

Eurailspeed

Parallel Session F.1

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Reducing high speed train noise: a challenge and an opportunity for Europe

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The need for an European high speed (HS) train network

**RESOLUTION 876 of Parliamentary Assembly
7 May 1987 (7th Sitting)**

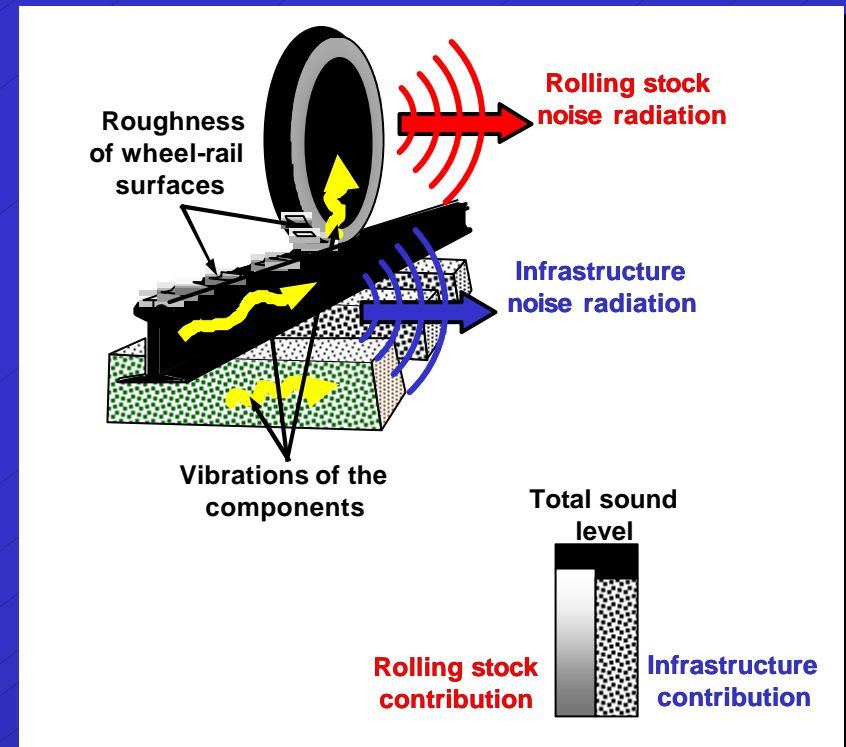
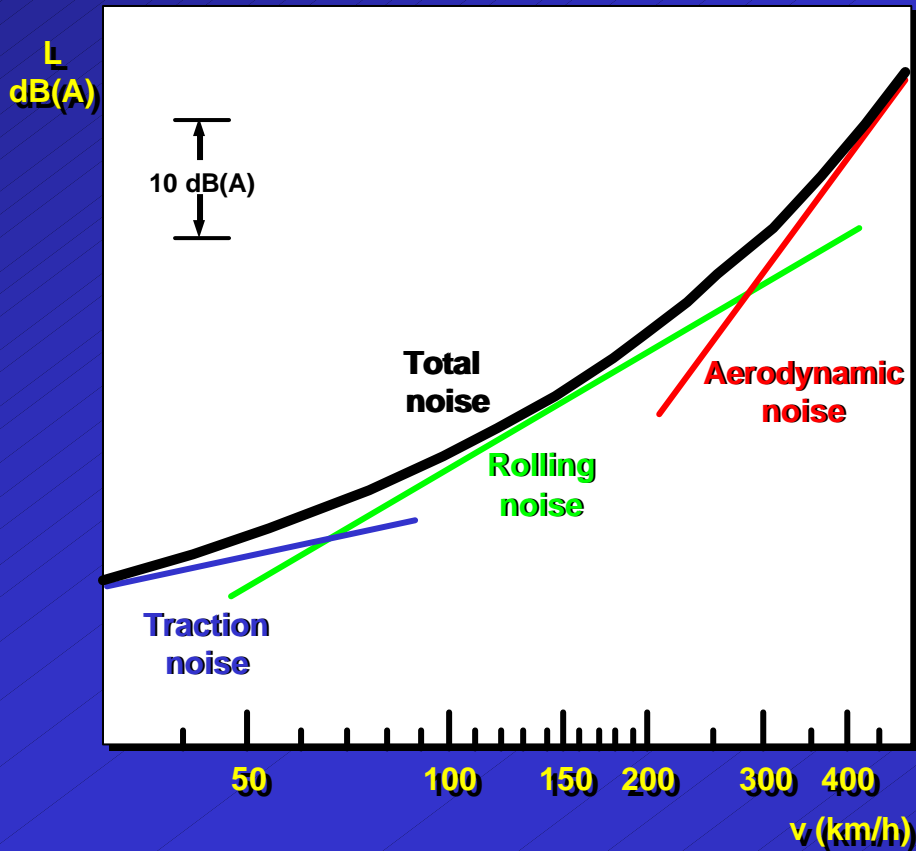
Why?

1. would bring peoples closer together and promote European unity
2. would create the conditions for the establishment of a large integrated market in Europe
3.

And above of all

the development of a European network would provide a comfortable, rapid, economical and **environmentally inoffensive** means of transport between the larger European cities

Noise sources as function of train speed and rolling noise generation mechanisms



Reducing HS train noise

At the source

Minimal rolling noise



- ✓ smooth wheels and smooth rails
- ✓ disc brakes and maintenance of tracks and wheels
- ✓ optimized track and wheels design
- ✓ wheel dampers and rail dampers
- ✓ wheel or bogie shrouds

Minimal aerodynamic noise



- ✓ streamlined design of the trains (head of train; no cavities and/or extruding parts)
- ✓ streamlined cover of boogies and pantograph
- ✓ avoiding as much as possible air turbulence and vortices

In the propagation path



- ✓ Noise barriers

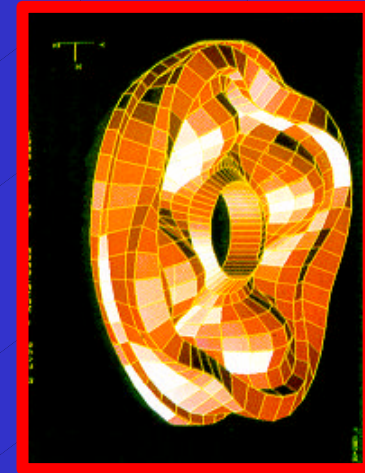
Some examples



Wheel with surface irregularities



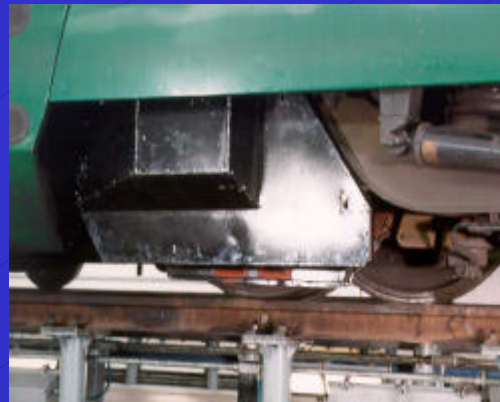
Corrugated rail



Model for optimizing wheel design



Application of dampers on a well smoothed wheel



Bogie shielding



Noise barriers

Noise emission limits set by TSI for HS trains

Interoperability of the trans-European high speed rail system
(Council Directive 96/48/EC - 23 July 1996)



to ensure high speed trains can run freely across the European network



Technical Specifications for Interoperability (TSI) adopted in May 2002 fix noise levels in high speed service

Speed (km/h)	250	300	320
Limits [dB(A)]	87	91	92

Measurements conditions: $d = 25$ m from the axis of the track, $h = 3.5$ m above the rail level, constant speed, configuration for normal service (according to prEN ISO 3095)

Conclusions

Q: Is the European HS train network environmentally compatible?

A: The following table

Modes of transport	CO ₂ emissions	NO _x emissions (acid rain)	Greenhouse effect (contribution)	Energy consumption
HS train/car	< 4.5	< 9.1	< 5.1	< 4.7
HS train/airplane	< 7.4	< 10.3	< 7.8	< 6.6

Environmental cost per passenger/kilometre

Source : TAV

Q: And noise problem ?

A: TSI limits are already a worth target. Technical measures at the noise sources could reduce levels from 2 to 4 dB(A) and more. It needs to solve some problems of design, cost, maintenance, safety and regularity of service. Acoustic barriers are the last solution