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PIPE EXPRESS®

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PIPE EXPRESS®

THE NEED

By developing Pipe Express® Herrenknecht AG has set new standards for installing pipelines. With this system, no groundwater lowering is necessary and, in comparison with the open construction method, routes can be considerably narrower. This has a positive effect on construction costs. Because it is highly ecological and cost-efficient procedure, the development of this new system is being subsidized by the German Environment Ministry.

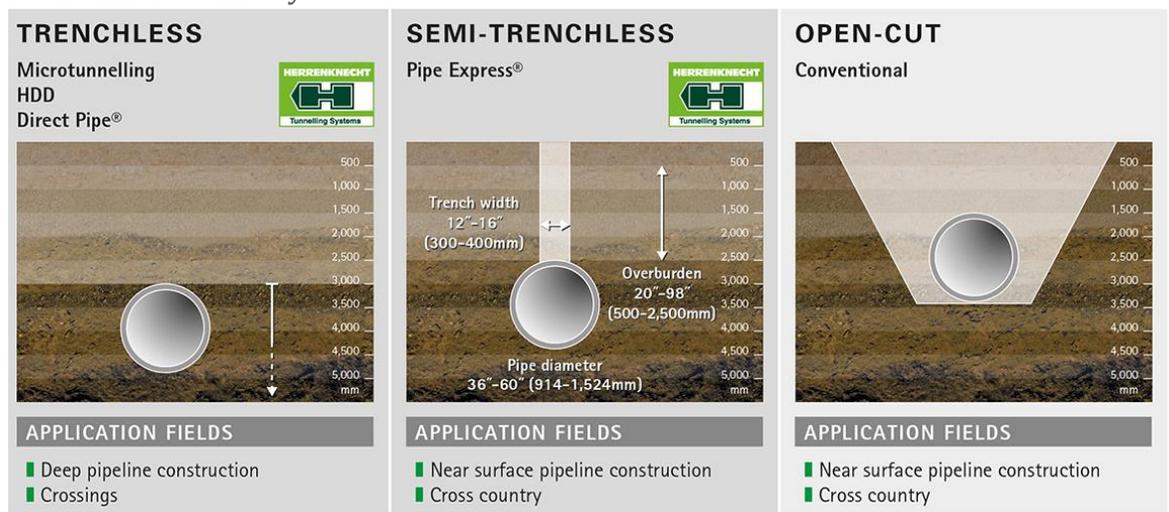


FIGURE 1 APPLICATIONS FOR PIPELINE CONSTRUCTION

THE TECHNOLOGY

Pipe Express® from Herrenknecht is a new, semi-trenchless near-surface pipeline installation method. In this method, a buggy with a trenching unit creates a narrow, approximately 40-centimeter-wide trench on the surface. Below it in the soil a boring machine is mounted that digs the actual tunnel with diameters of up to 1.50 meters and installs the pipeline in one step. The excavated soil is brought to the surface by the trenching unit and backfilled in the trench again behind the machine. Laborious finishing work is not required. The push force for both excavation unit and pipeline is provided by the Herrenknecht Pipe Thruster located in the launch pit. The modular design of the entire system allows easy transport and relocation, as well as high flexibility in changing project conditions. The compact system is remote-controlled from the operating vehicle and no trenches have to be dug. Up to 2,000 meter long



pipelines with a diameter of 900 – 1,500 millimeters (36" - 60") can thus be laid quickly and cost-efficiently.

MAIN SYSTEM COMPONENTS

The Pipe Express® technology is based on the combination of a tunnel boring machine (TBM) and a trenching unit (1) as shown in Figure 2. The native soil is loosened by the TBM and transported directly to the surface via the trenching unit. The required thrust for drilling and pushing the pipeline (2) into the borehole is provided by a stationary push unit (4) anchored at the starting point – the so called pipe thruster. The pipe thruster is controlled by the operating vehicle (3). It accompanies the excavation unit and provides the required logistics and control systems for the whole system. All machine operations are monitored on an integrated camera system visualized inside the operator's cab. Cameras on the advancing excavation unit and at the starting point allow the machine operator to constantly monitor the production.

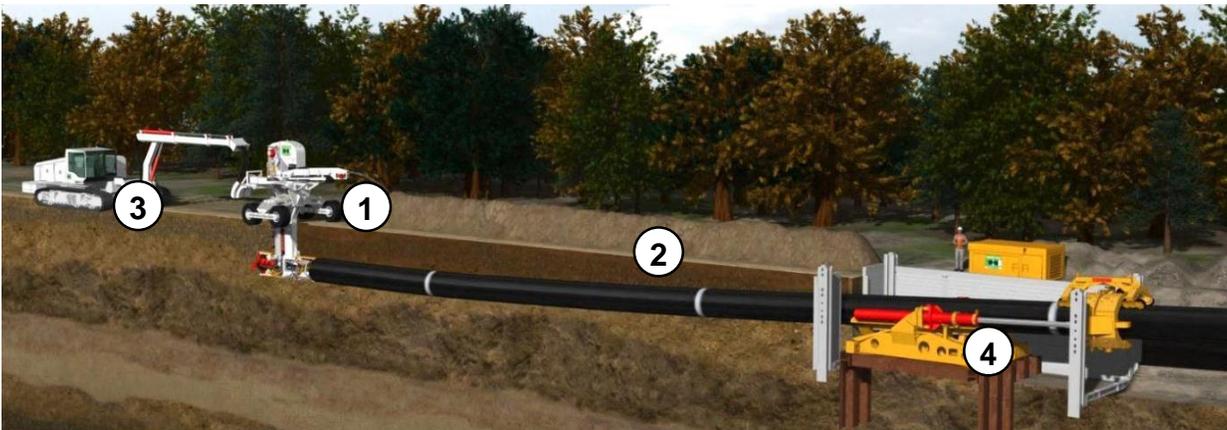


FIGURE 2 PIPE EXPRESS® MAIN COMPONENTS, INSTALLING PIPELINE FROM RIGHT TO LEFT

THE BENEFITS

The Pipe Express® technology combines the advantages of trenchless installations and open-cut solutions. Pipe Express® can be used in any kind of soft to medium formations. However, the technology exhibits its major benefits mainly in unstable soils such as sand and gravel as well as in soil with water-bearing layers.

Pipe Express® helps to keep the impact of the construction activities on the surrounding environment to a minimum. When crossing agricultural lands and environmental protection areas, major harvest losses and long-term compensation payments can also be reduced using the Pipe Express® system. Due to the reduced surface needed for the pipeline installation, the Pipe Express® method is the first-choice technology in environmentally sensitive areas. Disturbances of the natural soil structure are minimal which makes the subsequent cultivation easier. The groundwater level along the route does not have to



be lowered, only in the area of the launch and target pits. Water-saturated soil layers are prevented from drying out. The acceptance by the population, land users and land owners is improved due to the reduced use of heavy equipment and shorter construction periods.

As the pipeline is quickly installed in one step and fewer construction machines are required, emissions of exhaust gases and noise can be decreased considerably. Due to the removal of the excavated soil by screw, trench cutter and belt conveyor directly to the surface, no slurry circuit is required for the transport of the cuttings through the pipeline. Thus, separation equipment on the surface and water for the slurry circuit are not needed.

With Pipe Express[®], in comparison with the open-cut method the corridor as well as the corresponding earthworks can be reduced by up to 70 percent. This also increases acceptance by the population, land users and landowners as the use of large equipment is reduced and construction time is shortened. Extensive earthworks, groundwater lowering, the ramming of sheet piles etc. are not necessary. This means that only a minimum of heavy earthmoving equipment and manpower is needed, increasing work safety at the same time.



FIGURE 3 PIPE EXPRESS[®] OPERATION IN NARROW PIPELINE CORRIDORS



PIPE EXPRESS® HISTORY

In November 2012 the first gas pipeline was installed in the Netherlands using Pipe Express® technology. The 48-inch gas pipeline had a total length of about 1,600ft (500m) and was laid in two pipe sections. A further installation of a 42-inch gas pipeline has been executed in Thailand using PEX technology in 2014. The Pipe Express® record of a 1,036 meter long section of a 48-inch water pipeline near Stockholm in Sweden was set in March 2015. The Pipe Express® method was chosen to work under groundwater, with a water level just below the terrain's surface. Groundwater lowering was not required.

APPLICATION/BARRIER

- Pipe Express is designed for soft ground not for Rock formation
- Maximum crossing length is depending on the diameter & friction between clamping unit & pipeline. The smaller the diameter the lower the maximum push force. This can be compensated by using multiple Pipe Thrusters under consideration of the allowed pipe stress figures.
- Must be steel pipe, no plastic pipe possible, wall thickness of steel pipeline is important for determination of maximum allowable clamping & push/pull force.
- Installation depth up to 2,5m is standard, special design available up to 4,5m Installation depth.
- 36" Pipeline diameter is smallest Diameter for the Pipe Express unit with Cutter head and Trencher. Below 36" the Pipe Express machines is without cutter head but with the trencher
- The coating must be comparable to a coating which is used during the HDD or the Direct Pipe process.
- Under passing of utilities. The existing Utility lines must temporarily layed on a bridge where the Pipe Express Unit can pass underneath. If this is not possible you have to stop before the crossing, disassemble the Pipe Express machine, push the steel Pipe underneath the obstacle and assemble again the Pipe Express machine.
- Compared to the open trench you cannot use cold bended steel pipelines to change direction. The alignment of the Pipe Express route has to follow the minimum bending radius of the steel pipe like on a HDD design.

STATUS

In 2013, Herrenknecht received the IPLOCA 'New Technologies Award' and the 'bauma Innovation Award' for the Pipe Express® innovation. In November 2015, the Pipe Express® technology was honored with the NOVA Award in Houston.



FIGURE 4 PIPE EXPRESS® OPERATION IN SWAMPY AREA IN STOCKHOLM, SWEDEN

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REFERENCES

Peer reviewed as an emerging construction technology

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