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PROCEEDINGS OF SECOND SILENCE SEMINAR

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TABLE OF CONTENTS

1	Purpose of the Seminar	3
2	Agenda	3
3	Participation	4
4	Presentations	6
4.1	Overview of the SILENCE Project	6
4.2	Railway Activities in SILENCE	6
4.3	Tests on Trams	6
4.4	Tests on Trains	7
4.5	Diesel Motor Noise Reduction	7
4.6	Noise Reduction of Fans and Auxiliary Systems	7
4.7	Traction Equipment	8
4.8	Running Gear, Optimised Wheels	8
4.9	Urban Track Noise Reduction	9
4.10	Track Absorbers	9
4.11	Depots	10
4.12	Round Table Discussion: Noise Mapping for Railways, Technical Standards for Interoperability, Noise Creation Databases	10
5	Annexes	13

Second SILENCE Seminar: Reducing Railway Noise in Urban Areas

1 Purpose of the Seminar

This second SILENCE seminar was mainly targeted at railway stakeholders in noise abatement and aimed to inform this target group on the progress of the railway activities in SILENCE while also pointing out the potential of different noise abatement measures.

2 Agenda

The seminar programme was developed by Polis and SNCF with the cooperation of UNIFE and UIC in such a way that it gave an overview of the different railway activities that are being developed within the SILENCE project, both in relation to railway vehicles and railway infrastructure: The agenda was as follows:

08.45 Registration and Welcome Coffee

09.15 Overview of the SILENCE project
Karen Vancluysen, POLIS

09.30 Railway Activities in SILENCE
Pierre-Etienne Gautier, SNCF – Bernd Asmussen, Deutsche Bahn

09.45 Tests on Trams
Franck Poisson, SNCF

10.05 Tests on Trains
Franck Poisson, SNCF

10.25 Diesel Motor Noise Reduction
Sylvain Recorbet, Alstom

10.45 Noise Reduction of Fans and Auxiliary Systems
Anders Frid, Bombardier

11.05 Coffee Break

11.25 Traction Equipment
Stefano Ferraiuolo, Ansaldo Breda

11.45 Running Gear, Optimised Wheels
Daniele Ongaro, Lucchini

12.05 Urban Track Noise Reduction
André Van Leuven, D2S

12.25 Track Absorbers
Dave Farrington, Corus

12.45 Depots
Margreet Beuving, AEAT

13.05 Discussion / Round Up

13.15 Lunch Break

14.30 Round Table Discussion:
Noise Mapping for Railways, Technical Standards for Interoperability, Noise Creation
Databases

William Bird, European Commission – DG Research

Daniel Cadet, Alstom

David Guérin, Bruitparif

Pierre-Etienne Gautier, SNCF

Rick Jones, AEAT



The morning session of the seminar was chaired by Raimondo Orsini from UIC - the International Union of Railways, the roundtable discussion in the afternoon was moderated by Pascal Fodiman from SNCF.

3 Participation

The seminar was well attended by a wide variety of around 70 stakeholders.



Company/organisation	Surname	First name
AEAT	Beuving	Margreet
AEAT	Jones	Rick
Alstom	Cadet	Daniel
Alstom	Recorbet	Sylvain
Andalusian Delegation in Brussels	Garcia-Baquero	Jean-Christophe
Ansaldo Breda	Ferraiuolo	Stefano
ATOC Ltd	Shaw	Louise
Bombardier	Frid	Anders
Bruitparif	Guérin	David
Brussels Environment	Bourbon	Christine
Brussels Rep of the West Pannon Region Hu	Gonczi	Richard
CER - Community of Railway and Infrastructure companies	Lochman	Libor
CNCF' CFR' SA	Smarandescu	Aurora Gabriela
CNCF' CFR' SA	Stoicescu	Iuliana
Corus rail	Benton	David
Corus rail	Farrington	Dave
Corus RD&T	Kitson	Paul
D2S	Van Leuven	André
Deutsche Bahn	Asmussen	Bernd
Deutsche Bahn	Stiebel	Dorothee
Development Agency of Heraklion - EU Liaison Office	Katsaraki	Eva
Diputacion de Huelva	Romero	Elisabeth
DLR Brussels Officer	Wurzel	Dietmar
EEA_ European environment agency	Bäckman	Anna
ETS	Weerdmeester	Ronald
Europabüro der bayerischen Kommunen	Gottsmann	Eva
European Commission - DG Research	Bird	William
European Federation for transport and environment	Renshaw	Nina
Greater Manchester Brussels Office	McAdam	Victoria
IBGE - BIM	Simons	Jean-Laurent
IDP	Polvani	Ilaria
IHF	Costantino	Giulia
Information Office of the Lubuskie Region	Dach	Dominika
ISVR	Croft	Briony
ISVR	Jones	Chris
Land Salzburg	Schmatzberger	Senta
LNE - Flemish Government	Van Neer	Kris
Lucchini	Cervello	Steven
National Company of freight railway transport "CFR Marfa" SA	Trancu	Florian
Nedtrain Consulting	Paré	Marjelke
Nedtrain Consulting	Sikma	Erik
Netherlands Railways	Resida	Harold
Office of the Styrian Government	Karimi-Auer	Julia
Oficina de Castilla y León en Bruselas	Martín Perez	María Eugenia
ONERA	Leporcq	Bruno
PA Europe	Trieling	Esther
Patrona Catala pro europa	Mondragon Vial	Santiago
PKP Polish Railway Lines SA	Michajlow	Urszula
PKP Polish Railway Lines SA	Trojnara	Damian

Polis	Clement	Florent
Polis	Vancluysen	Karen
ProRail	Lammers	Jan Willem
Refer E.P. - Rede Ferroviara Nacional	Ribeiro	José Diogo
Region Campania	Canetti	Valeria
Representation of the State of Baden-Württemberg to the EU	Gaissert	Kurt
RPA	Lillis	Anne
SNCF – Strategy Management	Fodiman	Pacal
SNCF – Innovation and Research Management	Gautier	Pierre-Etienne
SNCF – Innovation and Research Management	Poisson	Franck
SNCF – Innovation and Research Management	Margiocchi	Florence
Spanbeton B.V.	Sijtsema	Peter
SPF Mobilité Transport	Fleurquin	Patrick
SPF Mobilité Transport	Pequet	Christophe
The Marcus Wallenberg Laboratory _ KTM	Abom	Mats
UIC	Hübner	Peter
UIC	Korpanec	Imrich
UIC	Orsini	Raimondo
ULB	Dozzi	Joel
Umweltbundesamt	Jäcker-Cüppers	Michael
UNIFE	Dindarova	Nailia
UNIFE	L'AMI	Suzanne
Unioncamere Del Veneto Brussels Office	Sitran	Alessio
Valdunes	Demilly	François
Vossloh Spain	Rivars	Mar

4 Presentations

4.1 Overview of the SILENCE Project

Karen Vancluysen from POLIS presented the overall aim, partnership and structure of the SILENCE project, including the specific objectives that each Sub-Project has set itself.

The full presentation is included in Annex 1.

4.2 Railway Activities in SILENCE

Pierre-Etienne Gautier from SNCF, leader of Sub-Project E on rail vehicles presented the SILENCE approach of the rail activities, which is based on hot spot analyses. Typical cases have been selected for trams/metros and heavy rail on the basis of noise maps. The ‘validation platform’ concept is used, looking at pass-by identification of sources on “state of the art” vehicles and tracks, the reduction of noise on individual sources, the assessment of reduction of levels and perception, and the validation of noise reductions through tests at the end of the project on prototypes of silent vehicles and tracks.

Bernd Asmussen from Deutsche Bahn, leader of Sub-Project G on rail infrastructure, presented the main objectives in relation to rail infrastructure and operation.

The full presentations are included in Annex 2.

4.3 Tests on Trams

Franck Poisson from SNCF gave an overview of the tests that are being carried out on trams and metros. The aim is to identify two types of validation platforms: a quieter platform to quantify the contribution of each source of a LRT in overall noise levels with a reallocation of research efforts to the most important noise sources, and a noisy platform to assess the

noise reduction in urban areas representing a typical European noise situation with a representative assessment of the technical solutions.

The full presentation is included in Annex 3.

4.4 Tests on Trains

Franck Poisson from SNCF also explained the test on trains that the SILENCE project is undertaking. The aim of these tests is to characterise the acoustic performance of state of the art validation platforms (trains and tracks), to confirm the most important sources of noise to be reduced (source ranking), and to characterise the acoustic performance of optimised state of the art validation platforms at the end of the project.

The full presentation is included in Annex 4.

Questions/Remarks

- Are other sources besides rolling noise wagons being looked at?
 - Indeed, they also look at other issues by means of antennas that measure other sources besides rolling noise wagons.
- It is important to look at the quality of noise, as the effect of noise on human perception can be very different.
 - This will be considered within each Work Package of the SILENCE project.

4.5 Diesel Motor Noise Reduction

Sylvain Recorbet from Alstom highlighted the SILENCE activities related to diesel powerpack systems, one of the most prominent noise sources. Advanced experimental tools for vehicle powerpack optimisation will be developed and validated.

The full presentation is included in Annex 5.

Questions/Remarks

- Are silencers an effective way to reduce noise?
 - Yes.
- Is diesel noise being investigated in steady state conditions only or also in other conditions?
 - Simulations are being done in different conditions and with moving trains, though not in the acceleration phase which is too difficult to simulate.
- Are exhaust cleaning/particle filters taken into account?
 - No, the aim is just to see the effect of noise reduction solutions. Nevertheless, at the end of the project, a real exhaust silencer including particle filters will be built.
- Are solutions based on annoyance factors?
 - Only in the preliminary phase. The end result will be a standard index looking at the correlation between annoyance, perception and physical phenomena.

4.6 Noise Reduction of Fans and Auxiliary Systems

Anders Frid from Bombardier gave an overview of what is being done to tackle noise from fans and auxiliary equipment, which are important sources of noise for trains at platforms and when accelerating. Existing solutions are being benchmarked and tune calculation models for fan noise prediction will be developed. The performance of new design elements will be investigated and the aim is to find new low-noise designs for an engine cooler, also building a demonstrator.

The full presentation is included in Annex 6.

Questions/Remarks

- Can lessons be learned from the reduction of fan noise in airplanes?
 - Surely, but still they mainly have to deal with turbulence and supersonic air flow, which is a completely different issue and not just transferable to railways.
- What about the micro perforation approach?
 - These are plates with small holes which are dedicated to reduce noise but have never been used in an airflow.

4.7 Traction Equipment

Stefano Ferraiuolo from Ansaldo Breda focused his presentation on the noise emission coming from electric traction. Potential prototype solutions are being assessed, taking into account railway system constraints, global retrofitting feasibility and a good cost/benefit ratio also from the maintenance point of view. Prototypes of improved components will be provided so that the noise reduction achieved can be evaluated in an assembled system. Two main solutions are currently under preliminary assessment and will be the subject of future work: at source level – the development of innovative feeding strategies; on the propagation path – the use of advanced shielding (hybrid active-passive skin panels).



The full presentation is included in Annex 7.

Questions/Remarks

- What is meant exactly with innovative feeding strategies at source level?
 - Some strategies will be developed and tested with the difficulty being that not only noise is the problem but that also the performance of traction needs to be guaranteed. The hybrid active-passive skin panels refer to passive properties for insulation and can be activated to control noise.

4.8 Running Gear, Optimised Wheels



Daniele Ongaro from Lucchini presented the development of new damping solutions for freight wheels within SILENCE. The aim is to improve the performance of rolling noise reduction, with a low cost solution that requires limited modification of the wheel design, with resistance of the damping systems to thermal load and thermal rim elongation and with the possibility of internal ventilation for wheel cooling.

The full presentation is included in Annex 8.

Questions/Remarks

- Will you also look at issues such as screwing, lifecycle, maintenance?

- This is currently not foreseen.
- Will it be calculated which amount of damping is attributable to the outer damping ring?
 - No such measurements are planned.
- How much reduction is expected from the pass-by level of freight wagons?
 - Such calculations will be carried out in the next few months on Deutsche Bahn wagons with K-blocks.

4.9 Urban Track Noise Reduction



André Van Leuven from D2S illustrated the actions planned within SILENCE to reduce urban track noise. After an assessment of the existing situation and a definition of hot spots, a baseline analysis of hot spot noise will be carried out. New track solutions will be designed with prototype construction and lab testing, followed by on-site installation and evaluation through measurements.

The full presentation is included in Annex 9.

Questions/Remarks

- Will the tests be carried out on slap tracks or classic tracks?
 - On slap tracks, to make sure that the test replicates what it will be like in reality.

4.10 Track Absorbers



Dave Farrington from Corus looked into optimised tracks for railways in urban areas. The contribution of the track components and their vibration behaviour to the typical noise hot spots in urban situations are being evaluated. The aim is to come to a reduction of sound emissions from the rail for a given roughness level by increasing the damping of the track and by acoustic optimisation of track components, as well as to obtain a reduction of the corrugation growth rate.

The full presentation is included in Annex 10.

Questions/Remarks

- Will glue be the coupling medium?
 - The material has especially been chosen for its non-glue characteristics to remove the dampers if necessary. It provides a very good coupling between rail and damper and consists of a two-component poly-urethane.
- Is there a sensitivity related to the proper installation?

- Trials are carried out with putting too much or not enough material, and these confirm such sensitivity. In addition, tests also look at variation in time, and they show more variation in track than dampers.
- Have any effects been measured yet?
 - Yes, at SNCF with a reduction of 3 dBA, which was lower than expected due to noisier wheels. With less noisy wheels it can go up to 6-7 dBA. More results will become available in September – October 2006.

4.11 Depots



Margreet Beuving from AEAT explained the research and tests aiming for an optimal lay-out of railway depots based on the minimalisation of annoyance. Guidelines will be issued for lay-out, planning and processes.

The full presentation is included in Annex 11.

Questions/Remarks

- What do the permits used in Germany imply?
 - You are required to make a model and prove that you will stay below certain limits.
- Are complaints from people crossed with measurements?
 - Yes, but there's never a linear relationship with the measurements. You have to try to find out what people are suffering from and how you can identify this in your models.

4.12 Round Table Discussion: Noise Mapping for Railways, Technical Standards for Interoperability, Noise Creation Databases

Pascal Fodiman from SNCF, moderator of the roundtable debate, refers to the different presentations of the morning session, looking into technical solutions and interoperability concerns. The aim of the roundtable is to explore which further needs exist from different stakeholders.



Pascal Guérin from Bruitparif, representing the final client who will have to implement the solutions developed, is the first panellist invited to reflect on the issues raised. He explains the current status in Ile-de-France of the railway noise database for Directive 2002/49/CE and emphasises the importance of using dynamic noise maps in the future.

The full presentation is included in Annex 12.

Discussion

- Do you have sufficiently accurate data for such dynamic representations of noise?
 - The rolling stock, as well as emissions are known. Goods train emissions are not very well known however, these data are still insufficient.
- Why would we need such dynamic noise mapping?
 - For operational studies of noise reductions, static representations suffice. In order to have information on the noise impact however, you need dynamic representations. Dynamic maps give information on the real impact, you can hear how the noise level increases. Such maps are useful to communicate about noise to non-specialists, such as citizens and politicians.
- Which kind of precision do you intend to meet with the different databases and tools? Which precision level do you feel is necessary to fulfil the END mapping requirements?
 - Pictures, photos and film roughly give enough information to calculate results, but this is not efficient near stations for example.
- Taking an average over a year can be misleading, maybe you should show peak noise, certain events.
 - What counts is what is real for the people living there. If you only want L_{Amax} you need to close down everything.
- Do you also use this approach for road transport noise?
 - No, road traffic is a constant flow which is more easily represented by static information, and if you have a congested road then you have less noise.
- Do you relate such dynamic representations to annoyance as well?
 - Annoyance factors are not part of the calculation method. In order to relate annoyance and noise levels, people are interviewed, as this really depends on many parameters.
- Have you calculated the costs of such an approach?
 - The methodology has already been developed, it only needs to be applied and it is not much more expensive. Also, it's not necessary to use this approach for the whole city, dynamic mapping is especially important to analyse what trains do and helps to increase understanding in general. This does not mean however that static noise maps have become obsolete.



Pascal Fodiman invites William Bird from the European Commission to bring in the EC's perspective on railway noise. He presents the European policy framework in which SILENCE operates, as reflected in the Lisbon Agenda, the Transport White Paper and the objectives of the both the Sixth and Seventh Framework Programmes. The activities of ERRAC, the European Rail Research Advisory Council are highlighted as well.

The full presentation is included in Annex 12.

Discussion

- How much money will be allocated to rail in FP 7?
 - There has been a slight increase in the RTD budget, which is now being allocated to the different subjects. Transport is the third highest area out of 7.
- Is the railway community being consulted about the future and what could be the mid-term research needs?
 - The EC is open to suggestions as input for FP 7.



Daniel Cadet from Alstom gives the third intervention as panellist within the roundtable discussion. He stresses that it takes time to decrease noise levels and improvements are incremental. We should move from incremental solutions to a system approach for RS and the RS infrastructure system. The noise dimension should be taken into account during the design phase of sub-systems and their integration. At the same time however, there's an increase in competition, which makes cooperation very difficult.

The full presentation is included in Annex 12.

Discussion

- There's a difference between old and new trains. For pass by noise the standard deviation is less than 1dBA. The answer is maintenance!
 - It is true that the same level of dedication to maintenance is not reached for all kinds of trains. This is possible, but of course has a cost.
 - For old infrastructure, there's a compatibility problem.
 - The maintenance of infrastructure is the key.
- Will the SILENCE project help to improve technical specifications for interoperability?
 - The worst that could happen is to define levels of noise emission that are not based on robust scientific data. The SILENCE project can help to identify limits where you cannot go beyond and to reach consensus on this. The noise emission of the *system* has to be reduced, the public doesn't care about which particular component is causing the noise.



Pierre-Etienne Gautier from SNCF then brings in some additional questions and reflections for discussion, referring to the homogeneity/representativity of data for rail/tram sources in noise mapping, the current state of and differences between TSI (homologation) and noise mapping, and work towards a common format for databases.

The full presentation is included in Annex 12.

Discussion

- There's a difference between TSI values and emission data for noise mapping. Calculation schemes work with average values. A relationship is needed between TSI and calculation schemes.
 - National legislation defines the input data for noise mapping.
 - A harmonised model is needed for noise mapping prediction.
- Is it easy to assess roughness data on a 10-20.000 km network?
 - A tool has just been developed for 1 meter long measurements. It will take time to measure the whole network.
 - You need to separate between two things: a 1 meter device is not practical and it is not necessary to use it all over the country; you have to look at the roughness, but currently it is not possible to have actual data for different places.
 - Measurement systems on board are not very accurate but produce acceptable results in relation to noise. This could be an affordable solution.

Finally, Rick Jones from AEAT brings in the experience of the IMAGINE project, which provides guidelines, examples, and databases for the implementation of the harmonised noise computation method. It is not intended to deliver a linked suite of programmes – it is required to provide a set of methodologies and databases formulated on a coherent basis, for implementation by software designers.

The full presentation is included in Annex 12.

Discussion

- How many vehicle track functions were acquired?
 - From UK, Hungary, France, the Netherlands, and more.
- Would cross checking of SILENCE and IMAGINE databases be possible?
 - Yes, absolutely.

After this, the seminar is concluded.

5 Annexes

The following annexes include the presentations that were given by the different speakers at the seminar. They have also been made available on the SILENCE website at www.silence-ip.org.

Annex 1: Overview of the SILENCE Project – Karen Vancluysen, POLIS

Annex 2: Railway Activities in SILENCE – Pierre-Etienne Gautier, SNCF / Bernd Asmussen – Deutsche Bahn

Annex 3: Tests on Trams – Franck Poisson, SNCF

Annex 4: Tests on Trains – Franck Poisson, SNCF

Annex 5: Diesel Motor Noise Reduction – Sylvain Recorbet, Alstom

Annex 6: Noise Reduction of Fans and Auxiliary Systems – Anders Frid, Bombardier

Annex 7: Traction Equipment – Stefano Ferraiuolo

Annex 8: Running Gear, Optimised Wheels – Daniele Ongaro, Lucchini

Annex 9: Urban Track Noise Reduction – André Van Leuven, D2S

Annex 10 : Track Absorbers – Dave Farrington, Corus

Annex 11: Depots – Margreet Beuving, AEAT

Annex 12: Round Table Discussion:

- Pascal Guérin, Bruitparif
- William Bird, European Commission, DG Research
- Daniel Cadet, Alstom
- Pierre-Etienne Gautier, SNCF
- Rick Jones, AEAT

All Annexes are available at <http://www.silence-ip.org/site/index.php?id=53>