

Transmitted by the expert from Germany

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agenda item 7.)

Road surface characteristics and tyre road noise

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Main Goals of the German Ministry of Transport

- Mitigation of road traffic noise at the source (Tyre Road Noise)
- Today about 4% of the cost of constructing a new road is for noise mitigation

BASt* Experience:

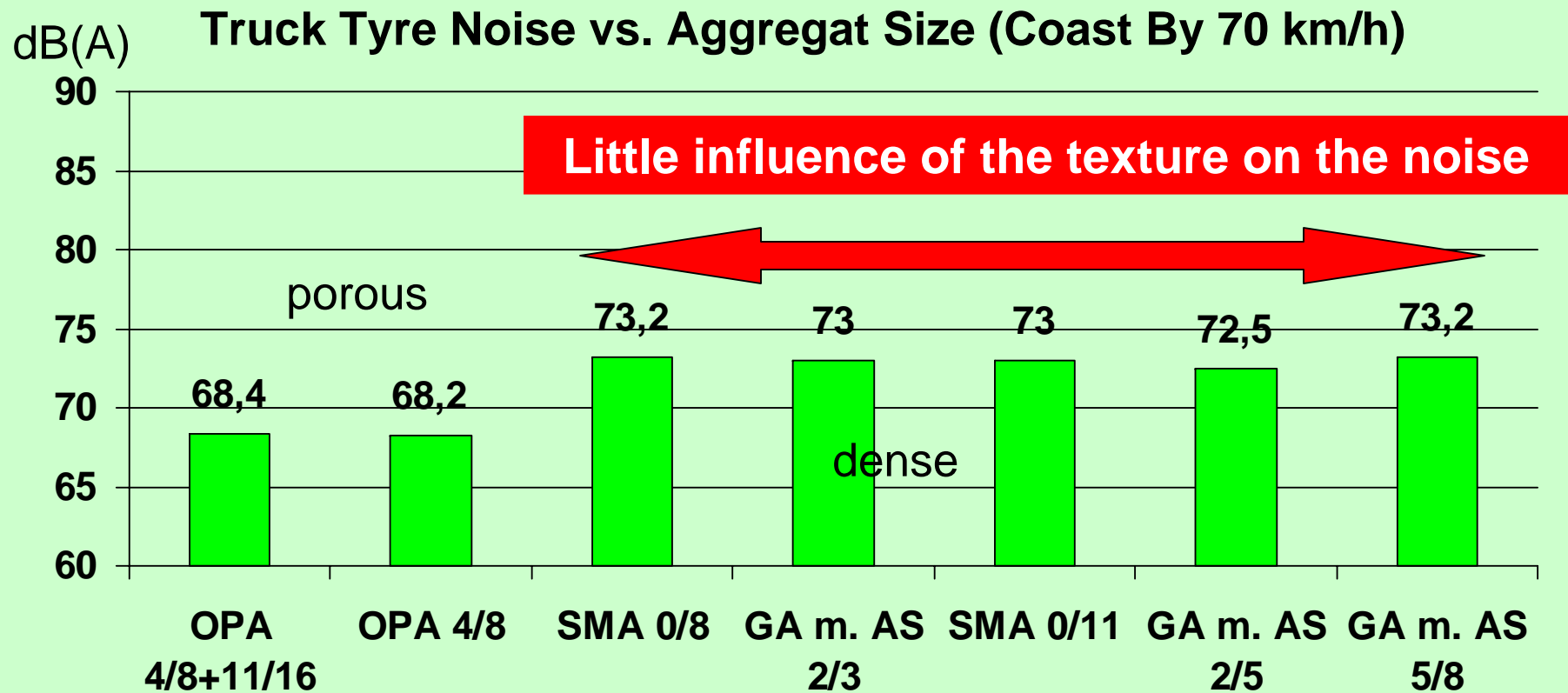
- Sperenberg Project
- Leiser Straßenverkehr 1
- Leiser Straßenverkehr 2
- Silence (EU Project)
- Michelstadt (New ISO surface)
- Several test sites in highways
- Tyre Road Noise Study (FEHRL**)

*Federal Highway Research Institute

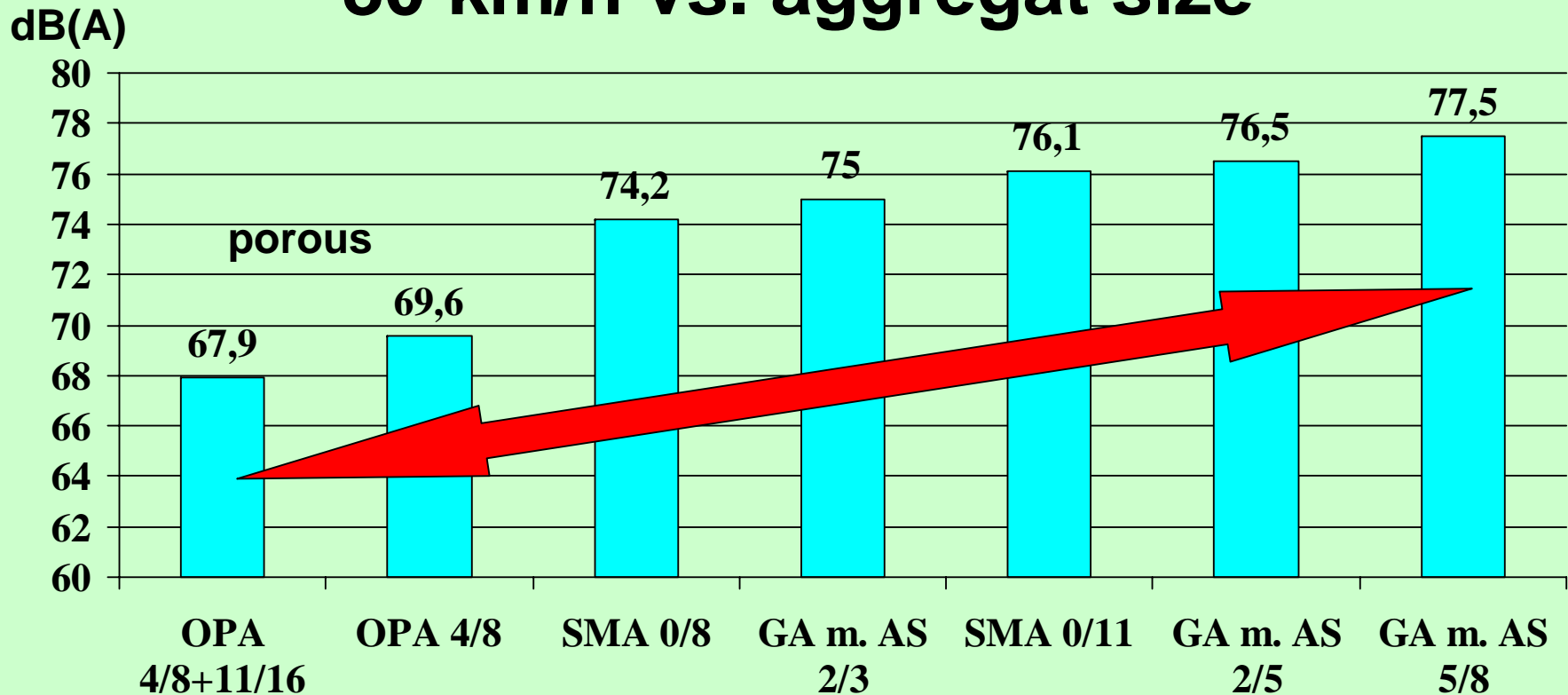
**Forum of Highway Research Laboratories



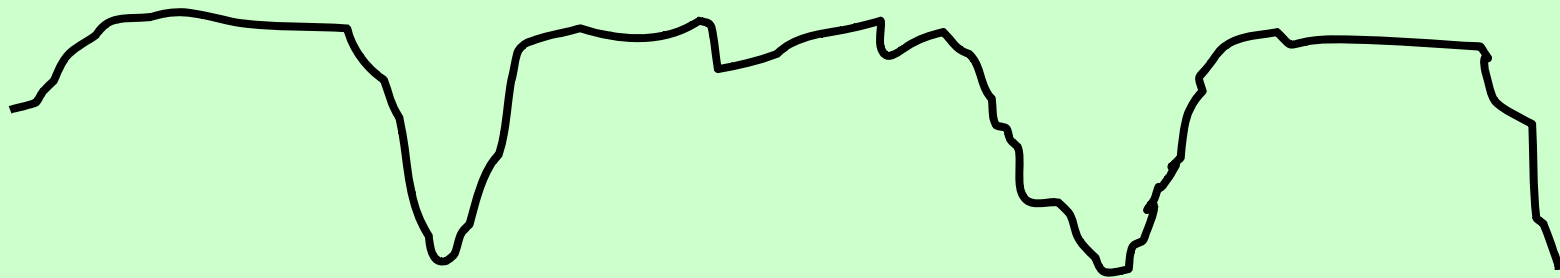
Sperenberg Project:



Passenger car coast by noise level at 80 km/h vs. aggregat size



Plateau with gaps for dense surfaces



- Reduction of tyre profile vibrations
- Minimisation of air pumping

Dense Surfaces

Stone Mastix Asphalt with chipping size 0/8 is the major road surface type in the German primary road network.

This surface type has in average a -2 dB(A) tyre noise level compared to a reference surface

Porous Asphalts

Systematic construction and testing began in Germany in 1986.

5 generations of porous asphalt:

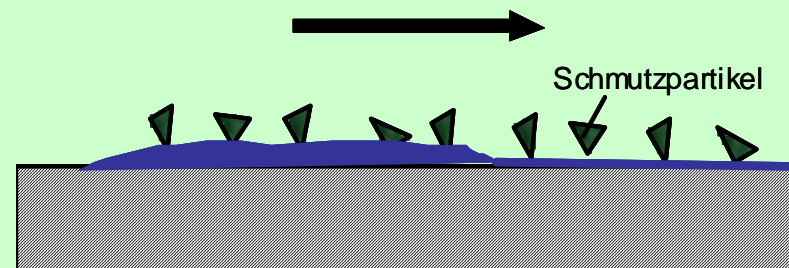
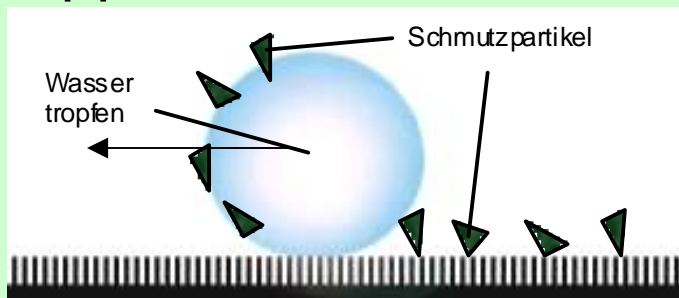
Increase in void content 15 ---> 22 Vol.-%

Increase of acoustic effectiveness

Increase of durability by polymer modified binders

Twinlay: top 8 mm, bottom 16 mm aggregate size

Appliance of Nano Technology to avoid clogging



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Porous Asphalt

Advantages:

- Reduction of splash and spray →
- High resistance to rutting
- Highest acoustic effectiveness [-7 to - 9 dB(A)]

Disadvantages:

- Higher cost (+30 €/m²)
- Repairing problems and higher maintenance costs
- Reduced durability (clogging, ravelling, binder hardening)
- Bad wet grip short after construction

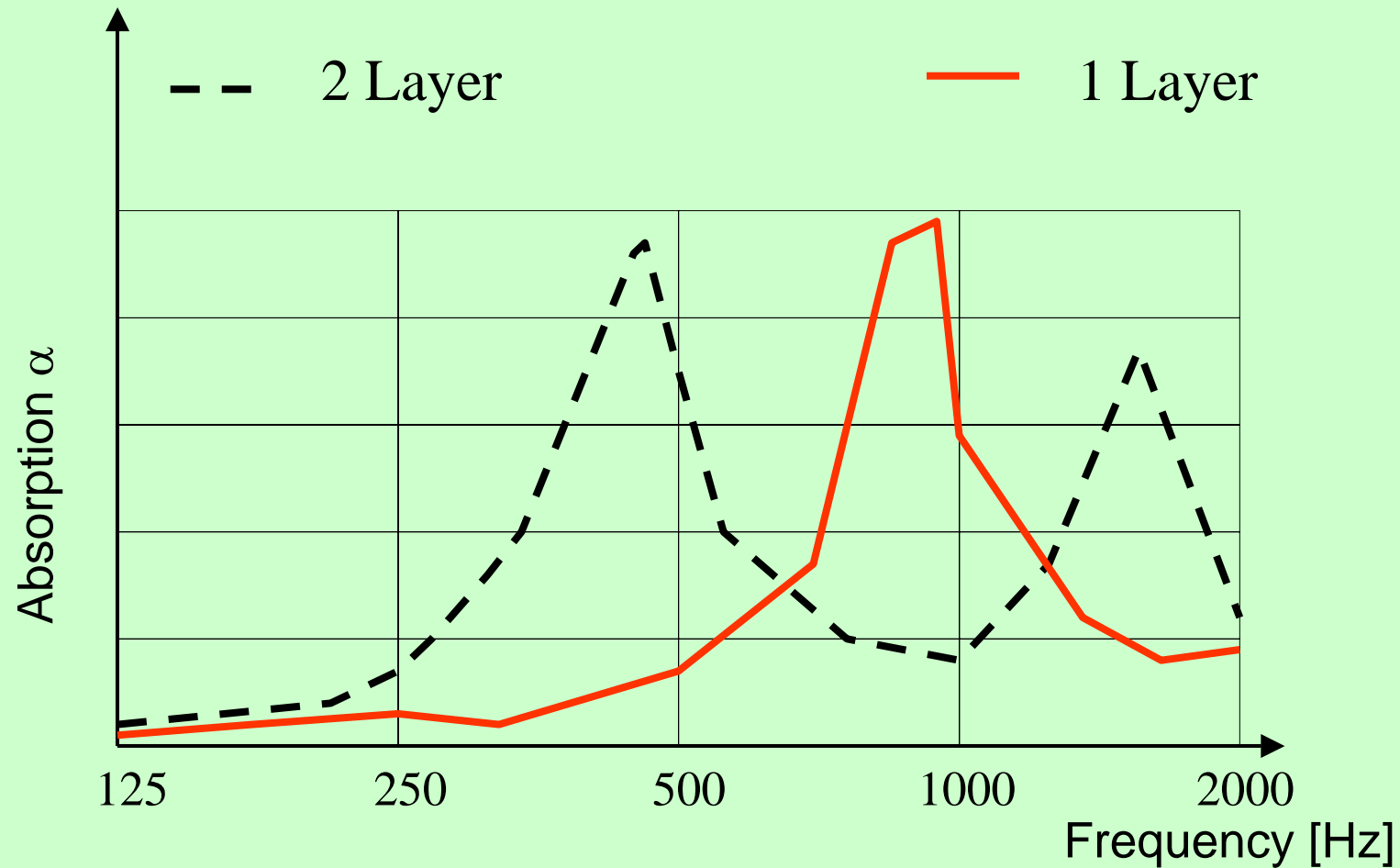


dense / porous

Effectiveness of Porous Asphalt

Generation	Date of Construction	SPB Noise 120 km/h Pass.Car	SPB Noise 90 km/h Trucks
1	1988	79	-
2	1993	78	85
3	1997	76	84
4 (Twinlay)	1998	77	82
5 (increased thickness)	2003	76	-

Acoustical Mode of Function of Porous Layers



Construction of Twinlay



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Surface Ruination

Ravelling



Clogging

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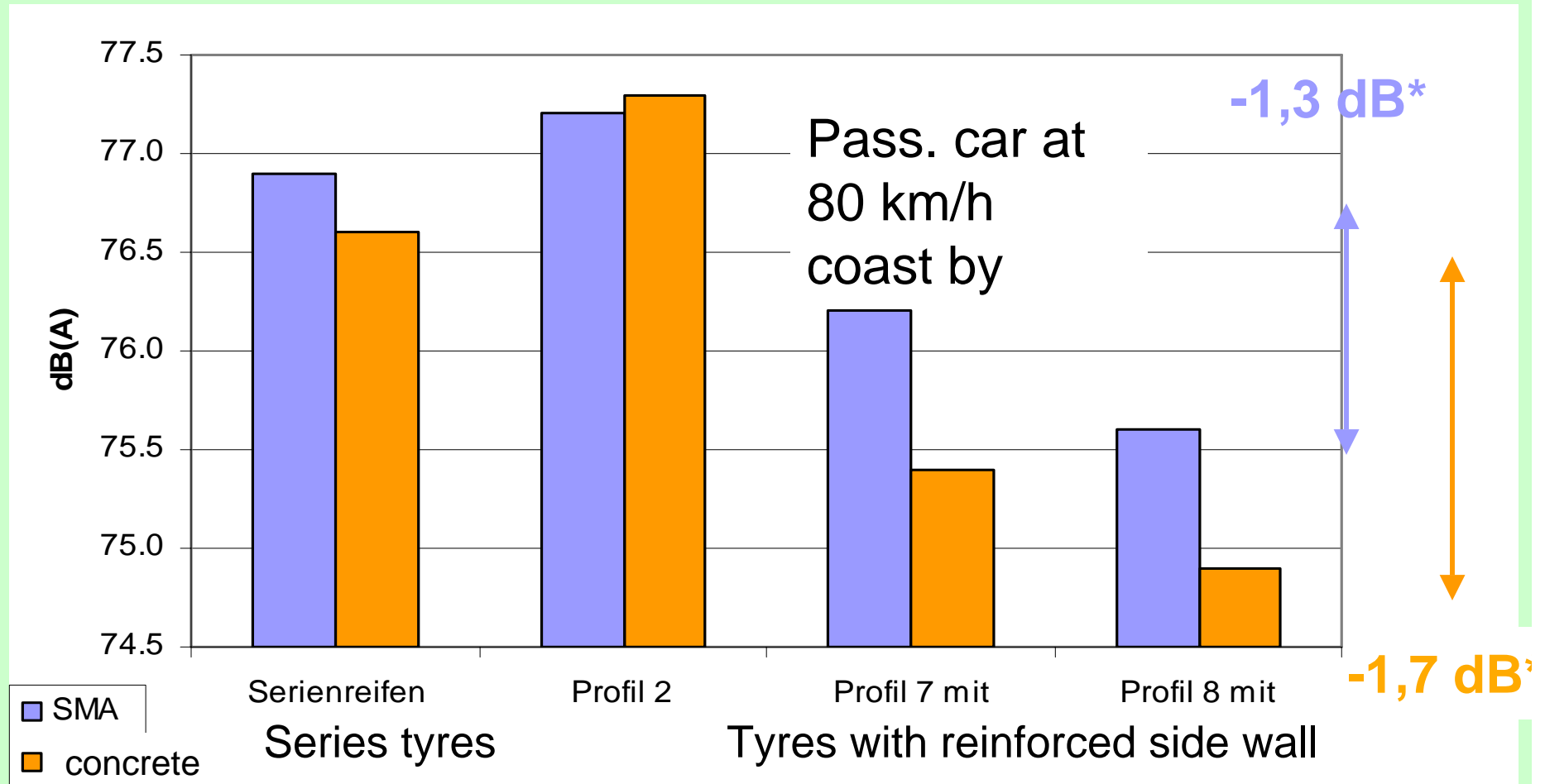
Porous Surfaces

Only used in “noise hot spots” in the German primary road network

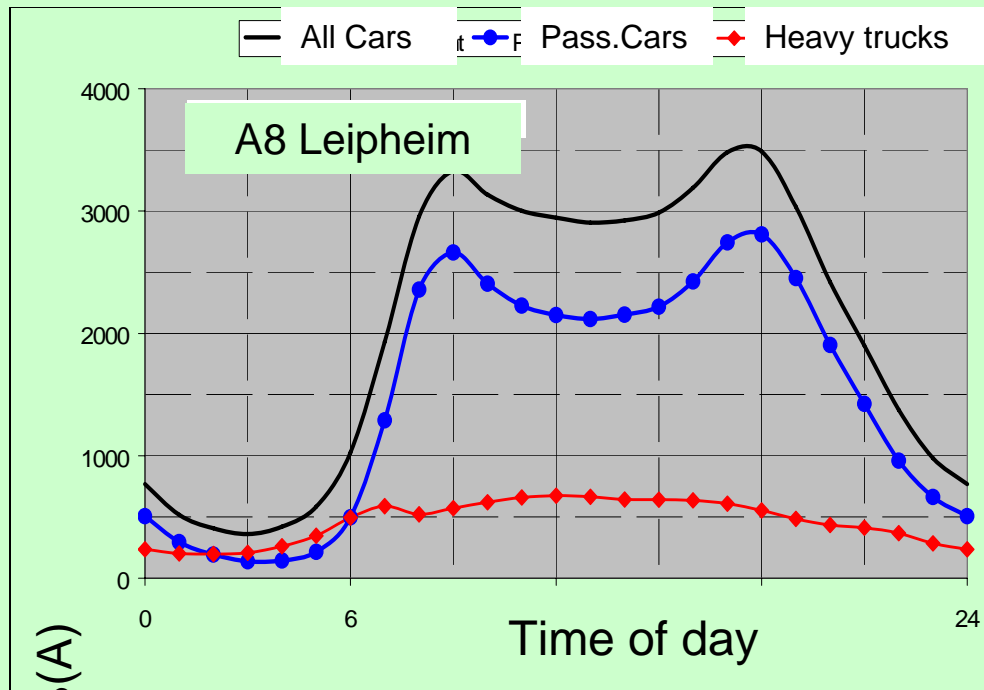
Only about 2% of the 12,000 km long Autobahn network consists in porous asphalt

Porous concrete surfaces are also possible to construct, but too many open problems

Tyre development in “Leiser Strassenverkehr 1”



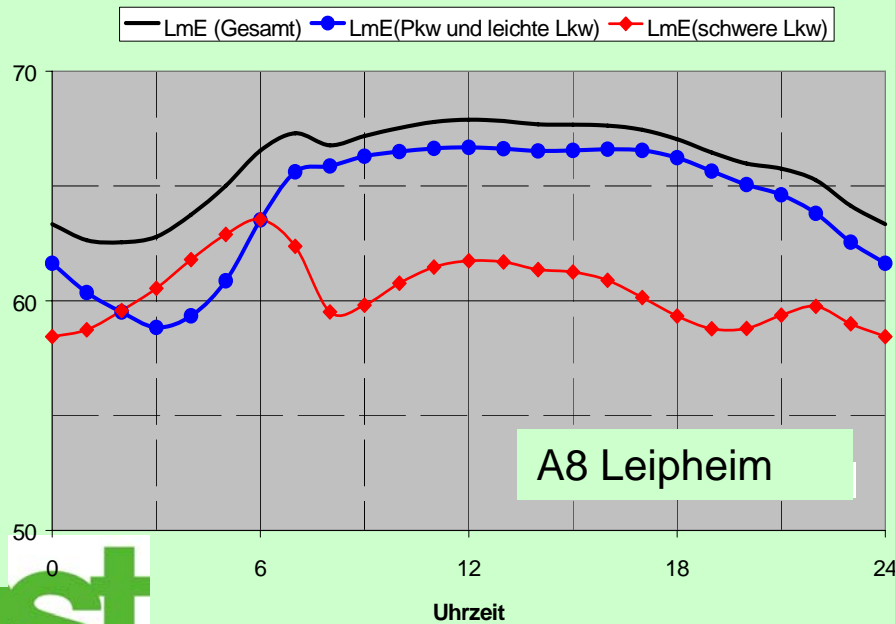
Number of cars per hour



Heavy truck traffic is dominant between 2 and 6 o'clock (ca. 60 %).

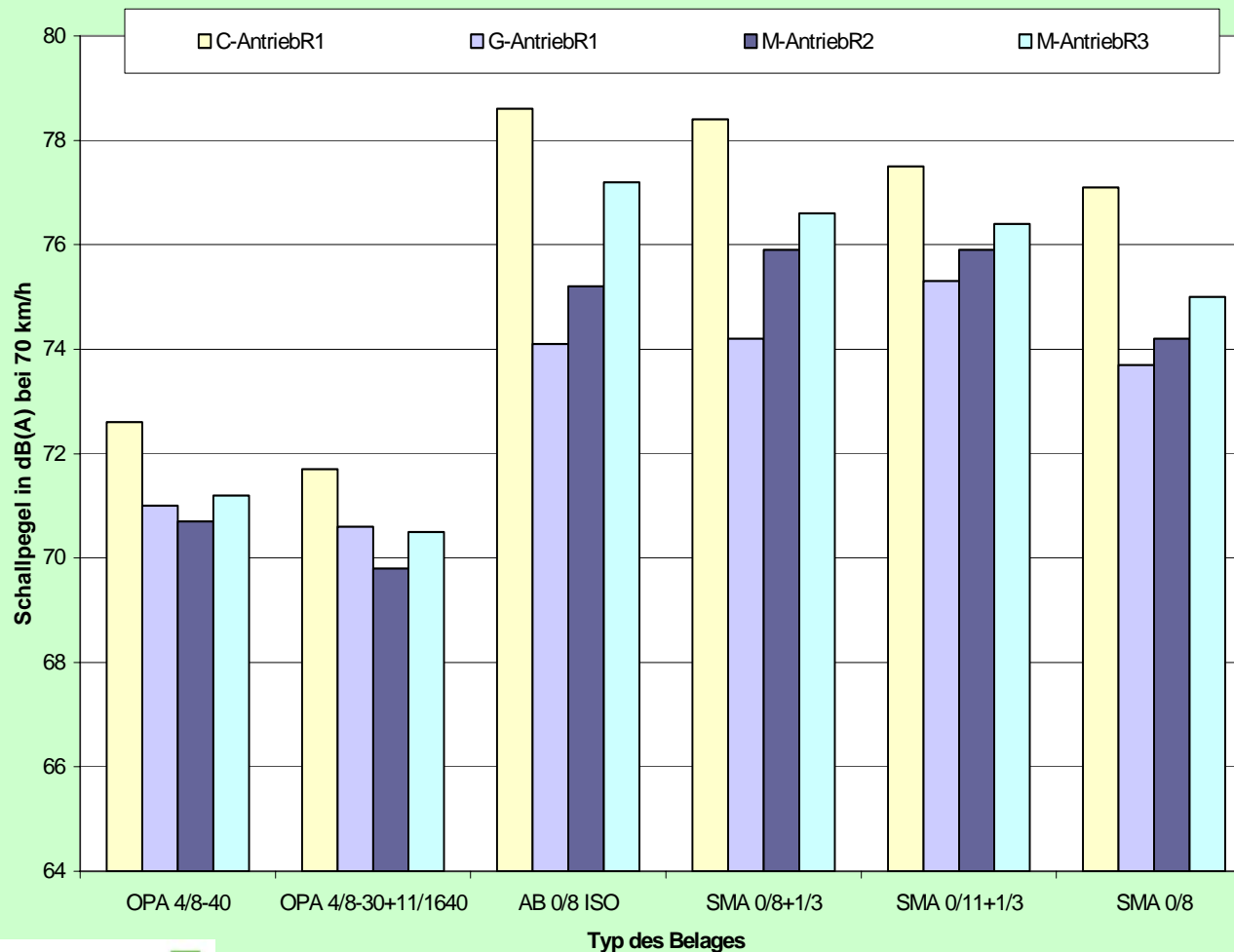
One truck each 8 sec.

Noise level in 25 m dist. dB(A)



Noise emission level between 2 and 6 o'clock is dominated by trucks.

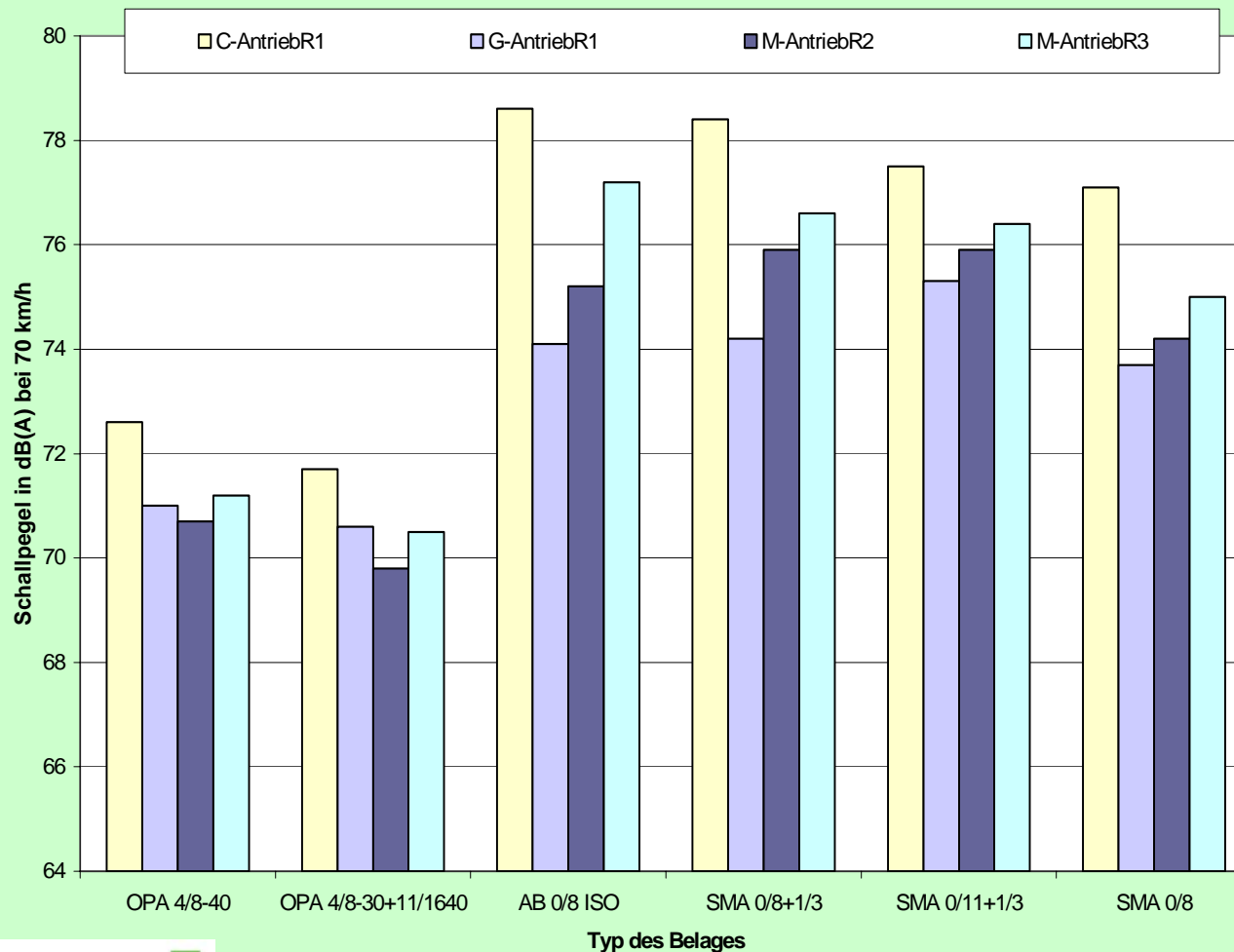
Truck drive axle tyres are about 3-4 dB(A) louder than steering axle tyres



Drive axle tyres of different brands vary up to 4 dB(A) on dense surfaces and 1,5 dB(A) on porous surfaces

Source: DWW (NL) measured on Sperenberg surfaces, 70 km/h

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For truck drive axle tyres a noise reduction of 3 dB(A) seem to be possible without changing other tyre features too much.

This is reached only by the profile design, no changes in carcass or rubber mixture.

(Source: Leiser Straßenverkehr 2)

Future Tyre Road Noise Research of BASt

Tyre Pavement Interaction Test Facility



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Gluing of the road surfaces into the caskets



Preheat of the caskets



140° C hot polymer modified bitumen



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Thank you for you attention !



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