

■ Introduction – Marek Pawlik 1

News

■ Accreditation of an Inspection Body Operating within the Railway Research Institute's Structures 2

■ Cybersecurity Guidelines for Railway Employees 2

■ Hydrogen Powered Train in Żmigród 2

■ 14th International Railway Fair TRAKO 2021 8

Articles

■ Young Talent Symposium SYMTA 2021 - Important Event in the Year of Celebrating IK 70-year Anniversary – Anna Lewczuk 3

■ Laboratory Testing of Innovative Rail Track Vibration Isolators – Jakub Siwiec 4

■ Independent Safety Assessment Based on Experience of Accredited Inspection Bodies – Iwona Karasiewicz 5

■ IK Participates in „HYPERNEX: Ignition of the European Hyperloop ecosystem” – Krzysztof Polak 6

■ Measurements of the wheel sets parameters of railway vehicles – Andrzej Aniszewicz 7

Editor's

Marek Pawlik,

Railway Research Institute, Deputy Director for Railway Interoperability, ISAC-Rail Poland coordinator



Dear Readers,

as it was described in the 23rd IK Newsletter nine railway companies created Information Sharing and Analysis Centre for the railway transport sub-sector (ISAC-Rail Poland) at the end of the year 2020. Meetings, which take place every second month, are substantial as many cybersecurity related documents need to be presented and discussed. Works which are ongoing in relation to future legal documents, namely NIS-2 directive and

Polish Act on the National Cybersecurity System are being consulted with railway sector involvement. ENISA, the European Union Agency for Cybersecurity, has issued report "Railway cybersecurity – Security measures in the Railway Transport Sector" while CENELEC has accepted technical specification TS 50701 "Railway applications – Cybersecurity". However, the most use has already been derived from "Transport Cybersecurity Toolkit" issued by the European Commission in December 2020.

"Transport cybersecurity toolkit" covers air, water, and land transport, including railway transport. It contains the fundamental information about threats and recommendations for two levels of persons: all employees (regardless of the type of transport) and persons and bodies responsible for the transport cybersecurity (separately for different types of transport).

ISAC-Rail Poland has accepted five-panel guidelines for the employees of the railway infrastructure managers, railway undertakings, the entities in charge of maintenance, and other companies carrying out works for the railway transport.

These guidelines are based directly on the European Commission's "Transport cybersecurity toolkit". They were distributed to ISAC-Rail Poland members and are available on Railway Research Institute web pages (see https://problemykolejnictwa.pl/images/PDF/191_5E_1.pdf) and on the web pages of the Railway Transport Office – the Polish National Safety Authority, so they are widely available to employees.

The guidelines cover the general nature of cyberthreats in transport and four panels dedicated to threats and good practices, to be used by all employees, with respect to:

- malware,
- (distributed) denial of services (D)DoS,
- unauthorized access and theft, and
- software manipulation.

ISAC-Rail Poland recommends (to railway infrastructure managers, railway undertakings, entities in charge of maintenance, and all other entities carrying out works for railway transport) that the guidelines are used to build the awareness of all employees. These panels may be distributed via internal networks or official e-mails or may be displayed when employees log in to the corporate network or to services used for company purposes. The statement that people are the weakest link in the system of protection against cyberthreats may sound like a cliché, but this does not excuse the entities responsible for railway transport from taking actions that at least minimize the threats that follow the employees' lack of knowledge.

ISAC-Rail Poland on the basis of the quoted documents intends to prepare also "Cybersecurity Guidelines for the Employers in the Railway sub-sector", so we will keep IK Newsletter readers informed in that respect in the future.

mpawlik@ikolej.pl

Accreditation of an Inspection Body Operating within the Railway Research Institute's Structures

On 31 May 2021, the Polish Centre for Accreditation (PCA) issued a new version of the scope of accreditation for the Quality and Certification Centre as a type A inspection body for inspection of the adequacy of application of the common safety assessment method in the field of risk evaluation and assessment, thus starting a new cycle of assessment of the inspection body. In the course of the audit carried out by PCA, the Railway Research Institute confirmed its substantive com-

petence in the following areas: structural subsystems (Infrastructure, Energy, Rolling Stock, Control Command and Signalling (including RAMS standards) – Track-side and Control Command and Signalling (including RAMS standards) – On-board, and functional subsystems: operation and traffic management, maintenance.

In all areas, the Railway Research Institute has confirmed its competence to assess safe integration.

Cybersecurity Guidelines for Railway Employees

Cybersecurity Guidelines for Railway Employees, coordinated by Doctor of Science Marek Pawlik, have been developed in the Information Sharing and Analysis Center ISAC-Kolej.



The study is based on the document "Transport cybersecurity toolkit" prepared and published by the European Commission. The guidelines are available in the latest issue of "Problemy Kolejnicwa" (Railway Reports).

The guidelines describe in an accessible and synthetic way the four most important threats: malware, (distributed) denial of services (D) DoS, unauthorized access and theft

malware, and software manipulation. The document also outlines good practices to minimise risk. Modern digital solutions are used both to support the activities of entities contributing to the railway system and to support the operation and supervision of railway operations. Therefore, the guidelines should be disseminated to the maximum possible extent among railway employees that use computers in their work.

ISAC - the Information Sharing and Analysis Center ISAC-Kolej was created as a result of agreement between railway entities, Railway Research Institute and NASK - National Research Institute. The main objective of ISAC-Kolej is the continuous exchange of knowledge and experience in the field of cybersecurity incidents between the participating entities. The initiative also contributes to increasing the resistance to cyber threats of ICT systems used by the railway transport.

Hydrogen Powered Train in Żmigród

On 22 June 2021, the Coradia iLint™ train was presented at the Test Track of the Railway Research Institute in Żmigród. This is the world's first hydrogen powered train, which was designed and manufactured by Alstom. The vehicle is equipped with fuel cells to convert hydrogen into electricity, moreover, is fully CO₂ emission-free - emitting only water vapour and water. It is equipped with innovative solutions such as clean energy conversion technology, systems for efficient energy supply and storage in batteries, and smart drive power and available energy management systems, among others.



Young Talent Symposium SYMTA 2021 - Important Event in the Year of Celebrating IK 70-year Anniversary

Anna Lewczuk

POL-on System Coordinator, Railway Research Institute



The Young Talent Symposium SYMTA 2021 was carried out at the Railway Research Institute (IK) on 19–20 May 2021. Twenty-two papers were presented by young IK researchers. The Symposium was conducted online in video-teleconference mode.

The goal of the Symposium was to present scientific and professional achievements of the participants, share information about the work performed in the organisational units of the Railway Research Institute, exchange experience in presenting and publishing their achievements, and prepare young IK staff for independent scientific and research activities.



Photo 1. Start of the first day of the Symposium

The speeches, illustrated by professionally prepared presentations, fully helped to achieve this goal and brought the audience closer to the thematic scope of work of particular IK departments and research laboratories. Young researchers of the Institute presented possibilities of specialist test and measurement stands as well as modern research equipment owned by the Institute. They also demonstrated the interdisciplinary nature of research work conducted at the Institute and its openness to the implementation of modern technologies and technical solutions. The listeners were also introduced to the complicated certification processes and their significance for the Institute's activity.

The two-day agenda of the Symposium covered the following thematic sessions:

- fire safety,
- rail vehicles,
- electromagnetic compatibility,
- infrastructure elements,
- certification processes,
- simulation in tests and operation,
- railway communication systems.

The participants of the Young Talent Symposium were supported by the substantive supervisors of the individual sessions as well as members of the Scientific Committee and the Organising Committee. For smooth presentations, the IK Scientific Secretary had prepared a seminar introducing good practices in this field.

Young researchers of the Institute demonstrated high competence and ability to present substantive knowledge from various research fields. They thoroughly answered numerous questions, both from those present in the hall and from the IK staff listening to the speeches via video-conference.



Photo 2. Session I Fire safety

Some presentations were delivered from outside the conference venue, due to the fact that the speakers, young employees, were on a business trip and were conducting their previously planned tests at the IK Experimental Test Track in Żmigród. Their speeches were illustrated by a short film report on field tests carried out on location at the time.

The event was open to all Institute staff online. The Symposium attracted a considerable interest of the audience, who asked the speakers numerous questions.



Photo 3. Session IV Infrastructure elements

All the participants of the SYMTA 2021 Young Talent Symposium as well as the organisers demonstrated broad competence and openness to the challenges of modern technologies and multimedia presentation techniques. Young researchers of the Railway Research Institute gained further experience in public speaking using modern online platforms.

Not only did the SYMTA 2021 Young Talent Symposium contribute to the increase of young IK researchers' activity, but also to the sense of belonging to the scientific staff community of the Railway Research Institute.

A monograph collecting papers presented at the SYMTA 2021 Young Talent Symposium as well as the young researchers' achievements will be published in the near future.

alewczuk@ikolej.pl

Laboratory Testing of Innovative Rail Track Vibration Isolators

Jakub Siwiec

Materials and Structure Laboratory, Railway Research Institute



The protection of people and buildings from vibrations caused by rail traffic is one of the most important issues connected with the impact of rail transport on the environment. Vibration elimination is achieved by using additional, flexible damping elements in the track construction, the mechanical characteristics of which must be selected in such a way as to damp vibrations as much as possible (low stiffness) on the one hand and, on the other, to ensure adequate stability and resistance to loads from train traffic (high stiffness).

Finding a compromise between these opposing requirements was the main objective of the third stage of the InRaVis project, carried out at the Railway Research Institute under the Smart Growth Operational Programme together with the Faculty of Civil Engineering of the Warsaw University of Technology (Project Leader) and the companies Tines Rail and Budi-mex.

The tests carried out in the Materials and Structure Laboratory covered four types of vibration-absorbing elements used in the railway superstructure, i.e. USP under sleeper pads (glued to the underside of pre-stressed concrete sleepers); UBM under ballast mats (laid on the substructure layer before ballast filling; USM under slab mats (used in the non-ballasted superstructure under the track slab) and block rail supports in elastic EBS wrapping.

First, the Laboratory determined the mechanical characteristics of several variations of the above vibration isolation elements (Fig. 1) and then the samples with the best characteristics were subjected to long-term fatigue tests (3 million load cycles) using specially designed test stands (Fig. 2 and 3).

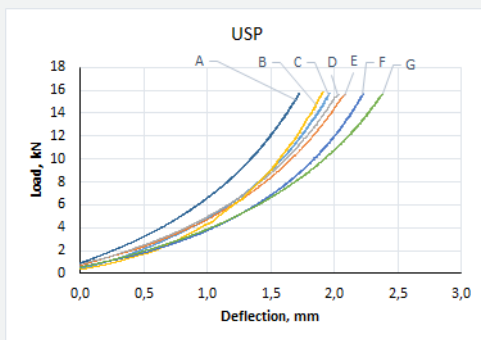


Fig. 1: Comparison of static characteristics of different USP pads samples (source: own study)

After completion of the fatigue tests, the surface damage of USP and UBM mats was visually inspected and measured, among others, using digital microscopy (Fig. 4) and static parameters were measured again to determine the percentage change in stiffness due to repetitive loads.



Fig. 2. EBS specimen on the fatigue test stand



Fig. 3. Test stand for UBM mats

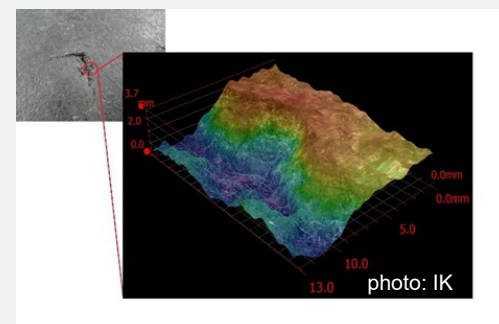


Fig. 4. Measurement of an example of USP pad surface damage

The final result of the work carried out by the Laboratory within the third stage of the InRaVis project was the selection of the two best varieties from among each of the four groups of vibration-isolating elements for further operational tests conducted by the Railway Research Institute on its own experimental test track in Żmigród.

jsiwiec@ikolej.pl



Republic
of Poland

European Union
European Regional
Development Fund



Independent Safety Assessment Based on Experience of Accredited Inspection Bodies

Iwona Karasiewicz

Safety Assessment Coordinator, Railway Research Institute



One of the conditions to be met in order to maintain or improve the safety level of the railway market are the safety requirements regulated by Commission Implementing Regulation (EU) No. 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No. 352/2009, as amended, hereinafter referred to as the Regulation.

In accordance with the provisions of the Regulation, the railway entities referred to in Article 3 are required to analyse any change affecting safety of a technical, operational or organisational nature (provided that the change affects the operational conditions).

The Regulation is also applied to structural subsystems to which the Railway Interoperability Directive applies under the conditions set out in the Regulation.

An entity wishing to replace an existing element of the railway system with another or wishing to introduce a new element is obliged to analyse if this element impacts the safety of the railway system. The next step is to assess the significance of the change according to Article 4 of the Regulation. As a result of the assessment of the significance of the change, the entity decides whether the implemented change is to be considered as a significant or non-significant one. For an insignificant change the further work from a legal perspective is limited to the documentation and justification of the decision. However, the entity may proceed in a similar way to the case of a significant change. In this case, the entity making the change is required to conduct a risk management process based on the provisions of the Regulation.

In accordance with Article 6 of the Regulation, the risk management process carried out is subject to an independent assessment by an Assessment Body. According to Article 3 of the Regulation, 'assessment body' means the independent and competent external or internal individual, organisation or entity which undertakes investigation to provide a judgement, based on evidence, of the suitability of a system to fulfil its safety requirements.

It follows that the Assessment Body must not be involved directly or as an authorised representative: in the design, manufacture, construction or maintenance of the system under assessment. Nor may the Body carry out on behalf of the proposer the process of assessing the significance of the change or the risk assessment. For this reason the work of the inspection body cannot be seen as unnecessary bureaucracy. It is also a mistake to treat the inspection body as an entity whose task is to issue, in the shortest possible time, a Report with a positive assessment for the work performed by the Applicant. The role of the Risk Assessment Body is to independently assess the correctness and completeness of the risk management process and to ensure that the implemented change can be safely implemented and controlled. It is therefore best to start working with the Assessment Body as early as possible

in the risk management process. This will allow for the ongoing elimination of errors, which will certainly contribute to the smooth and safe implementation of the proposed change. The work carried out by the body requires a careful analysis of the documentation received for the applicant and a full understanding of it.

The most common problems encountered by risk assessment bodies in their work include:

1. Underestimating the role played by the inspection unit.
2. Applicants approaching the unit at too late a stage of project implementation.
3. Attempts to shorten the time needed for the body's work.
4. Submission of incomplete documentation for assessment,
5. Not taking into account comments of the inspection body.

Taking into account the role played by the Assessment Body, i.e. an independent link in the risk assessment process, the legislator in Annex II to the Regulation has defined detailed requirements that it must meet. The basic requirement from 21 May 2015 is to have accreditation. In Poland, accreditation is issued by the Polish Centre for Accreditation (PCA). In order to obtain accreditation, it is necessary to document compliance with all the requirements of PN-EN ISO/IEC 17020:2012 and to document compliance with the general competence criteria. In Poland, accredited risk assessment bodies are inspection bodies performing a type of ICSM inspection of the adequacy of the application of the common safety method of risk assessment and evaluation. Several years of experience in conducting independent safety assessments by entities with verified personnel qualifications allowed not only to improve the conducted activity by developing, among others, the "Clarification Note on Safe Integration" but also to take over the tasks of independent safety assessment in relation to CENELEC standards by AsBo.

To conclude, taking into account the experience of the risk assessment bodies, in order to carry out the risk management process in an efficient and complete way the entity making the change should, as early as possible in the risk management process, cooperate with a risk assessment body. When choosing the Body to cooperate with, attention should be paid to the fact whether the competence area of the inspection body coincides with the nature of the introduced change. Polish Centre for Accreditation, while issuing accreditation, indicates in which of the areas, i.e. structural subsystem and/or functional subsystem, the Body can provide services. The entity using the services of the Body must be sure that it performs its work objectively, independently and based on high competence of the personnel.

The Quality and Certification Centre (type A according to PN-EN ISO/IEC 17020:2012) accredited for structural subsystems (Control-Command and Signalling Track-side Subsystem, Control-Command and Signalling On-board Subsystem, Rolling Stock, Energy, Infrastructure) and functional subsystems (Operation and Maintenance) operates within the Railway Research Institute as an independent Risk Assessment Body (Inspection Body).

ikarasiewicz@ikolej.pl

IK Participates in „HYPERNEX: Ignition of the European Hyperloop ecosystem”

Krzysztof Polak

Research and development specialist, Railway Track and Operation Department, Railway Research Institute



European project "HYPERNEX: Ignition of the European Hyperloop ecosystem", aims at fast development of hyperloop technology. Hyperloop uses pods (capsules) to carry passengers and freight, which move in a tunnel with a pressure reduced to about 100 Pa.

The Railway Research Institute together with 12 other consortium members from 8 European countries (Table 1) was awarded a grant under the 8th Framework Programme Horizon2020 (as part of Shift2Rail initiative). The project was launched on 1 December 2020 and will be implemented over the next 12 months. The value of the project amounts to 250,000 euros.

No.	Participant organisation name	Type	Country
1	Universidad Politécnica de Madrid (UPM)	UNI	ES
2	HIT CERTH (CERTH)	RTO	EL
3	Hardt Hyperloop (HARDT)	SME	NL
4	Nevomo ¹⁾	SME	PL
5	IFS-RWTH Aachen University (RWTH)	UNI	DE
6	Institut Kolejnictwa (IKOLEJ)	RTO	PL
7	University of Leeds (UNIVLEEDS)	UNI	UK
8	Sintef (SINTEF)	RTO	NO
9	TransPod France (TRP)	SME	FR
10	TU Berlin (Hermann-Föttinger Institut (TUB))	RTU	DE
11	Union Internationale des Chemins de Fer (UIC)	RTO	FR
12	Sapienza Università di Roma DICEA (DICEA)	UNI	IT
13	Zeleros Global, S.L. (ZEL)	SME	ES

¹⁾ Former Hyper Poland

Table 1. Project participants (source: own study)

In addition to a large research team, a proper support for the project is also an important factor of the project's success. The project comprises 14 entities that are members of the Advisory Board and 11 institutions supporting the project (Project Supporters) (Table 2).

The objective of the project is to launch joint research and cooperation between R&D institutions, research centres and entrepreneurs in order to enable a sustainable development of the new technology. A report will be prepared within the project in which the most crucial aspects that could affect the development of the hyperloop technology will be taken into consideration and analysed.

Project Supporters		Advisory Board	
Actisa	Bane NOR	Altran	AYESA
Foamrox	Global Cloud Group	U. Birminham	EURNEX
HyperNOR	Infraestructuras de Portugal	Virgin HyperloopONE	Gesnaer
Norwegian Rail-way Directorate	Ramboll	Renfe	Sener
Schneider electric		TIS	TU Delf
		Univaq	RTI

Table 2. Project Supporters (source: own study)

The Railway Research Institute will be the co-author of the task entitled "Transferability and roadmap beyond HYPERNEX" which will cover 3 main aspects :

1. Transferability under Shift2Rail roadmap.

The task will focus on the identification of the research synergy with rail under Shift2Rail project, fostering these areas where research activities could be beneficial for both parties.

2. Transferability and cross fertilization to non-guided modes.

This task will be related to the analysis of the project correlation/synergy with other areas and programmes, i.e. climate, FCH as well as mutual expertise exchange with other means of transport.

3. Standardization and regulation.

The task should define possibilities if current European regulation practices could be applied into the Hyperloop certification system, identify roles and powers of Assessment Bodies (AsBo), as well as analyse possibilities to apply current technical railway standards to hyperloop technology components.

The Institute will be responsible for developing substantial content to Point 3, i.e. standardization and regulation .

The Hypernex project will allow a significant acceleration of hyperloop system development in Europe as well as strengthening the position of European entities implementing the vacuum rail system. The exchange of experience and knowledge will enable to establish a complementary and compatible means of transport in Europe.

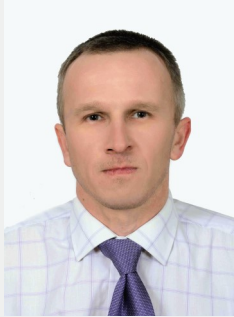
HYPERNEX

kpolak@ikolej.pl

Measurements of the wheel sets parameters of railway vehicles

Andrzej Aniszewicz

Engineering and technical specialist, Metrology Laboratory, Railway Research Institute



The Metrology Laboratory of the Railway Institute performs calibration of railway measuring instruments and measurements of railway infrastructure elements.

The most frequently measured parts of railway vehicles are running gear - wheel sets.

For this purpose, the Laboratory is constantly developing its measurement capabilities. Specialized devices are purchased - handheld, portable

electronic devices. They successfully replace old, mechanical devices.

Railway vehicle wheelsets are a movable, rotating element. As a result of cooperation with the brake system and rails, they wear out in a controlled manner during operation. The Metrology Laboratory uses the Calpri C40 device to measure laser wear.

We can measure: - wheel profile (Fig. 1), - wheel diameter (Fig. 2), - wheel clearance (Fig. 3 and 4), - brake disc wear (Fig. 5).

Dedicated computer software installed on a portable laptop (Fig. 7) allows you to take measurements precise contactless measurement (Fig. 6).

displays it to the user. The great advantage is imprecise handling is compensated by a patented tilt correction. Acoustic and visual signals guide the operator during the measuring process.

The pictures show examples of use and obtained results of geometric dimensions measurements of wheel sets made with the portable Calpri C40 device.

The device is used to determine the dimensions of the wheel-sets parameters, wheel discs, brake discs.



Fig. 3. Measure wheel clearance



Fig. 4. Measure wheel clearance close-up view



Fig. 1. Measure wheel profile



Fig. 2. Measure wheel diameter



Fig. 5. Measure brake disc wear

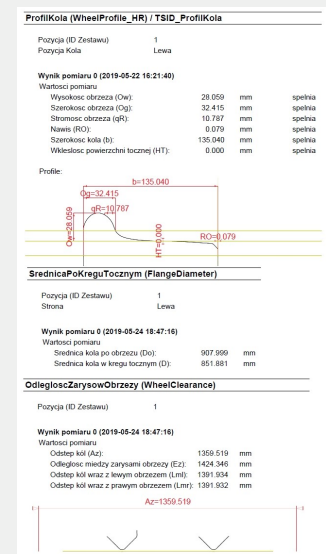


Fig. 6. Measurement report (source: own study)

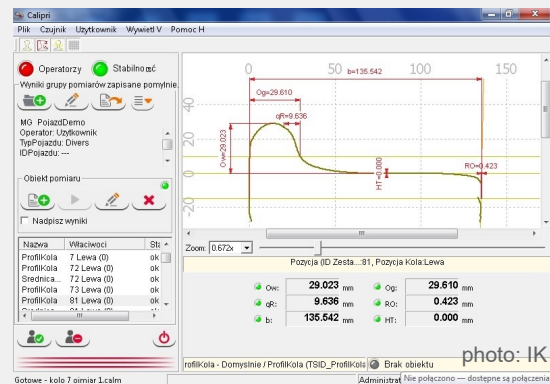


Fig. 7. Dedicated computer software installed on a portable laptop

aaniszewicz@ikolej.pl

14th International Railway Fair TRAKO 2021

The Railway Research Institute has once again participated as an exhibitor at the TRAKO International Railway Fair this year.

On 21–24 September 2021, the IK's offer for the railway industry was presented at the AmberExpo trade fair centre in Gdańsk.

It was the biggest event of the transport industry in Europe this year, widely reported in domestic and foreign media. On more than 30 thousand m² of exhibition area and 1000 m of tracks for the exhibition of rolling stock, machinery and track equipment, about 700 exhibitors from 30 countries presented their services and products.

The event attracted 130 accredited journalists from Poland, the Czech Republic, Denmark, Germany, Great Britain, Ukraine and Romania. The honorary patronage was taken by Minister of State Assets - Jacek Sasin, Minister of Infrastructure - Andrzej Adamczyk, President of the Railway Transport Office - Ignacy Góra and President of the Association of Polish Electrical Engineers - Piotr Szymczak.

The Institute's stand located in hall B27 was a two-storey stall of the total area of 200 m², shared with the co-exhibitors: Ministry of Infrastructure (MI), Railway Transport Office (UTK) and Centre for EU Transport Projects (CUPT).

On the second day of the fair, 22.09.2021, from 12.30 to 14.30, the Third Investment Debate "Prospects for the Development of the Polish Railway Infrastructure" took place, organised by the Railway Research Institute, the Ministry of Infrastructure, PKP SA, PKP Polskie Linie Kolejowe and the Economic Chamber of Land Transport, and AMBEREXPO. This event, which is organised regularly, has become a permanent feature of the TRAKO programme. Interest in the debate exceeded the organisers' expectations. We hosted eight panellists on stage. The guests taking part in the debate included Andrzej Adamczyk, Minister of Infrastructure; Andrzej Bittel, Secretary of State at the Ministry of Infrastructure; Marita Szustak, President of the Land Transport Chamber of Commerce; Ireneusz Merchel, President of PKP Polskie Linie Kolejowe S.A.; Ireneusz Maślany, Member of the PKP S.A. Management Board; Andrzej Massel, Deputy Director of the Railway Research Institute; and representatives of CPK and Pekao S.A. In the course of the debate, the representatives of public administration, the ordering parties, the world of science and the market of contractors and industry discussed the most important issues connected with railway investments.

The four days of the fair proved to be an excellent opportunity to exchange views and establish contacts with new, future business partners.



photo: IK

The Railway Research Institute would like to express its thanks for visiting our stand and invite you to further meetings with experts during the 15th TRAKO International Fair on 19–22.09.2023.



photo: IK



More information: www.trakofair.com

Editors:

Dr Renata Barcikowska, Editor-in-chief
 Agata Pomykała
 Jolanta Olpińska
 Małgorzata Ortel
 Andrzej Szmigiel

Contact:

IK - Railway Research Institute
 04-275 Warsaw, Poland
www.ikolej.pl
 E-mail: ikolej@ikolej.pl

Copyright © 2021 IK - Railway Research Institute
 All rights reserved