



UPTUN

Cost-effective, Sustainable and Innovative Upgrading Methods for Fire Safety in Existing Tunnels

The European economy relies heavily upon a sustainable transportation system. In this transportation system, tunnels are a key element. The safety systems in a significant part of the existing tunnels were designed on the basis of traffic and its estimated growth of two or more decades ago. It appears however that traffic has grown more significantly and also changed in composition (more combustible and flammable goods). Consequently the safety level in existing tunnels has decreased in cases where no intermediate measures were taken to cope with the changed supply of rolling stock. This holds throughout Europe, for road-, rail- and mass-transit tunnels.

In addition to this, the accidents in recent years have drawn widespread attention to the risks of fires in tunnels. This has two consequences. First, the fires themselves have resulted in fatalities, casualties and/or economic damage. They have also resulted in lengthy shutdowns of the tunnels themselves. Secondly, the perceived risk of fire is also likely to have discouraged tunnel usage in some cases. (tunnels might become an unwanted impediment for trade). Both of these consequences will have added to congestion and hence noise, particulate and airborne pollution with negative environmental and health consequences. As a result of the accidents, and the media attention they have caught, the public acceptance level of fires causing major losses has also decreased.

The main problem statement is now listed as follows. Unsafe, or supposedly unsafe, tunnels hamper the use and the development of sustainable transportation systems, needed in a healthy European economy. Upgrading the safety level in tunnels is, with existing technology and within the legislation and guidelines frameworks of the member states, in most cases, however either nearly impossible or too costly.

Secondary problem is that fire safety is based on a conventional rather than a rational approach. Moreover, fire safety is seldom looked upon in an integral fashion, comprising all aspects (probability of incidents, consequences of fires, human response, structural response, emergency response teams, tunnel operators) in a similar manner. This may result in adverse interaction between preventive mitigating measures or non-optimal safety investments.

The UPTUN project main objects are therefore:

- Development of innovative technologies where appropriate and where relevant comparing to and the assessment of existing technologies for tunnel application. Focus is on technologies in the areas of detection and monitoring, mitigating measures, influencing human response, and protection against structural damage. The main output is a set of innovative cost-effective technologies.
- Development, demonstration and promotion of procedures for rational safety level evaluation, including decision support models; and knowledge transfer. The main output is a risk based evaluating and upgrading model.

The desired spin-off of the UPTUN project would be:

- the restoration of faith in tunnels as safe parts of the transportation systems;
- the levelling out of trade barriers imposed by supposedly unsafe tunnels;
- an increased awareness of stakeholders for the necessity to develop initiatives to link all relevant research.

In order to achieve these objectives, a strong European consortium is needed, covering all relevant expertise, with sufficient mass and impact to ensure adoption of UPTUN deliverables throughout Europe. The consortium was built around the prominent tunnel safety institutes in Europe, balancing owners, industry, research and other stakeholders on the one hand and balancing the (tunnel) member states on the other hand.



The UPTUN consortium consists of 41 members from 13 different EU Member States, 1 EEA Member State and from 3 accession countries. The distribution of the input to the project is well balanced over the eastern, northern, southern and western EU member states.

The project is specifically targeted at ensuring a pan-European approach towards the improvement of fire safety in European tunnels. This will enable European tunnel operators and regulators to benefit from the economies of scale resulting from a European approach, thus additionally creating community added-value.

An advisory group will be established to monitor developments outside the UPTUN project allowing to anticipate on new perceptions and priorities and to provide an independent critical appraisal of UPTUN progress and deliverables.

The work is divided into 7 technical workpackages:

WP 1 Prevention, detection and monitoring

WP 2 Fire development and mitigation measures

WP 3 Human response

WP 4 Fire effect & tunnel performance: system structural response

WP 5 Evaluation of safety levels and upgrading of existing tunnels

WP 6 Fire effects and tunnel performance: system response

WP 7 Promotion, dissemination, education/training, and socio-economic impact (WPL STUVA; D)

The first four WPs are to increase insight and develop new measures to reduce probabilities and to mitigate consequences of fires in tunnels. The fifth and sixth work-package are mainly focussing on the development of the innovative integral upgrading approach. The last work-package is to promote and disseminate the results.

Furthermore, since not all aspects can be foreseen from the start of the project, nor can all problems be solved within UPTUN, strong links will be established with existing relevant research projects on national and international level (e.g. the European projects DARTS, FIT and SafeT).

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