

Marek Bartczak: Adaptation of the PKP PLK S.A. Train Light Signaling to Higher Number of Signal Aspects

The article discusses the train signaling system developed in OSZD. The traffic light signaling currently used on the network managed by PKP Polskie Linie Kolejowe S.A. (Polish Railway Lines) is also described. A proposal of traffic light signals is presented, enabling the transmission of information on travel speeds on the turning tracks of turnouts operated on the PKP PLK S.A. network. The proposed signaling has been developed based on OSZD (in Rus. *Организация со-трудничества железных дорог – ОСЖД*) signaling. The number of signals needed was obtained by introducing a second yellow light strip and optionally two different flashing frequencies.

Keywords: railway signaling, signaling for trains, lineside signals, railway traffic control devices

Anna Butor , Krzysztof Labisz , Michał Batko , Tomasz Okamfer: Classification and Analysis of Elements of Railway Infrastructure Maintenance in Order to Minimize Costs

Maintaining the railway infrastructure in a condition ensuring safe railway traffic is the basic responsibility of railway infrastructure managers resulting from the Rail Transport Act. Elements of the railway infrastructure are subject to difficult atmospheric conditions as well as changing dynamic loads resulting from the operation of a given part of the infrastructure. The lack of proper maintenance of tracks adversely affects their operation: lowering the permissible speed, reducing driving calm, decreasing the safety of railway traffic, increasing the degradation of aggregate and railway subgrade, as well as increasing the influence of dynamic impacts on the surrounding buildings. The following article presents an analysis of maintenance tasks performed at 5 different locations. For the purposes of the article, data were collected in 2016–2018 on 100 km of track from daily reports performed by qualified supervisors managing maintenance brigades. The aim of the article is to present the results of the collected data, to analyze the most common maintenance tasks, to determine the root causes that result in the need to perform specific tasks and to propose remedies. The aim of the research was to achieve market competitiveness by minimizing costs because today's performance of duties related to the maintenance of railway infrastructure is characterized by very high costs associated with high workload, repair technology, the need to use specialized equipment, and temporarily exclude a part of the line from traffic.

The research was carried out in a company which is a manager of railway infrastructure.

Keywords: maintenance, railway infrastructure, railway infrastructure manager, costs

Paweł Drózd, Adam Rosiński , Lech Konopiński: Functional Testing of Railway Traffic Control Device

The article presents the problems of functional tests of railway traffic control devices. The purpose and scope of the tests as well as the impact of testing on the SRK devices are presented. The methodology of selecting tests depending on the scope of research is proposed. For this purpose, the SRK devices were analyzed for functional and diagnostic properties.

Keywords: functional tests, railway traffic control devices, tests

Maja Fojud, Artur Fojud: Role of the Multimodal Centre in Shaping Sustainable Mobility and Quality of Life in a Medium-sized City – Nysa Case Study

The article presents the results of the evaluation of the relationship between the way of shaping public space related to ensuring sustainable mobility in the city and the experiences of users influencing the perceptible quality of life. The assessment was carried out for one of the medium-sized cities, which was included in the list of cities threatened with exclusion. The subject of the evaluation was the city multimodal centre organised around the railway station in Nysa. The aim of the research was to identify a selected, small group of key challenges and recommendations aimed at improving user experience in using a multimodal centre in the city. The article highlights the role of service infrastructure (stops, stations, transfer centres) in the ecosystem of sustainable urban mobility. Each element of this ecosystem (designed in accordance with the idea of universal design) can have a significant impact on the improvement of the perceptible (declared) quality of life in the city, if the applied solutions positively influence the user's experience (including the sense of comfort and care). The authors focused on the current state of play in order to identify the key areas of intervention needed to improve the user experience in using the multimodal centre in a small and medium sized city. Attention was paid not only to the aspect of infrastructure accessibility, but also to the relations between urban, architectural and engineering solutions in the context of their impact on the assessment of the multimodal centre in terms of its usefulness in three dimensions: functional, rational and perceptible. The summary outlines the process of achieving from the basic solution standard to interoperability. This knowledge will allow better decision making in the planning of user-oriented projects in the city. This may be of particular importance when the conscious objective of the action is to achieve the level of interoperability expected by users of facilities such as, inter alia, a multimodal centre, which is one element of an urban public space with a significant impact on the quality of life of the citizen.

Keywords: user experience, quality of life, universal design, interoperability, sustainable mobility

Włodzimierz Kruczek: Interaction between a DC Traction System and an AC Power System Through Earth-return Circuits

The article describes a problem that occurs in electrified railway transportation, involving the interaction between the earth-return circuits of different power systems. One of the analysed circuits is the earth-return circuit of a high-voltage power grid, the other is the return path of a 3 kV DC traction power supply system. The paper presents the results of the field tests carried out so far and discusses a mathematical model developed in the Matlab-Simulink environment with the aim of determining the interaction between both of the said systems.

Keywords: earthing, traction substation, traction return system

Roksana Licow, Franciszek Tomaszewski: Analysis of the Ways to Identify Rail Running Surface Defects by Means of Vibration Signals

The article discusses a preliminary concept of a method enabling the identification of chosen rail running surface defects, such as squats, spalling, and running surface defects, by analysing the parameters of vibration signals. It features a description of the methodology

of the conducted tests, the scope thereof, and the selection of the measurement points with specific defect types. The article covers selected results of vibration tests, the results of analyses of recorded signals for defective track sections and those for control track sections. The presented measurement results have been obtained for the technical–operating conditions occurring on railway line no. 213 Reda – Hel and line no. 131 Chorzów Batory – Tczew. The preliminary test results and conclusions included in the article show that it is reasonable to pursue further research into the phenomena involving the utilisation of vibroacoustics in rail performance diagnostics.

Keywords: vibroacoustics, squat, spalling, running surface defect

*Roman Pniewski: **Safety of Single-Channel Railway Traffic Control***

Reversible gates enable the creation of fault tolerant digital devices. The application of these gates allows safe control systems to be realized. At present, control systems based on relays are being replaced by systems based on computer technology. This technology allows the implementation of safe systems. Because this system is composed of many elements, it is very difficult to obtain a high safety level for it. The application of reversible logic in the synthesis of digital systems constitutes an alternative approach. The paper presents reversible gates along with examples of their usage in the synthesis of digital systems. The main advantage of reversible logic is the possibility of synthesis of self testing and fault tolerant circuits. The application of circuits based on reversible logic allows safe control systems to be developed. The paper also presents a proposal for the application of reversible logic in simple control systems.

Keywords: reversible logic, railway traffic control, safety