

D.O. Bosiy, E.M. Kosarev: Calculation of the Traction Power Supply Systems Using the Functions of Resistance

The article is devoted to the development of a new method of calculating the instantaneous traction power supply circuits of the system. On the basis of the design scheme of generalized traction substations zone provided analytical functions of the resistance. Using the known functions of the current distribution of functions putted into the concept of resistance feeders traction substations. The functions of resistance and current distribution used in a more straightforward method of calculating the instant schemes that allow to formalize electrical calculations of electrical traction power supply systems.

Keywords: electric traction, electric power supply, instant scheme, calculation, resistance function, feeder currents, voltage losses, power losses

Mariusz Fabijański: Possibility Use of Plastic Materials Recycling Used in Rail Transport

The repeated recovery of materials is synonymous with technical and economic maturity. Concern for the environment causes the amount of recycled and re-used plastic (polymer materials) constantly grows. All ecological activities associated with limiting environmental pollution and the maximizing used previously of materials. Regulations, EU directives oblige to recycle and have the effect on the amount of recycled materials on the market. It means that recycling is not only recovery of materials, but also a search for new applications of those materials. The re-use of materials is not without influence on their properties. Some polymeric materials are not suitable for re-processing, however, if such possibility exists, then we should take an advantage of it. This article contains results of mechanical changes in the properties of the polymer material subjected to multiple terms of the processing.

Keywords: recycling, polymeric materials, multiple processing, mechanical properties

Andrzej Kochan, Lech Konopiński, Przemysław Ilczuk, Juliusz Karolak: Formal and Legal Requirements of Interfaces Testing in Railway Traffic Control Systems (Wymagania formalno-prawne dotyczące badania interfejsów w systemach sterowania ruchem kolejowym)

Implementation of the first level of the ETCS in Poland makes that its elements are being connected with existing railway traffic control devices. Created and completely new interfaces and connections created by this, need development of methods for examination. Such methods should make possible assessment whether changes made in existing devices do not disturb their proper work and especially they do not change a safety achieved by utilization of those devices.

At the same time changes made in acts and regulations on placing into service railway devices, subsystems and systems introduce the necessity of interfaces examination, with ambiguous terms: an interface and a connection.

In this article different approaches of defining the interface term are presented and definitions of the interface and the connection are proposed. Selected types of interfaces are described and formal and legal issues included in acts and documents for interfaces designing and examination are explained. Review of documents specifying interfaces issues was made. An analysis of gathered documents indicates the necessity of clarification of the definition of the interface as well as specification of rules of allocation of the authorization for examination of specific interfaces and connections of system elements using these elements.

Keywords: interface, railway traffic control system, ETCS

*Julian Kominowski, Bogdan Sowiński: **Quality Assessment of Surface Railway Track After Correction Process** (Jakościowa ocena stanu toru po jego regulacji)*

Article shows quality assessment of surface modernized railway track before and after correct process. Object of research is modernized and exploitation section railway lines no. 271 Poznań – Wrocław. Shown selected defects of track geometry and estimated traffic load. Moreover shows selected results of direct and indirect track geometry measurement and wavelengths of track geometrical irregularities was found. Results of analysis was confronted and referenced to current regulations. Simultaneously recording car dynamic response was measurement.

Results analysis shown direct and indirect measurement of track geometry, wavelengths of track geometrical irregularities were similar but their amplitude was different. Difference between results affect to rail quality index and to assessment of rail state. Measurements made on the same track indicate, that the wavelengths of irregularities did not change, but their amplitudes are changed. Results of vehicle dynamic response before and after correct process confirm improvement.

Keywords: railway infrastructure, track geometry, diagnostics

*Jarosław Łuszcz, Mariusz Buława: **Analysis of Electromagnetic Disturbances Generated by Rolling Stocks** (Analiza zaburzeń elektromagnetycznych generowanych przez pojazdy szynowe)*

The paper presents the specific character of electromagnetic interference in railway applications. Methods of analysis of electromagnetic disturbances generated by track vehicles have been described. Exemplary results of analyses in time and frequency domain are compared to the results of time – frequency analysis which enable identification and the localization of disturbances sources in track vehicles. The paper indicates possible reasons of changes of levels of generated disturbances by track vehicles in their life cycle.

Keywords: electromagnetic compatibility, rolling stocks, conducted emission, interferences

Egidio Quaglietta, Francesco Corman, Rob M.P. Goverde: ON-TIME: A Closed-Loop Real-Time Traffic Control Framework in a Realistic Railway Environment

A wide literature is available on models and tools for the optimal real-time management of railway traffic, but the knowledge of their effects on real operations is still blurry and very limited due to the scarce implementation of these systems in practice. This paper analyses how these tools perform when interfaced in a closed-loop setup with a realistic traffic environment. A framework is developed that couples the rescheduling tool ROMA with the microscopic simulation model EGTRAIN. Railway traffic is managed for different perturbed scenarios using a rolling horizon scheme where optimal plans are periodically computed based on current traffic information and implemented in the simulation model. The closed-loop setup is investigated for different combinations of its parameters relatively to quality and stability of rescheduling plans. A comparison is performed against a typical open-loop approach that implements only the plan computed on the basis of expected train entrance delays. Both the closed-loop and the open-loop approaches are evaluated against the case in which no rescheduling is considered and trains keep on following the original timetable. Results obtained for the Dutch corridor Utrecht-Den Bosch show that the closed-loop always outperforms the open-loop in terms.

Keywords: real-time rescheduling, closed-loop model predictive control, stability analysis, quality of dispatching plans

Zbigniew Szafranski, Dariusz Laskowski: Security on Railway Border Crossings – Development and Implementation of Modern Techniques

The article presents the scope of the project proposed, and the description of activities aimed at precisising this scope. The project is aimed at defining the technical and functional brief fore design, preparation of the documentation, and implementation of the monitoring system (demonstrator) at the selected railway border crossing in Poland. The basic function of the monitoring system, supporting protection of an extensive area of a RBC (called „MoRA System” or „MoRA Demonstrator”), is automatic, continuous and intelligent Monitoring of Railway border crossing Area i.e. part of a railway line between a state border and a border railway station, an area of a railway station itself, and if necessary – adjoining areas. MoRA System will ensure implementation of current possibilities in automation of the system operation, and maximal inclusion of an infrastructure (telecom and IT networks) currently being operated, and data possible to be collected from systems in exploitation [2]. The scope of the MoRA System project will include also a technical infrastructure for data collection from monitoring devices, registration of it, and selected transfer to services and bodies interested. The future user will have a full disposal to the technical solutions with an option of adjustment, maintenance and training. The MoRA System will ensure security of RBC area, with a continuity, reliability and complexity of supervision at the level unavailable for traditional methods of monitoring.

Keywords: railway transport, border crossing, border security, security of state

*Wojciech Ulatowski: **Methods of Providing Safety for the Interlocking Systems on the Example of Axle Counter System UniAC1*** (Metody zapewnienia bezpieczeństwa systemów automatyki kolejowej na przykładzie licznika osi UniAC1)

The paper presents methods providing fulfilment of the top-level Safety Integrity Level (SIL4) for the railway interlocking systems. The paper describes equipment and programmatic solutions implemented in the axle counter system UniAC1 which possesses the SIL4 certificate, including the safe communication solutions. The paper describes also the safety analysis carried out using the method of Markov graphs and presents the results for the UniAC1 system.

Keywords: safety, safety on the railway network, axle counter system, interlocking systems, railway automation

*Andrzej Wolfenburg: **Optimization of Solving Conflicts Among Trains During Designing their Graphs Using BBS Method*** (Optymalizacja rozwiązywania konfliktów między pociągami podczas projektowania wykresów ich ruchu przy wykorzystaniu metody BBS)

The research problem to be solved is adapting the BBS method to the optimal resolution of the problem related to conflicts among trains and the verification of the method correctness. The research methodology used is the analyses of software procedure results correctness, possibly changing algorithm and error correction up to obtaining the optimal solutions. The methods used are the method of discrete simulation and optimization, methods of computer programming and the BBS method itself. The obtained results confirmed entirely the usefulness of the BBS method for the purpose of optimal train conflict solving and for the optimal train graphs designing using a single line as an example. The software optimization program has been included in the Train Graphs Designing System, which had been previously created by the author for the Railway Institute. The author intends to continue his works related to the system taking into consideration any track layout, including lines with two or more tracks.

Keywords: BBS method, conflicts among trains, optimal traffic graph

*Łukasz Zawadka, Dominik Adamski, Andrzej Białoń, Juliusz Furman: **Influence of Magnetic Field Generated by Rolling Stock on Trackside Signalling Devices in According with Applicable Standards*** (Wpływ pola magnetycznego generowanego przez pojazdy trakcyjne na urządzenia SRK na tle obowiązujących standardów)

Article describes documents regulating issue of electromagnetic compatibility between rolling stock and train detection systems. It presents measurement method of magnetic fields generated by rolling stock that meets European standards and also elaborated results in accordance to polish infrastructure manager requirements. Finally article introduces possible magnetic fields influence consequences on trackside signalling devices with special consideration to axle counters.

Keywords: magnetic fields, interferences, axle counters, permissible interference levels