URBANTRACK

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Urban Track is a research project aimed at developing, testing and validating innovative products and methods for urban rail track infrastructure. It is a four year EC research project of around 18 million euros, which started in September 2006.

Objectives

The project aims at developing innovative products with a '2020 ERRAC vision': low life cycle cost, high performing, modular, safe, low noise and vibration rail infrastructure systems which fit into a harmonised European market. The Urban Track project aims at a reduction in LCC of urban track infrastructure by at least 25%. Urban Track considers both new lines (development of modular maintenance free track systems) and existing lines (optimisation of renewal methods and maintenance methods). For new lines, the project deals with ballast-less track solutions; hence only concrete slab track is considered for the new track systems being developed.

Network of Operators

UITP is organising a Network of Operators to offer an opportunity to operators who are not consortium members to support, provide input into and utilise the results of the project. The first workshop took place at the end of May 2007 in Brussels and the next will take place on the 4th December 2007 in Karlsruhe, Germany. Interested metro, tram and light rail operators are invited to contact Mrs Izaskun Arenaza at izaskun.arenaza@uitp.org. Two workshops per year are planned with the purpose to update operators on the progress of the project and to scrutinise and subsequently validate its results.

Design and Implementation of solutions at test sites

The results obtained in the other sub-projects will be validated on the networks of 10 users including Madrid, Brussels, London, Seville, Bremen, Paris, Barcelona, Karlsruhe, Manila and Singapore.

SIXTH FRAMEWORK PROGRAMME

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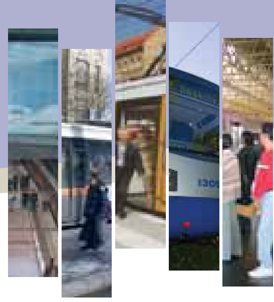


Low cost modular new track systems & fast installation methods

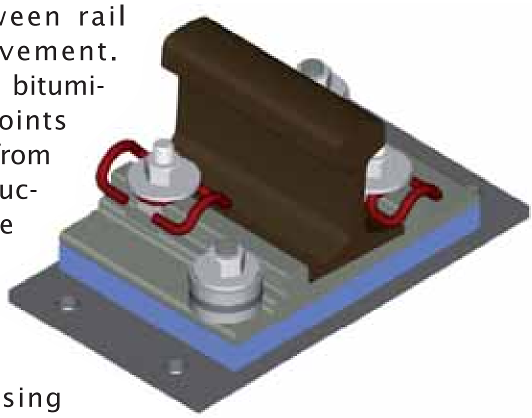
This subproject carries the responsibility of developing a variety of new track systems that achieve the above goals. A first task addresses the design of a removable embedded rail system for metro applications. The design offers reduced installation time, a top of rail which is flush with the tunnel invert and a reduced tunnel invert section. The tracks will come in three different stiffnesses to mitigate possible ground borne noise and vibration issues and offer the possibility of replacing 18 m of track within less than 4 hours. As the track system is specifically geared to provide safe evacuation of the vehicles in tunnels, it is also necessary to address the electrical issues and safety lighting. Work has centred mainly on the features that enable the easy extraction and insertion of the rail without disturbing the surrounding concrete. Modelling work has been performed to study the behaviour under operating conditions and small prototypes have been made for testing. A full scale prototype will be produced for qualification testing.

A second task concerns green tram tracks which includes artificial grass tracks. The favoured track design consists of sedum and moss, which eliminates the need for cutting the grass and requires a minimum soil depth that prevents the growth of weeds. Acknowledging a changing climate, the chosen plants can cope with drought which eliminates the need for additional irrigation during dry periods. The plants are placed in grass paver structures to permit emergency vehicle traffic whilst maintaining a stable plant soil.

Automatic build-up welding - STIB

Green tracks not only offer great benefits in terms of noise reduction; since the plants are placed next to the road traffic – one of the main sources of particulate matter – they also play a role in particle retention; not to forget the esthetical and psychological effect green has on people. In areas where track greening with plants causes difficulties, artificial grass could be a solution.

Besides the development of the appropriate growth medium, the key challenges are the prevention of stray currents and the reduction of the width of the concrete around the rail: bringing the plants as close as possible to the rails minimises noise reflections and achieves maximum noise absorption. Various green track design solutions using grass, sedum and artificial grass have been designed and the noise absorption coefficients of a variety of bedding materials have been measured.



A third topic studies the interface between rail and street pavement. The widely used bituminous asphalt joints were adopted from highway construction to seal the narrow gap between road surface and rail, with specifications focusing on adhesion to these two surfaces. With the requirement of rail replacement without disturbing the surrounding concrete, the gap now has a width ranging from between 80 and 130 mm depending on the type of rail. Joints of this width on hybrid (fastener plus embedded) systems have failed in service, indicating that current specifications do not reflect the new situation. Moreover, the use of polyurethanes and epoxies as embedding material has facilitated the entry of polyurethane joints. Test methods complementary to the existing ones are under development to better replicate the in-service behaviour of these wide joints.

Cost Effective Track Maintenance, Renewal & Refurbishment Methods (Existing Lines)

Grinding after build-up welding - STIB

This subproject studies maintenance and renewal methods for existing track with particular emphasis on (life cycle) cost, environmental aspects, speed of execution and continuous availability of the tracks.

A large variety of methods are studied, of which the Manila case may serve as an example: Urban Track assists the Philippine capital in a complete refurbishment process of their track system from status analysis to the development of maintenance and renewal rules. With a view towards European integration, such rules should be harmonised at least Europe-wide; this is why this subproject also aims at the proposal of a pan-European maintenance standard. The Network of Operators is involved in this proposal formulation at various steps, such as surveys, site visits and personal interviews.

Apart form the hands-on assistance to Manila there is also extensive research carried out on lubrication which will only later in the project be followed up by the practical implementation of the new findings (on-site in the RATP network, Paris).

Another application studied is build-up welding for used track, on-site or in the workshop, in order to increase its life-time. New methods for fast (de)installation in this respect are also of interest.

A number of the track forms to be installed at a later stage are tested on a circular rig to make conclusive statements about their behaviour under specified wear conditions.

Life Cycle Cost

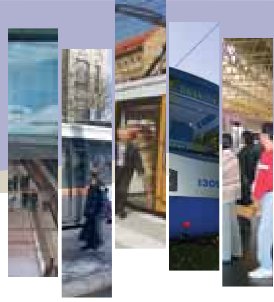
Urban railway operation is characterised by the need for sizeable initial investments and large annual budgets for maintenance and renewal activities. Hence, the systematic and controlled development of LCC strategies on a European level and their comprehensive implementation has become a crucial issue for the economic sustainability of the urban railway business.

In the first 12 months of Urban Track, this subproject spent significant effort on the development of the LCC model and the specification of the software tool during this first phase of the project.

Additionally, a socio-economic assessment model is being developed, which will assess the socio-economic effects stemming from the different systems and maintenance methodologies developed in the other Urban Track subprojects.

Test circuit Cologne at Stuva

To ensure developments are in line with the requirements of both the Urban Track project and the public transport industry, a questionnaire was developed and sent out via UITP to various network operators.



Functional requirements

The main focus of this sub-project is to encompass the functional requirement of urban tracks, which are typically made of concrete slab layers. This sub-project attempts to answer the following questions: What are the main parameters that have an effect on track degradation and the biggest impact on LCC? Can a model be drawn out of that in order to optimise these parameters? Considering the great diversity of track forms throughout Europe, this task is quite ambitious. At the same time, it should be noted that a vast amount of experience has also been accumulated over the years.

For this reason, a first activity involved issuing a questionnaire to the Network of Operators. It asked operators to describe the track degradation observed with associated track and vehicle characteristics.

Modelling activities were also initiated dealing with a discretely supported track form and a continuously supported track form.

An analysis of current fastening standards has showed that they are not fully applicable to track forms with continuously supported rails or directly fixed track with high resilience.

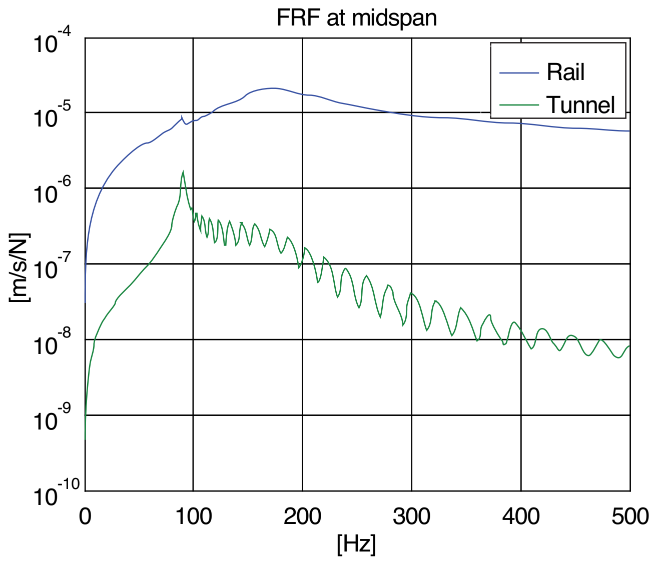


Diagram model POLIMI