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Editor's

Andrzej Massel

Deputy Director for the Study and Research Projects



New opportunities

Research activities of the Railway Research Institute are carried out in 4 units, 4 accredited laboratories and in the Test Track Centre in Zmigród. In 2015 capabilities of the Institute have been strengthened through increased investment in new, highly specialised equipment and through development and accreditation of

new test procedures. Let us focus on just 3 representative examples:

Analyses, planning and optimisation of operational procedures, carried out in the Railway Track and Operation Division of IK, are currently supported with dedicated railway simulation tools: RailSys and OpenTrack. The new software has been already used for development of operational plan for a few investment projects like modernisation of Bydgoszcz – Gdynia line No. 201 and modernisation of Cracow – Zakopane railway.

Thanks to accreditation of new procedures, the Materials and Structures Laboratory fully utilizes new test stands for conducting fire tests according to EN 45545 (see Newsletter No. 2). Increased number of materials used for construction of rolling stock is currently being tested in the Laboratory.

The Signalling and Telecommunication Laboratory is capable of testing of selected parameters of GSM-R transceiver interface. It is also possible to carry out GSM-R frequency electrical intensity tests. The test equipment for these measurements has been acquired recently. The Laboratory has already carried out measurements of GSM-R on E30 main line and on the Pomeranian Metropolitan Railway (PKM). For more details on GSM-R tests see Newsletter No. 3.

11th Edition of International Railway Fair TRAKO 2015

On 22th – 25th September 2015 took place 11th edition of International Railway Fair TRAKO 2015. This prestigious and biggest meeting of the rail transport branch in Poland gathered c.a. 600 domestic and foreign exhibitors. The IK as during previous years, played the role of an exhibitor, together with the Office of Rail Transport (UTK) and the Ministry of Infrastructure and Development (MIR). The joint stand of the IK together with the UTK and MIR is a result of the crucial role the IK plays in supporting both institutions in area of advisory in research and development activities.



Railway passenger transport perspectives in Poland

During the fair the IK organized the conference: “Railway passenger transport perspectives in Poland”. The conference was aimed to analyze the current state of passenger traffic, its impact on shaping public transport offer in agglomerations and cities, analysis of modern traffic methods, discussion on strategic direction of traffic development. The meeting was coordinated by the specialist in area of passenger traffic scheduling - Mr Andrzej Żurkowski, the Director of the IK.



World Congress HSR High Speed Rail - Japan

The 9th UIC World Congress on High Speed Rail was organized in its cradle – Japan in 50/50 convention under the heading “Celebrate the past, Design the future” on 7th – 10th July 2015 in a beautiful and modern Tokyo congress centre “Tokyo International Forum”, Yuraku-cho. The congress was organized by the UIC with the support of the one of Japanese rail companies – JR East. The 50th anniversary of developing High Speed Rail became an occasion to celebrate and reflect on the future.

Polish participation in the Congress.

There was also a Polish accent on the 9th World Congress on

High Speed Rail. Three presentations were specially prepared for the Congress and were presented by the IK experts:

- Preparing of timetable, technical and traffic conditions
- Andrzej Żurkowski, the Director of the IK,
- Gradual implementation of High Speed Rail in Poland
- Andrzej Massel, the Deputy Director of the IK.



The IK Participation in the European ProtectRail Project

Artur Rojek

Chief Researcher

Head of Electric Power Division



In 2015 the European Commission has finally accepted the results and reports from realization of ProtectRail project – The Railway-Industry Partnership for Integrated Security of Rail Transport. The project was realized by 28 partners from 11 countries. Costs of the project realization were almost 22 millions EUR.

ProtectRail is an international project realized under the 7th Framework Programme aimed to improve security on railway and develop integrated systems allowing to detect and specify external threats, such as:

- risk of terroristic attack,
- destruction of rail infrastructure,
- stealing of infrastructure elements,
- destruction of rolling stock (e.g. graffiti),

as well as to solve crisis situations and develop crisis management procedures in the European railway protection system. Details are available on <http://www.protectrail.eu>

The IK took part in realization of the project within the framework of SP5 sub-project – Integration of safety systems – demonstration of proposed solutions, in the following work packages:

WP 53 – Passenger security architecture design and integration;

WP 54 – Rail freight security architecture design and integration;

WP 57 – Onboard and way-side equipment installation;

WP 58 – Demo - Modularity demonstration and integrated system validation demonstration.

The works within the project were performed in Test Track Centre of the IK near Żmigród. Within the works performed by the IK there were developed and build such objects, systems and devices, as:

- platform with electrical and IT installations;
- IT network with server room and fibre optical links;
- device power supply system;
- active fencing of holding tracks;
- monitoring gate for rolling stock entering the holding tracks
- adaptation of cars to the project needs.

There was also prepared the infrastructure necessary to perform the final demonstration of the project results.

The IK was responsible, amongst others, for safety of internal IT network and its proper connection with the public internet network. The capacity of the network, allowing to control the devices and collect data by the employees of the companies – project consortium members, located in different parts of Europe was established. As a result of works within ProtectRail security systems of platform, area of the station, holding track, server room and passenger cars were integrated.

The safety system, apart IT system together with the servers, fibre optical links and other communication devices, included day and night cameras, LTE system, Wi-Fi and GPRS on the whole track length and the area of the station, luggage and passenger control, crowd analysis systems, biometric sensors, movement sensors, luggage screening, biological, radioactive and chemical substances detectors, passenger information systems and others.

All developed, built and presented security systems confirmed the main objective of ProtectRail project, which was an integration of available solutions and technologies produced in different companies into one interoperable rail transport security system.



tem. The system elements, regardless their source, cooperated in accordance with uniform standard developed within the project. It allows to achieve interoperability solutions in security system of rolling stock and railway objects against external threats such as terrorism, vandalism, stealth, etc.

On the basis of ProtectRail results the “ProtectRail White Paper – Key Lessons for the Railway Sector on PROTECTRAIL Security Architecture” was developed. The results of the project are the basis of the security systems against external and internal threats standards developed by the UIC.

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NDT training center in railway maintenance industrial sector

Lukasz Antolik
Scientific assistant
Materials & Structure Laboratory



Since several decades in the Railway Research Institute have been performed research and development works on ultrasonic testing. Since 2011 within the IK structure Ultrasonic Testing Training Centre, which has been continuously training non-destructive testing personnel according to PN-EN ISO 9712:2012 in UDT-CERT system. In the first stage the personnel responsible for ultrasonic testing of sensitive element of rolling stock, i.e. wheelsets axles was trained.

Subsequently, the training centre widened the scope of trainings on monobloc and rimmed wheels, which allowed to improve operators' competences in area of complete wheelsets NDT. Until now, in the IK have been trained many ultrasonic testing operators working in railway maintenance industrial sector, for such companies as PKP Cargo, PKP InterCity, Przewozy Regionalne, NEWAG and many others. After several years of educational activity a lot of positive feedback on significant improvement of fatigue crack detection in operated rolling stock was received.



Fig 1. Equipment used during trainings

Due to limited classes hours, the trained operators obtain skills in using manual testing equipment during exploitation tests of rolling stock elements.

At the same time domestic carriers are in possession of rolling stock and purchase new one, with more complicated characteristics of tested components. One of such elements are hollow axles used e.g. in ED 250 Pendolino passenger trains, characterized also with more complexed geometry. In presented case manual testing performed in traditional way is possible to perform, however it is charged with decreased probability of

fatigues detection. In order to improve testing effectiveness it was decided to use technological hole through which transverse waves angle heads are insert, using "corner effect" and perfectly suited to detect hollow axles fatigue cracks.

The exemplary testing scheme is presented in Fig. 2, where heads location and tested sphere are read by head location encoder fastened to axle stub face.

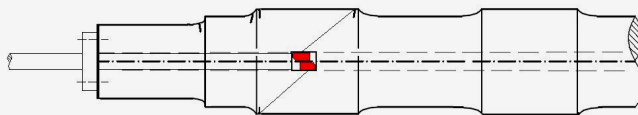


Fig 2. Hollow axis ultrasonic testing scheme

The personnel performing described activities should be additionally trained, however currently presented operation is mostly performed by certified personnel of rolling stock manufacturer within maintenance activities, which were the subject of tender procedure. It is caused by lack of specialized equipment in maintenance workshops, need of highly accessible rolling stock and economic factors in the age of outsourcing.

In 2014 the IK organized the scientific seminar, the main theme of which were ultrasonic testing approach issues. The seminar had an outstanding frequency among railway sector companies decision makers and government authorities representatives.

Issued conclusions confirmed that NDT should be performed by certified, responsible and motivated personnel. On NDT operators lies responsibility for their decisions on possibilities of further, safe exploitation of tested elements. Undetected during testing crack often cause threats to human lives and enormous material injury.

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Research of high speed turnouts in Poland

Grzegorz Stencel

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Railway Track and Operation Division



Past

The IK (formerly CNTK) tested a large number of different designs of high speed turnouts. The first experimental station with high speed turnouts was Psary station, located on the E65 corridor at the point of branching routes from Warszawa to Kraków and Katowice. Turnouts were built in a period of five years, from 1998 to 2002. The

research demonstrated their suitability for use on lines with speeds of 200 km/h.

In 2009, we completed research at the next training ground located on the E65 corridor at the Korytów station served to check out the possibility of the use of switches with fixed common crossings at a speed of 200 km/h. Similar turnouts were tested at Ciechanów station in 2012. Research on these stations were successful.

Present

Currently under study there are turnout which geometry is not used in Poland so far: 60E1-760-1 14 and 60E1-2500-1: 26.5. Turnouts with a radius of 760 m were built at the experimental Pszczółki station. The study confirmed the applicability of these turnouts on lines with a maximum speed of 160 km/h.

Evaluation for the exploitation of turnouts at 200 km/h will be possible after the dynamic tests.

Turnouts with a radius of 2500 m were built in 2015 at Grodzisk Mazowiecki station. Maximum speed on the turning direction is 130 km/h. Due to the fact that it was designed for the station Grodzisk Mazowiecki top speed of 160 km/h, the turnouts manufacturers decided to apply the fixed common crossings. It should be recognized that this is a solution that meets the conditions only at this station, because the turning speed is rarely a ¾ of speed on the straight direction. However, there is potentially a great need for turnouts with 2500 m radius, on the

occasion of upgrading the speed to 250 km/h on E65 corridor. Accepting the principle that the speed of the diverging track is approximately half the speed on the straight track, it's known that crossovers with a 2500 m radius are enough for lines with a maximum speed of 250 km/h, but it is necessary to use a moveable frog.

Future – The latest designs turnout with movable frogs (with a radius of 500 and 1200 m) was built on Szeligi station and Strzałki station (E65 corridor). All of the delivered turnouts are covered by the EC declaration of conformity issued on the basis of the TSI HS INS. At these stations they will also be carried out tests, including dynamic tests.

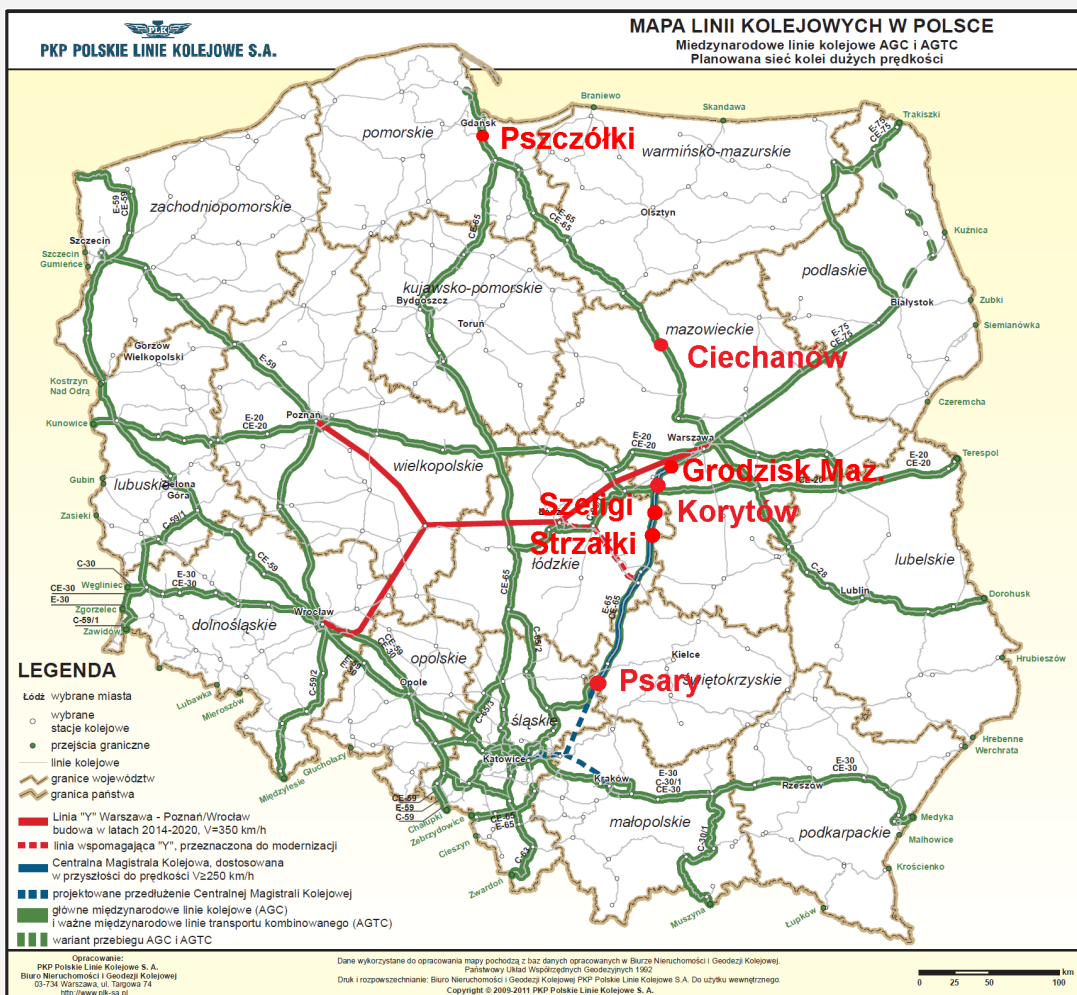


Fig 1. Planned network of High Speed Railway in Poland

Source: PKP Polskie Linie Kolejowe S.A.

Research institutes in the innovative policy of Poland in terms of membership in the European Union

Renata Barcikowska

*Deputy Head of Project Coordination Centre
and International Cooperation*



In Poland subjects that deal with scientific- development activity belong in more than 90 per cent to the public sector. In national conditions scientific research centers which have at their disposal necessary specialized personnel and necessary research facilities, such as workrooms, laboratories, polygons etc. are the following: institutes in the PAN [Polish Academy of Sciences] structure, universities and academies, departmental research institutes.

In the present work entitled: Research institutes in Polish innovative policy under conditions of membership in the European Union, the subject of interest is constituted by the following aspects of innovative policy in Poland in the last decade:

- broadly understood concept of innovation: different concepts of this term, role of innovation in an economy based on knowledge, sources of innovation,
- innovative policy in Poland, process of its evolution, aims and tasks, subject, instruments,
- activity of subjects dealing with scientific activity in Poland,
- scientific research sector in Poland,
- research institutes as subjects and executors of innovative policy, and in particular: their usefulness in realization of objectives of national and EU innovative policy of the country and mutual correlations and links with other subjects representing science in Poland and entrepreneurs,
- activity of similar institutions in chosen European countries with high indicator of innovation,
- finally, broadly understood effects of actions undertaken within the national innovative policy towards research institutes and conclusions for the future.

The aim of the present work is to show in exhaustive way the political aspects of functioning of research institutes in Poland. The problematic question is: What is the role and place of research institutes in Poland in innovative policy since the accession of our country accession to the structures of the European Union till nowadays? Many other questions also require revoking. Are research institutes useful in the present reality as a „specific relict of the past” of a centrally planned economy? How do the changes introduced, national reforms, new Law of research institutes, European funds influence the functioning of research institutes? How do the mutual relations and connections between research institutes and other subjects (universities, PAN institutes) look like? Does the conflict of interests between them occur or is there a cooperation? What are the organizational, legal, economic consequences of changes introduced by a country towards research institutes? What are the perspectives of development and functioning of research institutes? The answers were given on some questions raised at the beginning of the thesis as well as conclusions deriving from analysis of literature, source materials, participation in numerous conferences and meetings, talks with representatives of Main Board of Research Institutes. An attempt of evaluation of effectiveness of innovative policy of the country related to the research institutions was made. Finally a prognosis of development of departmental research institutes was presented, taking into consideration the plans of the European Union. It seems that the structure of this work formulated in the above-

mentioned way allowed to answer the questions raised above. It is worth mentioning at this point that nevertheless the second part of the thesis title: under conditions of membership in the European Union, was not highlighted directly in its structure, the “after accession” perspective is present in all chapters. The innovative policy of Poland, especially a place and a role of research institutes in its conceptualization, creation and conducting were presented in the context created by the accession to the European Union. A research hypothesis adopted in the present thesis is the following: research institutes play an important role in the development of economy based on knowledge and are a substantial element in Polish innovative policy. In the work several research methods were used, which are adequate to the studied subject on subsequent stages of this work:

- historical - taking into consideration the need to present from the historical perspective the innovation policy in Poland as well as her evolution,
- systemic, necessary in the analysis of scientific research sector in Poland, with particular emphasis on the research institutes,
- institutional, useful during analysis of functioning of institutions that create a scientific system in Poland,
- comparison, which was used while comparing the activity of research institutes in other chosen European countries and governmental actions referring to the research institutes, universities and PAN institutes,
- synthesis – while formulating evaluations and conclusions in individual chapters.

A research technique used in the work was the analysis of source materials. By source materials are intended here legislation acts (laws, regulations, decisions) and other national and European documents, internal documents of the Railway Research Institute, materials gained while participating in conferences, seminars, debates concerning innovations and research institutes in Poland as well as statistic data. Apart from what mentioned above, information gained by the Author during talks with people representing Main Council of Research Institutes, Chairmen's and personnel of chosen research institutes turned out to be a source for this work. A conducted consideration enabled to formulate conclusions referring to the scientific policy of the country as per the departmental research institutes. Therefore it was possible to give answers to the questions if funding rules applying to the research and development works in Poland are appropriate and if means from the country budget contribute enough the activity of the institutes. It is worth mentioning that literature concerning characteristic and evaluation of functioning of research institutes from the perspective of the policy is not very broad. The conducted analysis and professional experience of the Author enabled to prepare a study, consisting of reflections related to the Polish and EU innovative policy, its creation, functioning and effectiveness related to the departmental research institutes, mutual connections with main recipients and at the same time authors of innovation in the Polish science.

The public doctoral thesis presentation by Renata Barcikowska, MA entitled **Research Institutes in the Innovative Policy of Poland in Terms of Membership in the European Union** was held on 9th October 2015 at the Cardinal Stefan Wyszyński University in Warsaw at the Faculty of History and Social Sciences. The supervisor of the thesis was Prof. Aniela Dylus, PhD, DSc and the reviewer – Prof. Leszek Rafalski – the Chairman of Main Council of the Research Institutes (RGIB).

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International Conferences organized by the IK

Mirosław Siergiejczyk

Scientific Secretary of the Railway Research Institute



On 18th - 19th November 2015 took place the 4th International Conference ADVANCED RAIL TECHNOLOGIES organized by the IK and Faculty of Transport of Warsaw University of Technology.

The conference was a platform for exchanging views on rail transport issues. Domestic and foreign research and development centers were able to

present their achievements in implementation and exploitation of modern rail transport technologies.

The conference included the following areas:

1. Rail traffic, operation,
2. Rail transport infrastructure,
3. Traffic control and IT for railways,
4. Traction and rolling stock,
5. Materials engineering and recycling in the rail transport,
6. Transport organization and technology,
7. Certification in the rail transport.

Amongst the participants were representatives of universities, research institutes, public administration bodies as well as railway companies, producers and service providers in rail transport area. The speakers during the conference recruited from the research workers from:



Marianna Jacyna Chairwomen of the Scientific Council IK and Andrzej Żurkowski Director IK were opening the conference ART 2015

1. Academic centers, amongst others: Poznań University of Technology, Warsaw university of Technology, Cracow University of Technology, Gdańsk University of Technology, Wrocław University of Technology, AGH University of Science and Technology, Military University of Technology, University of Humanities and Science in Radom,
2. Research and development centers: The Railway Research Institute, The Rail Vehicles Institute (IPS TABOR), The Road and Bridge Research Institute (IBDiM), The Institute of Logistics and Warehousing (ILiM), foreign academic, research and development centres and railway organizations:
 - WNIIZhT (JSC Railway Research Institute) – Russia,
 - Dnipropetrovsk National University – Ukraine,
 - RIA (Railway Industry Association),
 - UNIFE (European Rail Industry),
 - HŽ Infrastruktura (Croatia),
 - SIRT (Italy).
3. Rail transport companies.

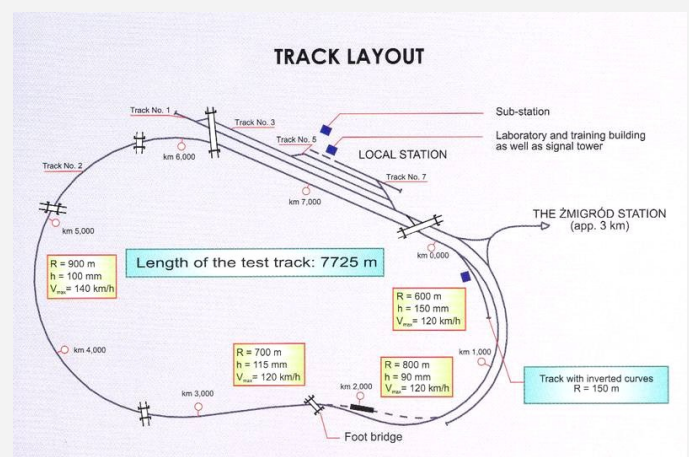
International Scientific Conference Railway Test Rings will be held from 8th to 9th June, 2016 in Trzebnica.

The Conference will be held in association with Celebration of the 20th anniversary of the test Ring Zmigród the day before.

The Railway Test Rings Conference will create an excellent platform for exchange of unique experience related to operational, technical and organizational challenges the railway test rings are facing, as a dedicated infrastructure for conducting test cases and verification processes. The capabilities as well as experiences gained by the railway test ring operators will be presented. Discussion will comprise opportunities and challenges associated with utilization of specialized test facilities, application of different technical solutions, verification of innovative technologies.

Conference topics:

- test rings infrastructure,
- railway test rings offer,
- methodologies and research programs,
- methods for assessment of innovative solutions and technologies,
- interaction between test rings operation and scientific staff development,
- prospect for development of the test rings.



Information about the conference can be found at: www.ikolej.pl
contact: rtr@ikolej.pl

Doctoral Seminars in the IK

In the academic year 2014/2015 in the Railway Research Institute there were organized scientific seminars for its employees willing to prepare a doctoral thesis in technical sciences. The seminars were led by prof. Henryk Bałuch. The aim of the seminars was to simplify and speed up the process of obtaining the doctor's degree by interested employees and therefore to improve the scientific potential of the Institute. The seminars were based using PBL (Problem Base Learning) method. The topics of the seminars included general rules of performing scientific works, statistic and heuristic methods, using of optimization, decision support systems, artificial neural networks, rules of drafting articles for periodicals listed on the ISI Master Journal List, etc.

The participants of the seminars had also possibility to study 5 doctoral theses completed at foreign universities and several theses of domestic authorship.

A significant part of the seminars was devoted to discussion on concepts of individual theses presented by the participants. Currently many people professionally involved in rail transport issues are willing to carry on with their education on III degree studies (doctoral studies). Therefore the IK is planning to offer the open classes formula for the employees of the rail transport area in the following academic year.

If you are interested, please contact: jcybulska-drachal@ikolej.pl

The IK Programme of Seminars in 2016

January 19th, 2016

Artur Rojek, Eng, PhD

New aluminium alloy catenary equipment generation

February 9th, 2016

Henryk Sanecki, Eng, PhD, DSc

Fatigue resistance tests in rail vehicles

March 8th, 2016

Witold Olpiński, MSc. Eng

Unsolved issues of level crossing security in the light of regulation No. 1744 of 20 October 2015

April 12th, 2016

Grzegorz Stencel, MSc. Eng

Rail profiling factors in maintenance of permanent way

May 10th, 2016

**Robert Konowrocki, Eng, PhD
Jacek Kukulski, Eng, PhD**

Experimental and simulation studies of rail brake friction pairs

June 14th, 2016

**Krzysztof Olszewski, MSc. Eng,
Tadeusz Główka, Eng**

Measurements uncertainty evaluation methods in the Signaling and Telecommunication Laboratory

September 13th, 2016

Jan Raczyński, MSc. Eng

Possibilities of using High-Speed Rail for regional transport services

October 11th, 2016

**Paweł Kowalik, PhD,
Łukasz Antolik, MSc. Eng**

Impregnation of timber sleepers with creosote oil. Properties of hardwood. Cracking and mechanical properties of beech sleepers

November 8th, 2016

Andrzej Toruń, Eng, PhD

ETCS L1 on-board equipment examination stand on the Railway Research Institute test track

December 8th, 2015

Agata Pomykała, MSc. Eng

Socio-economic aspects of High-Speed Rail system in Poland

Mirosław Siergiejczyk

Scientific Secretary of the Railway Research Institute

Here you will find a list of seminars that will be held in 2016. All meetings will take place in the IK conference building at Chłopickiego 50 in Warsaw, Poland.

More information about the seminars is available on www.ikolej.pl



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