for a specialist, to form a theoretical and practical basis for training of an engineer manager are considered. The generality of the accompanying tasks, solutions and synergy of their implementation are declared in the system of priorities of Total Quality Management (TQM) and modern innovation and communication technologies on the example of large, structurally heterogeneous, logistically complex infrastructural systems of the transport industry. The authors set a goal to show why these provisions acquire special significance precisely for infrastructure transport and logistics structures, where the price of risk, error, insufficient protection of information is too great.

Keywords: transport, logistics, quality management, information, security, engineering management.

Terminal Infrastructure and Container Trains: Object Clustering

Moskvichev O. V.

Pp 158 – 173

The task is considered based on the long-term planning of development of a container transport system (CTS) as a part of a transport complex and associated with rational placement of the terminal infrastructure with respect to the areas of industrial production and consumption of container-compatible products. A methodological approach to clustering of objects of the terminal and logistics infrastructure was

developed to create conditions for the mass use of container trains on the railway network. The enterprises are divided into clusters with geometric centers, where stations and container points are located.

Keywords: cluster analysis, container transportation, container terminal, placement of transport facilities, container train, storage and distribution center.

Causes of Accidents and Criteria of Control on the Roads

Penshin N. V., Ushakova, M. A.

Pp 176 – 182

In the article, which has a nature of a review, the views of domestic and foreign researchers on the problems of road safety on roads, the causes of accidents and ways to prevent them are analyzed. Attempts are made to trace the main trends of scientific research in this field, including those that concern diagnostic criteria and indicators for assessing safety of passenger vehicles, as well as the human factor in all its contemporary manifestations.

Keywords: road safety, passenger motor transport, accident rate, diagnostics, control criteria, prevention of violations, human factor.

«Safety Intervals» at the Bus Stops of the City of Volzhsky

Chernova G. A., Velikanova M. V.

Pp 184 – 197

Analysis of the street-road network in the city of Volzhsky, a tense security situation with embarkation and disembarkation of public transport passengers is provided. The discrepancy between the lengths of stopping points and the incoming traffic of buses is determined. Proposals are made to improve the quality of passenger transportation, taking into account safety intervals at bus stops and optimizing the routes of urban public transport, private buses and fixed-route taxis.

Keywords: urban public transport, bus, stopping point, safety interval, route network, route optimization.

Criteria of Environmental Safety of Railway Transportation

Ovanesova E. A.

Pp 198 – 204

The article describes the case when railway transport complex is presented as an element within structured concept of national economy's transition to sustainable development. A question of formulating objective criteria of environmental safety of freight and passenger transportation is discussed. Environmental aspects of operation

of railways are developed, and criteria-based approaches to safety of railway-related infrastructure, rolling stock and environment are suggested.

Keywords: railways, transportation, carriage, sustainable development, ecological aspects, criteria of environmental safety.

Special Software for Pilot Training

Arinicheva O. V., Vlasov E. V., Grehov V. A.

Pp 208 – 216

The article is devoted to description of methodological problems, occurred during application of special software package intended for training civil aviation personnel within the program «CRM – twoman crew resource management». The authors suggest approaches to solution of main problems in assessment of efficiency of interaction in the aircraft crew, and to realization of suggested solutions. The article continues previously discussed topic (see World of Transport and Transportation Vol. 12, 2014, Iss. 5; Vol. 14, 2016, Iss. 1; Vol. 15, 2017, Iss. 3).

Keywords: civil aviation, flight safety, CRM, special software, methodological follow-up.

Struggle of Trade Unions against Social Dumping

Zubkov S. A., Krainov G. N.

Pp 218 – 225

In the context of modern globalization, transnational corporations (TNC) use social dumping in their practice, which is expressed in the export of low-quality economic resources, political ideas or sociocultural values for their own advantage to underdeveloped countries. The authors of the article, using examples from the activities of international transport unions, show their struggle against such dumping, in defense of the labor rights of wage workers, as well as attempts to establish mutually beneficial cooperation between trade unions, business and government.

Keywords: globalization, transport trade unions, international transport workers' federation (ITWF), social dumping, transnational corporations, trade union struggle strategy, labor rights of workers.

Rack Railway – a Way to the Top

Tikhonova T. Yu.

Pp 228 – 245

Today there are more than 160 rack railways around the world. Constantly (in winter and summer) about 60 of them operate. Half of all permanent roads are in Switzerland, where, as is known, more than 61 % of the territory is occupied by

mountains. A rack railway is a special type of railway with a steep incline, which has toothed wheel gearings, usually located between track rails. The author tells in some detail about the history of their creation, construction and operation. Currently, they are used as a means of moving along tourist routes in mountainous terrain or as urban passenger transport (for example, in Budapest, Zurich or Stuttgart). At the same time, the Swiss rack railways are profitable. In the territory of Russia, there are no rack railways. This despite the fact that in Russia there are also many mountain territories ($\approx 33\%$). And, as the author rightly points out, rack railways could promote their development and organization of activities that contribute to the development of the local community and the country as a whole.

Keywords: mountain relief, tourism, rack railway, history, gear wheel, toothed wheel gearing, turn mechanism, spring shock absorber, Blenkinsop system, Abt system, Marsh system, Riggerbach system, Strub system, Morgan system, Locher system, Lamell system.

Sea and Land Logistics of Cargo Front

Prokhorov V. M., Chirukhin V. A.

Pp 246 – 257

The authors analyze the organizational problems of the pre-war and wartime and the logistics methods of managing rail and sea transportation of the USSR in the period from 1938 to 1945. The article presents statistics, facts, a historical digression designed to assess the true scale of the «cargo front» and its role in protecting the country, people and overall victory over the enemy in the during the Second World War.

Keywords: war, evacuation, logistics, transportation management, railways, sea transport, lend-lease.

Windows of Opportunities for Trans-Eurasian Belts

Davydov A. M.

Pp 264 – 268

Vacuum and levitation transport systems: scientific foundation, technology and outlook for railways: Collective monograph. Edited by B. M. Lapidus, S. B. Nesterov. Moscow, RAS publ., 2017, 192 p.

Collective monograph of the members and scientific partners of the Joint scientific council of the JSC Russian Railways is devoted to the issues of fundamental research in the field of magnetic levitation and vacuum levitation technology. The publication of the book is a timely and important step towards creation of national innovation and engineering consortium of universities, academic and corporate research institutes, design organizations, innovation and venture companies, who will be capable to promote public industrial, scientific, research and

educational policy, aimed at creating new magnetic levitation and vacuum levitation transport systems.

Keywords: transport, magnetic levitation, projects, vacuum levitation engineering, transcontinental transport system, future railways.