

THE EJPOVICE TUNNEL

A NEW RAILWAY TUNNEL WILL CUT THE TRAVEL TIME BETWEEN PRAGUE AND PILSEN

After almost two years of hard work, the diaphragm of the south tube of the Ejpovice tunnel, near the portal located in Doubravka, a suburb of Pilsen along the Prague-Pilsen railway line in the Czech Republic, was officially broken through.

The tunnel is a key element of the Rokycany-Pilsen line, which forms part of the trans-European transport network and the national Third Railway Transit Corridor which runs all the way to the German border. The tunnel will reduce the length of this stretch of the railway line by more than 6 km: once work has been completed – in 2018 – it will take less than one hour to travel from Prague to Pilsen and trains will be able to travel at speeds of 120-160 km/h; it currently takes around one and a half hours to travel between the two cities.

The modernization of the Rokycany-Pilsen railway line is part of a larger project concerning the national railway in the Czech Republic. The project also fits into the concept of trans-European transport networks by the European Commission and complies with the requirements for interoperability of the European railway network.

The Ejpovice tunnel is the main tunnel of this project and its construction is supposed to improve the safety of railway operations. The project included the construction of two parallel single-track tunnels, each of 9.89 m-diameter with a length of 4,150 m. The tunnels were bored by a tunnel boring machine (TBM) named Victoria which weighs 1,800 tons, is 114 m long and 10 m in diameter and has a rotating head which allows tunnels to be bored and then lined with







segmented concrete rings, completely automatically, through both hard rocks and softer ground, or below aquifers. According to the original schedule planned by the designers of the tunnel, the TBM Victoria should have completed digging operations in November 2015, but during tunnelling operations it encountered unexpected problems due to the geological conditions of the ground. The TBM was then disassembled and refurbished and transported to the town of Kyšice, where it started to dig the second tube of the tunnel.

CUTTING-EDGE ADMIXTURES FOR A COMPLEX PROJECT

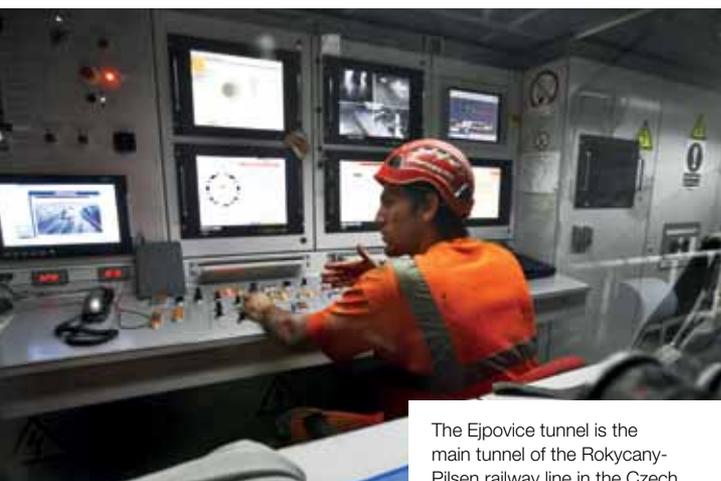
Mapei UTT (Underground Technology Team) cooperated closely with the contractor to choose the most proper chemical products for ground conditioning and find out their ideal application method. The process included several laboratory

tests conducted at the Polytechnic University of Turin (Italy) and then directly on the building site. The soil at the tunnel face is generally conditioned with the injection of POLYFOAMER FP/CC liquid foaming agent, with its parameters constantly adapted to the changeable geological conditions. In some tunnel sections the conditions were particularly complex, with the presence of huge amounts of water at the tunnel face, which required some other measures than just using the foaming agent. In these sections MAPEDRILL M1 synthetic polymer in liquid form, fully compatible with the foaming agent used, was injected into the excavation chamber of the tunnel boring machine. This polymer is able to improve the muck consistency immediately, thus allowing its extraction by means of the screw conveyor. The use of this polymer allowed the contractor to increase significantly the efficiency of the tunnel boring machine, improving the speed of the excavation works and reducing the time loss due to production breaks.

One of the TMB boring method characteristic is to build the lining using pre-cast reinforced concrete elements in the shield. The shield has always bigger diameter than the outer diameter of the tunnel lining ring. Therefore, cavities between the lining and the soil arise naturally during the boring and it is necessary to fill them by injection.

MAPEQUICK CBS SYSTEM, a two-component system for cement-based mixes for injection, has been chosen for the Ejovice tunnel. It is a system made up of MAPEQUICK CBS SYSTEM 1 liquid retarding agent, which during the application phase is mixed with the MAPEQUICK CBS SYSTEM 2 liquid activator admixture, which is able to ensure a very quick set of the mix.

DEFOAMER XP liquid defoaming agent was used in this building site to get rid of the foam during its release to the machine or on the surface. MAPEQUICK AFK 889 alkali-free accelerator for sprayed concrete was used during smaller additional boring works such as in the entrance and access pits.



The Ejovice tunnel is the main tunnel of the Rokycany-Pilsen railway line in the Czech Republic. Mapei supplied several products for excavation operations using a tunnel boring machine (TBM) named Victoria.



IN THE SPOTLIGHT MAPEQUICK CBS SYSTEM

It is a system specifically designed for use in cementitious mixes that need long workability. It includes MAPEQUICK CBS SYSTEM 1, a liquid retarding agent and MAPEQUICK CBS SYSTEM 2 liquid activator admixture. MAPEQUICK CBS SYSTEM 1 is a low viscosity solution able to retard cementitious mixes maintaining mix workability. In addition the solution assists in reducing bleed of the grout and decreases the grout viscosity. MAPEQUICK CBS SYSTEM 2 is suitable for activating cement setting in mortars or slurries used in injections. It also increases the viscosity of cement-based mixes, even where there is a high water/cement ratio. The main application field of MAPEQUICK CBS SYSTEM is the injection of cementitious mixes used in back-fill grouting behind the precast concrete segments in tunnels excavated by means of TBM (Tunnel Boring Machines).

TECHNICAL DATA

Ejpvovice Tunnels, Rokycany-Pilsen railway line, Czech Republic

Period of Construction: 2015-2017

Year of the Intervention: 2015
Intervention by Mapei: supplying products and admixtures for excavation works with tunnel boring machines

Design: Sudop Praha a.s.

Client: ŠZDC

Works Direction: Štefan Ivor

Contractors: Sdružení MTS, SBT - MTÚ Rokycany, Metrostav a.s.

Mapei Co-ordinators: Zdeněk Runštuk, Krcmar Ondrej, and Hela Vlastimil, Mapei spol. sr.o. (Czech Republic)

MAPEI PRODUCTS

Defoamer XP, Mapedrill M1, Mapequick AFK 889, Mapequick CBS System 1, Mapequick CBS System 2, Polyfoamer FP/CC

For further information see www.mapei.com and www.utt.mapei.com