

“EUROPETRAIN” CONTINUES ITS SUCCESSFUL RUN

By Johannes Gräber, DB

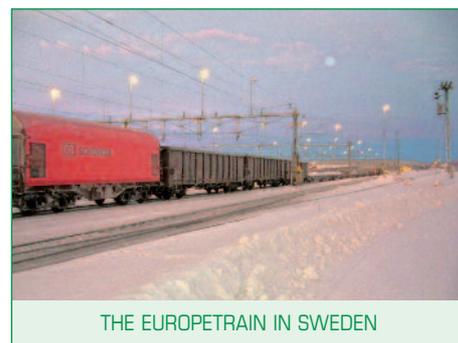
24 railways and the sector organisations CER, EIM and UIC signed the “Joint Resolution of the Chairmen of the European Rail Operators on EuropeTrain” on 5 September 2009 to speed up and improve LL brake block testing in operations. This project shows the clear will of the sector to support the successful development of LL brake blocks as a means for cost-effective noise reduction at its source. 29 railways and a couple of industry partners support the project, which has meanwhile successfully completed its first phase.



5 DIFFERENT LOOPS THROUGH EUROPE

In January and February the train completed its second loop in Germany, travelling approximately 13,000 km from Minden going south via the Rhine Valley towards Freiburg and back. At the end of February it began the third loop, via the Netherlands and Belgium towards France where it travelled between Paris, Orleans, Bordeaux, Toulouse and Lyon.

During each loop, a number of wagons are equipped with a continuous measuring system that collects information about the running behaviour and the application of the braking system during the run. Furthermore each loop is followed by an intensive measurement programme on



THE EUROPETRAIN IN SWEDEN

wheels and brake blocks. The EuropeTrain’s International Analysis Team (IAT) will analyse and evaluate the results. Based on these results, IAT will define further activities, such as the change of the loading, the installation of additional continuous measurement systems. In parallel to this, the IAT also decided to perform additional running stability tests on a test track on a number of wagons with worn wheels. >>

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The project EuropeTrain serves as a tool to help find a quicker solution to the open points in the homologation of LL-blocks, namely the “Study on Equivalent Conicity” and insufficient understanding of LCC. The train consists of about 30 wagons and runs throughout Europe only for the in-service testing of LL brake blocks. The central aim of the project is to validate wheel wear, wheel profile evolution and solutions for equivalent conicity, in order to be able to homologate LL-blocks in 2012.

The EuropeTrain officially started its journey on 6 December 2010, leaving its base at DB Systemtechnik in Minden to head north for the Scandinavian loop. In the first three weeks it travelled more than 11,000 km, going up and down Sweden, reaching the northeast part of Sweden 100 km north of Kiruna.

7TH ANNUAL WORKSHOP ON RAILWAY FREIGHT NOISE REDUCTION

ANNOUNCEMENT

Date: Tuesday **8 November** and Wednesday **9 November** 2011
Venue: UIC Headquarters in Paris

The UIC promotes silent railways. In a series of annual workshops UIC reports on progress, in particular on issues concerning retrofitting rolling stock with composite brake blocks. Both political issues (e.g. EU policy, noise differentiated track access charges, freight corridor effects) as well as technical questions (e.g. progress in composite brake block homologation) will be addressed. This year’s workshop additionally enlarges the

scope to include developments within individual railways as well as reports on UIC noise projects.

The UIC invites you to attend this workshop. It is free of charge, however we request you to register with Martine Cellier (cellier@uic.org). If you have further questions, please contact Jakob Oertli (jakob.oertli@sbb.ch) or Lisette Mortensen (mortensen@uic.org). ■

Railway Freight Noise Reduction, 6th annual workshop: bringing things together

By Jakob Oertli, SBB

The sixth annual UIC workshop on railway freight noise reduction, held on Tuesday, 23 November 2010 at UIC headquarters in Paris, was attended by more than 60 participants. The main aim of the workshop was to report on the progress in terms of incentives for silent freight vehicles on a European level and concerning LL-block homologation. The conference was rounded off with additional talks on proximity issues in Canada, a description of the current UIC projects, an update on railway vibrations and a description of the STARDAMP Project.

A short summary of some of the main points of the workshop is as follows:

Incentives at European level: The EU has undertaken several studies over the past few years concerning incentives. The method of choice for the EU is noise differentiated track access charging (NDTAC). As part of the recast of the first railway package the EU is amending directive 2001/14/EC to allow NDTAC. An expert group will propose practical solutions for their implementation. The railway sector has reservations concerning the implementation of NDTAC and therefore suggests that there should be a level playing field between road and rail and that NDTAC should not weaken the railway sector. The complexity and administrative costs should be kept to a minimum. All in all the efforts must stay proportionate for all transport modes. Due to the complexity of the railway sector (e.g. wagon owners and operators are often not identical) there are also doubts about the effectiveness of NDTAC as an incentive. An alternative proposal could consist of direct funding first and NDTAC in the future. Additionally another incentive, the TSI noise (mostly regulating new rolling stock) was modified slightly, basically by simplifying certain test conditions.

Progress in LL-block homologation: Several working groups at UIC are engaged with composite brake blocks including brake block contours and position, winter properties, light-weight brake rigging as well as a regular composite brake users meeting. The EuropeTrain has started



operations on 6 December 2010 and will allow extensive testing of LL-blocks, in particular new contours and brake block positions. Two projects in Germany: Leiser Rhein (including the retrofitting of vehicles especially in the Rhine Valley) and L&Giv (development of improved K- and LL-blocks) will support UIC's efforts. All in all LL brake blocks are proving to be a promising noise reduction measure; however they still require further improvement before they can be used on a large scale in Europe. The further tests such as the EuropeTrain are required to solve problems of "equivalent conicity" and to better estimate the LCC of the system.

Proximity issues: Canadian Railways have had considerable success in managing proximity issues including noise. The programme builds on increasing awareness, establishing guidelines and creating a framework of dispute resolution.

UIC noise projects: UIC has two groups dedicated to noise: the network noise and its core group. These groups share information on railway noise abatement and manage additional noise projects. Current projects include studies on bearable noise limits as well as on the noise annoyance correction factor (noise bonus).

Railway vibrations: Vibrations are becoming more and more of an issue. Technically vibrations are more difficult to address than airborne noise. Two projects are currently underway: sharing information on under sleeper pads and the EU 7th framework programme project RIVAS (railway induced vibration abatement solutions).

Stardamp: This project is a Franco-German collaboration to facilitate the development of rail and wheel absorbers in Europe.

The conclusion of the workshop was that progress was indeed being made and that many projects and players are involved. It is important, however, not to lose sight of the aim, i.e. reducing the noise of the European freight fleet. In order to achieve this aim, it is necessary to bring players and projects together to prevent work from diverging. It is necessary for an entity such as UIC to keep an overview of all activities. ■

THE RAILWAY NOISE ANNOYANCE CORRECTION FACTOR

DISCUSSION PAPER ISSUED BY UIC

When the intensity of noise and duration of the exposure to noise increase, the effects on human beings increase as well. Residents will be more annoyed the closer they live to a railway line or a motorway. Moreover: the passage of a single train per hour will be less annoying than a train every five minutes. These conclusions are usually presented as so-called dose-response relationships. Such relations were derived from field studies in the 1970s. Usually they relate self-reported annoyance (assessed on the basis of scores in a questionnaire) to long-term average noise levels.

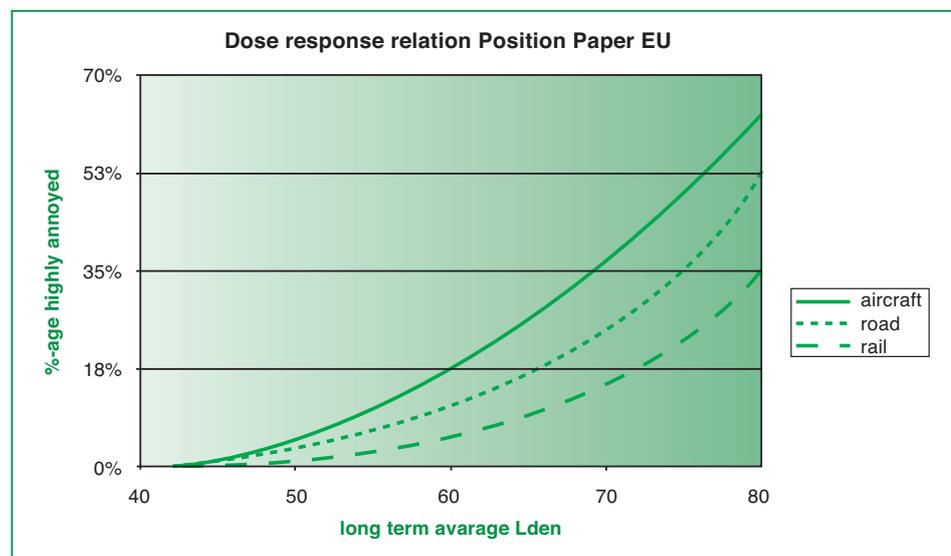
In the early eighties it was found, in several of these field studies, that at equal long term average exposure, railway noise caused annoyance to fewer people than road traffic noise. This result was the basis for a differentiation in legal noise limits between road and rail traffic; the difference usually amounts to 5 dB. Some 6 member states introduced this

Over time, the justification of the noise annoyance correction factor was frequently questioned, particularly when there was growing public discussion on railway noise increased, for example when high speed lines were planned, or currently in situations with rapid growth in freight transport. UIC has commissioned a study from DHV in the Netherlands,

list, currently standardised by the ICBEN1. Moreover, these two parameters invariably show a rather good correlation.

Poor correlation is found when other parameters are chosen. For example, there is a tendency to apply maximum noise levels instead of equivalent energy levels as the dose parameter. For night time noise in particular, a wide range of parameters can be found, registering e.g. sleep disturbances. When comparing sleeping near a railway line to sleeping near a road, the window setting often alters the picture: most people near a busy road sleep with the windows closed.

Further study is needed to find ways to compare the regular dose parameters such as L_{den} to the other, more incidental parameters. For the time being, there are no fundamental indications that the railway noise annoyance correction factor should be omitted. ■



differentiation, either in limits or in the prediction method. In Germany, the limits are identical for road and rail noise, but the prediction method introduces the 5 dB correction factor. This correction factor has been given the name "railway bonus", a somewhat unlucky choice, since many people think that this correction factor is merely reflecting the environmental benefit of rail transport relative to road transport. As the above introduction illustrates, there are other, more fundamental reasons for this factor.

reviewing the available references on this topic, both recent and historical. The study concludes, on the basis of numerous international references, that most field studies confirm that the correction factor is still justified, even when traffic circumstances have changed. This applies to the standard routes, where long-term average noise levels are currently expressed as L_{den} (day-evening-night level, with penalties for evening and night included), and "annoyance" is the self reported result chosen from a score

The discussion paper is available on the UIC website

<http://www.uic.org/spip.php?rubrique1638>

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The in-service test will last more than a year, taking into account all climatic seasons. All operational conditions relevant to Europe have to be covered in a balanced way, e.g. running on different gradients with different operational modes, arctic winter areas and high temperature zones. Therefore next loops are planned for Poland, Switzerland, Austria and Italy. In the end, a mileage of approx. 200,000 km is needed for sufficient results, so each loop will have to be completed several times. A first intermediate report is planned to be drafted in May/June this year, after the fourth run to Poland. ■

Additional information is available at

<http://EuropeTrain.uic.org>

¹ International Conference on the Biological Effects of Noise

FROM THE LIMITED TO A FULL REVISION OF THE CR NOISE TSI

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The recent limited revision of the Conventional Rail Noise Technical Specification for Interoperability (CR TSI NOI) is currently under publication, after its formal vote by the Member states representatives in June 2010. Stating that such a “limited” revision could correspond to secondary or cosmetic changes, compared to the version in force since 2006, would certainly not be true. It would also not reflect the intensive work performed within the ERA working party throughout 2009 to improve the procedure for conformity by means of new principles. This work has been made possible of course with the technical support of the railway sector, and its core technical mirror groups bringing together for instance organisations such as UIC, UNIFE, CER and EIM.

Therefore in order to identify changes, a summary of the main points of this revision is mentioned in this paper and comments on the remaining technical work to fulfil in order for these new principles to be applied.

Objective of the limited revision of the Noise TSI

The main goal of this limited revision was to introduce some flexibility and reduce accordingly the costs for the process for obtaining the “authorisation to place in service”, thanks to acoustics criteria.

In this respect, the revision was considered “limited”, since most of the principles set out in the Conventional Rail Noise TSI (CR NOI TSI) remain unchanged, such as:

- The functional and technical specification of the subsystem (stationary, starting, pass-by noise, interior noise, noise from locomotives, multiple units and driving trailers),
- The basic noise parameters and their related limits (LAeq,tp for pass-by and stationary noise, LpAFmax for starting noise, LpAeq,T for the cab interior noise of locomotives, multiple units and driving coaches),
- The definition of the reference track parameters and related limits (rail acoustic roughness and vertical and lateral Track Decay Rates (TDR)),
- The main pass-by test condition (microphone position: distance height, reference speed of the vehicles, operating conditions of the vehicles).

The main changes to the limited revision of the Noise TSI

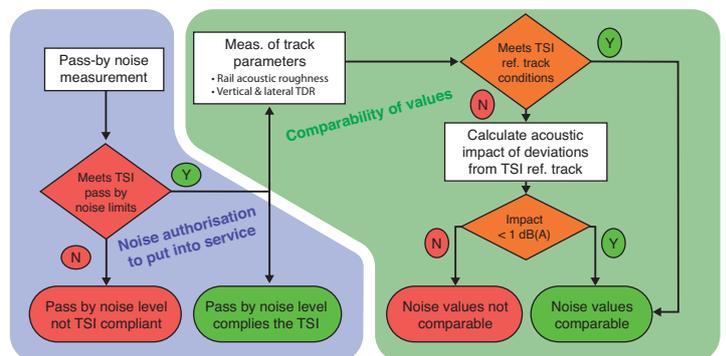
The main changes are twofold and commented on hereafter.

Change in the acceptance scheme and use of the reference track

In principle the new acceptance scheme no longer requires tests to be performed on a TSI reference track (and in most cases in practice), even if the noise emission values are still considered to be those defined on a reference track.

Thus, while testing a rolling stock against pass-by or interior noise, any track can be used to perform tests as soon as the noise limits are met. This has a major impact on the process for obtaining authorisation to place in service. The new process is described in figure 1. It is split in two main parts:

- The left part is purely dedicated to a comparison between the noise value and the noise limit, the main difference being that any track can be used to perform the noise tests. Therefore, as soon as the TSI noise emission values are met on this track, they are deemed to comply with the TSI, and there is no need to use a reference track to meet the limits. Of course if the noise emission limits are not met, the rolling stock cannot be accepted, insofar as it cannot be demonstrated that those noise values could have been met on a reference track.
- The right part is related to the classification of the noise value as comparable or not to other (comparable) noise emission values. The comparability of the noise values between rolling stock is an important condition in the opening of the rail market. In particular, this part relies on the “small deviation method”¹, which aims to ascertain any overestimation of the variation in the noise emission values due to the fact that the track is not a reference track. If this variation is lower than 1 dB, the impact can be considered to be less than the measurement uncertainty. The measured noise values can then be considered a comparable.



¹ This method is described in the TSI [1], and is applied to the rail acoustic roughness parameter. Some improvements showed this was also applicable to the Track Decay Rate parameter of the track [3]

Use of a simplified method

The second change allows the potential use of a simplified method which may reduce the number of test cases and/or take advantage of calculation instead of measurements schemes.

This allows a further simplification of the verification process of the TSI (section 6.2.3 of the TSI) with the following principles:

- The units that are positively assessed against noise with the High Speed Rolling stock TSI (HS RST TSI) are deemed to comply with the CR NOI TSI without further checks.
- It is possible to substitute some or all of the tests with a simplified evaluation method, requiring some eligibility criteria to be met:
- In the case of multiple formation units: there is no need to assess all the cases as the one with the highest noise emission level is enough
- The renewed or upgraded units
- New units which are largely based on existing design, especially the ones from the same family

It is possible to make use of the simplified evaluation for each of the specified noise item separately: stationary noise, starting noise, cab noise and pass-by noise.

For freight wagons, the following variation cases are explicitly considered to fall within the scope of this simplification for they may not require further tests: variation of tare weight, speed, number of axles per metre ...).

As a matter of fact, this new input establishes the principle that proof of conformity can be demonstrated via calculation instead of measurement and therefore have a positive impact on costs. However, the description of such method is lacking, as it is not explicitly developed in the limited revision of the CR NOI TSI.

Finally, in addition to these two main changes in the TSI, some other changes have been inspired by the standardisation work (new EN ISO 3095 version under enquiry). They brought some flexibility to the carrying out of tests (relaxing some test conditions where possible), so that tests can reasonably be achieved in every member state: for instance, relaxing the requirements in terms of the rail acoustic roughness can ensure that a reference track can be achieved with current rail grinding technologies. This then allows every Member State to access their own reference track if they wish. These changes in standards are not further explained in this paper, which concentrates on the main functional changes.

How to improve the applicability of the CR Noise TSI and address the needs of the full revision?

As noted in the previous section, the introduction of calculation schemes in the CR NOI as a tool to reduce the number of test cases has introduced some flexibility to the whole acceptance process vs. noise.

It has also pointed out that harmonised methods and tools were therefore lacking. As far as calculations are concerned, many potential issues have to be dealt with before an efficient calculation scheme can be considered, including:

- The high variability of noise sources,
- The several rolling test case conditions to be addressed,
- A real need for an assessment of uncertainty of the proposed methods,
- The applicability to either CR freight and passenger trains and high speed cases,
- A clear description of what is achievable and what is not (limits of the method).

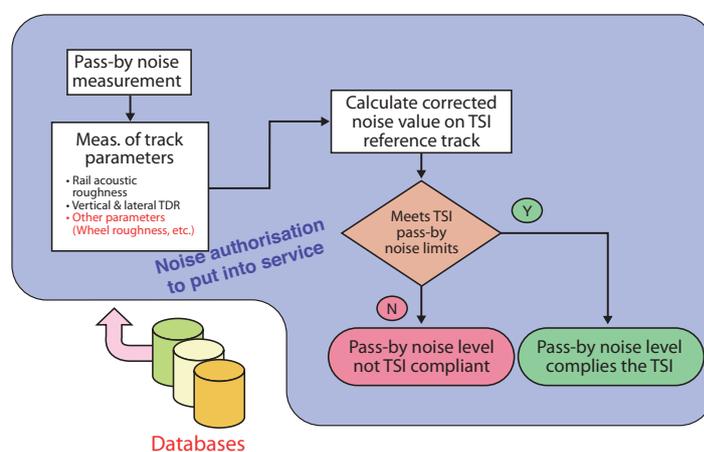
A short term approach: a clear description of the simplified method

There is a strong need to give the sector a transparent explanation of what, when and how a simplified method can be applied. This could either be addressed through a European standard or an application guide [2]. In this respect, the application has been started in CR TSI in the case of wagons, where the noise sources and potential variations of parameters and combinations of sources seem simpler. In order to be exhaustively applicable however, this work should be completed for other kinds of rolling stock.

A mid-term approach: towards a virtual homologation scheme

The larger use of calculation methods in the acceptance scheme, as proposed in the limited revision of the CR NOI TSI has also raised the idea that an acceptance process could progressively be endorsed by calculations in the future. The precision calculation tools should of course require the same level of certainty compared to the existing measurement methods. This requirement was the main limit until present to achieve this goal.

The following figure, as an echo to figure 1, illustrates the principle of virtual homologation.



In order for this to be achieved, there are some major issues to deal with beforehand, which are mainly related to the assessment of the number of parameters required to feed a general calculation model. Among them the development of new techniques need to be developed:

- Assessment of the wheel rail roughness, which is a major parameter of the wheel-rail generation model, with potential input from previous studies [4],
- Development of updated model of sources,
- Characterisation of specific noise sources,
- Separation techniques (aerodynamic vs. rolling noise and also track vs. wheel sources),
- Synthesis methods for noise sources.

The development of efficient databases is a condition in achieving this goal.

The main advantage of such an approach is that the authorisation to place in service could be based on the assessment of parameters of the track "as is". The model would then calculate the noise emission values under the reference track conditions.

On the condition that research work towards this aim can be promoted at European level, this ambitious approach could be a further answer to the needs of the sector. Moreover, the research work performed by the railway sector during the last 10 years is a good basis from which to start. One condition of success is certainly strong coordination and technical steering of this issue in order to maintain a consistent approach, especially of the rail/wheel interface against noise as a whole.

And what next?

Other points to be addressed for the full revision

A full revision of the CR NOI TSI is expected from 2011, which should lead to the publication of a new version by the end of 2013. If we stick to the decision of the 2005 version, some new major points need to be addressed:

- An expected (further) lowering of noise emission limits. In view of past experience, this looks like too challenging a requirement for RS to be ordered after 23/06/2015 (chapter 7.3) or authorised to be placed in service after 23/06/2018, with the recommended following figures: -5 dB as a general case and -2 dB for EMU & DMU. Many questions and issues are subsequently raised such as: For freight wagons in particular, the homologation of LL block is still pending (Europe train) and remains a precondition to be able to fulfil the (even existing) limits at acceptable cost. The question remains acute for other rolling stock.
- Including infrastructure in the scope of the TSI raised the following technical questions:
- How to define an efficient characterisation and/or monitoring scheme of track parameters (rail acoustic roughness, and track decay rates) along long distance operational lines?

- How to specify these track parameters and classify operational tracks/lines against them, taking into consideration their actual state of maintenance?
- On what basis would in-service limits be achievable, considering the economic impact of induced "acoustic" maintenance on the infrastructure maintenance scheme?
- Some other point related to the consistency of the European regulations (e. g. TSIs and Environmental Noise Directive), such as:
- The Merging of HS RST appendix N and NOI CR TSI (a trainset approach for HS vs. a single units approach for CR), difference of indicator, differences in measurement distances)
- A connection of the noise TSIs with the END Directive 2002/49-EC. Is it welcome? If so, how should it be considered?

This review shows there is a long way to go before establishing a new version of the CR NOI TSI, addressing both the recommendations expressed in 2005, and the efficient application of the new items developed in the limited revision. The many remaining technical questions raised represent a significant sector contribution in the shape of guidelines, standards, short and mid-term research work.

This will thus be an opportunity for the sector to improve its environmental friendliness against noise, for the sake of the whole society. One of the conditions in achieving such a goal is that this noise issue can be addressed at European level, and that some financial support can be obtained by the railway sector to fulfil these goals. ■

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