Project no. COOP-CT-2005-508674

Project acronym:

CORPTUS

Project title: Concrete Railtrack Panels for Tunnel Safety

Instrument: CRAFT
Thematic Priority: FP6-2002-SME-1

PUBLISHABLE FINAL ACTIVITY REPORT

Period covered: from 1.11.2005 to 31.05.2008

Date of preparation: 25.08.2008

Start date of project: 1.11.2005

Duration: 31 month

Project coordinator name: Alexius Vogel
Project coordinator organisation name:
Risk Assessment Dipl. Ing. Dr. A.Vogel GmbH (RAI)

Revision 1

1. *Project execution*

Publishable executive summary

CORPTUS
COOP-CT-2005-508674
www.corptus.org

Project objectives

CORPTUS project included different objectives from scientific, industrial/economic and societal points of view.
The main **scientific objectives** of CORPTUS were as follows:
• to develop a concrete rail track panel system, useable for rail and subway tunnels, which, for the first time, enables trafficable access of conventional road vehicles in emergency cases
• to examine and use optimal materials in terms of durability, load/vibration and fire-proof quality, and recycling properties and
• to achieve also noise reduction by application of the system.

The prime **industrial/economic objectives** of CORPTUS were:
- to test the production of ready-made concrete panels and to plan a cost-effective way of production on large scale
- cost effectiveness for the production caused by long durability and possibilities for full recycling after reaching the life time
- to reduce the need for cost-intensive emergency tools for tunnels, like road-rail vehicles or fire brigade trains
- to reduce personal costs for stand-by personal for emergency case
- to reduce training costs for emergency cases and
- to open a new market niche for the SME participants.

The **societal and policy objectives** were:
- to reduce the task force time for rescue teams and fire brigades in case of emergencies in rail tunnels, which is up to date too long
- to improve the evacuation procedures
- to improve self rescue opportunities of rail and subway passengers
- to improve first aid facilities on the spot, because of the opportunity to enter the tunnel with more emergency vehicles at one time (in existing systems only one special road-rail vehicle can enter the tunnel at one time)
- to improve travel convenience for passengers in rail tunnels by noise reduction
- to improve working conditions for rail workers in tunnels
- to increase employment in ready-made concrete industry and sale and
- to increase employment in rail and metro infrastructure processing and planning sector

Main contractors

• Risk Assessment Dipl.- Ing.Dr.Alexius Vogel GesmbH
Vienna; Austria
• Chladek & Tintera a.s.
Litomerice; Czech Republic
• Kölngleis Gleisbau GmbH& CoKG
Köln; Germany
• Hartl GesmbH
Vienna; Austria
• Federal Austrian Railways OEBB
Vienna; Austria
• Maba Prefa Veseli spol.s.r.o.
Veseli nad Luznici; Czech Republic
• Swietelsky Baugesellschaft mbH
Vienna/Linz; Austria
• Brno University of Technology
Brno; Czech Republic
• Vienna University of Technology
Vienna; Austria
• Wopfinger Baustoffindustrie GesmbH
Wopfing; Austria
• Work Research Institute
Oslo; Norway

Co-ordinator

Risk Assessment Dipl.- Ing.Dr.Alexius Vogel GesmbH
Puschmanngasse 1/3
1210 Vienna; Austria
Tel.: +43 664 1620726
Fax: +43 1 25964424
E-Mail: vogel@risk-assessment.at
Web: www.risk-assessment.at; www.rai-austria.com

Work performed

During the project
- the co-ordination and the project management was installed
- the kick-off meeting took place in Vienna on Nov. 17/18, 2005 and
- a password-protected web-zone was created under www.corptus.org

Fig. 1: Participants of the kick-off meeting in Vienna Nov. 17/18, 2005.

At the kick-off meeting the creation of a Concrete Consortium (CC), working on the components and the noise behaviour of concrete and a Design Consortium (DC), working on the design of the panel system was decided.
With agreement of the co-ordinator, the CC proposed, to invest more time in material research, mixtures and experiments, to avoid adapted models and later comparative experiments. Caused by this fact two complete work packages could be connected as one unit in the further progress of the project.
In January 2006 the first reports on material research were available and the material components for the first series of test models were fixed. A draft design layout was made.
Caused by the opportunity to combine the first CORPTUS workshop with the international symposium SANACE 2006 in Brno, the date for the workshop was fixed on May 25, 2006.
Papers of 6 partners of the consortium were presented and were published in the conference proceedings.
The partner OEBB presented during this meeting as test tunnel the Windhofkehren tunnel with a length of 559m on the line 67, the Aspang Line in Austria (Fig. 2).
During the same period the experiments on test models were on the run (Fig. 3). The reports of the results of experiments (environmental resistance, load pressure and fire behaviour) were published in October 2006.
The evaluation of the experiment results lead to the final material components and the mixture for the draft models of the panel.
The static calculation and detail planning for the construction plan of the first panels, used for installation in the OEBB tunnel Windhofkehren were made in September 2007.

Fig. 2: The test tunnel Windhofkehren in Austria


Fig. 3: Preparation of large scale concrete models for fire tests

In February 2008 a prototype of the panel was available and installed by the Partner Switelsky on its company's own test track. (Fig. 4)

Fig. 4. Corptus panel prototype.

Based on this first test and the experiences of the first installation procedures, partner Swietelsky also developed a special installation tool for the CORPTUS panels, which is usable with most of the common two way roadrailer, a machine, which is used in track construction in rail engineering as well as for track laying for metro systems.
It allows a quick and safe installation method of the panels on the track (Fig. 5)
Final small adaptations of the panel size connected with improvements of the installation technique lead to the official permission of the partner OEBB to install the CORPTUS panel system in their railway network at the site of Windhofkehren Tunnel.
The final workshop took place in Brno on May 22/23, 2008, where all the results were presented and the time table for production and the installation method were discussed.

Beginning with the kick-off meeting a special film team accompanies the most important stages of the project (i.e. fire tests, meetings, conferences, visits of tunnel site, final installation, final workshop, etc.). The final cut of the film is ready and the German version is available now.

Fig. 5. Process of the installation of the CORPTUS panels.

Impact of the project on the industry sector

As alternative for gravel tracks, e.g. for high-speed routes and upgraded old routes, as well as tramways and metro systems various systems of concrete track slabs are existing.
The difference to the common gravel-bed track is the replacement of the gravel-bed as load-dispersing element by other position-stable materials such as concrete or asphalt.
Such replacements and new installations are very costly and time consuming and are connected often with long time interruptions of the train traffic. Therefore the railway industry is searching for new low cost solutions with systems, which should be installed during short train breaks.
The most essential innovation of the CORPTUS system are the facts of low costs for its fabrication and the short time impact for its installation, connected with all the features and characteristics of concrete track slabs **without** replacement of the gravel bed including the main goals of its ability to be installed in high speed train routes with speeds up to 250 km/h and producing the availability and all features necessary for a busy road (Fig. 6).

Fig.6 Corptus panels installed in the access into the tunnel.

2. Dissemination and use

Section 1 - Exploitable knowledge and its Use

Overview table

Exploitable Knowledge	**Exploitable product(s) or measure(s)**	**Sector(s)** of application	Timetable for commercial use	Patents or other IPR protection	**Owner** & Other Partner(s) involved
1. Fire proofed concrete	*Mixture*	*Concrete Industry*	*2009*	*A material patent was issued 2008*	***RAI,*** *CHLADEK, KOELN, HARTL*
2. Panel system	*Panel system*	*Rail, Metro, Tram*	*2009*	*A panel patent was issued 2008*	***RAI,*** *CHLADEK, KOELN, HARTL*

Section 2 – Dissemination of knowledge

During the reporting period members of the consortium participated at different scientific conferences and presented papers in form of scientific publications. Such conferences were:

- International Conference "Security – A Challenge for the European Railways"; Vienna; Austria; April 24/25, 2006.
- International Symposium "Repair 2006"; Brno; Czech Republic; May 24/25, 2006.
- International Symposium "Concrete Days 2006"; Hradec Králové; Czech Republic; Sept. 1/2, 2006.
- International Symposium "Repair 2008"; Brno; Czech Republic; May 22/23, 2008.

At the University of Technology at the Institute for Structural Engineering and Technology two diploma thesis for MSc were published:

- G. Sinkovits: CORPTUS – Slabs for tracks in railway tunnels – Concrete technology; MSc Thesis; November 2006
- W. Baierl: CORPTUS – Slabs for tracks in railway tunnels – Fire tests; MSc Thesis; November 2006

The project website www.corptus.org was installed, addressing different user groups. Confident contents are included in a password-protected web-zone.
An information flyer was printed as a basis for future marketing concepts.
Beginning from the kick-off meeting a special film team accompanies the most important stages of the project (i.e. fire tests, meetings, conferences, fabrication, visits of tunnel site, final installation, workshops, etc.). The final cut of the film is ready and the German version is available since August 2008.

Overview table

Actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
04 2006	*Conference*	*Research*	*Europe*	*80*	*RAI*
05 2006	*Conference*	*Industry (concrete)*	*Europe*	*100*	*all*
09 2006	*Conference*	*Industry (concrete)*	*Europe*	*70*	*BRNO-UT*
03 2007	*Publications*	*General public*	*Europe*		*all*
05 2006	*Project web-site*	*Higher education*	*Europe*		*RAI*
05 2008	*Flyer*	*General public*	*Europe*		*RAI*
08 2008	*Direct e-mailing*	*Research*	*Europe*		*RAI*
08 2008	*Film/video*	*General public*	*Austria*		*all*

Section 3 - Publishable results

CORPTUS project was focussed on the development of a concrete rail track panel system, useable for rail and metro tunnels, but also for tram lines, which enables trafficable access of conventional road vehicles.
The most essential innovation of the CORPTUS system are the facts of low costs for its fabrication and the short time impact for its installation, connected with all the features and characteristics of concrete track slabs without replacement of a possibly existing gravel bed.
In railway and metro tunnels this panel system additionally support the installation of cable systems for communication and safety and the integration of pressurized water pipelines for producing high pressure water fog for fire brigades.