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EURNEX

EUropean **R**ail research
Network of **EX**cellence

SIXTH FRAMEWORK PROGRAMME

PRIORITY 1.6.2: SUSTAINABLE SURFACE TRANSPORT

Pole Action Plan

Pole 8: Infrastructure and Signalling

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Introduction

Based on the workshop discussions during the 2nd EURNEX Integration Conference each pole of excellence has to prepare an **action plan** to develop and to consolidate the pole within the next critical months. The Action Plan is therefore the “short-term precision” of the mid-term/long-term pole strategy. In order to ensure consistency within EURNEX a template for the action plan had been prepared (see following pages). It is divided into sections with boxes indicating the expected content for the section concerned.

As emphasised on the Integration Conference again, the European Commission expects from EURNEX the more efficient use of the rail research resources. In essence, for our preliminary poles this means:

- Concentration and specialisation
- Integration of research
- Interdependency among pole members

The action plan therefore has to reflect the steps on how to achieve this. Moreover, the contribution of each pole to the durable, long lasting EURNEX business case must be addressed, in particular by the project acquisition planning.

With the aim to cover the relevant items for short-term pole development, the action plan template covers the following sections:

- ❖ Objectives of pole
- ❖ Capabilities involved
- ❖ Collaboration opportunities identified
- ❖ Capability gaps still existing
- ❖ Projects towards Business Case
- ❖ Other actions supporting the establishment of the pole
- ❖ Pole development and milestone planning

It is apparently not necessary to prepare a comprehensive report. The focus should be on understandable and verifiable statements providing the ideas on how to move forward with pole development. Even if not every detail can be described or anticipated today the first issue of the action plan should be prepared as soon as possible, because its submission is the condition to achieve support from the EURNEX WP's.

The action plan shall be a “living document” and periodically updated.

Pole Action Plan

Pole 8: Infrastructure and Signalling

<p>1 Objectives of the pole</p> <p>Are there amendments to be made towards the available description of the poles?</p> <p>1.8.1 Objective To optimise the cost, reliability and availability of the infrastructure</p> <p>1.8.2 Contents This pole should cover the following content::</p> <ul style="list-style-type: none"> • Track including sub-grade and rail • Switches and crossings • Level crossings • Wheel/rail interface (with pole 3) • Signalling and control systems [electrical system and mechanical components] • Line-side equipment • Railway structures, cuttings and embankments • Remote condition monitoring • Electrical power distribution • Maintenance procedure • Catenary • Life cycle cost (e.g. in relation to maintenance) • Noise, vibration and corrugation (with pole 7) • Signalling compatibility • Interlocking 					
<p>2 Capabilities involved in the pole</p> <p style="text-align: center;">- mainly based on Workshop introduction slides -</p> <ul style="list-style-type: none"> - Institutions and persons included - Main topics of research with relevance to the pole - Expected contributions to the pole - Facilities, laboratories, simulation tools etc. available - Researchers involved (name of senior & no. of further researchers) - Selected project references 					
<p>Institutions attending Workshop* (plus others added later), main topics of research and nominated representative.</p> <table border="1"> <tr> <td style="width: 50%;"> <p>University of Birmingham*</p> <ul style="list-style-type: none"> • Asset management systems for infrastructure </td> <td style="width: 20%;"> <p>UoB</p> </td> <td style="width: 30%;"> <p>Dr MPN Burrow</p> <p>m.p.n.burrow@bham.ac.uk</p> </td> </tr> </table>			<p>University of Birmingham*</p> <ul style="list-style-type: none"> • Asset management systems for infrastructure 	<p>UoB</p>	<p>Dr MPN Burrow</p> <p>m.p.n.burrow@bham.ac.uk</p>
<p>University of Birmingham*</p> <ul style="list-style-type: none"> • Asset management systems for infrastructure 	<p>UoB</p>	<p>Dr MPN Burrow</p> <p>m.p.n.burrow@bham.ac.uk</p>			

<p>infrastructure</p> <ul style="list-style-type: none"> • Modelling track performance and deterioration • Comparative track design • Rail metallurgy and performance • Power systems • Remote condition monitoring of infrastructure 		<p>(also Prof K Madelin madelink@aol.com)</p>
<p>French National Institute for Transport and Safety Research*</p> <ul style="list-style-type: none"> • Diagnosis of infrastructure (Rail defects detection, Track circuit analysis, Diagnosis of catenary defects...) • Maintenance of infrastructure (optimal maintenance rules, predictive maintenance...) 	INRETS	<p>Dr P Aknin aknin@inrets.fr (also Laurent Bouillaut laurent.bouillaut@inrets.fr)</p>
<p>Consorzio Nazionale Interuniversitario per I Trasporti e la Logistica*</p> <ul style="list-style-type: none"> • Electric power infrastructure and components • Signalling systems • EM emissions of electric power infrastructure • RAMS • Modelling and simulation 	NITEL	<p>Prof P Pozzobon (pappo@crt.unige.it)</p>
<p>Technical University Berlin*</p> <ul style="list-style-type: none"> • Testing and analysis of infrastructure • Optimization of railway operations • Life-cycle costs • Maintenance strategies • Strategic analyses concerning the optimization of track systems 	TUB	<p>Prof J Siegmann jsiegmann@railways.tu-berlin.de (also Jan Weisser jweiser@railways.tu-berlin.de)</p>
<p>Deutsches Zentrum für Luft und Raumfahrt e.V.*</p> <ul style="list-style-type: none"> • Signalling and train control systems • Comprehensive simulation environment for train control systems including HIL • Validation of operational processes and systems, subsystems and components 	DLR	<p>Dr M Meyer zu Hoerste Michael.MeyerzuHoerste@dlr.de</p>

Centrum Naukowo - Techniczne Kolejnictwa*	CNTK	Dr W Olpinski olpinski@cntk.pl
University of Southampton* <ul style="list-style-type: none"> • Soil modelling and testing • Soil / structure interaction • Instrumentation • Cast iron bridges 	Soton	Dr D Bowness d.bowness@soton.ac.uk
Centre for Research and Technology Hellas / Hellenic Institute of Transport* <ul style="list-style-type: none"> • Contact wheel/rail • Gauge widening and alignment • Safety assessment • Models and quality indicators 	CERTH/HIT	Dr C Pyrgidis chpyrgidis@hermes.civil.auth.gr
Universidad politecnica de Madrid* <ul style="list-style-type: none"> • Structural dynamics of railway bridges • Structural analysis of bridges • Dynamics of track systems • System simulation and implementation • Components validation 	UPM	Dr J Goicolea jose.goicolea@upm.es (also Clara Zamorano clzamorano@caminos.upm.es)
Chalmers University of Technology* <ul style="list-style-type: none"> • Train-track interaction and rolling contact fatigue • Corrugation and roughness • Sleeper design • Track stability • Ballast and subsoil • Rail material 	Chalmers	Dr A Ekberg anek@chalmers.se
Linköping University* <ul style="list-style-type: none"> • Dynamic train/track interaction • Numerical modelling • Track settlement; track degradation • Track stiffness variations • Unsupported sleepers • Pantograph/contact wire interaction 	LiU	Prof T Dahlberg torda@ikp.liu.se
Luleå University of Technology* <ul style="list-style-type: none"> • Operation and maintenance management • Track degradation models, forces measurements • Sustainable bridges, sub structure • Track design.minimising maintenance • Reliability analysis of turnouts • Interaction wheel rail (rail lubrication, grinding) 	LTU	Prof U Kumar uday.kumar@ce.luth.se

<p>Universidad del Pais Vasco - Euskal Herriko Unibertsitatea*</p> <ul style="list-style-type: none"> • Wheel/rail contact; rail forces; rail wear; risk of derailment • Railway noise • Rail corrugation 	UPV	<p>Prof E Garcia Vadillo</p> <p>impgavae@bi.ehu.es</p>
<p>Delft University of Technology*</p> <ul style="list-style-type: none"> • Railway track design – slabtrack • Wheel-rail contact and rolling contact fatigue • Track stability • Track maintenance including life-cycle costs • Track reliability (RAMS based design) 	TUD	<p>Prof C Esveld</p> <p>esveld@ct.tudelft.nl</p> <p>(also Valeri Markine V.L.Markine@CITG.TUDELFT.NL)</p>
<p>Munich University of Technology</p> <ul style="list-style-type: none"> • Permanent way (all components, whole systems, lab. and in-situ testing) • Ballast-less tracks (all components, whole systems, lab. and in-situ testing) • Light rail • Structure borne noise 	TUM	<p>Dr B Lechner</p> <p>bernhard.lechner@bv.tu-muenchen.de</p>
<p>Università di Roma “La Sapienza” Dipartimento di Idraulica, Trasporti e Strade</p> <ul style="list-style-type: none"> • Track testing and analysis • Switches and crossings • Wheel/rail force measurement 	DITS	<p>Dr Riccardo V. Licciardello</p> <p>Riccardo.Licciardello@uniroma1.it</p>
<p>Politechnical University of Catalonia</p> <ul style="list-style-type: none"> • Vehicle dynamics • Failure mode analysis • Interoperability 	UPC/CENIT	<p>Dr P Teixeira</p> <p>paulo.teixeira@upc.edu</p>
<p>Kungl Tekniska Hogskolan</p> <ul style="list-style-type: none"> • Track structures • Wheel/rail interface • Modelling and simulation 	KTH	<p>Prof Mats Berg</p> <p>mabe@kth.se</p>

3 Projects towards Business Case

Project approaches and ideas, incl.

- Short description of objectives and expected results
- Pole members to be involved
- Expected necessary partners from the rail sector (supply industry & operators)
- Need for cross-pole collaboration?
- Timing and estimated budget
- Preparation steps to implement the project
- Please make use of the Acquisition table template attached also

At the pole meeting in June it was strongly advised that links to relevant EU calls are put on the EURNEX website.

5.1 INNOTRACK. At our first meeting (March 2005), Guy Larible from SNCF explained the INNOTRACK proposal for the next call of FP6 aimed at developing a new track capable of carrying high speed and high load trains. He invited Pole 8 to provide expert advice and participation. The proposal was in an early stage and it was agreed that the first meeting of pole 8 would be arranged in May to enable members to be briefed on the proposal and advise on the research methodology.

However when planning the May meeting pole 8 was advised that it was not possible for them to contribute before July 2005. Strong representations have been made to UIC and UNIFE asking for the involvement of the pole8 but no replies have been received. It is not yet possible to conclude whether INNOTRACK will assist with the business case of EURNEX.

At the pole 8 meeting in June, Anders Ekberg advised on his involvement in INNOTRACK on behalf of Banverket. Birmingham had also been helping Network Rail. In the absence of any invitation for pole 8 to become involved, members were advised to seek inputs via their own national groups.

5.2 WP5 has passed to Pole 8 information regarding the next call and specifically Research Area 2.6:

‘Design and manufacture of new construction concepts for road, rail, waterborne and inter-modal infrastructure, that are high quality, cost effective, energy efficient, low noise, safer, risk mitigating and low maintenance, and that promote rapid infrastructure renewal.’ Project 5.1 above is likely to be promoted under this call and the next meeting of the pole will consider other possible projects.’

5.3 WP5 has referred to pole 8 the following projects that had been identified in the first group of new projects:

Project 3 – Maintenance for interoperability

Project 4 – Rail induced noise and vibration (with pole 7)

Project 8 – Wheel/rail interface (high-speed tilting trains – with pole 3).

Project 12 – Rolling contact fatigue in Europe (with pole 3)

Project 15 – Level crossing safety (with pole 6)

The meeting in June reviewed these and other projects. The result was that the following groups of key projects in 5.4 were identified for development.

5.4 New Projects

A. Alternative track constructions [Bernhard (TUM) & Tore (LiU)]

1. Design of for cost effective environmentally sensitive maintenance free railways (possible follow-up to INNOTRACK):

- * rail pads,
- * slab tracks,
- * use of waste material,

2. Tackling the sucking-up of ballast in high-speed operations.

B. Light rail [Ernesto (UPV)]

1. Wheel-rail contact model for sharp curves. Valid especially for trams, where radii down to a little more than 20 m may be found. The proposal could be included in a larger project on light rails, especially. trams and metros and could include:

- * evaluating of contact forces,
- * noise & vibration,
- * account for two-point contact, etc

2. A rational approach to the design & maintenance of light rail.

3. Rail induced noise and vibration (pole 7 should take the lead in a pure noise / vibration project)

C. Deterioration modelling (link with wheel-rail interface) [Anders (Charmec), Uday (LTU), Tore (LiU)]

1. Deterioration based track forces.

2. Heavy trains and fast trains in mixed traffic

3. Track degradation and settlement models:

- * (differential) settlement model,
- * grinding and lubrication.

D. European Maintenance strategies (link to optimization of maintenance) [Riccardo (DITS), Michael (UoB)]

1. European monitoring strategies:

- * identification of representative parameters for monitoring,
- * ways of measuring and reporting; differences in different regions; standardisation,
- * connection to simulation parameters,
- * transfer of knowledge to local companies.

2. Improve structural performance of existing subgrade.

3. Optimization of maintenance

- * benchmarking maintenance practises for railway infrastructure,
- * renewal vs maintenance,
- * establishment of appropriate maintenance standards (LCC).

4. Benchmarking European practice

- * benchmarking current practice,
- * renewal and maintenance polices,

E. Other projects

1. Track--structure interface. Different policies in different parts of Europe. [Jose (UPM)]

2. Interlocking and other signalling issues. The issues are also tackled in the Integrail project. [Klaus (DLR)]

3. Level crossings [Klaus (DLR)]

- * not included within ETCS (European Train Control System), which is extended to cover also conventional lines,
- * remote condition monitoring

5.5 PERFORMINFRA It is proposed to review this project, previously developed but which failed to gain approval.

The meeting in June reviewed PERFORMINFRA, It was agreed that the proposal had been assembled in haste it should be possible to improve the presentation and scientific content. Anders Ekberg will check up on available information and confidentiality agreements with Banverket. If approval can be gained to access the original information then PERFORMINFRA wa s a project that pole 8 would like to develop.

4 Other actions supporting the establishment of the pole

- E.g. periodic seminar / conference to support pole's visibility and business
- Scientific service towards the rail sector supporting pole's durable business

4.1 Organisation

Based upon the opportunities for collaboration identified in section 3 above, and to support the EC in its aim to have focused scientific groups, it is proposed to create small specialist sub-groups within pole 8. The suggested groups and membership are indicated below: Membership will be subject to revision. These groups will apply to WP2 for funds to enable them to meet. A trigger person for each group is identified (t).

At the meeting on 16 June 2005, it was unanimously agreed that Prof Anders Ekberg (Chalmers) be invited to lead the pole for a period of two years and then reviewed. It was also agreed that the leaders of the other four groups should form an executive group for the management of the pole.

A. Rails

Soton (input from pole 7)
UPV
Chalmers (t)
CERTH
UoB
TUD

C. Structures

UPM (t)
Soton
LTU
KTH

E. Power

NITEL (t)
UoB (input from pole 3)
INRETS

B. Track

TUM
TUD
Chalmers
Soton
UoB (t)
LiU
TUB
LTU
DITS
KTH

D. Signalling

DLR (t)
UPM
NITEL
INRETS

4.2 Meetings/workshops

- The whole group of pole 8 should meet at least three times each year.

In view of the budget allocated to pole 8 this aim will not be realised. The next meeting has been arranged for Gothenberg in November

- Specialist groups should meet at least twice in 2005

Specialist groups will only meet when budget is available

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4.3 Short Courses

The following short courses offered by members have been identified and submitted to WP7 via Ernesto Garcia Vadillo (UPV):

- * Geotechnics of railway track foundation design (UoB),
- * Railway asset management (UoB),
- * Railway aerodynamics (UoB),
- * Metallurgy of rail steels (CERTH),
- * Forces acting on the track (CERTH),
- * A short course in Porto in September on dynamics of high-speed bridges.