FLASHES OF LIGHT AT THE END OF THE TUNNEL

Excavation of a complex tunnel system for the XFEL European research facility in metropolitan area Hamburg was successfully completed in early June when the Herrenknecht AMELI tunnel boring machine entered its last target shaft. AMELI and its TBM sister TULA had to be relocated several times for the eleven tunnel sections between the research center DESY in Hamburg Bahrenfeld and Schenefeld in the district of Pinneberg. Exact laser technology provided by the Gesellschaft für Vermessungstechnik (VMT) kept the two TBMs perfectly on course over the route totaling 5.78 kilometers.

Hamburg/Schwanau, Germany, August 3, 2012 As of 2015, electron and x-ray light – not traffic or water – will be flowing through the European XFEL (X-Ray Free-Electron Laser) research project tunnel system. Up to 27,000 ultra-short laser flashes per second will be generated in the x-ray range by XFEL with the aim of enabling the shooting of chemical reactions, for example, and giving rise to entirely new research opportunities for physicists, biologists, chemists, doctors and material scientists.

"Technically, the tunnel system is extremely complicated", reports Steffen Benad from Herrenknecht, who provided support at the jobsite in western Hamburg. "Just imagine how large this structure is and then how small the light beam will be at the end." The two 500 and 560-ton Mixshields with diameters of 6.16 and 5.45 meters were baptized TULA (Tunnel for Laser) and AMELI (Am Ende Licht - Light at the end). They were used by Hochtief AG and Bilfinger Berger AG for excavating the complex tunnel system network. In order to keep them exactly on course in the 3.4-kilometer plant, Herrenknecht used a laser-guided navigation system from VMT, subsidiary of Herrenknecht AG based in Bruchsal. By late July 2011, TULA had successfully completed its task for the more than two kilometer long main tunnel and the two further 600 meter long sections.

The tube system network at the end of the tunnel proved particularly complex for the engineers. The total of eight tunnel sections involved moving AMELI three times through a finished shaft and lifting it out of the shaft four times for relocation.

"Tunnelling is one of the most difficult areas of the construction", claimed Prof. Dr. Massimo Altarelli, CEO at European XFEL GmbH, within the framework of a ceremony. "We are delighted that this work is being completed on time." Operation of the two Herrenknecht machines for the tunnel system network over a total distance of 5.78 kilometers took from July 2010 to the end of June 2012.

Prof. Dr. Helmut Dosch, Chairman of the Deutsche Elektronen-Synchrotron DESY Board, head shareholder of the European XFEL GmbH, was visibly satisfied: "Completion of

tunnelling work on time has enabled us to achieve a key milestone for this unique research facility." And now there's nothing to stop the installation of technical infrastructure and accelerator components.

There is a tradition of collaboration with Herrenknecht in Hamburg which is also associated with various innovations. For the first time in 1985, Herrenknecht supplied a Mixshield to Hamburg for the construction of the HERA (Hadron-Elektron-Ring-Anlage) elementary particle accelerator. This was the first machine to move safely in soil containing excessive ground water. In 1997, Herrenknecht supplied the world's largest Mixshield at the time for excavation the 4th Elbe Tunnel tube.

Other key projects in Hamburg:

1985-1987:	Herrenknecht delivered its first Mixshield for the Hadron-Elektron-Ring-Anlage (HERA): HERAKLES.	
	Diameter: 5.95 meters	Tunnel length: 6,300 meters
1997-2000:	Herrenknecht Mixshield TRUDE (deep under the Elbe) masters the fourth tube of the Elbe Tunnel.	
	Diameter: 14.2 meters	Tunnel length: 2,560 meters
2004-2006:	SOFIA (German acronym for: Olsdorf-Airport suburban railway in progress) burrows through construction sections 5-8 of the Hamburg Airport suburban railway line (S1).	
	Diameter: 6.87 meters	Tunnel length: 3,413 meters
2008-2010:	The Mixshield VERA excavated for the U4 metro line (from the Elbe toward the Alster).	
	Diameter: 6.57 meters	Tunnel length: 5,620 meters

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