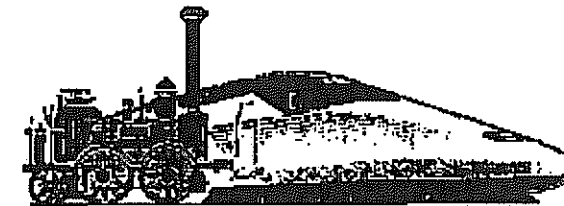




University of Žilina
CETRA
Centre for Transport Research



21st International Symposium
EURO – ŽEL 2013
"Recent Challenges for European Railways"



Symposium Proceedings

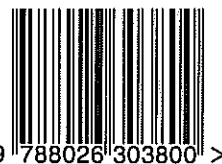
4th – 5th June 2013

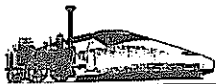


Žilina, Slovak Republic

Tribun EU

2013





EURO – ŽEL 2013

PROGRAM COMMITTEE

prof. P. Cenek, PhD., University of Žilina, SK - chairman
 assoc. prof. Ing. P. Fabián, PhD., University of Žilina, SK
 prof. Ing. K. Rástočný, PhD., University of Žilina, SK
 Ing. P. Márton, PhD., University of Žilina, SK
 prof. Ing. L. Skyva, DrSc., Academy member, University of Žilina Žilina, SK
 Dr. Ljiljor Lochman, CER Brusel, BE
 Ing. K. Višňovský, AŽD Praha, CZ
 prof. Ing. A. Janota, PhD., University of Žilina, SK
 assoc. prof. Ing. A. Dolinayová, PhD., University of Žilina, SK
 dipl. Ing. H. Laumen, Scheidt und Bachmann, DE
 prof. Dr. Ing. Dr.h.c. E. Schneider, TU Braunschweig, DE
 prof. PhD. G. Tarnai, TU Budapest, HU
 assoc. prof. Ing. J. Mikulski, PhD., Silesian University Katowice, PL
 assoc. prof. Ing. T. Molková, PhD., Univerzita Pardubice, CZ
 Ing. W. Olpinski, Instytut Kolejnictwa and ECTRI, PL
 prof. Miloš Ivić, PhD., University of Belgrade, Serbia

ORGANIZATION COMMITTEE

assoc. prof. Ing. P. Fabián, PhD., University of Žilina, SK - chairman
 Ing. P. Márton, PhD., University of Žilina, SK
 Ing. L. Krištofová, CETRA, University of Žilina, SK
 Z. Jakubcová, CETRA, University of Žilina, SK
 E. Kucharovičová, AURA, Žilina, SK

PAPERS INCLUDED IN THE PROCEEDINGS WERE REVIEWED BY

prof. Ing. L. Skyva, DrSc., University of Žilina, SK
 prof. Ing. Petr Cenek, PhD., University of Žilina, SK
 prof. Ing. K. Rástočný, PhD., University of Žilina, SK
 prof. Ing. A. Janota, PhD., University of Žilina, SK
 assoc. prof. Ing. P. Fabián, PhD., University of Žilina, SK
 assoc. prof. Ing. J. Slovák, PhD., University of Žilina, SK
 Ing. Peter Márton, PhD., University of Žilina, SK

Proceedings edited by L. Krištofová, P. Fabian, CETRA

Important note: The papers reflect only the authors' views and the University of Žilina is not liable for any use that may be made of the information contained therein.
 In some cases the original layout and formatting have been changed by the editors to suit better the format of the proceedings. The texts were checked for misspellings and grammatical errors by Microsoft® Word UK English facility and changed where considered appropriate. The editors would like to apologize in case of any unintentional misinterpretations and dependent changes.

©University of Žilina 2013
 This edition © Tribun EU, 2013

ISBN 978-80-263-0380-0



Contents

B. Abramović, D. Karalur, Z. Lacković Modelling Train Cost in HZ Cargo d.o.o.	6
R. Burdzik, J. Mikulski Analysis of Vibration Distribution in Means of Transport	14
E. Dahlhaus, J. Keilert Sorting Freight Cars with Own Power Units on Restricted Track Number and Track Length	22
P. Dorazil, T. Diringer Accuracy of ECTS Trackside Objects Measurement	29
P. Ercegovac, N. Pavlović, M. Marković, G. Stojić, I. Tanackov Effect of Perceptual – Motor Characteristics of Executive Railway Staff on Prediction of Railway Accidents	37
L. Fiala Analytic Methods of Railway Station Layout Capacity Estimation	45
H.-Ch. Graf, M. Egger, B. Rüger "Store&Go+" – Automated Luggage Store Systems Using Passenger Friendly Top Loading Containers	50
M. Halás, J. Gašparik, L. Pečený Rail Infrastructure Capacity Research as a Part of Train Paths Allocation	58
S. Hodas, L. Ižvolt Selected Operational, Environmental and Design Aspects of Building High Speed Tracks	67
P. Ihnát The Cooperation Between a Rail Freight Undertaking and the Carrier in the Context of TAF TSI	75
S. Janković, S. Mladenović, S. Vesković, S. Mitrović Cloud Databases in Railway Transport	82
K. Baudyš, V. Janoš Competitiveness of the National Rail Carrier in the Process of Market Opening for Public Passenger Rail Transport	90
I. Kempe Effective and Safety Train Detection System BUES 2000	96
Š. Klapka, L. Kárná Linear Code Composition	104
D. Krásenský Exchanging Information and Cooperation of Railways in the International Context	112
A. Lieskovský, I. Myslivec ETCS and ATO – Recent and Future Development	118
P. Márton Contribution to Efficiency Increasing of Wagon Sorting	124
J. Mašek, M. Kendra, J. Čamaj, J. Gašparik The Impact of Liberalization on Regional Passenger Transport in Slovakia	131

knowledge" (23%), "entertainment" (20%), "possibilities to exercise " (18%), "relaxation practises" (17%). With increasing age the interest in service features heavily decreases.

With increasing journey duration, the interest in service features increases as well. Passengers on a free time ride show more interest in service features than travellers on a business trip. Around two-thirds of all respondents show interest in healthy nutrition during their train journey. This desire is more common under female passengers than under male ones.

9. Atmospheric environment

The outcomes of this particular subject won't be discussed any further. Generally speaking, the nominations made by the passengers are very subjective and do not always refer to any comprehensible objective criteria. For instance, in every sort of train the temperature was between 25 and 26 °C, nevertheless there are different sensations and evaluations regarding the temperature, which can be connected to the sort of train. The highest percentage of satisfied passengers is to be found in trains of the private operator Westbahn (over 80% satisfaction). The average registered temperature is exactly identical to the temperature registered in the Railjet-trains of OB. However, Railjet was evaluated ten percentage points less than Westbahn. It is obvious that not only the temperature, but rather the general well-being or the consciousness of a deliberately taken decision to travel with a new operator (Westbahn was operating only eight months at the moment of the opinion survey) contributed to this outcome.

The opposite way around also Railjet was not only evaluated regarding temperature, but rather general well-being (for that matter Railjet scores rather low).

There is a similar effect notable when it comes to train categories (first or second class). Passengers travelling first class rated the atmospheric environment higher than passengers travelling second class, there was no objective difference however.

It has to be considered that subjective sensations had a great influence also on questions regarding well-being, illumination and stress factors. Advanced studies would be very helpful in order to interpret the outcomes in the right way.

References

- [1] Viktor Plank: Dimensionierung von Gepackanlagen in Reisezugen, Wien 2008
- [2] Viktor Blank, Bernhard Ruger, "Grundlagen fur eine optimierte Gepackunterbringung in Reisezugen"; ETR - Eisenbahntechnische Rundschau (eingeladen), 07+08 2009 (2009), 07+08; S. 417 - 421.
- [3] Flexicoach, Endbericht AP2, Nutzerbedurfnisse, Wien 2013



EDUCATION IN RAILWAY ON INTERNATIONAL LEVEL - A WIN-WIN-WIN SITUATION FOR STUDENTS, UNIVERSITIES AND RAILWAYS

Bernhard Ruger¹, Georg Barta², Urs Brotschi³, Matthias Gather⁴, Frank Michelberger⁵

Summary: In winter term 2013 the new international master's degree program "European railway systems" shall be offered for the first time. The program constitutes a cooperative offer from the University of Applied Sciences Erfurt in Germany and the St. Polten University of Applied Sciences in Austria with the involvement of the Zurich University of Applied Sciences (School of Engineering) at Winterthur in Switzerland. The idea is to offer students with a background in railway engineering a more comprehensive understanding of European and international "Railway Systems". The courses are based on the respective situation in Austria, Germany, and Switzerland, but, at the same time, a larger international perspective is integrated. The paper will present the motivation of those institutions to start cooperation like this. The challenges in the process of setting up an international program will be discussed and the specific didactic design that has been developed will be presented. Furthermore the added value for the students as well as for other players like universities and railways will be demonstrated. The conclusion will show the need of international education in railways and give an outlook on further developments.

1. Introduction

Traditionally university railway education is separated into civil engineering, mechanical engineering and transport engineering. In all three traditional studies railways have a minor priority and cover only part of the railway system. On the other hand the liberalization of the European railway market by European directives many railways were privatized during the 1990ies. This meant not only the privatization of directly transport related infrastructure and services but also the separation of other only indirectly rail related services. In Germany for example Deutsche Bundesbahn and Deutsche Reichsbahn had run their own institutions for higher education equipped with the formal sovereign right to graduate their students. These in-house universities were successively abolished in the course of privatization. Both effects support the defragmentation of railway education. Furthermore railway ran through a massive process on internationalisation in the last

¹ FH-Prof. Dr. Bernhard Ruger, Assistant Professor, St.Polten University of Applied Sciences and Vienna University of Technology, Research Centre for Railway Engineering, bernhard.rueger@fhstp.ac.at and bernhard.rueger@tuwien.ac.at

² FH-Prof. Dipl.-Ing. Georg Barta, St.Polten University of Applied Sciences, georg.barta@fhstp.ac.at

³ Urs Brotschi, ZHAW School of Engineering, urs.brotschizhaw.ch

⁴ Prof. Dr. Matthias Gather, Erfurt University of Applied Sciences, matthias.gather@fh-erfurt.de

⁵ Frank Michelberger, St.Polten University of Applied Sciences, frank.michelberger@fhstp.ac.at

couple of years especially in Europe, whilst the classic forms of education in the specific countries still are focussing on the national priorities in railway. So the need for a new integrated and more international approach for railway education is evident and can be an answer for tomorrow's challenges in the complexity of the railway system.

2. The national ways of railway education in Germany, Austria and Switzerland

In FH Erfurt (Erfurt University of Applied Sciences) in Germany 2005 the bachelor course "railway systems" started in close cooperation with Deutsche Bahn. This three year course began with a focus on infrastructure management and in 2009 railway services was added. This degree course was planned to replace the "Fachwirt" ("Associate's Degree" as an in-house degree) but still integrating a 2 years' vocational training as train directors. About 100 students have successfully graduated with a Bachelor of Engineering (BEng) degree as economic engineers for railway systems in the meantime. Most of them are now working with Deutsche Bahn but not necessarily with DB Netz, the rail operator, as their comprehensive skills are well looked after throughout the corporate group.

In Austria FH St. Pölten took a similar approach beginning cooperation with Austrian Federal Railway's (ÖBB) main education centre situated in the same city by offering a six semester's Bachelor programme "Railway Infrastructure Technology" from 2008, followed by a Master's programme with the same focus since 2011. ZHAW School of Engineering in Winterthur (Switzerland) started 2009 with a Bachelor Programme in Transport Systems.

3. The tri-national concept for railway education

Like the course in Germany and Austria, this course has been developed in cooperation with the three national incumbent railways DB, ÖBB, and SBB and focuses on questions of interoperability and national benchmarks. Graduates will receive a joint degree of FH Erfurt (Germany) and FH St. Pölten (Austria) and will have equally studied at FH Erfurt, FH St. Pölten and ZHAW.

The fact that the students will have a joint degree and not a triple degree including ZHAW Winterthur is one example for the challenges that came out in the process of setting up this international master. Background is that the lengths of study programs are different. In Germany as well as in Austria 120 ECTS points and duration of four semesters are common while in Switzerland no master program may be longer than three semester or 90 ECTS. The partners agreed that a minimum of four semester is necessary to assure a sufficient level of quality in the education. In the end, the solution was to provide a joint degree of FH Erfurt and FH St. Pölten only and include ZHAW as a provider of knowledge and teaching power only.

Although all three partners share the same language, some linguistic problems occurred, for example with the indication of the program. While in Germany the indication "Studiengang" is common for all study programs, in Austria there is a legal distinction between "Studiengang" and "Lehrgang". The first denomination is

only being allowed for state financed programs and the second one is reserved for those where the complete costs are borne by the students. So in Germany it is useful to use "Studiengang" because of the recognition value and in Austria it is necessary to use "Lehrgang". In this case the solution was to use both words separated by a slash in all official documents and folders.

Other examples for challenges that had to be overcome in such a transnational process are different examination regulations, different academic gradings (Germany: 1 - 6, Austria: 1- 5, Switzerland: 6 - 1) or different internal regulations within the three institutions. Especially the last point was seen as the biggest challenge, because the specific regulation within every institution must not be evaded but a common solution had to be found. In the end flexibility, openness and straightforwardness was the key to the solution, and in the end the three partners were prepared to bring in these requirements keeping in mind, that the result should be a common program with as less organizational expenses as possible for the students.

4. Added values

The aim of setting up this master course was to create an academic, railway-specific offer to qualify future managerial staff of European Railways for personal and human resource development of railway and transport companies and public authorities. The target groups of the new master course therefore are alumni of cooperating partners, interested employees of the transport sector as well as alumni of other universities.

The preconditions for being inscribed into the Master course are

- a first university degree, or
- a state-recognised equivalent in rail or transport (or equal course) and relevant professional experience of at least 2 years. After a thorough assessment of the applicants those 2 years professional experience will be credited with 24 ECTS. The selection process of the applicants will be based on:
 - Final grade of degree
 - Relevance of the first degree, particularly with regard to engineering, business and planning sciences
 - Relevance and duration of professional experience, that means wide and deep professional base
 - Special benefits and qualifications (e.g. additional qualifications, work experience abroad)
 - Letter of motivation

The fee of 12,000 € (3,000 €/semester) will have to be paid at the beginning of each semester, costs of teaching material as well as travel and accommodation costs not being included. These fees lie within the midfield of other European master programs, but as this is an absolutely new program no experiences exist about the willingness to pay so far. The three national railways concerned were very interested

at the beginning of the course development process, when they were invited to take part in the workshops held at Erfurt, St. Pölten and Winterthur respectively and to yield their particular sights and necessities. All work sessions were participated by engineers and training experts of DB, SBB and ÖBB. This is not a guarantee that the railways will automatically send their employees to study this master program, but it is a strong signal that the development of the course was market oriented and that the railways are interested in this new program for railway education. In addition, the course is set up as an independent program that is open to every interested person or institution. To sum up, the new master program can be characterized as a unique program with a tri-national profile (D-A-CH) and a joint degree, an extra-occupational course conception, and a high market- and practice-orientation, which bundles the competences of three cooperating universities.

5. Contents and specific design of the master program

An overview of the design is provided in Tab. 1.

Tab.1. Design of master program

2 years professional experience = 24 ECTS					24 ECTS
M 0 Management of railway systems (basics)					
Semester		FH St. Pölten	FH Erfurt	FH Zürich / Winterthur	
1	Course P 1 Project	Course M 1.1 Infrastructure Management I	Course M 1.2 Management of Railway Operations I	Course M 1.3 Railways and Transport Systems	24 ECTS
2	Course P 2 Project	Course M 2.1 Infrastructure Management II	Course M 2.2 Management of Railway Operations II	Course M 2.3 Interoperability/ European Standards	24 ECTS
3	Course P 3 Project	Course M 3.1 Railway and Environment	Course M 3.2 European Transport Politics	Course M 3.3 Rolling Stock and Propulsion	24 ECTS
4	Course M 4.1 Excursions	Course M 4.2 Master thesis and examination			24 ECTS
Sum					120 ECTS

As can be seen the main modules comprise infrastructure management, railway operations, and rolling stock and propulsion. These rather technical subjects are complemented by systemic modules about European developments (Interoperability and European Transport politics), as in all modules the questions of interoperability and national solutions are dealt with in a European context.

Very important for the functioning of the whole programme are the projects (course P1 to P3). These projects are the interface between the practical experiences

of the employed students and their University studies. The contents of those projects therefore are concerned with a critical reflection of every day's work and deal with human resources management and development, negotiating and conflict management, presentation skills, project management etc. The last semester finally consists of a compulsory excursion in a European transport region outside the German speaking countries, which has to be organized by the students themselves to apply, test and develop their managerial skills, and the development of a master thesis.

6. Conclusions

This example can be paradigmatic for higher railway education in German speaking countries providing a win-win-win situation for students, universities and railways in an international context with respect to the future needs of the railway system.

- Rail privatisation in Europe often meant an abolishment of existing internal higher railway education and recruitment of young experts
- Around 2005 after years of agony some universities started and tried to fill this gap by introducing special Bachelor- and Master-Programs.
- These programs often were developed in cooperation with the incumbent railways to secure strong market orientation.
- The new tri-national master programme of FH Erfurt, FH St. Pölten, and ZHA Winterthur is a further step to provide international and innovative engineering and managerial skills and thus to attract high potentials to the respective universities.
- However, there is quite a strong competition between the universities for the best students and fiscal assistance of the railways – similar to other rail supply industries.
- As a result of this competition in the future a further differentiation of railway related bachelor and master-programmes can be expected.