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INNOTRACK

Integrated Project (IP)

Thematic Priority 6: Sustainable Development, Global Change and Ecosystems

D7.2.2 Report on training needs and plan for training programmes

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Glossary

Abbreviation/acronym	Description
IM	Infrastructure Manager
SP	Sub-Project
LCC	Life Cycle Cost
RAMS	Reliability, Availability, Maintainability, Safety
TEG	UIC Track Expert Group
PoSe	Panel of Structural Experts

1. Executive Summary

To implement the results and technological outputs of INNTRACK, training programmes targeted at different tiers and segments of the rail infrastructure sector are necessary. These are established via the identification of technical training needs, which have been established in consultation with the sub-project leaders. Of the various technical areas identified as requiring possible training, the responses from sub-project leaders were gathered and are presented in the following table:

Topic based on outputs from SPs (please add to list)			Technical Training Target Groups << Enter: Xr, xr, Xo, xo in relevant cells to select >> See key below										
Add any additional topics			Infra Managers (Engineers)				Track Staff				Industries (suppliers, contrac.)		
Training Media	Key		Guideline alone	Group seminar	Dedicated visit	Other (specify) Comments	Guideline (English)	Guideline (Translated)	Individual training (IM)	Other (specify) Comments	Guideline alone	Group seminar	Other (specify) Comments
	Enter:	Definitions											
	Xr	X = Real need											
	xr	x = Pos sible need											
	Xo	r = Resources available											
xo	o = No resources available												
SP1 - Duty Requirements													
Collection and effective management of track and vehicle data													
Railway modelling, simulation and validation of technical solutions													
Track Segmentation				xr									
SP2 - Support													
Geophysical investigation of railway track defects								x					
Methods of track stiffness measurement				x				x					
Modelling of track subgrade: poor quality sites and numerical modelling													
Subgrade reinforcement with geosynthetics				x				x					
Subgrade reinforcement with columns				x				x					
Slab track benefits and selection of a track system				xr				x					
Other (specify):													
SP3 - Switches and Crossings													
Optimization of switches & crossings			xr	xo	xo		xr	xr					
Monitoring systems for switches & crossings			xr				xr	xr					
Functional requirements for hollow sleepers for UIC 60 switches			xr				xr	xr			xr		
Other (specify):													
SP4 - Rails and Welding													
Guidance on the use of different rail grades			xr	xr	xr		xr	xo	xr				
Minimum action rules and maintenance limits			xr	xo	xr	xo	xr	xo		extracts	xr		rail supplier
Laboratory tests of rail steels			xr										
Innovative inspection and maintenance processes			xr	Xo	xr		xr	xo	xo		Xr		
Innovative welding processes				xr	xr		xr	xo	xo		Xr		
Other (specify):													
SP5 - Logistics													
Improvements in logistics of Support, Switches & Crossings and Rail			x	x							x		
Other (specify):													
SP6 - Life Cycle Cost Assessment													
Recommendation for RAMS and LCC in contracts/wordings/policies			Xo								Xr		Individual training
Guidance for LCC and RAMS analysis of innovations				Xr	Xr			xo			xo		
RAMS technology				xo	xo						xo		
LCC analysis				Xr	Xr						Xr		Individual training

The following media are employed for training:

- Guidelines: instructional easy-to-read documents which may be translated into different languages subject to available resources
- Group seminars / workshops: presentation to a group of several infrastructure manager reps and/or industries or a group from one Infrastructure Manager.
- Dedicated technical visits: personal visits by project partners to Infrastructure Managers.
- Track staff training: for technical 'track-side' technologies of a 'hands-on' nature.
- LCC/RAMS workshops: dedicated workshops for training in methodology and tool.

Several programmes have already taken place and future programmes are planned for during the year of 2010 addressing both technical and LCC/RAMS areas.

Special training courses will be arranged 2010 by UIC through TEG and PoSE. See chapter 5 in D7.1.6.

Special visits to several IM and Industrial partners will take place. See chapter 3.2.6 in D7.1.6. One of them in Sweden was transformed into a training activity.

2. Introduction

It is very important to implement and maintain the results of the INNOTRACK project. Dissemination and implementation are the most crucial parts of the project in order to assure that the project results are really implemented and to give credibility to the quality of the project results.

Therefore it is vital to cover the training needs and to meet the requirements of all stakeholders, including those not involved in the project, with training programmes on required topics.

In all countries training is an important task due to the huge amount of special questions that railway covers. As already mentioned in other INNOTRACK reports the way to train differs from country to country. The consequences of this are that there are competent training centres in most countries, but that these are organized in different ways. Therefore training has to be tailored according to national needs.

3. Training needs

3.1 Identification of the training needs

The project technical training needs were established in consultation with the sub-project leaders. The final list of training areas was selected from a long list of identified technical areas via a thorough review of the work completed per individual work-package. The training needs were gathered from the sub-project leaders via a simple questionnaire which asked the sub-project leaders to mark against training needs areas beneath three identified target groups for different training mediums: if training is needed (x), the level of need (X or x), and whether or not there are resources available to perform the training (r or o).

The questionnaire is illustrated below:

Topic based on outputs from SPs (please add to list)		Technical Training Target Groups << Enter: Xr, xr, Xo, xo in relevant cells to select >> See key below											
Add any additional topics		Infra Managers (Engineers)					Track Staff					Industries (suppliers, contrac.)	
Training Media	Key Enter: Xr xr Xo xo	Definitions X = Real need x = Possible need r = Resources available o = No resources available	Guideline alone	Group seminar	Dedicated visit	Other (specify) Comments	Guideline (English)	Guideline (Translated)	Individual training (IM)	Other (specify) Comments	Guideline alone	Group seminar	Other (specify) Comments
			SP1 - Duty Requirements Collection and effective management of track and vehicle data Railway modelling, simulation and validation of technical solutions Track Segmentation										
SP2 - Support Geophysical investigation of railway track defects Methods of track stiffness measurement Modelling of track subgrade: poor quality sites and numerical modelling Subgrade reinforcement with geosynthetics Subgrade reinforcement with columns Slab track benefits and selection of a track system Other (specify):													
SP3 - Switches and Crossings Optimization of switches & crossings Monitoring systems for switches & crossings Functional requirements for hollow sleepers for UIC 60 switches Other (specify):													
SP4 - Rails and Welding Guidance on the use of different rail grades Minimum action rules and maintenance limits Laboratory tests of rail steels Innovative inspection and maintenance processes Innovative welding processes Other (specify):													
SP5 - Logistics Improvements in logistics of Support, Switches & Crossings and Rail Other (specify):													
SP6 - Life Cycle Cost Assessment Recommendation for RAMS and LCC in contracts/wordings/policies Guidance for LCC and RAMS analysis of innovations RAMS technology LCC analysis													
Description of training media: Guideline alone: The written Guideline itself is sufficiently instructional and further training is not necessary Group seminar: Training group workshop presented by INNTRACK partner(s) to a group of IM or Industry representatives Dedicated visit: Individual visits to IMs to present to and mid- and (possibly) high- level IM representatives Individual training (IM): Practical training prepared and given by IM's training officer to a group a track staff													

Figure 1 – Training needs questionnaire

The questionnaire was sent to each sub-project leader. They represent a mixture of Infrastructure Managers and industry experts. With a detailed knowledge of the individual work packages inside their sub-projects, they were asked in their capacity as sub-project leaders what the training needs of their respective sub-projects are. Most SP leaders indicated the training needs for their responsible SP only but in some cases indicated the perceived training needs in other SPs. It is necessary to bear in mind that SP leaders may treat the questionnaire subjectively, viewing training needs from the viewpoint of their particular country even though this wasn't the intention of the questionnaire.

A description of the training media was given for guidance.

3.2 Training needs

The results from the training questionnaire are indicated below:

Topic based on outputs from SPs (please add to list)		Technical Training Target Groups << Enter: Xr, xr, Xo, xo in relevant cells to select >> See key below											
Add any additional topics		Infra Managers (Engineers)				Track Staff				Industries (suppliers, contrac.)			
Training Media	Key	Guideline alone	Group seminar	Dedicated visit	Other (specify) Comments	Guideline (English)	Guideline (Translated)	Individual training (IM)	Other (specify) Comments	Guideline alone	Group seminar	Other (specify) Comments	
	Enter:												Definitions
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Methods of track stiffness measurement													
Modelling of track subgrade: poor quality sites and numerical modelling													
Subgrade reinforcement with geosynthetics													
Subgrade reinforcement with columns													
Slab track benefits and selection of a track system													
Other (specify):													
SP3 - Switches and Crossings													
Optimization of switches & crossings													
Monitoring systems for switches & crossings													
Functional requirements for hollow sleepers for UIC 60 switches													
Other (specify):													
SP4 - Rails and Welding													
Guidance on the use of different rail grades													
Minimum action rules and maintenance limits													
Laboratory tests of rail steels													
Innovative inspection and maintenance processes													
Innovative welding processes													
Other (specify):													
SP5 - Logistics													
Improvements in logistics of Support, Switches & Crossings and Rail													
Other (specify):													
SP6 - Life Cycle Cost Assessment													
Recommendation for RAMS and LCC in contracts/wordings/policies													
Guidance for LCC and RAMS analysis of innovations													
RAMS technology													
LCC analysis													

Figure 2 – Response from questionnaire

3.2.1 Technical training in technology sub-projects (SP2, 3 & 4)

The technology (or vertical) sub-projects report the need for training in most of the technical areas listed. In general, the needs are perceived to be greatest for Infrastructure Managers (Engineers) and Track Staff. Guidelines (sometimes translated according to the country's English level) and group seminars are in most cases considered the necessary medium of training for infrastructure engineers. There is scope for some dedicated visits, where evidently one-to-one discussions are the best means of conveying the technologies from the project. For track staff, guidelines (preferably translated given the generally lower level of English skills at this level) are the essential medium, though SP4 – Rails and Welding sees scope for some individual training. In addition, SP4 suggests some training for the industries in the form of guidelines.

3.2.2 Training in integrating sub-projects (SP1, 5 & 6)

The integrating (or horizontal) sub-projects report training needs quite differently. In SP1 for example, "Track Segmentation" is the only area identified in need of training. SP5 suggests training for both Infrastructure Managers and Industry in the form of guidelines and possibly a group seminar. SP6 has clearly identified the need for comprehensive training in LCC and RAMS, both for Infrastructure Managers and the industries: This should be a combination of guidelines, group seminars and a dedicated visit to the Infrastructure Engineers, depending on available resources.

4. Plan for training programmes

4.1 Technical training programmes

4.1.1 Guidelines

In most areas for which training is required, guidelines are a sufficient medium. Where possible and where appropriate, translations will be made either internally within UIC or with the assistance of the national railway companies. The list of guidelines for which translation is considered necessary shall be provided to the railway companies of UIC members.

The concept and contents of guidelines is described in deliverable D7.1.6 and details of them can be referred to there.

4.1.2 Group seminars / workshops

Group seminars are considered necessary for several technical areas in all sub-projects. Therefore, group seminars are being organised for each SP. The programme of each workshop will reflect the training needs areas identified. Two workshops have so far taken place (SP2 Substructures and a combined SP3 Switches and Crossings and SP4 Rails and Welding workshop) and further workshops are planned for 2010.

List of seminars / workshops

Seminars already taken place in 2009

Sub-project	Topics	Date / Venue
SP2 Track Support	<ul style="list-style-type: none">- Measurement campaigns / database, onset of settlement, track stiffness investigations, numerical modelling- Subgrade reinforcement using concrete columns- Under-ballast reinforcement with geosynthetics- Innovative superstructure solutions- LCC and RAMS analysis	15 October 09 UIC, Paris
SP3 Switches & Crossings and SP4 Rails & Welding	<ul style="list-style-type: none">- The root causes of problem conditions and priorities for innovation- Selection of rail grades based on knowledge of rail degradation mechanisms – lab - in field.- Maintenance strategy to avoid rail defects and breaks and scientific validation of minimum action rules- Optimized welding procedures; Corrugation, squats, insulated joints – maintenance limits- Strategies for rail grinding and friction management- Optimization and recommendations for S&C design- Innovative track form solutions- LCC and RAMS analysis for track and S&C	14 October 09 Infrabel, Brussels

Seminars / workshops carried out / planned for 2010

Sub-project	Topics	Date / Venue
General project	<ul style="list-style-type: none"> - Identified cost drivers and how they were met with innovative solutions - Cost reduction using subgrade improvements - An example of Asset Management of track with INNOTRACK result - How LCC and RAMS has been developed in INNOTRACK - LCC and RAMS for innovative track form solutions - Economical impact of enhanced Logistics procedures - Enhanced rail maintenance by grinding - strategies, specifications, logistics - Overall cost reduction – effects of INNOTRACK 	19 January 10 UIC, Paris
SP2, SP3 and SP4	Courses arranged by UIC 2010 <ul style="list-style-type: none"> - Subgrade improvements - Recommendation on S&C - Rail grades - Minimum action rules and maintenance limits - Other Proposed Courses are Inspection techniques and Grinding 	2010
SP5 Logistics	Activities in EIM, EFRTC and CER	Still proposals
SP6 LCC & RAMS	- LCC calculations	2010

4.1.3 Dedicated technical visits

Dedicated visits to Infrastructure Managers (engineers) are considered necessary for some technical areas in some sub-projects (SP3-possibly, SP4 & SP6). Therefore, dedicated visits are being organised for these SPs, to take place in early 2010. The programme of each workshop will reflect the training needs areas identified. The visits will be made by the SP leader and relevant work-package leaders, as well as representatives of the local Infrastructure Manager in INNOTRACK (if possible). The visits will enable a detailed technical discussion based on the deliverables, guidelines and some specific examples. The visits will generally be conducted in English unless it is necessary to hold in local languages due to language barriers.

List of dedicated visits to take place early-mid 2010

Sub-project	Topics	Date / Venue
SP3 S&C	- Optimisation of switches and crossings (tbd)	tbd
SP4 Rails & Welding	<ul style="list-style-type: none"> - Guidance on the use of different rail grades - Minimum action rules and maintenance limits - Innovative inspection and maintenance processes - Innovative welding processes 	tbd
SP6 LCC & RAMS	- Guidance for LCC and RAMS analysis of innovations	tbd

	<ul style="list-style-type: none">- RAMS technology- LCC analysis	
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4.1.4 Track staff training

Training for track staff is considered necessary for some technical areas within SP4 Rails and Welding due to the 'track-side' nature of the technologies; here technique and practical field knowledge is important. Therefore, specialist track staff training is to be recommended for interested Infrastructure Managers depending on the availability of training resources. INNOTRACK will offer support in detailing the areas in which training is required and the training itself will be carried out by the Infrastructure Managers' training departments.

List of areas for training of track staff

Sub-project	Topics	IMs
SP4 Rails & Welding	<ul style="list-style-type: none">- Guidance on the use of different rail grades- Innovative inspection and maintenance processes- Innovative welding processes	tbd

4.2 LCC and RAMS training programmes

In this regard, a basic training workshop LCC has carried out and conducted by DB on 26-27 February 2008 in Paris. The training contained the LCC methodology with theoretical background, results of the software benchmark and exercises of test cases in LCC analysis with the software D-LCC. The tool D-LCC was evaluated as the most suitable tool for INNOTRACK purposes as a result of the software benchmark.

Coupled with this training activity, a specific software demonstration on D-LCC took place on 17th September 2008 in Paris and was held by ALD together with DB. The introduction of the software tool, import/export of data, modelling etc. have been some of the contents of the specific software training.

In general, the basic training was on the basis of LCC, how it can be used in INNOTRACK and on the LCC tool that is used for LCC analysis.

DB had also planned a workshop on defined LCC cases (reference systems and innovations) as part of SP6 result, but this could not be carried out due to lack of participants. Another result of SP6 is the Guideline for RAMS and LCC analysis, which final version will be finished in February 2010.

As DB is very skilled in the fundamental LCC training, which is also being done as internal training at DB, DB is interested to cover training needs on LCC/RAMS and to assure the project results and a widespread dissemination of the LCC and RAMS technology respectively. Thus DB has planned to carry out workshop on LCC and RAMS e. g. for some IMs in the next future. However, also group seminars or dedicated visits on LCC and RAMS, as mentioned in previous chapter, can be carried out by DB if required independent of the target group.

5. Conclusions

Based on the training needs identified by the sub-project leaders, comprehensive training programmes have been organised in both technical and LCC/RAMS areas.

The guidelines form the basis of the training material and will be the training medium in most cases and to most target groups. Further, the training material for workshops, technical visits and track staff training will be based on the guidelines with additional material taken from selected deliverables as required. Several of the guidelines will be translated into other European languages: German and French initially with the possibility of further translations based on available resources.

Other training media:

The following group seminars / workshops have taken place:

- SP2 Track Support
- SP3 Switches and Crossings & SP4 Track
- General project – focussed on the economic impact/result of the project

The following are to take place in early-mid 2010:

- SP5 Logistics
- SP6 LCC & RAMS

Dedicated technical visits to Infrastructure Managers will be undertaken for:

- SP3 S&C
- SP4 Rails & Welding
- SP6 LCC & RAMS

Track staff training is planned for SP4 Rails & Welding.

The comprehensive training programmes will aid in implementation of the project results and transfer of technical knowledge to the different tiers and segments of the rail infrastructure sector.