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MODEL OF SOLUTION OF OPTIMIZATION PROBLEMS

Ustich, Petr A., Ivanov, Alexander A., Chernyshova, Lydia M.

pp. 6 – 16

The article refers to main outlines of mathematical model of rail transport. The authors substantiate the necessity to use dynamic programming method to optimize the parameters of the rail sector state. They argue the utility to use rail car department as a sort of department that is a «vehicle» of a key model idea. The authors suggest requirements concerning objective function, its formulae, and a tool to transform it into additive function via solving auxiliary optimization problem. They prove the necessity to realize a new paradigm of car designing model, which is mandatory for effective use of achieved optimum parameters of rail sector state. The management system for rail sector, as it is considered by the authors, is deemed to be multilevel and hierarchic, allowing there-by to analyze problems relevant to local conditions and objectives and according new possibilities to assess transit capacity of Russia and to create globally railway nets with scientifically bases management system. The implementation of such project might permit to achieve advantages for railway transportation, notably taking into account the maintenance of ecological balance and reduction of carriage costs, to gain part of market of truck, air and sea haulage.

Key words: railways, complex system, state parameters, optimization, management system, mathematical model, transport sector reforming, objective function, method of dynamic programming, reference state of a system.

THE TRAIN IN CURVE: ADDITIONAL POWER LOSSES

Alexandrov, Igor C.

pp. 18 – 23

The article assesses relationship between friction forces in the contact area of wheelset and rail and the features of track curve. The study has been developed on the basis of Euler formula that establishes a ratio of forces in a pair rope – cylinder (capstan). Theoretical analysis argues under certain conditions in favor of positive outlook of modular trains (see also the article by the same author in previous issue of Mir Transporta (World of Transport and Transportation) Journal, 2013, Vol. 49, Iss. 5, pp.28–37 taking into account editorial remark on the necessity of comprehensive study of the subject).

Key words: railway, wheelset, rail, curve, friction forces, power losses, Euler's formula.

METHODS OF EVALUATION OF THE IMPACT OF FREIGHT CARS ON THE TRACK

Anisimov, Petr S.

pp. 24 – 32

The author suggests experiment-calculated method to evaluate the impact of freight cars on the rail track. The suggested instruments have own mathematical apparatus, system of rates and equations, set of methods to identify stresses in the main platform of subgrade and in the ballast. Methodical basis of comparison of estimated and experimental data has been proved to be correct (discrepancy does not exceed on average 4–5%) and can be used as an alternative to long-term and high-cost tests.

Key words: rail track, freight car, rails, subgrade, springing, dynamic load, evaluation of impact, experimentcalculated method.

CHOICE OF PARAMETERS FOR A METRO COACH WITH PNEUMATIC SPRINGS

Serdobintsev, Evgeny V., Zvantsev, Pavel N., Ye Win Han (Republic of Myanmar).

pp. 34 – 41

The government of the Republic of Myanmar cooperates with Russian experts in implementation of the project of metro construction in the biggest city of Yangon. Shaping out of technical specification for manufacturing of rolling stock, well adapted to local conditions, includes the task of selection of design and parameters of springs. At the project phase that task is fulfilled through comparison of dynamic features of metro coach models. The use of pneumatic springs as elastic and dissipative element of body part of spring suspension is one of the variants which are now studied. The article contains results of comparative analysis of dynamic features of pneumatic and classical springs

Key words: metro, Myanmar, Yangon, rolling stock, spring suspension, pneumatic spring, quality indices, mathematical model, comparative analysis.

CRAFTS TO MAKE NAVIGABLE ICE LANES

Sazonov, Cyril E., Dobrodeev, Alexey A.

pp. 42 – 49

One of the main tasks for ice-breaking crafts is pilotage of freight ships under ice-bound conditions. The use of icebreakers which are complex engineering structures with high operative costs is not always reasonable, especially for inland waterways and for coastwise navigation. The effective solution of the problem of extension of navigation period could be found through designing of specialized ice-breaking devices which can make ice-lanes at less cost. The article is devoted to evaluation of different ice-breaking devices for icebreakers and towboats. The authors describe pushtrain and fish mounted crafts designed in Krylovsky research center to create wide ice-lane.

Key words: navigation, in-land water ways, coastwise traffic, ice, ice-breaking device, pushed device, towed device, ice-breaker, wide ice-free canal.

ACCUMULATING POWER STORAGE DEVICES FOR METRO TRAINS

Loginova, Elena Yu., Kovalenko, Andrey V.

pp. 50 – 57

See positive results of the use of power storage devices for rolling stock traction, the article studies variants to use them for Metro motor coaches. The authors have held numeric simulation of moving of trains equipped respectively with moving with standard power system and the system with power cumulating storage devices, and compared operation of those systems using power efficiency ratio. The study resulted in conclusion on practicability of on-board power cumulating systems for metro rolling stock.

Key words: metro train, regenerative power, power cumulating system, mathematical model, model of coach's electric circuit, traction mode, braking.

CONTACT PRESSURE IN CYLINDRICAL SURFACES OF CENTER PLATE ARRANGEMENT

Voronin, Nickolay N., Voronin, Nickolay N. (Jr), Zin Aye Min (Myanmar).

pp. 58 – 65

Contact pressure is one of main factors that influence level and character of wear and tear of center plate arrangement. Distribution of contact pressure over the

contact zone in the case of cylindrical surfaces is unbalanced. A software was developed in order to numerically analyze the influence of different diameters of top (pivot block) and bottom center plate (end thrust bearing) on changing of monitored values. The obtained results have shown that the values of contact pressure depend on clearance between top and bottom parts of center plate arrangement. At the initial stage of operation the values of contact pressure for nominal values of diameters of both top and bottom part of center plate are lower than when they are manufactured with admissible departure.

Key words: railway, rail tank-car, tribology, central plate arrangement, contact pressure, numerical analysis.

COMPUTED MODEL FOR TRACTION GEAR

Mochalova, Tatiana O.

pp. 66 – 73

The article describes development of finite element model which doesn't contradict real unit and is intended for dynamic computation of traction engines of locomotives.

The article argues in favor of use of the method of finite elements because it allows reflecting elastic, inertial and dissipative features of dynamic systems. The approaches towards simulation of the bogie with the account for springing, traction engines, braking cylinders at the edges of the frame are substantiated. The described model of «frame bogie – traction engines» is verified for conformity with experimental data.

Key words: locomotive, railway, model, system «bogie frame – traction gear», finite element method, forms of oscillation, amplitude spectrum of accelerations.

LIMIT OF CONTROL ACTUATION IN SWITCHING AND CONTROL UNITS OF DOUBLE-FILAMENT BULBS OF LIGHT RAIL SIGNALLING SYSTEM (PKU-M)

Zenkovich, Yury I.

pp. 74 – 78

The article deals with methods of determination of limit values of actuation of control block unit in microelectronic switching and controlling devices of color light signals. The author describes techniques to determine value of voltage or current that actuates comparator in threshold device of the circuit of digital processing of the signals in the units of control of light signals system's bulbs.

Method of statistical decision-making on the basis of average risk criterion is used to obtain calculated formulas. The set of proposed methods can be used at manufacturing plants to adjust manufactured devices.

Key words: switching device, signal transformer, double-filament bulb, light signal, control device, AC 220 V input, individual fuse, operative current of a bulb, mathematical expectance, dispersion, risks, root-meansquare deviation.

MULTIMODE LOGISTICS CENTERS: EXPECTED EFFECTS

Petrakov, Gennady P.

pp. 80 -85

The article assesses possible outlook on socioeconomic effects of development of multimode logistics centers (MLC) in Russia. The author comments on the advantages of international multimode carriage for operating companies and cargo owners. The efficiency of multimode traffic is illustrated at the example of delivery of 40 foot container from Saint Petersburg to Berlin. Computations, observations and conclusions prove organization of MLC to be quite reasonable and efficient for all the participants in the carriage process.

Key words: multimode logistics center, road transport, sea port, railway, economic effect, international carriage, containers.

APPLIED METHODS AND RESULTS OF COMPUTATION OF ELASTICITY OF DEMAND RELATIVE TO TRANSPORTATION QUALITY

Lavrov, Ilya M.

pp. 86 – 95

Market demand for carriage depends on a variety of factors which can be divided into two groups: controlled factors (freight tariff, quality of transportation service) and uncontrolled factors (emergencies, accidents, fluctuations of market conditions).The objective of the present article is to assess the impact of quality on demand for transportation. The system of quality indices establishes balance of interests of operators and customers of transport services. This balance permits operators to raise quality of their services in advance, and allows customers to protect their rights on the basis of the rules established by contracts and standards. But in order to determine the impact of a single factor it is necessary to eliminate other factors, which are relevant and admissible for forecasting.

Key words: railways, economics, freight traffic, demand, quality, variation, deseasonalization, approximation.

SYNERGETIC EFFECT OF TRANSPORT

Galaburda, Victor G.

pp. 96 – 100

The article underlines problems of insufficient funding of innovative development of Russian railways, shows ways to attract funding via non transport (synergetic) effect for the customers of transportation services in the framework of privatepublic partnership. The author proposes formulae of definition of reduced expenditures and results for assessment of investment in infrastructural projects, methods of calculation of some elements of synergetic effect, which is achieved through accelerated rotation of material resources, reduced inventory norms, increased incomes of realty owners in the regions adjacent to transport networks, social effect of increased mobility of population if innovative transport capacity of the country considerably develops.

Key words: transport infrastructure, off-transport synergetic effect, criterion of investment effectiveness, saving of floating assets, real estate price, social effect, co-funding of innovative projects, private-public partnership.

NETWORK STRUCTURE OF INTERREGIONAL TRANSPORT SYSTEMS

Tararychkin, Igor A., Slobodianuk, Maxim E., Nechaev, Grigory I.

pp. 102 – 111

The article studies organization of transport systems on the basis of clusters with account for industrial links emerging between them.

The network structures are considered at local, regional and interregional levels. The authors propose approaches towards transport network organization, methods of managerial actions, demonstrate examples of structural decisions for variants of clusters located next to and at a distance from transit corridors.

Key words: transport, transportation, system, network, structure, freight flow, cluster, nodal point, traffic nodal center, region, management levels.

BULK FREIGHT AT THE PORT: SITUATIONAL HANDLING

Prohorenkov, Alexander M., Istratov, Roman A.

pp. 112 – 125

The article describes study on approaches towards solution of a problem of situational control of transshipment of goods at the sea port on the basis of virtual technology and mathematical simulation. The results of the study are demonstrated with the help of examples of Murmansk sea port and Internet-site, which serves to prove the efficiency of electronic data exchange.

Key words: sea port, multimode traffic, bulk freight, situational management, mathematical model, Internetsite, electronic data exchange.

DIGITAL MODELS OF STATION TRACK DEVELOPMENT

Umansky, Vladimir I., Dolganuk, Sergey I.

pp. 126 – 133

In order to use automatic control of train and maneuvering routes it is necessary to position moving objects (locomotives, maneuvered trains, rail cars) at station tracks in real time mode. So there is a need for tools of satellite navigation, intelligent systems based on digital models of station tracks. The article describes approaches of that problem, methods of database development, needed for simulation of system elements as a selection of different types, as well as methods of solution of equations describing trajectories of the axis of rail tracks.

Key words: railway, station, track system, track development, gridiron, digital model, intelligent system, routing control.

MULTIMODE PASSENGER TRAFFIC IN KAZAN

Kovalenko, Alexander N.

pp. 134 – 138

The article refers to the problems of transport services in the city of Kazan, capital city of the Republic of Tatarstan. The author proposes variants of enhancement of transportation services relative to enlargement of rail infrastructure, organization of multimode passenger traffic, passenger traffic from city rail station to international airport.

Key words: urban transport system, multimode passenger traffic, rail infrastructure, transport transfer hubs.

THE RESULTS OF EXPERIMENTS IN THE AREA OF HIGHWAY EROSION

Kovalev, Peter D ., Gorbunov, Alexey O., Plekhanov, Philip A., Zarochintsev, Vitaly S.

pp. 140 – 145

Research of wave regime and transformation of waterside relief in the coastal area of intense destruction of the road Yuzhno-Sakhalinsk – Okha, started in 2007, was continued in 2012–2013. Three detailed bottom bathymetric surveys were conducted, one of which showed a significant relief change. Comparison of the results of regular surveys and analysis of synoptic situation led to the conclusion that the most noticeable changes occur in autumn and winter periods, when the energy of cyclones attains maximum level, and it must be considered to ensure the safety of traffic on the Trans-Sakhalin road.

Keywords: highway, erosion area, field studies, bathymetric surveys, comparative analysis.

ON THE LEGAL RESPONSIBILITY FOR LASER ENDANGERING

Rahmanov, Boris N., Kibovsky, Vladimir T.

pp. 146 – 155

Hooliganism with the use of lasers against vehicles naturally causes legal implications in different countries.

Laser irradiation of the driver of the vehicle, particularly the pilot of an aircraft, leading to temporary blindness, and even to a loss of visual function can have very serious consequences, fraught with the death of allthe road or flight passengers.

The authors analyze the legal framework of liability and penalties for laser hooliganism; offer their mathematical apparatus to the methodology of risk assessment of laser radiation referring to transport operations.

Keywords: vehicle, aircraft, laser radiation, laser safety, «laser hooliganism» administrative offense, criminal offense.

ON THE LABOR ENVIRONMENT OF BRIDGE BUILDERS

Agapov, Andrey G., Dashkevich, Ivan M.

pp. 156 – 160

Interrelation of labor safety and of environment has always been a leading factor for profession of bridge builders who conduct construction and repair works at the railway installations. Cartogram of working conditions and analytic data permit the authors to classify this professional group as subject to injuries and risks.

Key words: labor safety, bridge works, cartogram of working conditions, traumatism, injury, ecological damage.

TRAINING GROUND OF NAVIGATION SIMULATORS

Ivanov, Mikhail A., Demchenkov, Oleg V.

pp. 162 – 169

Analysis of the causes of accidents on inland waterways of Russia permits to conclude that one can observe a stable trend to decreasing of professional skills of shipboard personnel of inland navigation. Navigation simulators constitute one of promising tools of professional training. Impartially, there is a problem of searching of a compromise between quality of professional training and duration of training. This problem depends directly on the contents of database of simulators.

The authors propose methodological approach towards the development of contents of database of navigation simulators on the basis of the concept of training ground taking into consideration typical elements of inland waterways, hydraulic facilities,

Practical implementation of proposed method supposes typical operations aimed at integration of the modules of fragments of inland waterways and other elements into the training ground.

The authors come to a conclusion on the practicability of creation of regional training and simulator centers for training of navigators of appropriate water areas and describe possible ways to better use navigation simulators, whose database's contents were developed in the framework of concept of training ground.

Key words: inland water transport, navigation simulators, database content, training ground, training area, testing area, professional training of navigators.

INTERGENERATIONAL ANALYSIS OF SELF-ASSESSMENT OF INTELLECTUAL POTENTIAL

Zhiriakova, Svetlana N.

pp. 170 – 175

Many studies were held and are currently been held on the adaptation of manpower resources to market environment. But there are still aspects which are rarely studied. Those are multidimensional character of psychological readiness of intellectual potential of different generations to adapt to market conditions, specific weak readiness of some generations, and differences due to regional cleavages explained by different life conditions. The author, studying assessments made by younger, middle and elder population of economically mono-profiled cities, particularly of the city of Gubkin, regarding local opportunities and personal prospects, make conclusions about their present and future situation and the broken intergenerational continuity.

Kew words: intellectual capacity, intellectual potential, intelligent systems, people generation, self-assessment, intergenerational analysis, socializing factors, education, profession, social and cultural values.

ABOUT THE OPTIMIZATION OF THE STRUCTURE OF JOB POSITIONS

Giricheva, Valentina A., Kanivets, Raissa F.

pp. 176 – 184

The article is devoted to optimization of the staff and workforce within the units of automatics and telemechanics of regional directions of the infrastructure department of JSC Russian Railways.

The authors computed indices that are characteristic of need in personnel in general, as well as regarding positions and occupations. The study presents an algorithm which considers span of control, structure ratio, equations expressing correlation of number of employees in staff lists with core factors that reflect differences in technical equipment, labor productivity.

The study also analyzed deviations of real staff strength from optimum calculated rates.

Key words: railway, personnel, staff, organization structure, structure factors, span of management, correlation dependency, job volume, labor productivity, staff list, optimization of personnel.

RUSSIAN BAST IN TELEVISION LINE ON THE OCCASION OF CENTENARY OF THE BIRTH OF S. I. KATAEV

Grigoriev, Nikolai D.

pp. 186 – 191

In the history of the invention of television cathode ray tubes and creation of a system of public television, his name stands next to the name of another Russian scientist and designer V. K. Zvorykin. Competition of their priorities, patents, typical for transient era of scientific and technological revolution, has unlikely highlighted all key points almost fairly. Biographical details, provided by the author, give more coherent picture of this outstanding representative of Russian science.

Keywords: television, cathode ray tube, invention, priority, history.

TELEVISION SETS ON RAILWAYS

Mikhailov, Vyacheslav V.

pp. 194 – 198

With the development of television broadcasting, an industry branch of a new electronic information industry was created. Railways were among the first industries that began to use the opportunities of black-and-white television (monochromatic) in image signals transmission systems of objects to control the functioning and transport safety and security. The article provides an overview of scientific and technological achievements in this field and chronological dates associated with them.

Keywords: railway, history, television apparatus, reading of moving trains numbers, chronology.

THE PLANNING OPTIMIZES THE FUTURE

pp. 200 – 202

The review of the book:

Trofimenko Yu.V., Yakimov M. R. Transport planning: establishment of efficient transport systems of big cities [Transportnoe planirovanie: formirovanie effektivnyh transportnyh system krupnyh gorodov]. Monograph. Moscow, Lotos publ., 2013, 464 p.

The book contains comprehensive analysis of modern approaches of transport planning in big cities within general context of urban transport systems and mobility

development. The authors suggest wide application of mathematical models and optimization problems.

Key words: transport system, city, infrastructure, structures, planning, mathematical model, management, optimization problem.