

## SILENCE MUST BE HEARD

### Silence deals with volumes

For environmental reasons, the increase of transport by train is widely welcomed. Both passenger and freight trains reduce the number of cars and lorries on our roads significantly. And the CO<sub>2</sub> emissions from the trains



themselves are much lower. Unfortunately this success has a downside: noise emissions from rolling stock and tracks. Without action, more trains means more noise. And

too much of it, especially in residential areas, affects the quality of living and causes annoyance.

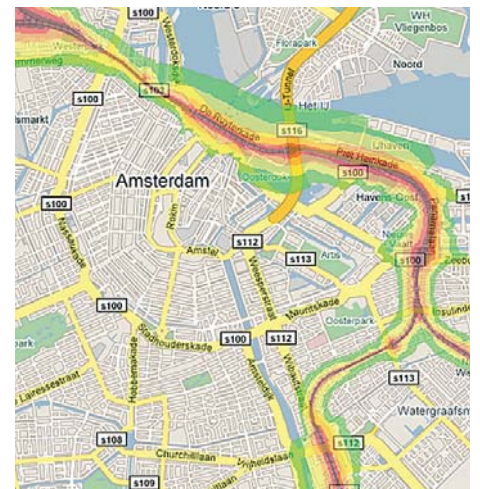
The European Union is in the process of tackling the 'noise issue'. It aims to reduce the exposure of its population to environmental noise - caused by roads, airports and factories as well as railways.

In order to realise this ambition, the EU's 'Environmental Noise Directive' (END) came into force in 2002.

### Turning issues into action

The directive results in:

1 Noise maps: visualisations of 'noise hot spots' in residential areas. For railway noise, the first editions of these maps should have been completed and will be updated on a regular basis every 5 years (main infrastructures with more than



30.000 trains per year and agglomerations with more than 100.000 habitants).

2 Noise Action Plans: the introduction of specific measures to prevent and reduce environmental noise and preserve environmental quality. For railway noise the deadline for the first round of action plans is 18 July 2008. ■

## THIS BROCHURE...

- provides you with a brief overview of the most important rail noise abatement measures, as compiled by UIC's Noise Expert Network.
- It will give you a clear impression of available measures and will be of help during the production of railway noise action plans.
- Some of the measures described have already proved themselves. Others are yet to be tested and implemented. All this is specified in the descriptions.
- Within the measures, there is a distinction between local and global. Any action taken on the track or at trackside is local and will not impact other parts of the network. Action taken on vehicles is global: the benefit will occur wherever that vehicle operates. This means that, in order to develop a cost effective action plan for a network, it should be assessed in its totality rather than as a series of local plans.

## OPTIONS FOR THE REDUCTION OF RAILWAY NOISE

Inside this folder you can read about the different possibilities of the following types of measures in more technical detail.

- Technical measures 'at source'
- Noise barriers
- Maintenance
- Traffic planning
- Land use planning
- Tunnels

# OPTIONS FOR THE REDUCTION OF RAILWAY NOISE

## TECHNICAL MEASURES 'AT SOURCE'

### Vehicle braking systems

When wheels and tracks become rougher, they become noisier. The main reason for the wheel roughness is the use of cast iron tread brakes, historically used for freight vehicles. Alternatives are disc brakes or tread brakes with blocks made from composite materials. These wheels are smoother than cast iron tread braked wheels and cause approximately 10 decibel less noise at the same train speed. For passenger trains disc brakes have been used for many years and the use of cast iron tread brakes is being phased out. On Europe's freight fleet, with its cast iron tread brakes, UIC is currently introducing composite brake blocks. Research confirms the noise reduction potential.

- An effective global action plan option where rolling noise from cast iron tread braked freight vehicles is the dominant source. The use of composite tread brakes will reduce the

track contribution to rolling noise as well as the vehicle contribution.

- However: funding and priority setting for this solution are still under discussion. Hence it is not suitable as a short term action.

### Rail dampers

Studies show that tuned absorbers, attached to the rail, can reduce the track contribution to rolling noise by up to 7 decibels and total rolling noise by between 2 and 3 decibels.

- An effective local action plan option where track contribution dominates rolling noise.
- Rail dampers may not provide the same noise reduction for all trains.
- For higher speed trains the vehicle contribution will probably increase and track treatments, such as rail dampers, will be less effective.

### Wheel dampers

Studies show that tuned absorbers, attached to the wheels of the train, can

reduce the wheel contribution to rolling noise by up to 7 decibels. A reduction of total rolling noise of about 2 dB(A) can be achieved with wheel dampers.

- An effective global action plan option.
- As a sole means of noise control it will only be effective where the wheel contribution dominates rolling noise.

### Quieter locomotives

Where locomotive noise dominates, a possible option is the replacement of the locomotive in question with a quieter model, or modify some components.

- Viability depends on whether there is currently a quieter model in use, whether there are enough locomotives available to provide the service, whether these locomotives are suitable in terms of power and speed, and the noise implications for the routes on which these locomotives are operated.
- If quieter locomotives are not in use on the network, or when the answer to all or some of the viability aspects is negative, the measure is very expensive and needs to be included in an overall future planning strategy for the railway.

### Innovation:

## RAILDAMPERS REDUCE RAILWAY NOISE



### Elimination of curve squeal

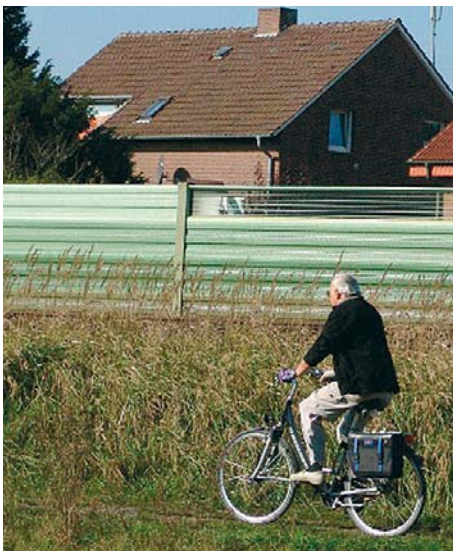
'Curve squeal', a high frequency tone, occurs when a train traverses a track curve. Studies, sponsored by UIC, have identified a number of potential solutions to control curve squeal, such as wheel treatments, steerable axles and lubrication of the track.

- A potentially effective local action plan option.
- However, the studies show that the identified options for eliminating the squeal need further reviews. Also the effect may not appear on the noise maps, depending on the acoustic calculation method. ■

## NOISE BARRIERS

Noise barriers alongside the tracks are widely used for reducing railway noise. The higher the barrier, the greater its effect will be. Where people live in low rise houses next to railway tracks, a 10 decibel reduction in rolling noise can be achieved by a barrier of approximately 2 metres high.

- An effective local option.
- However:
  - EU studies show that noise barriers alone are not cost effective. Noise reduction at source should be investigated before including noise barriers in a noise control strategy.
  - Noise barriers can be visually unappealing and may literally divide communities. The effectiveness of barriers can be underestimated by residents.
  - Barriers are less effective in the reduction of locomotive noise. ■



## TUNNELS

- Tunnels are a traditional way of reducing railway noise. However, they are not a practicable option in a noise reduction action plan for an existing railway. ■

## LAND USE PLANNING

This option refers to the introduction of new infrastructure in a residential area and the development of housing near an existing railway.

This is a local action plan option which is not considered to be realistic for existing railways. For larger distances, noise level is insensitive to even medium changes in distance. ■



Photo by courtesy of DB

## MAINTENANCE

Noise level depends on the roughness of tracks and wheels. Rail grinding and the removal of 'wheel flats' (small parts which gradually appear on the outside of the wheels, caused by intensive wheel/steel contact) are innovative maintenance measures which result in noise reductions of 2 to 3 decibels.

- Rail grinding is an effective local action plan option.
- Wheel maintenance is an effective global action plan option. ■

## TRAFFIC PLANNING

### Speed restrictions

- Train speed reduction is not an effective action plan option:
  - Useful noise reductions can only be achieved by large train speed reductions. Such changes are not compatible with the operation of a commercially competitive railway, on a national railway network where timetables have to be met and trains have to be at specified locations at specific times to meet the demand of freight clients and passengers.
  - Where there is a significant amount of diesel engine noise, at low speeds the maximum noise level from the whole train is fairly independent of train speed. Reducing the train speed can in actual fact slightly increase the noise level.

### Rerouting of trains

This reduces the number of trains passing a given point at specific times.

- Rerouting of trains is not an effective action plan option:
  - Studies show that noise level is insensitive to small changes in train numbers.
  - The measure will usually be incompatible with the operation of a commercially competitive railway, as passenger trains are required to provide regular services between specific railway stations and a freight service usually depends commercially on the operation of a prescribed number of wagons, between a specified start and end point, in a particular time period. ■

## MORE INFORMATION

Obviously a small brochure such as this can never be fully comprehensive.

For more information please contact one of the members of the UIC Noise network or UIC (Union Internationale des Chemins de Fer).

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**OR VISIT OUR WEBSITE  
WWW.UIC.ASSO.FR**



### UIC IS...

The International Union of Railways (UIC) is the world-wide organisation for international cooperation among railways and promotion of the rail transport mode. It was founded in 1922.

The UIC mission in 2008 consists in promoting Rail transport at World level in order to meet challenges of Mobility and Sustainable Development.

UIC groups 200 members (railways, rail operators, infrastructure managers, railway service providers, public transport companies, etc.) on all 5 continents. The Headquarters are located in Paris, France. ■

## MEMBERS OF THE UIC EXPERT NOISE NETWORK

Organisation	Website	Country
<b>CER (community of european railway and infrastructure companies)</b>	www.cer.be	
<b>Österreichische Bundesbahnen</b>	www.oebb.at	Austria
<b>Výzkumný Ústav Železniční, a.s. (VUZ)</b>	www.cdvuz.cz	Czech Republic
<b>Ratahallintokeskus (RHK) / Finnish Rail Administration</b>	www.rhk.fi	Finland
<b>SNCF</b>	www.sncf.fr	France
<b>Deutsche Bahn</b>	www.bahn.de	Germany
<b>DB Schenker</b>	www.railion.com	Germany
<b>Trenitalia</b>	www.ferroviedellostato.it	Italy
<b>Ferrovie dello Stato</b>	www.ferroviedellostato.it	Italy
<b>RFI (Rete Ferroviaria Italiana)</b>	www.rfi.it	Italy
<b>Jernbaneverket</b>	www.jbv.no	Norway
<b>CFR (Compania Națională de Căi Ferate)</b>	www.cfr.ro	Romania
<b>Banverket (Swedish Rail Administration)</b>	www.banverket.se	Sweden
<b>SBB CFF FFS</b>	www.sbb.ch	Switzerland
<b>ProRail</b>	www.prorail.nl	The Netherlands
<b>UK Railways</b>	www.rail.co.uk	United Kingdom