PROJECT

FORMAT

Fully Optimised Road Maintenance

Funding: European (5th RTD Framework Programme)  
Duration: Feb 2002 - Jan 2005  
Status: Complete with results

Background & policy context:

The operation of seamless intermodal door-to-door transport chains across Europe requires research to enable the cost-effective development and maintenance of infrastructures and nodal areas as well as to identify and realise promising alternative transport concepts.

The FORMAT project, which addressed Task 2.2.1/11 ‘Road infrastructure pavement maintenance management’ of the European Commission Key Action ‘Sustainable Mobility and Intermodality’, was designed to conduct in-depth research into highway maintenance works in order to improve the efficiency, safety and cost of the maintenance works by appropriate planning, timing and execution of work zone operations.

Objectives:

The objectives of the project were:

- to provide better performing road pavement maintenance techniques and procedures that will reduce traffic disruption at road works, thus reducing congestion and improving safety;
- to develop an integrated cost-benefit analysis model that addresses key aspects of pavement maintenance, including road user costs;
- to produce safety strategies for road works for arranging the work site lay-out and the timing of maintenance intervention to maximise the safety of road users and workers;
- to propose methods, procedures and equipment for monitoring the condition of road pavements at traffic speeds to minimise the number of road closures currently required for acquiring pavement condition data.

Methodology:

In order to achieve its wide ranging objectives, the project considered key aspects of the planning and execution of the pavement maintenance process and it was organised into 7 integrated groups of activities comprising:

- 4 scientific Work Packages within which the research was conducted;
- 1 Work Package (‘Elaboration’) to develop the detailed methodology to conduct the research;
- 1 marketing Work Package (‘Exploitation’) to enable the research results to be implemented within Europe;
- 1 management Work Package (‘Management’) to control and direct the project to achieve the agreed objectives.

The 4 scientific Work Packages addressed the following topics that were considered to be key to road pavement maintenance:

1) Pavement maintenance techniques and procedures (‘Technology’). The main activities were to review the developments in pavement maintenance technology throughout Europe and North America and identify the main innovations in this field concentrating on the most promising innovative maintenance techniques for both asphalt and concrete roads. Selected promising innovative treatment options were assessed and evaluated through accelerated testing in specialised full-scale road pavement test facilities. Pilot road trials were conducted on public roads to determine the efficiency of application of selected maintenance treatments, to provide data for the cost benefit models and to assess effective traffic management requirements.
2) Associated cost-benefit analysis methods (‘Cost Benefit Analysis’). An integrated cost benefit spreadsheet model taking into account the costs due to pavement deterioration, additional user costs and safety at the work sites was developed. In addition, environmental aspects such as benefits arising from recycling of road pavements and the reduction in noise from new innovative road surfaces were also modelled. The new models were assessed using data from in-service roads and from the pilot road trials conducted in the previous groups of activities (‘Technology’) in order to determine their applicability in practical situations.

3) Safety at work sites (‘Safety’). It addressed issues relating to enabling the engineering requirements of road maintenance treatments to be carried out while optimising safety of both road workers and users. The safety implications of different traffic management options, inclu

**Parent Programmes:**
FP5-GROWTH KA2 - Sustainable Mobility and Intermodality

**Institute type:** Public institution

**Institute name:** European Commission, Directorate-General for Energy and Transport (DG TREN)

**Funding type:** Public (EU)

**Partners:**

- Austria: Institut fur Strassenbau & Strassenerhaltung, Technical Univ. Vienna (ISTU)
- Belgium: Belgian Road Research Centre (BRRC)
- Denmark: Danish Road Institute (DRI)
- Finland: Technical Research Centre of Finland (VTT)
- France: COLAS SA; IFSTTAR
- Germany: Univeritaet Karlsruhe (unikarl-ISE)
- Hungary: Kozlekedestudomanyi Intezet Rt (KTI Rt)
- Portugal: Laboratorio National de Engenharia Civil (LNEC)
- Slovenia: Zavod za gradbenistvo Slovenije (ZAG)
- Spain: Autopistas delmare nostrum, S.A. (AUMAR); Centro de Estudios y Experimentatiónde Obras Públicas (CEDEX)
- Sweden: Vag och Transportforskningsintitute (VTI)
- Switzerland: Laboratory of Traffic Facilities, Federal Institute of Technology (LAVOC)
- The Netherlands: Dienst Weg- en Waterbouwkunde, Ministerie van Verkeer en Waterstaat, Directoraat-Generaal Rijkswaterstaat
- United Kingdom: Transport Research Laboratory (TRL)
- United States: U.S. Department of Transportation / Federal Highway Administration (FHWA)

**Organisation:**
Key Results:

The scientific achievements include:

1) Drawing up a comprehensive list of maintenance treatments and procedures used in individual European countries from which some effective and innovative treatments were selected for assessment. The treatments selected for testing were: a cement mortar grouted porous asphalt as an inlay; a binder course of steel slag asphalt concrete; two different high modulus bituminous binder courses as inlays under different thin asphalt surface layers; a high modulus bituminous binder course applied as an inlay to the wheeltracks alone under a thin asphalt surfacing; a thin asphalt overlay with geogrid over a cracked pavement.

2) The construction and evaluation of the test pavements in 4 Accelerated Loading Test (ALT) facilities. The ALT showed that in terms of performance the innovative maintenance treatments trialed gave promising results. Some of the treatments tested also showed considerable benefits in terms of material consumption and environmental impact. However, the success of these techniques relies strongly on good construction practices and enhanced quality control procedures. Finally, it should be borne in mind that the results from ALT will only describe the performance of pavement structures with respect to load associated deterioration mechanisms, and that this type of experiment must always be supported by results obtained in Real Load Tests (RLT) on road pavements, which are subjected to the effects of time and climatic variations, and where the variability of materials and construction procedures can play an important role in the pavement performance.

3) 3 pilot trials on public roads were conducted with positive results to determine the ease of application and assess the efficiency of the selected maintenance techniques in improving the pavement condition, as well as to determine any disruption to road users. The treatments assessed were: the application of a new 0/6.3 porous asphalt on the ring road of Toulouse (France); the structural rehabilitation of a jointed concrete pavement on a motorway near Valencia (Spain) involving injection grouting followed by either surface grinding or the application of two different asphalt surfaces with one incorporating a geotextile; the rehabilitation of a continuously reinforced concrete pavement near Baytown (Texas, in the USA) that included various local repairs followed by the application of a bonded concrete overlay.

4) Mathematical models for project level studies were implement

Policy implications

For what concern the research conducted on ‘Road Condition Monitoring’:

- The use of existing databases and the creation of combined condition indices have to be further developed.
- Common standards and definitions have to be established.
- The promotion and opportunities for joint ventures and European wide projects have to increase. To develop high technology equipment to monitor new desires is expensive. The need and desire seems to be common in many countries. Some of the desired pavement properties for maintenance planning do not need to be monitored as frequently as others meaning that single items of equipment can serve more than one road network. This implies that the optimal solution must be joint development projects between two or more countries.

For what concern the research conducted on ‘Safety at road works’:

- To seek to minimise any adverse effects of design detail, it is recommended that works are closely monitored during their first few days of operation. This should aid the identification of problem areas which can be addressed as a priority.
- It is recommended that all countries should implement regular monitoring of accidents at works. One aspect of this would be to ensure that regular data collection exercises are undertaken to establish the number of accidents occurring at works and compare this with the total number of accidents, this could be used to identify general trends in works safety.
- Speed is seen to be an important factor in establishing safe operation and it is recommended that
measures be put in place to maintain appropriate speeds. One method would be the use of speed cameras.

Documents:
Final Technical Report (Other project deliverable)

STRIA Roadmaps: Network and traffic management systems, Infrastructure
Transport mode: Road transport
Transport sectors: Passenger transport, Freight transport
Transport policies: Societal/Economic issues
Geo-spatial type: Other