Summaries – Problemy Kolejnictwa issue 202

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1. Historical Outline of Railway Control Command and Signalling Systems Development Based on Research Conducted at the Railway Research Institute

Andrzej Białoń

pages: 75-86

Summary. Railway control command and signalling systems ensure the safe operation of rolling stock by utilising appropriate equipment, either automatically or with the involvement of an operator. This paper presents a historical outline of the development of railway control command and signalling equipment from its beginnings to the present day. The process of refining traffic control equipment is illustrated through the example of work conducted in Poland, particularly at the Railway Traffic Control and Telecom Department of the Railway Research Institute. Attention is drawn to the elements of traffic control equipment that have evolved due to technological developments. The paper also highlights the international cooperation of the Railway Traffic Control and Telecom Department at the Railway Research Institute, as well as its knowledge dissemination activities.

Keywords: rail transport, traffic control, development, research

2. “Beautiful Helen” locomotive and more

Andrzej Chudzikiewicz, Ignacy Góra

pages: 87-98

Summary. Poland’s regaining of independence in 1918 was a powerful stimulus for many areas of social and economic life in the Polish state that was being created from scratch. One of such sectors, vital to the development of the economy and social life, was transport and the steam locomotive industry. At the time, the steam locomotive was a modern means of transport enabling people and goods to be moved over closer and further distances, quickly, efficiently and comfortably. This article presents the history of the development of the Polish school of locomotive design and construction after 1918 and, in this context, the development of research on steam locomotives constructed and built in newly established factories, and in particular the history of the design and construction of the Pt 31 steam locomotive. Following 1918, engineers, prominent steam locomotive constructors, began to return to Poland from Russia and began to perform “basic work”, establishing Locomotive Construction Departments at Polish technical universities and also participating in the organisation of the production and construction of new locomotives. Examples of such figures include: Antoni Xiężopolski, Wacław Łopuszyński, Albert Czeczott or Adolf Langrod.
The dynamically developing technical higher education in Poland after 2019, and in particular the mechanical faculties of the Lviv or Warsaw technical universities, resulted in the development of design offices in the emerging rail vehicle production plants such as Fablok, H. Cegielski, Warszawska Społka Akcyjna Budowy Parowozow or PZInż. in Ursus, as well as the establishment of organisational structures in the then Ministry of Transport (Ministerstwo Komunikacji) dealing with rail transport and in particular rail vehicles. Examples include: Department of Locomotive Construction (Katedra Budowy Lokomotyw) at the Warsaw University of Technology or the Experimental Division (Referat Doświadczalny) at the Department of Mechanical Engineering of the Ministry of Transport. One of the graduates of the Faculty of Mechanical Engineering at the Warsaw University of Technology in 1928 was inż. Kazimierz Zembrzuski, who, in 1930, at the age of 25, began working in

the construction bureau of the First Locomotive Factory in Poland in Chrzanow. After several years of work he designed, and then as head of the design team, supervised the construction of two prototypes of the Pm36 steam locomotive. One of these, at the International Exposition of Art and Technology in Modern Life in Paris, was exhibited in 1937. The article describes the course of development of the rolling stock construction and building industry at the beginning of the 20th century and the activities associated with the history of the Pm36 steam locomotive.

Keywords: Pm36 steam locomotive, K. Zembrzuski, Fablok

3. Determination of directional angle of a railway route and curvature of the railway track axis on high-speed railways

Władysław Koc

pages: 99-111

Summary. The paper describes the assumptions underlying two new calculation methods: the determination of the directional angle of a railway route and the determination of the curvature of a railway track axis. These methods use measurement data in the form of Cartesian coordinates of the track axis (obtained during the survey), while the basis for the calculation is the identification of a virtual chord projected in a horizontal plane, which connects two points on the track axis. The key role for the calculation is played here by the determined slope of the tangent to the track axis. Subsequently, an attempt was made to test the extent to which these methods correspond to the conditions specific for high-speed railways. This was illustrated using two calculation examples involving geometric layouts for speeds of 260 km/h and 350 km/h. In order to keep the applicability to reality to a greater extent, a decision was made to obtain hypothetical measurement data by virtual modification of these layouts. Qualitatively, the results of the analysis carried out were no different from previous analyses relating to standard railways. In particular, they confirmed beyond doubt the suitability of the methods considered for determining the directional angle of the railway route and determining the curvature of the railway track axis on high-speed railways. As shown, for use on these railways, a chord length of l_c = 100 m should be recommended.

Keywords: railway, high-speed rail, directional angle of a railway route, curvature of the railway track axis, calculation algorithms, example geometric layouts

4. Railway Buffer Stops

Dariusz Kowalczyk

pages: 113-126

Summary. Track end devices are highly significant structures, not only in rail transport. This paper presents and describes several instances of vehicle collisions with track end devices (buffer stops), demonstrating the substantial impact of these devices on safety, the effectiveness of their design, and the reduction (decrease) of damage. An analysis was conducted of the requirements for older track end device designs according to BN-79 9310-06 “Buffer Stops” and the currently applicable regulations.
The paper also outlines the guidelines for newly designed track end constructions, as mandated for PKP PLK railway lines and outlined in the document “Railway Track Superstructure – Volume 1” 2021 It describes examples of track end device designs, including fixed (non-sliding) and sliding types. Explicit finite element method (FEM) calculations were performed using the ANSYS Mechanical R2023 software, simulating the process of a vehicle colliding with a buffer stop

(fixed, non-sliding). The design of track end devices constructed according to the requirements of the industry standard BN-79 9310-06, which are still frequently found in railway infrastructure, was evaluated.

Keywords: buffer stop, sliding buffer stops, fixed buffer stops

5. Carbon Footprint in Rail Transport

Jolanta Maria Radziszewska-Wolińska, Maria Łyszcz

pages: 127-133

Summary. This article discusses the concept of the carbon footprint, which represents the total sum of greenhouse gas emissions caused directly or indirectly by a given entity (person, organisation, event, or product). It characterises the currently used methods for calculating and presenting the carbon footprint, based on the ISO 14067:2018 standard and the ISO 14040:2009 series of standards. Furthermore, it presents the carbon footprint in relation to different means of transport.
The analysis reveals that the highest amount of greenhouse gases originates from road transport, while the lowest comes from rail transport. However, it is important to note that for each journey and its associated carbon footprint, factors such as emissions generated during the production of components and their transportation to vehicle manufacturers, emissions from the vehicle manufacturing process and their deployment into service, as well as the construction of necessary infrastructure, must be taken into account. The article also demonstrates that the construction of new high-speed railway lines contributes to the reduction of carbon dioxide emissions in transport. Additionally, it suggests re-evaluating the feasibility of developing intermodal freight transport.

Keywords: ecological footprint, greenhouse gases, means of transport, intermodal transport