IBoTec

An innovative drilling technique for the installation of underground cables in the course of the German grid expansion

Actually the German Energy Supply is subject of a world-wide unique and generation-spanning change process. One important and urgent challenge is the requirement of a fast grid expansion in the high voltage transmission system. As laid down by the federal requirements plan, many of the additionally needed power lines in the German transmission system have to be installed using underground cables. A common way for their installation is the open-trench method. Use of a trenchless drilling technique could circumvent some construction sectional depending challenges of the open-trench method (e.g. space requirements, excavation, planning in construction and environment management). Out of these reasons the world market leader in mechanical tunneling technology Herrenknecht AG, the transmission system operator Amprion GmbH as well as the RWTH Aachen University working together on the development of a new drilling technique E-PowerPipe. The project passed already the first on-road test and is founded by the federal ministry for economic affairs and energy.

Figure 1: Installation of the drilling technique in principal [Source: Herrenknecht AG]

Necessity for new laying technologies

In the Federal Requirements Plan Act it is stated that the HVDC transmission lines planned in the framework of the grid expansion have to be constructed primarily as underground cables. The most common installation technique for underground cables is the open trench method. To minimize the environmental impact of this method, special construction measures have to be applied. For example, when refilling the trench the natural ground structure has to be restored at best. These measures lead to extended construction times, increased costs and larger land consumption along the cable route during the construction period. Already available drilling techniques limiting the excavation works to the start and end shafts of the drill hole, are currently not suitable for an extensive use in the framework of the
grid expansion. In the project IBoTec the partners Herrenknecht AG, Amprion GmbH and the IFHT are working together on the development of a new drilling technique, which fulfills the requirements to be used in sections with special requirements.

![E-PowerPipe Technology](image)

**Figure 2: E-PowerPipe Technology [Source: Herrenknecht AG]**

**Development and testing of the drilling technique**

Herrenknecht AG, market leader in the field of mechanized tunneling technology, performs the development of the drilling technique. A first test of the new technique is carried out on a test line on the Herrenknecht AG company site. The transmission system operator Amprion has provided a 300 m pilot line integrated in the construction of a 380 kV cable line near Borken.

**Analysis of the thermal operating behavior**

The IFHT carries out the investigations regarding the influence of the new laying technique on the cable operational thermal behavior. The aim is to facilitate the calculation of the ampacity of cables using this technique. In this context, a model based simulative analysis is conducted. Additionally experimental verification tests are performed. Therefore the drilling test line is extended to be able to measure the soil temperature and humidity around cables installed using the new technique under realistic conditions. A mobile test container is designed and constructed, which contains the necessary control and measurement devices.

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**Project information**

**Partners**
- Herrenknecht AG
- Amprion GmbH
- Institute of Construction Business and Project Management
- Institute for High Voltage Technology

**Facts**
- Acronym: IBoTec

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