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[N1035] Transportation noise abatement at the source: the Dutch perspective

Authors:

M.S. Roovers (Chiel) and G.J. van Blokland (Gijsjan)

M+P Raadgevende ingenieurs bv

Noise and Vibration Consultancy

P.O.Box 2094, NL-5260 CB VUGHT

Email address: {roovers,blokland}@ti.mp.nl

<http://www.mp.nl>

ABSTRACT

The needs for transportation and for living in a silent environment have been in conflict for many years now in the densely populated Netherlands. The Dutch policy to reduce noise nuisance has been focused on noise abatement at the source since the Noise Nuisance Act was erected in the late 70's.

Nowadays, source measures for road and railway traffic are being taken in a broad and structural way. Two fundamental requirements were needed to obtain this situation:

- the availability of technical measures to reduce noise at the source;
- the possibility to incorporate the acoustical effect of these source measures in legal procedures.

Additionally, the noise policy of the Dutch government includes stimulation of the application of low-noise solutions to speed up the introduction process of these techniques.

The current developments of the EU legislation will in effect result in the fulfillment of the above mentioned requirements for the whole European Union. This will lead to a consistent and structural base for application of low-noise techniques to reduce transportation noise.

KEYWORDS: noise policy, noise abatement, source measures, tyre/road noise, railway noise

INTRODUCTION

The needs for transportation and for living in a silent environment have been in conflict for many years now in the densely populated Netherlands. The Dutch policy to reduce noise nuisance has been focused on noise abatement at the source since the Noise Nuisance Act was erected in the late 70's. Source measures comply with the general environmental rule “to prevent is better than to cure”, and, not the least reason for their success, source measures are cost-effective. In this paper the present situation of applying low-noise techniques in the Netherlands are discussed.



Construction of double layer porous asphalt on ring road of Amsterdam

OUTLINE

Nowadays, source measures for road and railway traffic are being taken in a broad and structural way. Two fundamental requirements were needed to obtain this situation:

- the availability of technical measures to reduce noise at the source;
- the possibility to incorporate the acoustical effect of these source measures in legal procedures.

Additionally, the noise policy of the Dutch government includes stimulation of the application of low-noise solutions to speed up the introduction process of these techniques.

The mentioned requirements are being optimized continuously. Recent developments include:

- a broad Innovation Program is started to develop and apply low-noise solutions for road and railway traffic noise;
- extreme low-noise road surfaces have been developed within the Road surface of the future contest;
- for road traffic noise the legal calculation schemes have been upgraded with the possibility to incorporate the noise reducing effects of state-of-the-art silent roads;
- for railway traffic noise the legal calculation schemes have been upgraded with the possibility to incorporate the noise reducing effects of measures on railway tracks. Since the Dutch calculation scheme for railway traffic has been chosen to be the interim calculation method for the EU directive on environmental noise, also the possibility to incorporate the emission of arbitrary railway material has been included;
- a stimulation regulation for silent roads has been in effect for two years and has resulted in a broad application of state-of-the-art low-noise road surfaces;
- a stimulation regulation for silent tyres is being studied on its feasibility;
- an internet site for silent traffic has been initiated and successfully deployed.

These developments will be discussed in this paper.

Innovation Program Noise

The Ministry of Transport, Public Works and Water Management and the Ministry of Public Housing, Spatial Planning and Environmental Conservation together erected a broad innovation program (IPG) to handle the noise situation around the Dutch highways and railway lines [1]. Major effort will be put into innovative solutions for noise abatement at the source, including development of a third generation of silent road surfaces, special attention to the developments of silent tyres and vehicles, application of source measures on railroad yards and more efficient screening. For road traffic noise a noise reduction of 8 dB(A) with respect to the actual situation will be feasible at locations where innovative solutions are combined.



ROEMER of DWW measures tyre/road noise on Dutch highways

Roads to the Future

The Ministry of Transport, Public Works and Water Management started a program called Roads to the Future in 1996. Two parts of the program included the development of silent road surfaces: the Noise Pilot study and the Modular Road Surfaces. The first SPB-measurements of the Roads to the Future sections [2] indicate that for light vehicles at 100 km/h initial noise reduction levels vary between 5 and 7 dB(A).

Silent roads in the legislative calculation model

The application of silent road surfaces becomes more interesting for road administrations when the noise reducing affects are included in legal calculation schemes. The revised Dutch calculation scheme for road traffic noise includes a correction factor C_{road} (in Dutch: C_{wegdek}) for the noise reduction of road surfaces, and additionally it contains a procedure to determine C_{road} for new road products.

Important features of the road surface correction term C_{road} are:

- separate C_{road} factors for passenger cars and trucks;
- description of noise reduction in octave bands;
- a speed dependence of the noise reduction of road surfaces;
- values are based on SPB measurements at a height of 5 meters;
- defined relative to a reference spectrum, which on it's turn is based on a SPB-measurement data on several road surfaces of dense asphalt concrete (DAC).

Silent railway constructions and trains in the legislative calculation model

The revision of the Dutch calculation scheme for railway noise will include a measurement method to determine the noise emission of railway constructions and trains which are not included in the calculation scheme itself. The aim of this revision is two-fold:

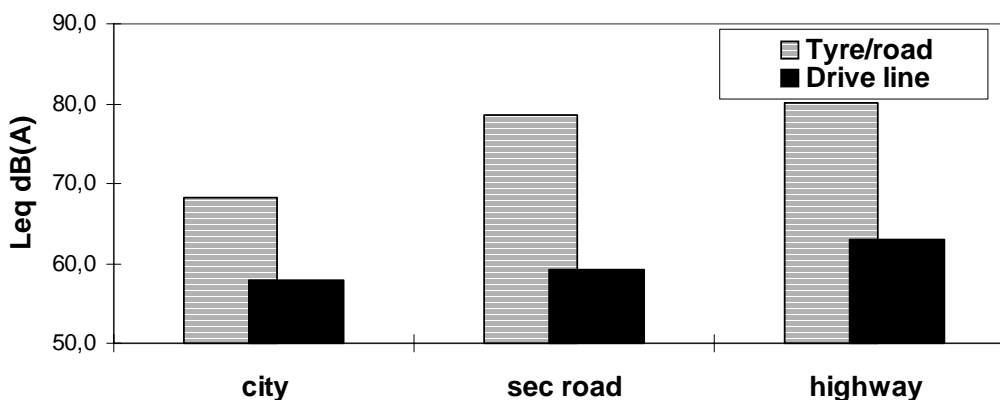
1. the calculation scheme is chosen to be the interim method to be used for strategic noise mapping on base of EU directive on environmental noise (COM(468)2000). The addition of the emission measurement method enables all countries to use their specific national railway material in the calculation scheme;
2. the application of silent techniques for railway constructions and vehicles becomes more interesting for railway administrations when the noise reducing affects are included in legal calculation schemes.

Stimulation regulation for silent roads

The Ministry of Public Housing, Spatial Planning and Environmental Conservation has over the past two years invested over 15 million euro in the stimulation of the application of silent road surfaces on communal and regional roads. The stimulation was effectuated by a subsidy regulation for communal and regional road administrations on the application of silent road surfaces.

The goal of the regulation was two-fold:

1. to have a broad experience in the application of several silent road types;
2. to achieve a local reduction of road traffic noise.



Reduction of tyre/road noise is solution No. 1 on all types of roads

Communal and regional road administrations were given the opportunity to request for a subsidy on a local project which included the application of a silent road surface. Several requirements were to be met:

1. project included a new road construction over 150 meters;
2. initial noise load due to road traffic was over 55 dB(A);
3. minimal achievable noise reduction at facades of adjacent dwellings:
 - road surfaces consisting of elements: 0 dB(A);
 - road surfaces with a single top layer: 3 dB(A);
 - road surfaces with a double top layer: 4 dB(A).

The gain of knowledge was achieved by demanding:

1. measurement of initial noise reduction (SPB or CPX);
2. monitoring the noise reduction over a period of 10 years (CPX).

This regulation was very successful: the budget for 4 years was spent in 2 years time due to the large amount of requests for a subsidy. A continuation of the regulation is under consideration.

Stimulation regulation for silent tyres

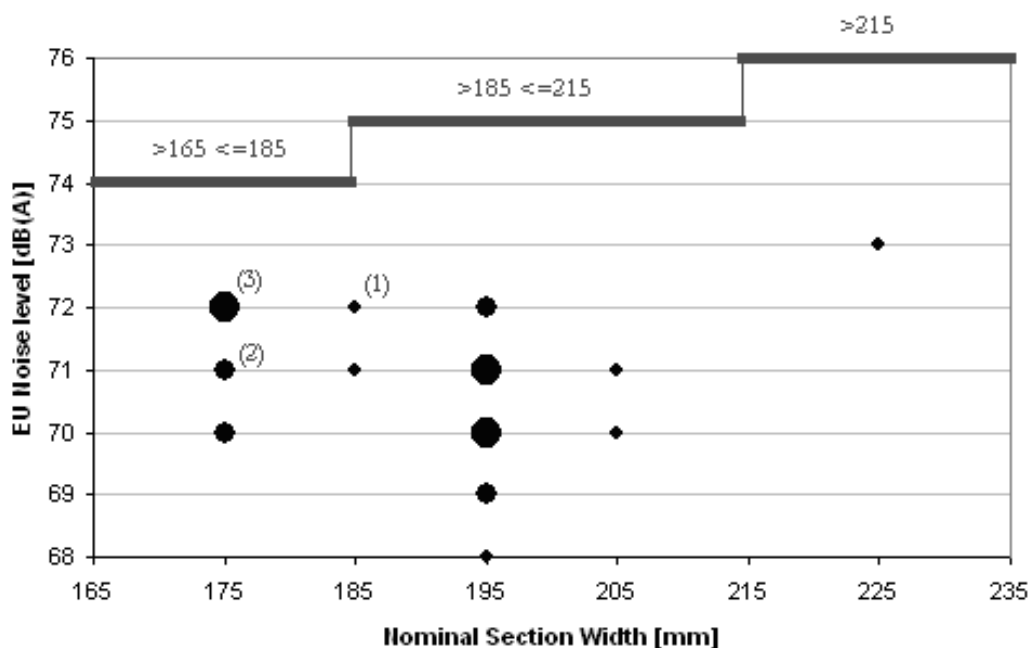
The broad application of silent tyres on both passenger cars and trucks could reduce the overall road traffic noise load in the Netherlands by 1 to 3 dB(A), depending on the achieved shift in the tyre population. This conclusion was drawn in a feasibility study on a stimulation

regulation for silent tyres, which was carried out by M+P and KPMG BEA in commission of the Ministry of Public Housing, Spatial Planning and Environmental Conservation.

Important input for this study were measurements on 24 passenger car tyres on base of the measurement method of the EU directive 2001/43 on the type approval of tyres.

The measurement results indicated that:

- all tested tyres meet the future requirements of the directive;
- differences between noise levels of the tyres up to 5 dB(A) are found.



Measured noise levels of 24 sets of car tyres (dot size represents total number)

In a literature study on the rolling noise of truck tyres which was performed by M+P in order of the Ministry of Transport, Public Works and Water Management it was concluded that truck tyres exhibit similar differences in noise emission.

As a conclusion it can be stated that the stimulation on silent tyres, to anticipate on the future European noise regulations on tyres, will:

- raise public as well as company awareness;
- result in an environmental gain in terms of a locally and temporally reduced noise load.

Internet site for silent traffic

On initiative of the Ministry of Public Housing, Spatial Planning and Environmental Conservation the internet site <http://www.Stillerverkeer.nl> (*in Dutch*, “silenttraffic”) has been

developed by Netherlands Information and Technology Center for Transport and Infrastructure (C.R.O.W.).

This website focuses on the Dutch trends in silent traffic. The main objective of the website is to distribute information about silent roads and their application possibilities. The website acts as a reference book, where questions can be asked and information can be found. Road administrations, consulting engineers, policy makers and the general public have found their way to this site, which attracts over 1,000 different visitors every month.

CONCLUSIONS

Source measures for road and railway traffic are being taken in a broad and structural way in the Netherlands. In this paper it was discussed that in general two fundamental requirements were needed to obtain this situation:

- the availability of technical measures to reduce noise at the source;
- the possibility to incorporate the acoustical effect of these source measures in legal procedures.

Additionally, the noise policy of the Dutch government includes stimulation of the application of low-noise solutions to speed up the introduction process of these techniques.

The current developments of the EU legislation will in effect result in the fulfillment of the above mentioned requirements for the whole European Union. This will lead to a consistent and structural base for application of low-noise techniques to reduce transportation noise.

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