PoroElastic Road Surface: an innovation to Avoid Damages to the Environment (PERSUADE)

Financement

Europe FP 7

Innovative environmental technologies including design concepts and materials for the reduction of damage to the environment

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Pilote

BRCC

Partenaires

DRD, ZAG, TUG, ETRA, LCPC, VTI, NCC, IBDiM, DVI, HET, KU-Leuven, Ifsttar (LAE)

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4 678 595,00 €

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135 106 €

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Context

Low-noise road surfaces are recognized as a cost-effective tool for traffic noise abatement. The best performance can be achieved by optimizing surface texture and porosity. That way, a bottom line of a 3dB lifetime average reduction with respect to ordinary asphalt has been reached. Any progress must resort to another noise-relevant characteristic i.e. elasticity by which the noise due to tyre vibrations can be suppressed. A recently completed European project has shown that, in order to be effective, the elasticity of the road surface must be in the same range as that of the tyre itself. This explains why previous attempts of incorporating a little rubber in an asphalt mix failed to produce significant noise reductions. The solution consists of a fully rubberized, porous compound: a so-called « PoroElastic Road Surface » (PERS). Trials in Japan and Sweden have demonstrated vehicle noise reduction close to 10 dB. However, that promising technology is not ready for application. The following problems have to be solved: resistance to wear and tear, adhesion to the base, winter maintenance, mechanical behaviour and the following have to be clarified: rolling resistance, skid resistance, frost behaviour, fire hazard, workability and production/laying processes including workers safety.

Aim

The project aims at developing a durable, cost-effective PERS using scrapped tyres, which would benefit the environment by contributing to abating traffic noise and vibrations but also helping to solve the problem of over 3 million tons of used tyres being dumped or burned every year in the 27 MS. One will take advantage of Swedish and Japanese experience. The former country is represented in the Consortium while he latter will be represented in an External Reference Group. Five countries including two NMS will host the experimental sites and test different variants of mixes and construction methods. One will also analyze the global, possibly positive impact on CO2 emissions.

The two PERS test plates on the parking area along the Holbaek highway in Arnakke, Denmark.

Macro view of the PERS surface on the test plate built in Arnakke in October 2011

Sound absorption measurement of PERS in Arnakke. Round robin tests between Ifsttar and DRD in June 2012

Mechanical impedance testing of PERS by Ifsttar in Arnakke in June 2012

Description

The general goal is to remove doubts about the technical and economical feasibility of the PERS solution for abating road traffic noise by demonstrating successful full-scale applications. This involves five steps:

- Step 1: Laboratory tests will be carried out with a view to optimizing the material mix with respect to several properties (mechanical, acoustics, resistance…). In addition, small-scale field tests of resistance to emergency braking and in case of fire.
- Step 2: Once an optimum mix design has been chosen, the material will be produced by specialized partner factories in different types of conditioning with a view to different laying/construction methods.
- Step 3: The conditioned material will be applied on real roads in order to study the behaviour of different variants of PERS under different traffic and climate conditions.
- Step 4: The test sections will then be followed up by means of initial and periodic measurements and monitoring regarding noise performance (SPB and/or CPX measurements), acoustic absorption, skid resistance, rolling resistance, drainage and behaviour in winter.
- Step 5: Finally, a global evaluation of the PERS technology will be performed and disseminated based on the technical results from the full-scale experiments and cost/benefit and Life Cycle Assessment.

Results

Most of works have been carried out to achieve an optimum mixture. To combine a sufficient skidding resistance with an acceptable durability has been a real challenge, but the continuous efforts of the PERSUADE consortium have now resulted in some promising options. The consortium has also been working on dissemination and on Cost-Benefit Analysis of this type of pavement.

References

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Web link

http://persuade.fehrl.org/