Advanced Rail Technologies

IK

RAILWAY RESEARCH INSTITUTE (IK)

NEWSLETTER

January, February, March 2023, No. 32

ISSN 2449-6049

IN THIS ISSUE

Editor's

Leszek Rafalski

Scientific Secretary of the Railway Research Institute

Dear Readers,

Scientific excellence is an important goal for scientific institutions, including Instytut Kolejnictwa, a research institute with over 70 year-experience. Three criteria have so far been used to evaluate Polish scientific entities: publications, revenues from R&D work and impact on the economy and society. The next evaluation scheduled for 2026 is also likely to adopt the same criteria. The Railway Research Institute is currently undertaking a number of activities aimed at its scientific development.

Experience to date has shown that the publication criterion, which includes articles in scientific journals, scientific monographs and patents, is essential. The output in terms of this criterion depends to a large extent on the publication activity of the Railway Research Institute's staff, in particular the publication of work results in renowned and high-scoring scientific journals and monographs. This applies in particular to the scientific, research and technical staff of the Institute. Therefore, efforts are made to systematically prepare scientific texts presenting the results of research carried out at the Railway Research Institute and send them to scientific publishers.

The Institute periodically organises scientific seminars related to rail transport. In the first half of 2023, there will be held seven free-of-charge and open meetings. In addition, a young researchers' seminar is planned for the fourth quarter of this year. These types of events allow young researchers to develop professionally and scientifically. In 2022, three young scientists from the Institute were awarded doctoral degrees and their scientific output will be disseminated and published in the form of scientific monographs.

Moreover, the Railway Research Institute issues the scientific journal Problemy Kolejnictwa (Railway Reports). It is a bilingual quarterly journal in which articles are published in Polish and English. The scientific quality of this journal is supervised by an international Scientific Board. Recently, steps have been taken to place Problemy Kolejnictwa on the list of the Minister of Education of Science with a score corresponding to the scientific content of this journal. In connection with the anticipated changes in the scoring of publications, the title of the monograph published by the Railway Research Institute was also clarified: Monographs Studies Reports, which will consequently ensure that the scoring for this publishing series will be maintained.

lrafalski@ikolej.pl

Inaugurating the participation of the research and development ecosystem built at PKP S.A. in 4 flagship projects of Europe's Rail JU partnership

On 18 January, a ceremony inaugurating the participation of the research and development ecosystem built at PKP S.A. in 4 flagship projects of Europe's Rail JU partnership was held at the headquarters of PKP S.A. in Warsaw. The main purpose of the meeting was to formally sum up the preparatory stage for participation in the Partnership, which will be implemented under the Horizon Europe framework programme. The event was attended by representatives of the central government administration: Secretary of State at the Ministry of State Assets Mr. Maciej Małecki, President of the Management Board of PKP SA Mr Krzysztof Mamiński, Secretary of State, Government Plenipotentiary for reforming the functioning of research institutes Mr Wojciech Murdzek, Member of the Management Board of PKP S.A. Mr Rafał Zgorzelski as well as representatives of all entities participating in the ecosystem. During the meeting there was presented general information about Europe's Rail JU Partnership.


Photo IK

The projects in which the ecosystem participates and the ceremonial signing of a wall with logos of each of the entities involved by the representatives took place.

The Railway Research Institute was represented by DSc Andrzej Massel - Director of the Institute and Dr Renata Barcikowska - Head of the Project Coordination and International Cooperation Unit. The Railway Research Institute is involved in two international projects within the framework of the Europe's Rail partnership, as an Affiliated Entity of PKP SA. These projects are as follows:

1. FA4 Rail4EARTH – Sustainable and green rail systems.
   Budget of the entire project: 63 961 991,04 €
   Duration: 4 years,
   Number of consortium members including associate members: 74.
2. FA6 FutuRe – Delivering Innovative rail services to revitalize capillary lines and Regional rail services.
   Budget of the entire project: 25 788 685,32 €
   Duration: 4 years,
   Number of consortium members including associate members: 49.


Photo IK

Cooperation agreement between the War Studies University (ASzWoj) and the Railway Research Institute

On 24 January 2023, a cooperation agreement between the War Studies University (ASzWoj) and the Railway Research Institute was signed at the Railway Research Institute's headquarters in Warsaw.

The agreement was signed by Director Andrzej Massel, Ph.D. on behalf of the Railway Research Institute, and Dean of the Faculty of Management and Command, Col. Prof. Tomasz Jałowiec, DSc, Ph.D., Eng. on behalf of the University.

The bilateral cooperation will be conducted in the scope of:

1. consultations in the field of science and research,
2. implementation of joint scientific and research projects,
3. joint organisation of scientific undertakings, in particular: conferences, symposia or seminars for scientific, research and technical employees, doctoral students and students,
4. cooperation leading to the improvement of the qualifications and scientific development of academic staff and students, including the organisation of joint classes and workshops in the field of the study of logistics conducted at ASzWoj, based on the relevant study programme,
5. organisation of student internships and research internships in specialised laboratories of the Railway Research Institute,
6. other undertakings, not listed above, within the scope compatible with the subject of activity of both Parties.

The Railway Research Institute was also represented by Assistant Professor Marek Pawlik, DSc, Ph.D. - Deputy Director for Railway Interoperability and Renata Barcikowska, Ph.D. - Head of the Project Coordination and International Cooperation Unit. On the part of the War Studies University, the participants included: Assistant Professor Stanisław Smyk, Ph.D., - Director of the Logistics Institute of the Faculty of Management and Command, and Katarzyna Pietrzyk-Wiszowaty, Ph.D., Head of the Department of Transport Management at the Logistics Institute of the Faculty of Management and Command.


Photo IK

EMC Test Stand for Testing Immunity to Radiated Radio Frequency Electromagnetic Fields at the Railway Research Institute

Łukasz John
Chief Research and Technical Specialist, EMC and Interference Coordinator, Railway Research Institute

In connection with the intensive development of the Signalling and Telecommunications Laboratory of the Railway Research Institute in Warsaw due to purchases of new measurement equipment as well as the construction of new electromagnetic compatibility (EMC) test stands in November 2022, another new EMC test stand for testing resistance to radiated electromagnetic fields of radio frequency was delivered to the LA-20 Laboratory, which meets the requirements of the currently valid PN-EN IEC 61000-4-3:2021-06 standard.

The measurement system comprises the following elements:

- signal generator,
- power meters,
- dedicated broadband amplifiers,
- logarithmic-periodic antenna including antenna mast,
- electromagnetic field probe including field probe mast,
- measurement computer together with EMC32 software (EMS option) to control measurements and calibrate field uniformity.

The equipment comprising the measurement system for radiated radio-frequency field immunity testing - except the electromagnetic field probe and the logarithmic-periodic antenna - is built into two racks and located in the AR room. A general view of the EMC measurement system is shown in Photos 1 and 2.

Photo 1. View of installed EMS measuring system equipment in a rack system

The new EMC measurement system allows immunity testing to be performed for equipment derived from:

- electrical and electronic devices installed in the railway environment according to EN 50155,
- electrical and electronic devices installed inside rolling stock according to the requirements of PN-EN 50121-3-2 standard,
- railway traffic control and signalling devices (srk) and telecommunication devices according to the requirements of PN-EN 50121-4 standard,
- apparatus and devices of fixed power supply system according to the requirements of PN-EN 50121-5 standard,
- electrical and electronic equipment intended for use in residential, commercial and light industrial environments according to EN IEC 61000-6-1,
- electrical and electronic equipment intended for use in industrial environments according to EN IEC 61000-6-2,
- digital radio telephones and other radiating devices operating on radio frequencies according to the requirements of PN-EN IEC 61000-4-3.

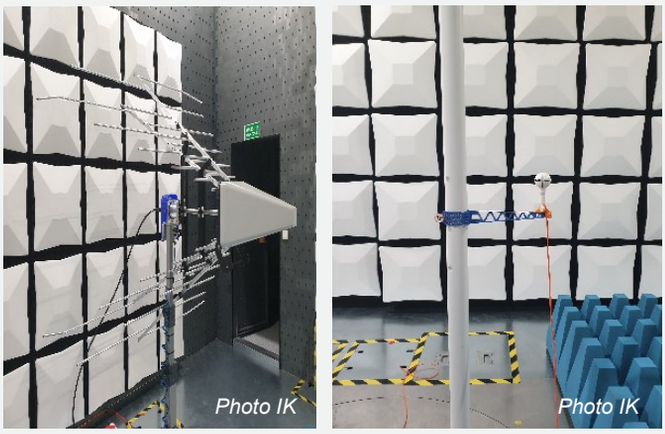

Photo 2. General view of the logarithmic-periodic antenna (left) and the electromagnetic field probe (right) of the EMS measurement system

The radiated radio-frequency electromagnetic field immunity test is performed for the above-mentioned devices to assess their immunity related to protection against radio-frequency electromagnetic fields from any source. The test is performed in a SAC-type chamber in the frequency range from 80 MHz to 6 GHz, subdivided into measurement sub-bands as required by the dedicated product standard.

ljohn@ikolej.pl

Smart city – Aspects of Transport

Iwona Wróbel
Senior Engineering and Technical Specialist, Railway Track and Operation Department, Railway Research Institute

The subject of smart cities is a new direction that applies modern information and communication technologies (ICT) in the sustainable development of cities. Nowadays, it is recognized that the proper functioning of urban centres as well as their further development requires intelligent management of all their co-creating elements. And all this in order to optimize the functional conditions, create a favourable environment and ensure a high quality of life, taking into account the resources and potentials specific to given centres and the needs of residents.

Due to development needs, and at the same time many challenges and transformations of urban centres resulting from changing demographic, economic or environmental conditions, there is a chance for effective management and policy implementation, using reliable data and evidence. The key to integrated city management is widely understood information. It is on the basis of current and reliable data about the city, phenomena or activities that take place within its borders that it is possible to manage the city more consciously and effectively.

The idea of a smart city basically involves an integrated city management system. It consists in managing processes in a comprehensive manner, taking into account the coordination of key areas of urban policy (e.g. spatial planning, natural environment, transport, public transport including, economic development) in the aspect of space, course of action and time. The main feature of a smart city is the analysis and use of data collected by IoT (Internet of Things) devices and sensors, which allows for improving infrastructure, municipal services, as well as conducting forecasting analyses. Smart city tools are modern technologies, products and services used to create a city that is better managed, more ecological and friendly to residents. Examples of implementation possibilities for the area of smart mobility in cities concern:

- optimization of urban transport and road safety,
- Intelligent Transport Systems (ITS),
- electric mobility (electric cars and charging systems),
- integrated traffic management,
- low-emission urban transport (hybrid solutions, electric hydrogen, CNG/LNG),
- shared mobility services,
- intelligent parking,
- cycling infrastructure.

The ISO 37120 standard, which was published on May 15, 2014 by the International Organization for Standardization in Geneva, is used to measure services and quality of life in the city. The Polish version of the standard under the name ISO 37120:2015-03 Sustainable social development - indicators of urban services and quality of life was issued by the Polish Committee for Standardization in February 2017.

The standard contains a set of 100 indicators characterized together with the exact methodology of their measurement, which defines the sources and scope of data, appropriate formulas for calculating indicators and the method of interpretation of measurement results. Forty-six indicators are of a basic nature, i.e. they are considered crucial for controlling and evaluating performance management. Fifty-four indicators are of an auxiliary nature - they extend the possibility of data analysis. The indicators have been grouped in 17 thematic areas concerning particular aspects of the functioning of the city. In addition, the standard includes 35 profile indicators defining the city in terms of geography and climate, population characteristics and socio-economic living conditions of residents and a given city.

The indicators in the standard have been selected so that reporting is as simple as possible, and at the same time - by indicating data sources available for cities - it does not generate additional costs. All indicators should be compiled annually, based on closed period data. The standard allows cities to take a methodical approach to measuring the progress of their development. Setting indicators on a regular basis makes it possible to track and monitor progress over time (e.g. year to year), control the achievement of goals, and introduce possible adjustments to the city's policy. It can also be a valuable aid in determining the needs of individual cities.

In the area of transport, the ISO 37120 standard lists 9 indicators.

Core indicators	
18.1.	Kilometres of high capacity public transport system per 100 000 population
18.2.	Kilometres of light passenger public transport system per 100 000 population
18.3.	Annual number of public transport journeys per capita
18.4.	Number of personal cars per capita
Auxiliary indicators	
18.5.	Percentage of commuters using a travel mode to work other than a personal vehicle
18.6.	Number of two-wheel motorized vehicles per capita
18.7.	Kilometres of cycle paths and lanes per 100 000 population
18.8.	Transportation fatalities per 100 000 population
18.9.	Commercial air connectivity (number of non-stop commercial air destinations)

Polish cities willingly use new, intelligent techniques and technologies as well as innovative methods of organizing life and successfully implement information and communication solutions in various functional areas, which allows them to be smarter. The investments carried out and the improvement of the functioning of the functional areas of cities contribute to the improvement of city services and the quality of life of the inhabitants. Five Polish cities hold the ISO 37120 certificate, which means that they meet the conditions of the so-called smart city. The following cities have undergone the certification process: Gdynia, Kielce and Warsaw (certified by the World Council on City Data), Lublin (certified by the Polish Committee for Standardization) and Gdańsk (certified by the Polish Register of Shipping). These cities have implemented a number of smart mobility solutions which can be a model and inspiration for other cities in order to improve the conditions for the functioning of urban areas and create friendly places to live. Moreover, obtaining the certificate proves that the status of a smart city is real and can also be achieved in other Polish urban centres. Currently, the Railway Research Institute is implementing a project entitled Transport quality indicators in terms of modern cities (smart city), including railways. The aim of this project is the measurement and analysis of transport quality indicators in selected voivodship cities, taking into account the requirements of the ISO 37120 standard.

iwrobel@ikolej.pl

Research and Development Ecosystem Established at PKP S.A. for Europe's Rail JU

Eliza Wawrzyn
Scientific Assistant , Railway Research Institute

Europe's Rail Joint Undertaking (Europe's Rail JU) is a public-private partnership set up to carry out research and development for the rail sector in the Horizon Europe financial perspective. Europe's Rail JU is the successor to the Shift2Rail JU; it was established for the period from 1.12.2021 to 31.12.2031 with a total amount of €1.2 billion to cover its activities. This budget is made up of funds provided by the European Commission of up to €600 million and the initiative members' own contributions. The 25 funder members of Europe's Rail have been selected, namely: adif (Spain), Alstom (France), Angelrail consortium (Italy), AZD (Czech Republic), CAF (Spain), CEIT (Spain), CD Ceske drahy (Czech Republic), DB (Germany), DLR (Germany), eSGR JV (Spain), Faiveley (France), FS (Italy), Hitachi Rail STS (Italy), Indra and Talgo (Spain), NO Rail Directorate (Norway), Knorr-Bremse (Germany), OBB (Austria), PKP S.A. (Poland), ProRail and NS (Netherlands), Siemens (Germany), SNCF (France), Strukton (Netherlands), Thales (France), Trafikverket (Sweden), Voestalpine (Austria). As part of their participation in Europe's Rail JU Partnership, the Founding Members, on behalf of themselves and their collaborating affiliates, have confirmed the contribution of eligible costs including in-kind contributions to operational activities (IKOP) and grant and in-kind contributions to additional activities (IKAA), as well as the payment of a membership fee. The level of funding for R&D work within the partnership is 60% of eligible costs. For the purpose of participating in the Europe's Rail JU Partnership, PKP created a consortium of entities, the so-called R&D ecosystem, which declared their willingness to carry out joint activities within the framework of Horizon Europe's international R&D projects. The ecosystem at PKP S.A. was formed by the following entities within the framework of cooperation in Europe's Rail:

1. AGH University of Science and Technology.
2. Centralny Port Komunikacyjny sp. z o.o. (CPK - Central Transport Hub).
3. Infrabyte sp. z o.o.
4. Road and Bridge Research Institute (POLTRIN network).
5. Institute of Electrical Engineering EMAG (Łukasiewicz Research Network).
6. **Railway Research Institute (POLTRIN network).**
7. Institute of Mechanised Construction and Rock Mining EMAG (Łukasiewicz Research Network).
8. Institute of Innovative Technologies EMAG (Łukasiewicz Research Network).
9. Łódzka Kolej Aglomeracyjna sp. z o.o.(Łódź Agglomeration Railway).
10. Państwowa Uczelnia Zawodowa im. Ignacego Mościckiego w Ciechanowie (I.Mościcki State Vocational College in Ciechanów).
11. PKP Energetyka S.A.
12. PKP Informatyka sp. z o.o.
13. Poznań University of Technology.
14. Poznań Institute of Technology (Łukasiewicz Research Network).
15. International Union of Railways - UIC.
16. Military University of Technology in Warsaw.

In the framework of the 1st Europe's Rail Partnership competition, the Railway Research Institute, as an affiliate of PKP S.A., entered two Flagship Projects (FP):

- FP4 – Sustainable and green rail systems - **Rail4Earth** and
- FP6 – Delivering Innovative rail services to revitalize capillary lines and Regional rail services - **FutuRe**.

In FP4, the Railway Research Institute will take part in the hydrogen refuelling station tasks, i.e. in safety analyses of hydrogen filling stations, including hydrogen storage, hydrogen filling station loading, the refuelling station process, and in the energy part, analyses of the impact of renewable energy sources (RES) on the quality of electricity and reliability of electricity supply, the selection of optimal parameters for the RES power supply system based on the characteristics of substation loads taking into account climatic conditions, and the selection of parameters for the electricity storage system for RES power supply systems.

The activities undertaken by PKP S.A. together with entities from the research and development ecosystem in the FutuRe project will primarily include the analysis and development of a model of offered transport services for small stations located on capillary lines and the provision of additional services accompanying local transport. In addition, thanks to the participation of the Railway Research Institute, it will be possible to get involved in the preparation of preliminary technical assumptions for a small capacity light rail vehicle, intended to operate traffic on non-electrified regional lines.

ewawrzyn @ikolej.pl

Concept for Otwock - Karczew Railway Line

Szymon Klemba
Senior Research and Technical Specialist, Railway Track and Operation Department, Railway Research Institute

Karczew is the southernmost city of the eastern, right-bank part of the Warsaw agglomeration, belonging to the poviat of Otwock, with a population of around 10,000. The town's location in relation to the rail and road network means that it is on the outskirts of the main transport routes, which also results in a poorly developed public transport network. One solution to this problem would be to connect the city to the rail network by building a new section of line. The Railway Research Institute, as part of an internal project, developed a concept for the new route, which mapped out the possible routes of the line, verified in the field in terms of their collision with buildings and technical feasibility. The organisation of rail traffic was also proposed and traffic forecasts were made.

The first variant proposes the construction of a line ending with a head station in Karczew with the construction of an intermediate stop Otwock - Soplicowo. Additionally, one of the sub-options assumes a stop on the border of Otwock and Karczew, at the level of the Ługi housing estate.

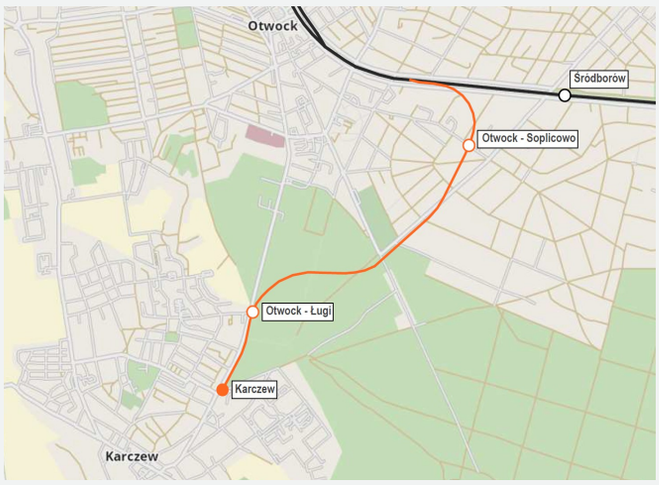

Fig. 1. Variant 1 with terminal at Karczew

In the case of a single-track line construction, it was assumed that the S1 urban line would be extended from Otwock to Karczew; if of a double-track line were constructed, the offer would be supplemented with additional regional trains during peak hours.

The second variant assumes the construction of a line with an intermediate station and its extension across the new bridge over the Vistula towards Konstancin-Jeziorna (and Warsaw).

Fig. 2. Variant 2 with an intermediate station at Karczew

This variant proposes the launch of a two-way, circular urban line, on the Karczew - Warsaw section supplemented by regional trains during peak hours.

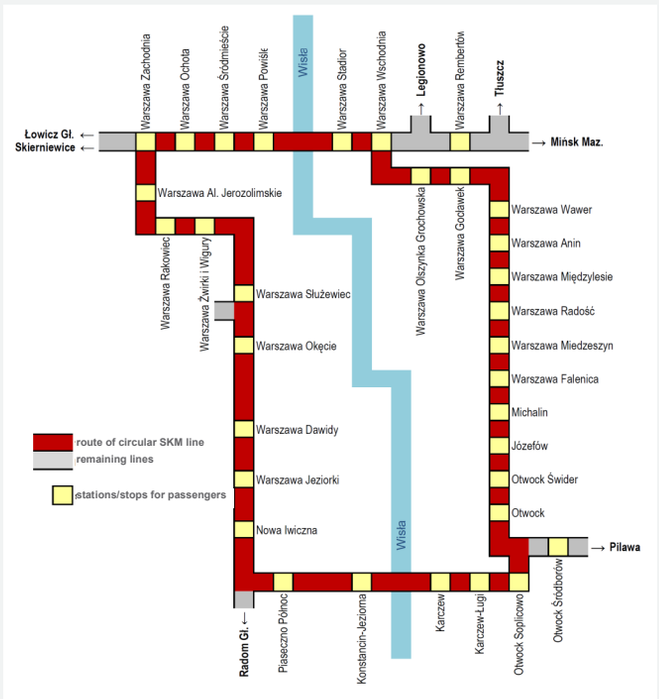

Fig. 3. Concept of circular SKM line in variant 2

The traffic forecasts that have been prepared predict that the new section of the line between Otwock and Karczew may be used by 2 - 2.7 thousand people per day.

sklemba@ikolej.pl

Models of Behaviour at a Railway Station

Piotr Chyliński
Senior Engineering and Technical Specialist, Railway Track and Operation Departament, Railway Research Institute

The Railway Research Institute implemented the In2Stempo project "Crowd management in high capacity stations" on behalf of PKP S.A. from 2018 to 2022 as part of the European Shift2Rail programme. The project consortium consisted of Thales (France), Network Rail (UK), Hitachi STS (Italy) and PKP S.A. from Poland. The aim of the project was to study the behaviour of crowds of travellers at railway stations and to develop a tool to assist the managers of large railway stations in the management of passenger flows , including in unusual and emergency situations.

In order to model the pedestrian traffic in a suitable simulation environment (SE Star by Thales), traveller behaviour patterns at the station had to be investigated and developed. The definition of the model groups of traveller behaviour should be a four -step process:

1. identification of railway station user groups,
2. definition of behavioural parameters for the groups (including e.g. walking speed),
3. estimate the proportion (number of travellers) in each group,
4. identifying how the groups differ and why they differ.

During the work, supported by site visits and participatory observation of traveller behaviour at Liverpool Street Station in London, Warsaw West and Warsaw East, two levels of traveller behaviour modelling were defined:

- macro-scale behaviour, determining the collective behaviour of the crowd,
- micro-scale behaviour, determining the individual behaviour of individuals at the station.

Macro-scale behaviour

Collective crowd behaviour of travellers on a macro scale is mainly determined by factors not directly related to individuals. These are factors that influence the mass behaviour of crowds and are most often linked to the disruption of the daily operation of the station. These can include, but are not limited to, the following predictable factors:

- time of day, day of the week and period of the year (school days/holidays),
- holidays with increased travel demand (in Poland 1 November, 1-3 May),
- mass events,
- restrictions on pedestrian traffic due to scheduled repair and/or maintenance works.

Much more challenging in managing pedestrian traffic are unpredictable, random factors that can happen during normal operation and which significantly affect the behaviour of a group of travellers. Such factors, the timing or circumstances of which cannot be predicted, could be:

- adverse weather conditions - downpours, hailstorms, snowstorms, heatwaves,
- train delays and interruptions,
- changes to platforms relative to the timetable due to traffic situations,
- restriction of pedestrian traffic due to unplanned/emergency repair works,
- natural disasters affecting train and road traffic,
- fires and smoke incidents,
- terrorist attacks.

All of these factors in the unpredictable category directly influence crowd behaviour regardless of the individual characteristics of travellers, their motivations for being at the station and the restrictions on freedom of movement to which they are subject due to luggage, disability, childcare, etc. However, it should be borne in mind that, for example, individual movement speed restrictions affect the evacuation time of a given group of travellers in the event that the railway station buildings have to be emptied due to an alarm.

Micro-scale behaviour

At the micro scale, the determinants of behaviour are linked to the individual people who make up the crowd at the railway station. Their behaviour is determined by a number of factors, including both the purpose of being at the station and the individual characteristics of the travellers. Individual behavioural determinants can be defined at the micro scale through the following aspects:

- direction of travel (departure/arrival/change),
- holding a ticket,
- luggage,
- personal mobility,
- other activities not directly related to the journey,
- method of arrival at the station.

The direction of travel determines activities such as buying a ticket, choosing a platform, the direction of movement through the station.

Holding a ticket or not is determined by the need to approach a ticket office or a ticket machine, or to purchase a ticket on the train.

The type of luggage determines the speed of the traveller, the paths chosen, the facilities used or resigning from certain routes.

Not only does personal mobility influence the speed of movement, but above all determines the behaviour in the station space, through the preference of certain paths and the complete exclusion of others such as stairs.

Non-travel related activities direct pedestrians to retail and service outlets located in the station area. It should be emphasised that some of the people using these spaces will not use the platforms because they are not travellers.

The model of micro-scale behaviour developed by the Railway Research Institute considered the links between the conditions listed above. It was identified that the occurrence of certain conditions clearly precludes the occurrence of others, and that certain micro-scale behaviour determinants coexist more frequently than others. For example, a person riding a bicycle will not be a wheelchair user at the same time, and a person disembarking from a train (finishing a journey) will not use ticket machines or ticket offices. A person who is not a traveller is most likely to be at the station as a drop-off person (so: no luggage and no need for a ticket), or as a person using the service premises. Groups of determinants that do not interact were also identified, for example:

- having or necessity to have a ticket is not linked to the type of luggage, the use of additional activities or the way of getting to the station,
- the way of arriving at the station does not determine the direction of travel, the way of purchasing a ticket or the use of additional activities at the station.

Conclusions

As a result of the study, a matrix of the co-occurrence of individual determinants of passenger behaviour at the station was created and, using information obtained from research carried out by PKP S.A., the percentage share of individual traveller groups defined by the behavioural pattern was estimated. Based on this, a pedestrian traffic model developed by Thales was programmed. The model was then tested by PKP SA employees in charge of monitoring and security control in the area of railway stations. An experiment with them showed that the use of the simulation tool combined with the analysis of live camera images would provide a useful tool for managing crowds and pedestrian flows at a railway station.

The project was carried out with the participation of the European Union under Horizon2020 - Shift2Rail.

pchylinski@ikolej.pl

Railway Research Institute's seminars

The scientific seminars of the Railway Research Institute have been organised at its premises for many years. In the academic year 2022/23 they have been resumed after a one-year break due to the coronavirus outbreak.
The topics of the presentations to date and those planned for the rest of the cycle are illustrated below on the attached table.

Date	Author	Title of the presentation
September 2022	K. Polak, PhD	Developing the acoustic signature of the ED250 electric multiple unit.
October 2022	P. Urbańczyk, PhD, Eng.	Computer simulator of the train braking process - assumptions and first operational versions
November 2022	M. Ostromęcka, PhD, Eng.	Classification of welding non-conformities of railway rails in relation to applicable ISO quality standards and other guidelines
January 2023	Prof. V. Kuznetsov, A. Rojek, PhD, Eng. NEEL	Overhead contact line anti-theft system
January 2023	A. Dąbrowski, MSc, Eng. Sz. Klemba, MSc, Eng.	Possibilities of the regional railway transport integration with the public urban and suburban public transport system in the Municipal Functional Area of Olsztyn
March 2023	IK Prof. B. Sowiński, DSc, Eng.	Selected issues in rail vehicle dynamics. Theory and practice
March 2023	A. Soczówka, PhD	Possibilities of using preliminary multi-criteria analysis as a tool for evaluating railway investments on the example of Ukrainian agglomerations
May 2023	P. Wetoszka, MSc, Eng. Ł. John, MSc, Eng.	Photometric and EMC tests of railway equipment
June 2023	A. Aniszewicz, MSc, Eng.	Problems of running tread diameter measurement on wheelsets
October 2023	W. Kruczek, MSc, Eng. A. Rojek, PhD, Eng. Arex and Siled	Dynamic lighting management system for railway premises
November 2023	A. Miszkiewicz, MSc, Eng.	TSI CCS 2022 - changes to radio communications

Study trip of a Railway Technical Secondary School students from Skierniewice to Railway Research Institute

On Friday 24 March 2023, the Railway Research Institute in Warsaw hosted students from the second, third and fourth grades of the Skierniewice Railway Technical Secondary School.
Director of the Railway Research Institute, DSc Andrzej Massel welcomed the young people, provided general information about the Institute, introduced our 70-year history and invited them to tour the IK facilities and laboratories.


Photo IK


Photo IK

After an initial health and safety training, the students had the opportunity to see what it is like to work at the Railway Research Institute, test the state-of-the-art equipment, meet the specialist staff and get answers to all their questions about rail transport.

During the several-hour tour, our staff presented the research capabilities of the Signalling and Telecommunication Laboratory, the Materials and Structure Laboratory, the Metrology Laboratory, the Rolling Stock Testing Laboratory, the Electrical Power Engineering Department, Rail Vehicles Department and the Railway Track and Operation Department.

The students took a very active part in the event, and the most successful were the large-size climate chamber and the SAC-type anechoic chamber for specialised EMC testing.

Editors:

dr Renata Barcikowska, Editor-in-chief
Jolanta Olpińska
Jolanta Cybulska-Drachal
Andrzej Szmigiel

Contact:

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