

### Project

- Exploratory tunnel Saint-Martin-La-Porte 4
- Double tube tunnel
- Excavation with drill & blast and TBM method
- Contractor: JV SPIE Batignolles, Eiffage TP, Ghella, CMC, GOGES
- Costs: 500 Mio EUR

### Duration

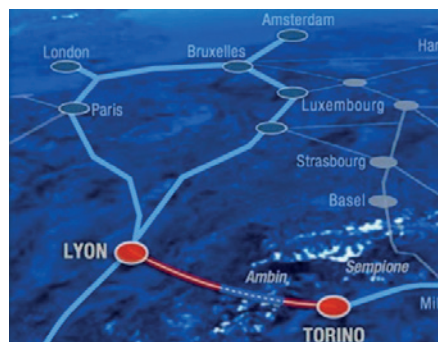
- 2015-2022

### Tasks

- Profile measurement
- Profile free
- Arch
- Blast pattern
- Rock bolt
- Contour

## Amberg Control speeds up the construction of the exploratory tunnel SMP4

The French-Italian base tunnel project, one of the longest rail tunnels in the world, lies at the heart of the trans-European rail network, connecting Eastern and Western Europe. The core of the project is a 57 km-long base tunnel crossing the Alps, between Saint Jean de Maurienne in France and Susa in Italy. This will form the main part of the new Lyon-Turin high-speed railway link.



The entire route from Lyon to Turin will be designed for operational speeds of up to 220 km/h, but in contrast to many recent railway projects, the infrastructure will be shared by both passenger and freight trains. The major advantages and benefits of the new line include increased safety as well as the reduction of heavy truck traffic. In addition, it will drastically shorten journey times between major European cities (source: Eiffage Travaux Publics, 2015).

### Construction of the exploratory tunnel SMP4

This project will round out the knowledge of the exploratory tunnel that was gained between 2002 and 2010 via the La Praz, Saint-Martin-la-Porte and Modane declines in France and the Maddalena decline in Italy. The project will mainly



“The use of Amberg Navigator tablet software is a big benefit for personnel, enabling them to carry out simple, routine surveying tasks reliably, efficiently and independently.

The Amberg Navigator tablet solution with the big screen allows us to see the 3D measured profile information clearly. Furthermore, positioning the instrument without knowledge of the control IDs is a plus and simplifies the workflow a lot.”

Olivier Gauche  
Surveyor Engineer  
Exploratory tunnel SMP4  
Eiffage Travaux Publics, France

### Challenges

- Up to four headings at the same time
- Real-time analysis
- 24/7 shift schedules

### Products Used

- Amberg Tunnel Office Software
- Amberg Control Office Software
- Amberg Navigator Tablet Software
- Leica TS15 Total Station

### Contact

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involve construction of an around nine kilometre long exploratory tunnel, which will be excavated in the direction of Italy using a TBM. This exploratory tunnel will be an integral part of the future cross-border tunnel that will link Saint-Jean-de-Maurienne and Susa. The purpose of the project is to gain greater knowledge of this geologically sensitive sector, which comprises a key stretch of the future Lyon-Turin line. For the exploratory tunnel at Saint-Martin-la-Porte, the French contractor is using the new and innovative Amberg Control software, which allows a simple and complete evaluation of 3D measured profile data exploited directly under the eyes of the tunnel crew: They are watching the profile that appears point after point on the tablet screen in order to correct under profiles.



Heading guidance with Amberg Navigator tablet software  
For drill & blast, the tunnel crew uses predefined patterns to simply set them out automatically on the tunnel face. In one section, the geology does not allow the use of drill & blast due to very big convergence which was measured. This part of the excavation is supported and executed by various Amberg Navigator tasks such as «Arch», which is used in sequential tunnelling, known as NATM. All Amberg Navigator tasks can be used by a dedicated tunnelling operator and you would not need a surveyor. But as a matter of fact, the tunnelling crew asks for so many different tasks that a surveyor was needed for the full time.



### Control surveying in 3D with Amberg Control

With Amberg Control, the simple and complete evaluation of measured profile data can be realised in a modern and intuitive software. Hence, importing and modifying design data becomes easier. Additionally, the 3D DXF-report to a CAD software is used frequently and is also very useful to generate a complete “as-built” model of the tunnel.

### Control point management in Amberg Tunnel

Managing the control points for each drive including a time history in the Amberg Tunnel software is what Mr. Gauche appreciates the most. New control points, which were missing due to convergence, shotcrete layer or damage by the tunnel crew, can be added easily. Furthermore, he highlights that the software can deal with all these features mostly automatically. For instance after a control point network measurement he can only press one button and all measured profiles from the past can be re-positioned to the new coordinates. “Without this control point management, or with the old TMS Office, we would have more than 1,000 points on the data base. In Amberg Tunnel we only have 400 control points and the history can be reached directly.”

The contractor and the tunnelling crew at the Lyon-Turin base tunnel confirm that the surveying tasks in the tunnelling process can be optimised by using the Amberg solution. Olivier Gauche states: “Especially the use of the built-in axis calculator improves the daily workflow. With the ability to work in Heading Stationing or in 3D Tunnelmeter, we can set out many equipments straightforward. The on-axis calculator in Amberg Tunnel calculates for instance the correct length of the conveyors belt, which follow the slope of the tunnel, efficiently.”