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INTEGRATED CONTROL OF HIGH SPEED RAILWAY

Tsvetkov, Victor Ya.

pp. 6 – 9

The article is devoted to the choice of a new model of control for high speed transport which is based on its definition in the space of parameters. It studies application of traffic schedule patterns and compares interval parameters of a real positioning of a transport object with a sample situation, set by schedule. The author suggests the ways how to use the described model to analyze and control intelligent transport system. Classical digital models of moving objects are computed on the basis of the coordinates in the point of their current situation. It means that such models, once they are applied for geoinformatics and transport, contain information on coordinates only and are determined in real 3D space. Temporal referencing of coordinates exists only as a form of recording of the time of measuring of a spatial point where the object is situated. The control, based on such approach, includes evaluation of the features of an object in a given point and decision making referred to such a point. While when high speed traffic is concerned, such an approach delays analysis of a situation, causing growing risks of object vulnerability and incorrect decisions.

In order to overcome such a default the author suggests using integrated control, based on a new type of digital models. Such digital model should be determined not only in the space of coordinates, but in a more capacious space of parameters including coordinate, speed and acceleration data.

The second feature of the new model consists in the interval character, the models are determined not for a point but for a certain interval of evaluated values «from… till…» for distances, speeds, and accelerations. The third feature supposes simulating of reference sample interval model of traffic according to traffic schedule of a rapidly moving object, that represents a set of mask (allowable intervals of distances, speeds, accelerations).

Control is accomplished via comparison of real digital interval traffic model and of reference interval traffic model.

Such an approach is a development of the ideas of integrated control of transport objects but the described dynamic model includes moreover geoinformatics data of interval variables and a sample system. Methodologically the suggested approach develops ideas of situation control of transport objects or of control under unforeseen circumstances.

Key words: high speed railway, intelligent control, interval models, digital models, traffic schedule, models of geoinformatics data for transport control.

ELECTRIC CURRENT DISTRIBUTION IN AUTOTRANSFORMER SYSTEM

Chernov, Yuri A.

pp. 10 – 18

The article exposes a method of calculation of current distribution within autotransformer system of power supply of single and double track railways with voltage between wire network and rails that differs from the voltage between feeding wire and rails. The presented equations result in simplified formulae that allow calculating the load on transformer's units. The calculations based on formulae show that compensating current doesn't influence the load of transitional autotransformers.

The load on the autotransformer which neighbors substation on one track depends on the load on the autotransformer which neighbors the substation on the second track.

Key words: railway, power supply system, autotransformer, current distribution, traction network.

ORGANIZATIONS OF THE FUTURE

Butov, Alexander V.

pp. 20 – 26

Theory of organization is permanently searching for new forms of business organization. The article reviews main trends of changes in the concept of management in 21st century and identifies forthcoming types of organizations that better suit modern system of management. The traditional forms of organization, which are linear functional, divisional, are replaced by new types of organization, some of them are well known, other are still being developed. For instance, team structure is characterized by flexibility, autonomy of decision making, independence (possesses wide spectrum of experts capable to decide complex problems). Virtual organization ensures integration of process of joint development, manufacturing, commercialization, service with business partners, creates temporary alliances, develops contract relations among the participants, widely uses modern information and communication technology, and owns joint assets. Entrepreneur type of organization structure, characteristic of diversified companies, focuses on profit centers, has entrepreneurial clusters, plain structure and flexibility. So called unlimited organizations extend their borders via open information exchange with the partners, by allowing access to internal computerized management systems etc. The article also refers to idealistic (missionary) organizations, suggested by Henry Minzberg, and to living company concept, developed by Arie de Geus.

Key words: management concept, organization structure, unlimited company, missionary organization, living company, system outlook

MODULAR TRAIN: ENERGY SAVING

Alexandrov, Igor C.

pp. 28 – 37

The article refers to comparative analysis of traditional and modular schemes of freight rail train. The author substantiates relative advantages and describes outlook for modular trains. The limits of using of super powerful locomotives are shown, followed by preliminary assessment of low level of their power and economic efficiency.

Existing theory of locomotive traction [1] considers motion of a train which is a system of material objects (locomotive and cars) as a motion of a material point where all the weight of the train is concentrated. This much reduced mathematical model permitted to analyze progressive motion of the train by the laws of Newton. Automatically ignored are energy processes within the system of material bodies itself. Particularly friction losses in the coupling and in other devices, which participate in transmission of power from locomotive to wheel pairs, are not considered, thus coming into conflict with tribology la ws.

The author suggests another approach of traction calculation, when the train is simulated as consecutive and parallel kinematic chain (KC). Simultaneously the most efficient variant of KC is determined. As alternative to traditional scheme of rail train leaded by locomotive (pic.1a) the author proposes to consider a construction where kinematic links are simplified and partially replaced by electric links (pic.1b). This scheme is named modular scheme. A module represents a cluster unit of rolling stock with motor car coupled with one or several ordinary (without traction) cars.

The author admits that the realization of motor car scheme is technically complicated see large number of power consumers in the train. Nevertheless the motor car scheme has been largely developed for electric passenger trains. That's why author argues that similar scheme should not be positively rejected for freight trains in future.

If we assume that the further development of heavy load trains continues by placing more and more powerful locomotives at the head of trains, it will cause reduced power efficiency, growing risk of their stretching, exceeding of admissible value of friction of wheel pairs of locomotive, breaking of couplers, deformation of lower frame of first cars, which are designed with account for definite value of stretching and impact load.

On the contrary the development of heavy load trains on the basis of modular technology could help to maintain (or even to reduce) traction load on the coupler within admissible values and to compose trains of any freight load, without contradicting physics laws, defining rate of adhesion of wheel pair with rail, and without increasing axle load, section power and weight of locomotives. The modular scheme takes into the account factors affecting longevity and reliability of rails.

Australian railways have already used super heavy load modular train with eight locomotives, distributed along the train (in other words they use eight modules), and 682 cars [8]. So the modular trains represent engineering approach which has already been implemented.

Key words: railway, freight train, rolling stock, modular scheme, gas turbine locomotive

IMPROVING OF CLIPPED SPEECH SIGNALS

Volkov, Anatoly A., Kuzukov, Vassily A.

pp. 38 – 43

The authors describe the method of filter-phase shaping of single-band signal with deep amplitude limiting (clipping) which, after using filter method with coherent quadrature detection, allows to condition single-sideband of frequencies of oscillations with phase-shift keying (PSK) at 180° and thereby to reduce by half the band of frequencies of the transmitted signal, maintaining maximum interference immunity of communication. The method engineered by them permits to solve to a large extent the problems of shortage of radio frequencies. Some other technical solutions, allowing improvement of speech signal transmission, are also described.

Keywords: clipping of speech, phase shift keying, single sideband modulation, detection, recovery of the envelope of the speech signal.

ADDITIONAL WORKS IN SCHEDULED MAINTENANCE OF MOTOR VEHICLES

Razgovorov, Constantine I., Amirseyidov, Shihseyid A.

pp. 44 – 47

The article contains results of the studies on revealing of additional repair works during routine maintenance at dealers' stations and on planning of its labor input for efficient organization of works. The authors substantiate indices of increasing of repair works on the basis of vehicles mileage, process of scheduling of station services› job.

Key words: motor vehicle, maintenance regulations, repair work, dealers' service stations, production program.

NEW REQUIREMENTS CONCERNING MOTOR ROLLING STOCK

Mordovin, Evgeny A.

pp. 48 – 53

Strategy of development of JSC Russian Railways and the growth in commuter passenger traffic put forward new technical requirements for electric trains. In conformity with those requirements Siemens has engineered a model of commuter electric train «Lastochka» (Swallow) with the outlook for further localization of its manufacturing in Russia. Motor rolling stock received modern braking system which is highly efficient and engineered for velocity up to 160 km / h. The article describes in details operation and design features of braking devices and its control units.

Key words: railway, motorized rolling stock, electric train Lastochka, efficacy of braking, technical requirements.

OPERATION OF POWER STORAGE DEVICE IN MOSCOW METRO

Grechishnikov, Victor A., Shevlugin, Maxim V.

pp. 54 – 58

The article refers to stages of implementation of regenerative braking system at Moscow metro.

The authors publish the results of experimental measuring of operation rates of the system of traction power supply and of stationary power storage device. The article describes installation process of storage device at the traction substation and its test operation. The monitoring confirmed high correlation of the rates of operation regime with previously calculated data.

Key words: electric power supply system, traction substation, metro, stationary power storage device, regenerative braking, test operation.

ON THE NECESSITY OF INDEXATION OF TARIFFS

Ryshkov, Anton V., Shahanov, Dmitry A.

pp. 60 – 67

Russian railways have limited capacity at some sections which are most used for freight carriage.

Balanced development of rail structures is really required for maintenance of appropriate level of transport security of some regions. Implementation of investment program of JSC Russian Railways is deemed to change the situation. But large

investment efforts are complicated by relatively low profitability, high level of capital output ratio, prolonged period of payback of structures. Taking into account that the capacity of debt burden for holding company of Russian Railways is limited, internal sources of funding could become a probable variant of supplementary consolidation of resources for implementation of investment projects. To achieve that goal the authors suggest and substantiate introducing of investment component within public tariffs for rail carriage.

Key words: railways, freightage, infrastructure, structures, tariffs, investment component, indexation, competitiveness, development strategy.

ANALYSIS OF INFRASTRUCTURE DEVELOPMENT OF RAILWAYS

Inozemtseva, Svetlana M.

pp. 68 – 77

The article refers to features of accountability of operation costs of rail infrastructure in relation with other corporate activities. The author cites examples of calculations relevant to different business sectors of JSC Russian Railways, costs units and expenses' groups, considers issues of methodology of economic analysis, of funding of structural projects, of comprehensive study of relevant processes, and of modification of traditional management methods. The author summarizes foreign expertise, main differences, specific features of world rail systems.

Key words: railway, infrastructure, economics, operation costs, development, projects funding, foreign and national expertise, comparative analysis.

ROLE OF INFRASTRUCTURE IN INTERACTION BETWEEN MARKET ACTORS

Tereshina, Natalia P., Nikitina, Maria A.

pp. 78 – 85

During the period of overcoming of the consequences of global financial crisis the rates of economic revival and goods exchange in Russia, and of dynamics of demand for general goods carriage lag behind previous forecasts. General trends towards stability and growth in world economics are neither positive. The worsening of conjuncture in China, continuing recession in Europe, lowering prices for coal, grain and nonferric metals weaken market position of leading actors of transport market who are normally at the origin of important flows of freight. Consequently priority should be given to increasing of efficiency of interaction between largest Russian infrastructure unit which are Russian Railways and the companies who forward their goods.

Key words: railways, infrastructure, economics, interaction, tariffs, public regulation, competitiveness.

INVESTMENT RISKS IN MOTOR VEHICLES MARKET

Lebedeva, Anna S.

pp. 86 – 91

The author analyzes prospects of applying of statistical method of quantitative analysis for investment risks assessment at motor transport enterprises, suggests techniques to evaluate investment losses, and assess efficiency of investment, taking into account features of the transportation services› market. The article contains results of approbation of statistical method of assessment of investment risks and losses at motor business structures.

Key words: motor transport, market, investment risk, quantitative analysis, statistical method, motor enterprise.

MINIMIZATION OF CHARGES FOR SCHEDULED REPAIRS

Bykov, Anatoly I., Petilava, Ruslan A.

pp. 92 – 95

The authors have developed method, that allow, focusing on economic criteria, to identify optimal car repair shop for scheduled repairs of cars, wagons and tank-cars. As a tool to determine extremum of objective function of minimization of costs they use linear programming.

Key words: railway, economics, competition, car repair, minimization of costs, method of computation, linear programming.

SIMULTANEOUS BOTH TRACK OCCUPATION

Kovalenko, Nickolay I., Grin, Elena N.

pp. 98 – 101

The efficacy of maintenance of track and structures at the railway sections with intensive freight traffic can be augmented by rational redistribution of repair works. Favorable conditions can be achieved particularly by according simultaneous both track occupation at double-track rail sections. The authors describe practices of track

maintenance at Kuibyshevskaya railway – a subsidiary to JSC Russian Railways as compared to international expertise.

Some railways, for instance in People's Republic of China, widely practice such 3-hours track occupations, thus allowing to do all necessary works, e. g. to replace singular rails, sleepers, elements of switches, to proceed with straightening and aligning of the track etc.

The authors have analyzed possibility to provide such track occupations at the network of Kuibyshevskaya railway. They have made a conclusion that there is a possibility to provide them all along the main track from Rybnoe to Chelyabinsk for 2–3 hours. In 85% of cases there is a possibility to provide them during day-time, and in 15% cases – during night-time.

Key words: both track occupation, section system, track maintenance, sections with intensive freight traffic, scheduled and prevention repair works.

SYSTEM REACTION TIME DURING INQUIRY PROCESSING

Berezka, Mikhail P., Sungatullina, Alina T.

pp. 102 – 107

The authors have studied features of network analytic database of automatic control system Express-3 that ensures collection, treating, storage, analysis of information on passenger traffic and baggage within the framework of relevant activities of JSC Russian Railways. Actually one can witness significant growth in number of control tasks and of users of Express-3 system, which causes high loading of system servers. In order to analyze the situation the authors studied features of automatic workstation «Monitoring of webapplications». The article describes the diagram of dependencies between system reaction time to users' queries and parallelism index, relevant statistic series.

The study revealed that dependency on complexity of queries is higher than dependency on users' number. The authors use histogram of the density of distribution, and empiric function of distribution of studied value, as well as Pearson criterion to verify conformity of empiric law of distribution of system query reaction time to exponential and logarithmically normal laws. Using the statistic data, collected during the study, the authors made conclusion that those laws don't conform to fitting criterion χ 2. That's why the article suggests that further simulation of existing process of simultaneous treating of users' queries in

Express-3 system environment should be based on relevant empiric functions of distribution which would serve as laws of time distribution of system reaction to users' queries for the analysis of WEB-resources like PZDFINN, NEWSPN, RMEST.

Key words: railway, control, automatic control system Express-3, users' query, monitoring, parallelism index, reaction time, statistical array, empiric distribution function.

HOW TO SHAPE OUT THE BALANCE?

Hodyrev, Alexander N.

pp. 108 – 113

Most municipalities have some transportation problems. Very often they are not separated from other social and economic problems. Among main reasons are shortage of powers of local authorities and relative deficiency of taxation incomes.

The article evaluates prospects of balancing of social, financial and administrative relations for municipalities.

Key words: city district, municipal transport, administrative balance, municipal powers, balanced administration, human resources, public control.

MECHANISMS OF RAILWAY INDUSTRY REFORMING

Panshin, Igor A., Sidrakov, Andrey A.

pp. 114 – 119

The article refers to some managerial and administrative tasks which are studied within the analysis of current results of railway industry reforming in Russia. The authors study three main fields: risks of loosing of integral indivisibility of responsibility for transport service; capacity to comprehensively assess ecological engineering tasks for railways; attempts to bring advanced computer tools closer to educational and training technology.

The authors give autonomous views and arguments concerning different fields, but all of them refer to urgent issues of economics and public administration in transport sphere. There is much place for discussion…

Key words: railway, reform, transportation service, management psychology, ecology, training technique, information, staff training, science progress.

TIME-TABLE PLANNING FOR ACCELERATED FREIGHT TRAINS

Prokofiev, Mikhail N.

pp. 120 – 124

The article describes approaches of designing of a special method of time-table planning for accelerated freight trains.

The author, having analyzed the features of technology of operation of accelerated freight trains, suggests that they are similar to passenger traffic and so it is possible to take for a basis the methods used for planning of passenger traffic time-tables.

The proposed method includes the following steps:

1) Identification of the volumes of traffic by destination stations with the help of linear programming. Target function is defined as maximum profit received out-of carriage service with a respect for some restrictive conditions:

• coping with density of freight flows;

• carriage without overload;

• non-negative values of quantity of trains by each destination;

2) Optimization of achieved plan of time-tables using criterion of competitiveness of destinations;

3) Analysis of achieved destinations using criteria of cost and time of delivery by main and alternative routes;

4) Distribution of trains by railways in conformity with capacity, providing for profitability of destinations.

The author suggests to use MS Excel Solver add-in to solve problems of linear programming. As example of planning of accelerated freight trains' time-table the article contains computation of cargo flows (not general goods) which are currently carried by main motor roads St.Petersburg – Moscow and Moscow – Nizhny Novgorod.

Key words: railway, train timetable, specific goods, small deliveries, accelerated carriage, computing method, technology.

EMERGENCY OPERATION OF A MAGLEV COACH

Petrov, Gennady I., Anisimov, Petr S.

pp. 126 – 135

The article refers to brief technical description of a maglev passenger coach, which had been engineered in Russia since 1976, and of mathematical model and software for PC and workstations which permit through simulation to forecast dynamic interaction of parts and units of the coach, as well as coach's behavior at the moment of its accident landing on the track. This model allows to determine criteria of traffic safety.

Mathematical model is represented as spatial mechanical system of 13 solids, joined by elastic dissipative elements. The system of differential equations, describing motions of the coach at the moment of its accidental landing on the track, is of 84th order. The authors used rapid not-iterated closed method of integration, designed by professor V. Husainov, where the third derivative in Taylor decomposition is represented by difference in relocation and not in acceleration. The authors describe the results of computations concerning different dynamic parameters.

Key words: railway, traffic safety, coach, track structure, magnetic levitation, levitation clearance, accidental landing on the track, mathematical model, software, dynamic parameters of rail car, initial speed of fall, braking distance.

ASSESSMENT OF STABILITY OF TRAFFIC PROCESS

Shevchenko, Anatoly I.

pp. 136 – 143

The article describes methodological approach of assessment of stability of rail traffic process. The author suggests analysis of internal and external destabilizing factors, possible algorithms of assessment of carriage process stability, and of stability control, providing for potential risks and damages caused by emergencies. The author substantiated criteria of stability (principal and auxiliary) and methods of its application in order to maintain the carriage process in safe limits (targeted or acceptable). The article also refers to issues of psychological and physiological conditions of the staff, their impact on human ecology and prevention of emergencies, quality of engineering solutions.

Key words: railway, emergency, stability of carriage, traffic, engineering ecology, human factor, management criteria, factors of risk and damage.

RUSSIA AND WTO (REQUIREMENTS CONCERNING ECOLOGY OF TRANSPORT COMPLEX)

Karapetyants, Irina V.

pp. 144 – 152

Transport network and structures are always of a certain threat to environment, population, nature. The features of every mode of transportation (sea, river, rail, air, and road) add its specific problems. The author analyzes different aspects of changing requirements to ecological risks' control in the context of adhesion of Russian Federation to World trade organization. The economic, financial, legal aspects are assessed.

Key words: WTO, Russia, transport complex, ecological safety, environment, international standards, transport vehicles, energy, structures.

MODEL OF TRAINING TEXT OF PUBLICIST STYLE

Bisikalo, Mira S.

pp. 154 – 157

The article describes requirements for a model training text of publicist style that should enhance speech culture and oral communication skills of future graduate of a technical university. The author also refers to evolutionary features of Russian language and to its critical analysis in order to arrive to modern comprehension of training tasks.

Key words: education, training text, Russian language, linguistics, text model, mass media.

PHYSICAL SKILLS ASSIST TECHNICAL SKILLS

Romanov, Alexey A., Komarova, Galina L., Kochetov, Victor V.

pp. 158 – 161

The article deals with the process of physical training of future graduates who will join railway staff. The authors insist that special physical training, exercises and training methods have large positive impact on technique of movement of a person, what is of importance for further job.

Key words: professional, vocational training, railway college (high school), physical training, special sport exercises.

PROFESSIONAL EDUCATION. EDUCATION BY PROFESSIONAL TRAINING

Aleynikov, Nickolay Ya.

pp. 164 – 168

The president of Russian Federation in his annual message to Federal Assembly addressed the tasks of education of next generation and of training of human resources who will work in national economy.

The article assesses trends of school and university education, political and economic aspects of interaction of employers and employees in the labor market, refers to some features of psychology and psychologics (a newly suggested term) of public consciousness and behavior.

Key words: education, training, politics, society, personality, higher educational institution in professional sphere, school, professional standard, qualification, social responsibility of business, civil values.

EICHENVALD TEST

Grigoriev, Nickolay D.

pp. 170 – 175

Professor Eichenvald belongs to the prominent cohort of Moscow University of Railway Engineering. He was first elected director (rector) of the University, had been head of the department of physics for more than 25 years.

He is well known in scientific community for his works in electricity, magnetic fields, non-linear acoustics, hydrodynamics equations, physical kinetics of gas. The article is devoted to his 150th anniversary.

Key words: science, education, history, electric engineering, physics, Maxwell equation, Eichenvald test.

SAINT ICONS AT THE STATIONS

Shaulsky, Boris F., Maslennikova, Svetlana V.

pp. 176 – 181

The article explains the history of the advent of the icons at the railway stations at the end of 19th century. As the stations emerged at great distances from cities and villages with the churches, it was allowed to have icons at the stations and to conduct a service there.

Key words: history, railways, personnel, religion, rail stations, icons, service.

NEW MOBILIZATION ON THE EVE OF THE VICTORY

Belogurova, Tatiana A.

pp. 182 – 186

The article suggests a historical review of social and economic aspects of operation activities of railways in Smolensk region after liberation in 1943. The author widely uses regional archives to document the events.

Key words: railway, Smolensk region, history.

INNOVATION: EVERYTHING IS LEGITIMATE

pp. 188 – 190

Aksionov B. A., Kattzyn D. V., Ustich D. P. Legal Regulation of Innovative Activities in Russia: Federal and Regional Level. Monograph. St. Petersburg, Petersburg State University of Railway Engineering, 2013, 252 p.

Organization in Russian Federation and in its regional entities of innovative system, based on sustainability and competitiveness, demands comprehensive legal basis. The book, reviewed by editorial staff, describes conditions of legal enforcement and legal regulation of innovative activities at federal and regional level. Special attention is drawn to financial, tax, insurance and other preferences, accorded in the innovation sphere, and to possibility to use them by JSC Russian Railways.

Key words: innovations, law, legislation, railways, investment.