



Press Release

HERRENKNECHT Turning old into new: tunnel enlargement during operation

September 09, 2024

Schwanau, Germany

In the second half of the 19th and early 20th centuries, hundreds of railway tunnels were built in Europe. They are largely still in operation today. In the coming decades, a considerable number of tunnels are due for substantial renewal. With the Tunnel Enlargement System (TES), Herrenknecht has developed a solution for enlarging the tunnel profile of old railway tunnels while rail traffic continues to run.

Two Tunnel Enlargement Systems (TES) from Herrenknecht have been in use since January 2024 for the renewal of Deutsche Bahn tunnels near Limburg an der Lahn. The 160-year-old tunnels will thus be renovated while rail service continues. The 426-meter long Fachingen Tunnel and the 732-meter long Cramberg Tunnel are part of the Lahn Valley Railway connecting the cities of Koblenz and Wetzlar.

With the start of industrialization in the 19th century, the construction of railway lines and the associated tunnels began. In Austria, Switzerland and Germany alone, around 800 tunnels were built between 1850 and 1910. They are now getting on in years. In order to electrify the lines, accommodate larger track gauges and faster trains, comply with current safety standards or replace the tunnel lining due to age, it is necessary to enlarge the tunnel profile.

The Tunnel Enlargement System (TES) developed by Herrenknecht makes it possible to carry out tunnel renewal during ongoing rail operation. First the existing tracks are dismantled, and a track is laid in the middle of the existing tube instead. Rail traffic will continue to run safely on this track throughout the entire construction period. The Tunnel Enlargement System (TES) moves forward step by step during excavation for the widening of the tunnel. At the same time, it serves as a protective enclosure and separates the construction work from ongoing rail traffic.

For the two double-track tunnels of the Lahn Valley Railway, the radius of the tunnel cross section will be enlarged by a good two meters, thus achieving dimensions

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corresponding to current new tunnels. The approximately 46 meter long, 270 tonne TESs with a diameter of around 12 meter for the Fachingen and Cramberg tunnels run on foundations and rails specially laid in the tunnel. The TESs are equipped for conventional excavation and support work. Depending on the hardness of the rock, excavation is done by chiseling or blasting. First, the old tunnel walls, usually masonry, are broken out. This is followed by excavation of the rock by chiseling or blasting and removal of the material. The excavated material falls to the side of the machine into the tunnel invert and is removed by separate conveyor and loading equipment. After each drilling and blasting round, a shotcrete manipulator applies the temporary shotcrete support. The rock is also stabilized with anchors. Reinforcement mesh and steel arches together with the shotcrete and anchors form the initial support. Once tunnelling with the TES has been completed, the final lining of the tunnel using in-situ concrete is then carried out in a second construction phase.

The TES consists of three parts. The front part of the machine is used for pre-excavation protection. It prevents the existing tunnel from collapsing in the area ahead of the respective excavation work or rock falling onto the tracks. The middle section is the carrier for the equipment required for tunnelling: telescopic drill rigs on both sides, hydraulic impact hammer on a central boom with a large radius of action, shotcrete system on a ring guide. The machine has large, retractable working platforms that allow the workers to safely reach the tunnel face and the intrados. The equipment for operating the TES is located in the rear part of the machine. This includes a hydraulic station to supply the hydraulically driven equipment, a compressor for the supply of compressed air, the electrical system, and a material storage.

The design of the TES used on the Lahn Valley Railway incorporated the consortium's experience from previous projects and that of Herrenknecht from the use of a first TES in Spain. Renovation of the 558-meter long Gaintxurizketa Tunnel between Astigarraga and Irun in the foothills of the Basque Pyrenees was completed in March 2024. The renovated tunnel will improve the connection between the Spanish and French rail networks as part of the EU's future Atlantic corridor.

PROJECT DATA: FACHINGEN TUNNEL AND CRAMBERG TUNNEL

- › Client: DB InfraGO AG
- › Contractors: Consortium of Porr GmbH & Co. KGaA, Feldhaus Bergbau GmbH & Co. KG and Heinz Schnorpfeil Bau GmbH
- › Application: tunnel renewal, tunnel widening under ongoing rail operation
- › Drive lengths: Fachingen Tunnel 426 m and Cramberg Tunnel 732 m
- › Geology: clay schist

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BORING TECHNOLOGY

- › Machine type: 2x Herrenknecht TES
 - › Boring diameter: 12,060 mm each
 - › Weight: 270 t each
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Photos:



Photo 1

Train passing through the Tunnel Enlargement System on the Lahn Valley Railway, shortly before the start of excavation work on the Cramberg Tunnel.



Photo 2

Inside the Cramberg Tunnel: Tunnel Enlargement System during ongoing rail operations.



Photo 3

Cramberg Tunnel: excavation of the rock by the hydraulic impact hammer of the Tunnel Enlargement System.

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For further information: Please contact us.

Herrenknecht AG

Herrenknecht AG is the only company worldwide to deliver tunnel boring machines for all geologies and in all diameters – ranging from 0.10 to 19 meters. The product range comprises tailor-made machines for traffic, supply and disposal tunnels, technologies for pipeline installation as well as additional equipment and service packages. Herrenknecht also manufactures drilling equipment for vertical and inclined shafts as well as deep drilling rigs.

In 2023 the Herrenknecht Group achieved total output of 1,296 million euros. The independent family business employs about 5,125 people worldwide, including approximately 200 apprentices and trainees. With over 60 domestic and overseas subsidiaries and associated companies working in related fields, Herrenknecht provides comprehensive, fast and targeted services close to each project and contractor.

› <http://www.herrenknecht.com/en/references>

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