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HIGH-TECH PREMIERE FOR TGV TUNNEL.

Two months earlier than planned, tunnel boring machine Charlotte reached the west side of the Vosges Mountains, concluding excavation for the first tube of the »Tunnel de Saverne«. A newly developed high-tech machine from Herrenknecht is being used, which can be converted inside the tunnel and adjusted for different soil conditions. The twin-tube rail tunnel is part of the section on the TGV Paris-Strasbourg line currently being expanded for train speeds of up to 320 kilometers per hour.

Schwanau, Germany / Ernolsheim lès Saverne, France, September 6, 2012. The French TGV currently takes two hours and 20 minutes from Paris to Strasbourg. From Paris to Baudrecourt in the Lorraine region it runs on a high-speed line. Further expansion eastwards over 106 kilometers through Alsace to Strasbourg is running at full speed in order to shorten the journey time for passengers by 30 minutes from 2016. For tunnelling under the Vosges Mountains the French construction consortium Spie Batignolles TPCI – Dodin Campenon Bernard is currently using a tunnel boring machine (TBM) from Herrenknecht. The TBM began excavation of the nearly four kilometer long north tube on the eastern side of the Vosges at the launch portal near Ernolsheim lès Saverne in November 2011. Two months ahead of schedule it was able to complete excavation of the first tube on the west side of the Vosges in late June 2012. During the seven months of tunnelling the site teams achieved daily best performances of up to 46 meters and weekly best performances of up to 250 meters.

The Schwanau engineers adapted the Herrenknecht tunnel boring machine known as "Charlotte" (open mode convertible EPB Shield S-670, Ø 10,010 mm) to the geological conditions in the project in such a way that it could handle excavation in two different soil types. For the first 200 meters of the northern tunnel it worked through unconsolidated rock (a mixture of sandstone and shell limestone) in the closed EPB (Earth Pressure Balance Shield) mode. In accordance with the prevailing hard rock (red sandstone) that followed, the rest of the advance was continued in open mode. For switching between modes all that is needed are some adjustments at the cutting wheel. The conveyor belt and the screw conveyor remain installed on the machine in both modes. The Saverne project is the first time a Herrenknecht TBM with a convertible EPB shield has been used that can also handle the open hard rock mode with belt conveyor discharge. "The Tunnel de Saverne is a special challenge," says Herrenknecht project manager Stephan Hanusek, and continues: "The conversion went without a hitch, so the machine was ready again in a few days." Since the breakthrough of the first tunnel, the machine is being disassembled and the individual components transported back to the launch platform at Ernolsheim lès Saverne. "Charlotte" is scheduled to begin excavation of the southern tube in October.

With well under two hours traveling time from 2016 the TGV on the Paris-Strasbourg line will be an attractive and eco-friendly alternative to the air link. Then the French railway companies will also have reached a milestone for the great European project of expanding the rail network for high speed services from Paris via Strasbourg and Stuttgart to Bratislava.

Herrenknecht AG

Herrenknecht AG is the only company worldwide to deliver tunnel boring machines for all ground conditions and all diameters – ranging from 0.10 to 19 meters. The product range comprises tailor-made machines for traffic, supply and disposal tunnels as well as additional equipment and service packages. Herrenknecht also manufactures boring systems for vertical and inclined shafts as well as deep drilling rigs. The Herrenknecht Group achieved a total operating performance of 1,104 million euros in 2011, supplying 65 tunnel boring machines for traffic tunnels alone in that same year. All in all, Herrenknecht equipment has completed 1,900 kilometers of tunnels in large diameter ranges of over 4.20 meters since its establishment in 1977. The Herrenknecht Group employs around 4,000 people worldwide and trains more than 240 young people. With 77 subsidiaries and associated companies in Germany and abroad, Herrenknecht offers comprehensive services tailored to the respective project and contractor.

Tunnel de Saverne, France

Machine data S-670		**Project data**	
Machine type:	Convertible EPB Shield	Project owner:	RFF (Réseau Ferré de France)
Diameter:	10,010 mm		
Cutting wheel power:	3,600 kW	Customer:	Spie Batignolles TPCI Dodin Campenon Bernard
Rated torque:	23,707 kNm	Tunnel length:	2 x 3,846 m
Weight:	2,400 t	Geology:	Red sandstone, sandstone, shell limestone
Length:	105 m		

TBM mode (closed/open)

Closed EPB (earth pressure balance shield) mode:
In this mode, secure support of the tunnel face is effected with the material excavated by the cutting wheel. The volume of the material transported away by a screw conveyor behind the cutting wheel is precisely regulated by the conveying speed of the screw.

Open mode:
The more stable tunnel face here only needs to be supported by the cutting wheel. The excavated material is transported away via a conveyor belt.

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