Impact of adverse weather conditions on pavement – Performance analysis in the case of temperature changes (ASTRA2009/004)

Impact des conditions météorologiques extrêmes sur la chaussée – Analyse des performances pour le cas du changement de températures

Funding: National (Switzerland)
Duration: Sep 2009 - Aug 2013
Status: Complete with results

Background & policy context:

The project is carried out within the framework of the COST TU0702 Action - Real-time monitoring, surveillance and control of road networks under adverse weather conditions.

The associated COST project will bring the required elements concerning the meteorological aspects of this research project, i.e. analysis of potential impacts of global climate change on current weather conditions (evaluation of change of meteorological parameters (intensity, frequency)).

Thereafter, a detailed assessment of the impact of these extreme weather conditions on the performances of pavements will be carried out in this FEDRO project. The following characteristics will be analysed: rutting, fatigue, tensile strength, etc.

This project will address problems related to temperature. Indeed, global warming will have a direct impact on the performance of pavements in a near future. The upward shift in the average temperature over a year, the increase of variations (daily, seasonal, etc.), etc. will have considerable impacts on pavement performances.

A performance-model for pavement performances under extreme conditions will be developed, calibrated and validated through laboratory testing (rutting, fatigue) and real-scale testing (thermal cycles - use of existing pavement structures in “halle fosse”). This model will thereafter be adapted to other types of pavements in order to work out a pavement-typology and to make recommendations on their use. The results will then be used for the development of a risk-analysis tool.

In the framework of the COST project, the results will then be used to develop a decision-aid model for pavement choice for given geographical locations. With help of partners from the meteorology domain, risk areas could be detected for Switzerland and recommendations could be formulated.

Objectives:

The present sub-project FEDRO will focus on the practical aspect of this research, i.e. to develop a performance-model of pavements to extreme weather conditions for the specific case of temperature changes. Particular attention will be paid to problems related to high temperatures and fast variations in temperature.

Methodology:

The methodology is divided into several parts:

- Literature search: Project consultation related to the proposed subject. Bibliographic research on weather and global climate change. Data discovery and analysis of accidents in Switzerland. This will be covered in the COST project.

- Contacts with experts: Contacts with experts from meteorological fields, modelling of climate effects, etc. This will be covered in the COST project.

- Laboratory tests: Laboratory testing of the impacts of extreme weather on the risk characteristics
determined. Full-scale tests with a simulator of heavy traffic (with the possibility of using a climatic chamber).

- Modelling: Development of a model of performance behaviour of surfaces compared to extreme weather conditions. Development of a risk analysis tool based on specific performance levels.

- Modelling: Modelling of extreme weather impacts on surfaces in order to achieve a model of decision support for the choice of the surface material. The test results are used for the calibration and validation of models.

Contacts through the COST TU0702: Contacts and exchange of information with the European research teams. Participation in seminars, conferences, workshops, etc. Establishing a pan-European network of information sharing and knowledge

**Parent Programmes:**
ARAMIS - ARAMIS information system

**Institute type:** Public institution
**Institute name:** Swiss Government: State Secretariat for Education and Research
**Funding type:** Public (national/regional/local)

**Partners:**
Switzerland
Swiss road laboratory.

**Organisation:** Ecole Polytechnique Fédérale de Lausanne Laboratoire des voies de circulation (LAVOC)
**Address:** Bâtiment GC
**Zipcode:** 1015
**City:** Lausanne
**Contact country:** Switzerland

**Key Results:**
Climate model prediction - Meteonorm 7.0
- Based on aggregation of 18 general circulation models
- Stochastic method for generation conditions regional climate

Modelling of three climate scenarios (IPCC):
- Moderate scenario (B1),
- Average scenario (A1B),
- extreme scenario (A2).

**Innovation aspects**
New models of performance behavior of road surfaces.

**Policy implications**
Enhancing of the road transport safety.

**Documents:**
- [Presentation (Project presentation)]

**STRIA Roadmaps:** Infrastructure
**Transport mode:** Road transport
**Transport sectors:** Passenger transport, Freight transport
**Transport policies:** Environmental/Emissions aspects
**Geo-spatial type:** Urban