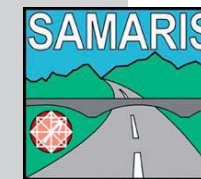


SAMARIS NEWS



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Technical guidelines for use of recycled and waste materials in road construction

- by Francisco Sinis, CEDEX, SPAIN

An important objective for the pavement stream of research in SAMARIS is to up-date and provide information and recommendations about the techniques and applications of recycling. The actions to achieve this main objective have focused on the elaboration of a Technical Guide on Recycling Techniques and on a review of the situation on recycling in Central European countries.

Work on the Technical Guide is being developed by CEDEX from Spain, EUROVIA from France and TU Brno from the Czech Republic.

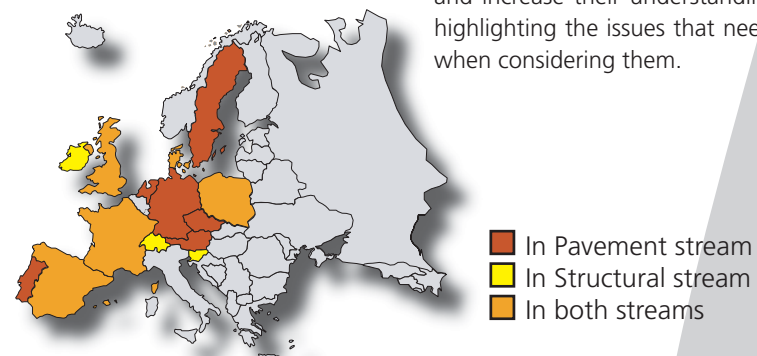
A first review of recycling of by-products in road construction in Europe was done by CEDEX in 2004, and reported in Deliverable D5 of the project. The work included analysis of documents published by a number of countries and organizations (CEN, Denmark, France, Germany, The Netherlands, OECD, RILEM, Spain, Switzerland, The United Kingdom and The United States). The literature review resulted in eleven waste materials and by-products being targeted for further study based on their potential and successful applications in road construction in Europe: colliery spoil; air cooled blast furnace slag; ground granulated blast furnace slag; steel slag; coal fly ash; coal bottom ash; building demolished by-products; scrap tyres; waste glass and foundry sands. Materials

from bituminous pavement recycling and their properties and use have been covered in depth by PIARC working groups, and were not included.

At the same time, EUROVIA, based on its own experience, produced the document "Recommendation for mixing plants for recycling works (characterisation, elaborations plants, uses in road construction of by-products)", deliverable D12 of the project. It considered the following wastes or by-products: building, civil engineering and roadway demolition materials; municipal solid waste incineration bottom ash; blast furnace slag; foundry sand; coal fly ash; and scrap tyres.

With basis in deliverables D5 and D12, and for each target material a technical digest was produced including the definition and origin, properties, environmental implications, main application in road construction, examples of use and technical references. These technical digests represented the starting point for the Technical Guide on Techniques of Recycling, which is now in the stage of final editing, introducing information from many other tasks and deliverables of the SAMARIS project and from comments and supplementary information from other SAMARIS members not directly involved in this part of the project.

It is intended that the Technical Guide shall assist road authorities in using recycled materials in road construction and increase their understanding of the usage potentials, highlighting the issues that need to be carefully evaluated when considering them.



The SAMARIS consortium

SAMARIS (Sustainable and Advanced Materials for Road InfraStructure) is a Shared-cost RTD and Demonstration research project from the Growth program of the 5th Framework Programme, partially financed by the European Commission and partially from the partners' national resources. The project was initiated in FEHRL, the Association of European National Highway Research Laboratories.

www.samaris.zag.si

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Latest on:

- Permanent deformation of bituminous mixtures
(I) Full scale tests on alternative pavement materials
(II) Reliable test methods and advanced material models
- Technical guidelines for use of recycled and waste materials in road construction

FEHRL



Permanent deformation of bituminous mixtures (I): Full scale tests on alternative pavement material

- by Erik Nielsen, DRI, Danish Road Institute

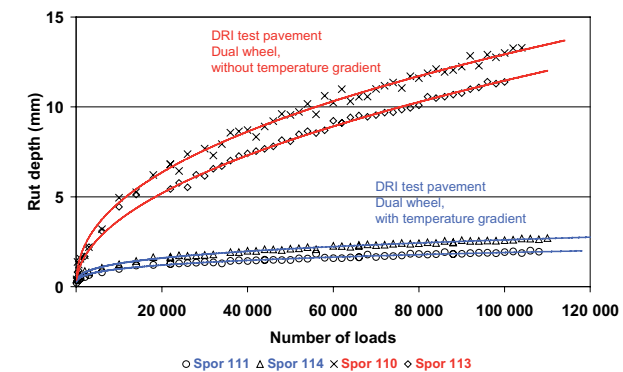
SAMARIS has conducted several laboratory activities to provide input data for the modelling of permanent deformation in bituminous materials. One such activity was a test programme for the full scale testing at DRI in the Danish Asphalt Rut Tester (DART), shown on the picture.

Part of that programme involved tests performed on asphalt slabs from a two layer test pavement containing nearly 100 % alternative materials (either recycled or reused): crushed railroad track ballast, blast furnace slag and reclaimed asphalt materials.

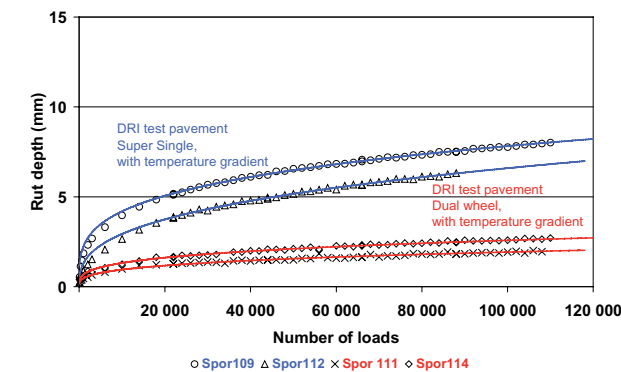
The load applications were performed with a super single and with a dual wheel mounting on a 1/2 axle. The carriage travelled at a speed of 5 km/h under approx. 10 kN load and a lateral wander of the wheel carriage was stochastically introduced. In the experiments the unique feature of the DART of creating a temperature gradient from top to bottom of the pavement slab under controlled conditions was also used.

The two figures show the influence of the temperature gradient (top/bottom: 40 °C/20 °C) as opposed to no gradient (40 °C/40 °C) with a dual wheel configuration and compare results from the super single tyre with the dual wheel configuration.

These test results will be used as input to the advanced model (Finite Element) for material behaviour together with other laboratory data from methods assessing the potential of asphalt materials to show permanent deformation. The other tests are wheel tracking tests (EN 12697-22: large scale device and small scale device procedure A and B), Uniaxial creep test and triaxial test (EN 12697-25). The evaluation and comparison can late in 2005 be found in Deliverable D28 on the SAMARIS web site.



Rut depth development under dual wheel mounting with and without a temperature gradient in the test slab.



Comparison of rut depth development under super single and dual wheel mounting (with temperature gradient).



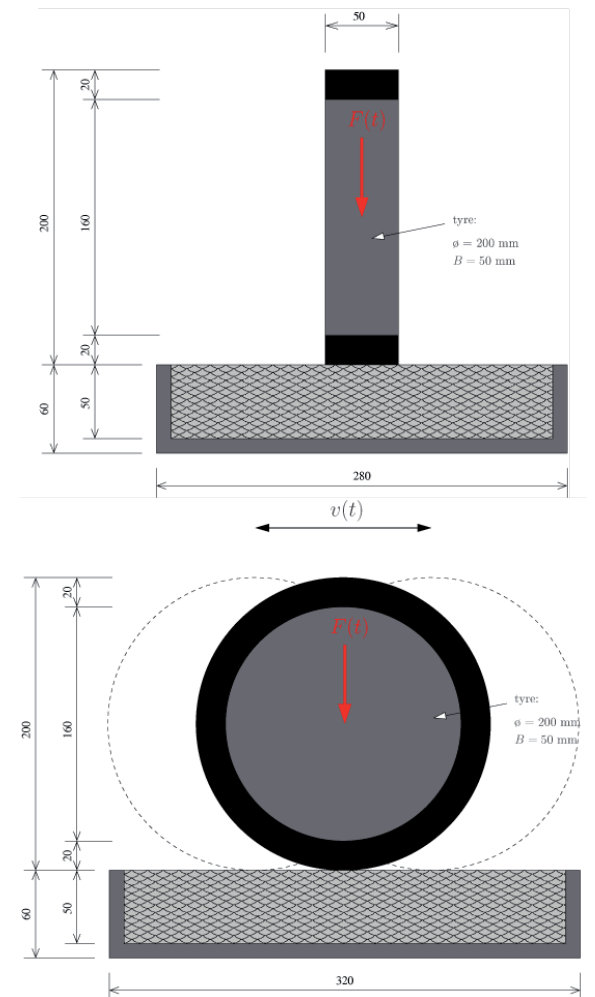
DART, with dual wheel mounting, in the off-loaded state. The pavement test slab is visible in the front of the picture.

Permanent deformation of bituminous mixtures (II): Reliable test methods and advanced material models

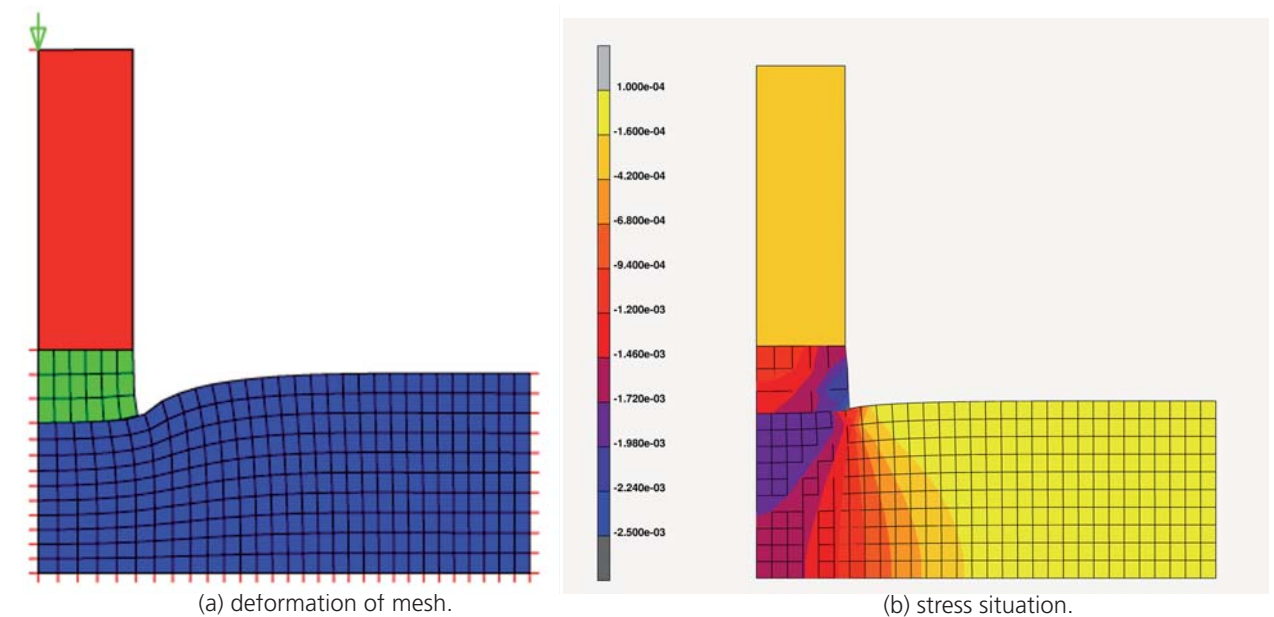
- by Ronald Blab, ISTU, Vienna University of Technology

The aim of ongoing research activities on bituminous mixtures is to specify asphalt in terms of fundamental, so called performance based properties. Technology therefore focuses on the development and standardization of performance-based test methods for bituminous materials on the basis of effective mechanical characteristics. The SAMARIS project has evaluated performance based test methods to address permanent deformation of bituminous mixes, i.e. uniaxial creep and cyclic uniaxial and triaxial tests. A test program on conventional and alternative asphalt mixtures was carried out. Further, mathematical tools are developed to derive material parameters from the laboratory tests for advanced rheological models that can be employed for numerical simulation of flexible pavement structures.

However, due to the differences in knowledge and experience in Europe it is not possible to choose only this fundamental approach. Within the framework of the new European Standards, asphalt may also be specified by means of requirements on so called performance related tests. In regard to permanent deformation wheel tracking tests with considerable differences in test conditions, e.g. specimen geometry, wheel type and size, temperature regime etc., are standardized. To evaluate these different wheel tracking test methods, inter laboratory tests on conventional and alternative materials as well as numerical simulations to assess the stress and strain situation in the asphalt specimen are performed. Based on these comprehensive experimental and numerical results SAMARIS can be expected to provide well founded recommendations for reliable performance related test methods to address permanent deformation of bituminous mixes.



Geometric dimensions of setup of Wheel-tracking test with "Small device".



(a) deformation of mesh.

(b) stress situation.

Results from simulation (FE) of a Wheel-tracking test with "Small device".