# MICROTUNNELLING

Trenchless public utility construction
and design from Colas Alterra

#No surface disturbance #Versable trajectory #No dewatering

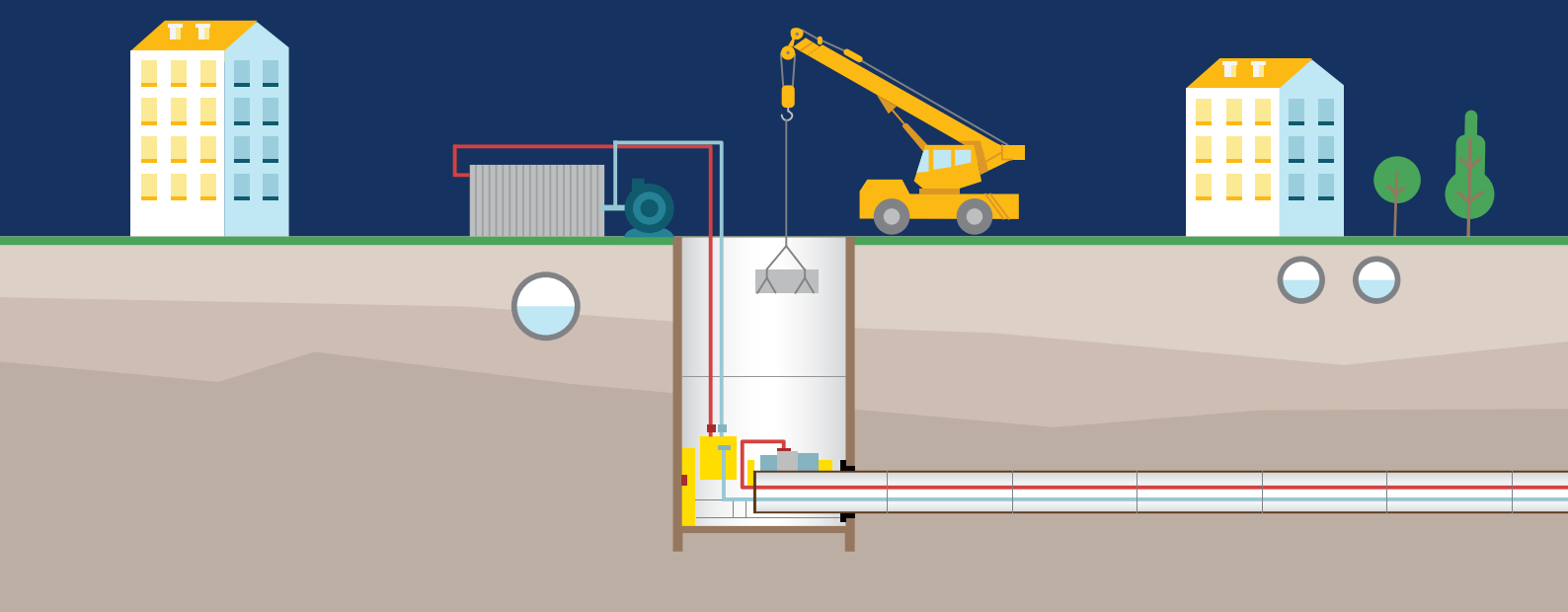
## INTRODUCING **COLAS ALTERRA**

Operating for nearly 90 years, Colas is now present with 57,000 employees in 50 countries on 5 continents. A member of the Hungarian Colas Group, Colas Alterra specialises in public utility construction works, environmental investments and urban rehabilitation projects. Our chief target is to remain a reliable partner to our clients, while applying the strictest technical standards, and completing our assignments on time in each and every case. Several of our projects have received the Hungarian Construction Industry Award for Excellence – including the construction of the Budapest Central Sewage Treatment Plant with the related main-current line discharge, and the construction of the Szeged main collector. Throughout its 65-year-long history, Alterra has gained considerable experience in the field of urban public utility and guided rail projects, which require a high level of expertise and first-rate organisation. We take pride in having become one of the key players on the market.

**Trenchless solution**

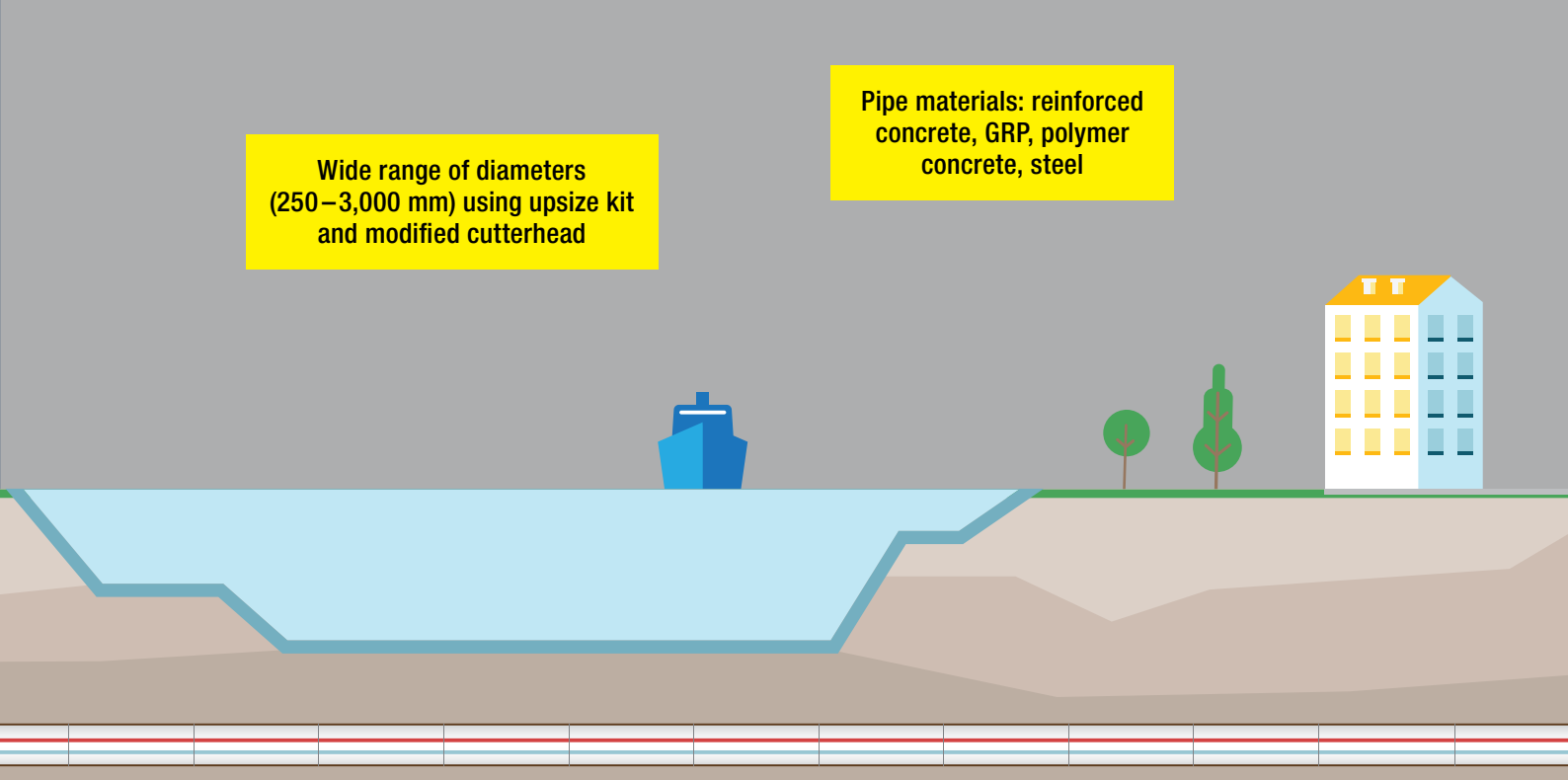
**No disturbance on the surface (traffic, rivers, buildings)**

**Adaptable to all soil conditions (rock, clay, silt, gravel)**



## MICROTUNNELLING

Trenchless public utility construction solutions are highly effective in case of densely built-up urban areas, passages under watercourses and numerous other applications. Microtunnelling techniques start from a diameter of 250 millimetres – however, the method enables the construction of underground utility lines with concrete, steel, or glass-reinforced plastic (GRP) pipes up to three metres in diameter. Depending on the type of soil, we can distinguish two major methods within microtunnelling: AVN (Automatisches Nassförder System) and EPB (Earth Pressure Balance Shield). Both technologies resemble tunnel boring procedures, but in case of microtunnelling, a smaller, remotely controlled machine performs the boring and the jacking of the public utility pipes. Since 1999, Colas Alterra has been using the equipment manufactured by German company Herrenknecht for microtunnelling works.



## AVN TECHNOLOGY

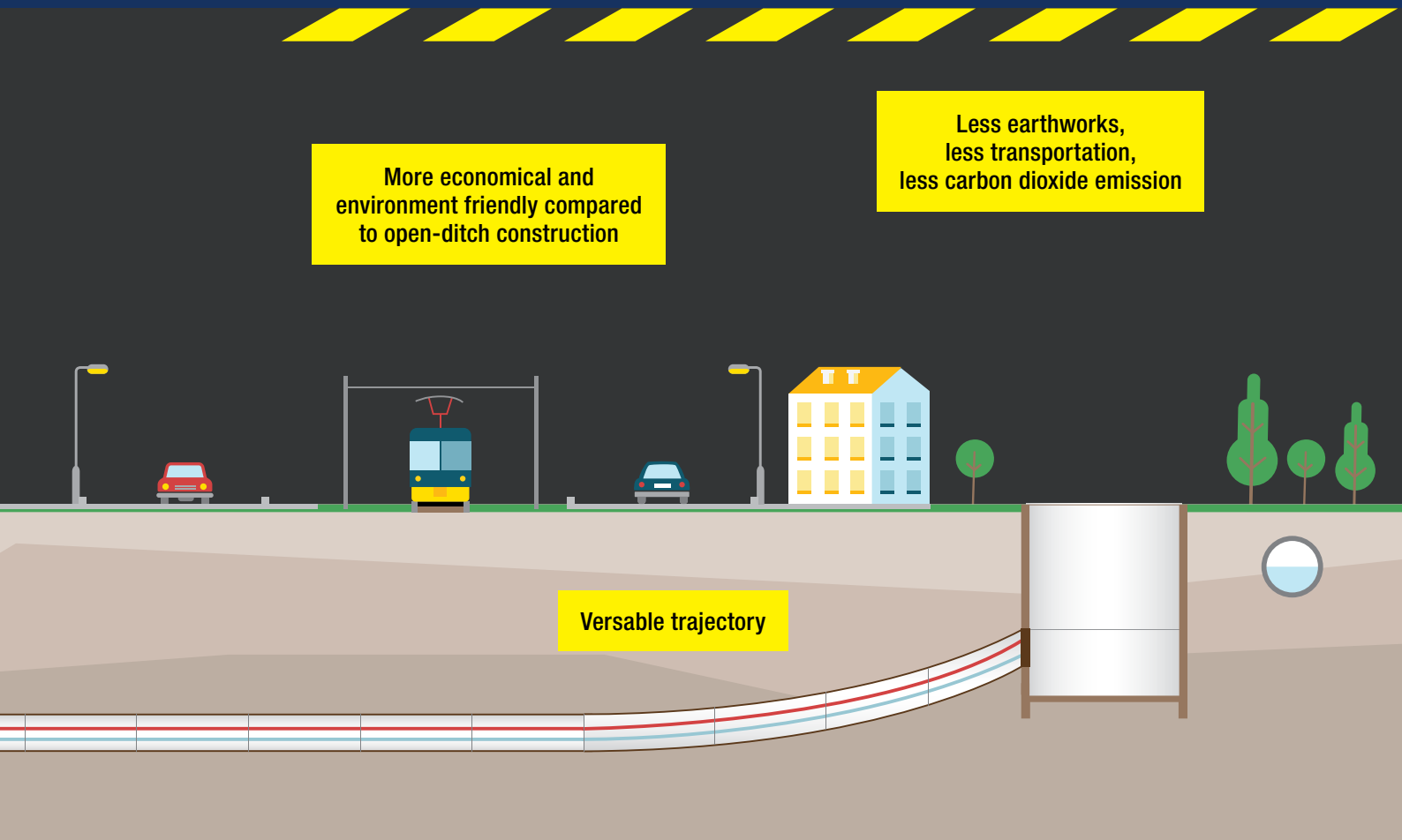
The automatic wet tunnelling technology applies a hydraulic slurry circuit. Soil is excavated by a cutterhead matching the respective soil type ranging from silt to rock. Excavated rocks are crushed inside the excavation chamber, and advance to the suction port, where the material is mixed with water, and is removed by pumps.

## EPB SHIELD TECHNOLOGY

The Earth Pressure Balance technology is ideal for soft clay and silt soils. The homogeneous excavated soil is used as support medium. In the excavation chamber, the excavated soil is mixed into a paste, which is used as a pressure medium. Balance is achieved by controlled advancing and soil removal though screw- and belt conveyors.

> SINCE 1999, COLAS ALTERRA HAS SUCCESSFULLY COMPLETED OVER 25 PROJECTS WITH THE APPLICATION OF MICROTUNNELLING TECHNIQUES

Microtunnelling procedures allow for both vertical and horizontal changes of direction in pipelines. If the intended length of the pipeline is too extensive for jacking, intermediate jacking stations can be put in place to push the entire section into place with a sort of peristaltic motion. Upon jacking, the rubber gaskets inserted between the pipe segments are pushed to each other, and ensure the sealing of the pipeline. Furthermore, bentonite is pumped between the soil and the concrete pipes, which facilitates progress during the jacking phase.

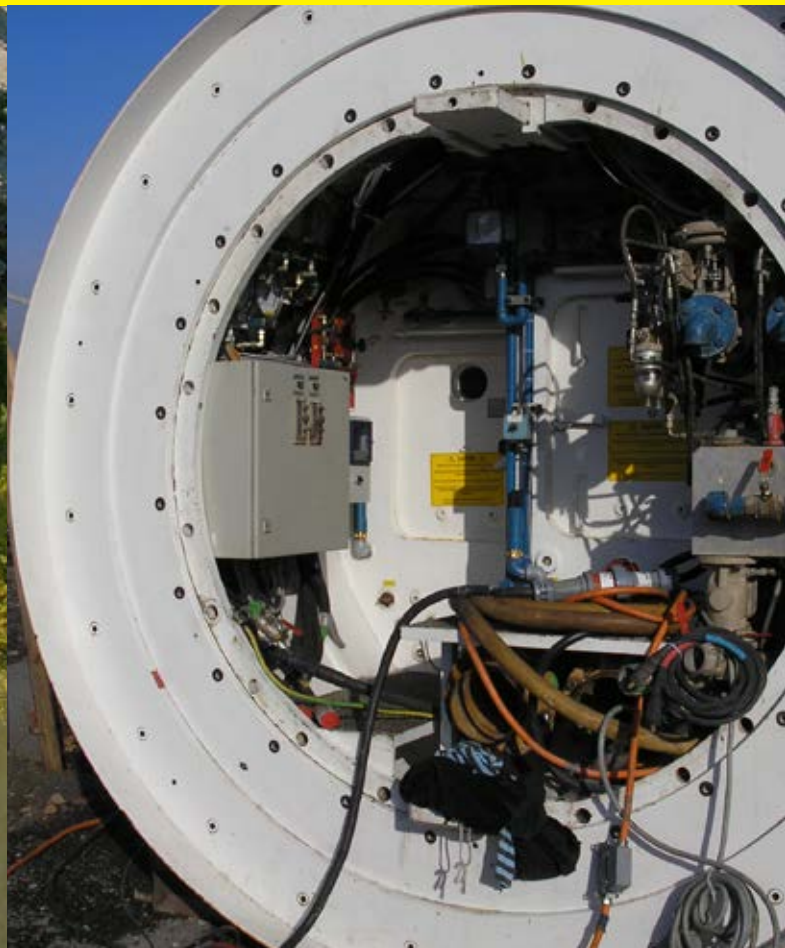


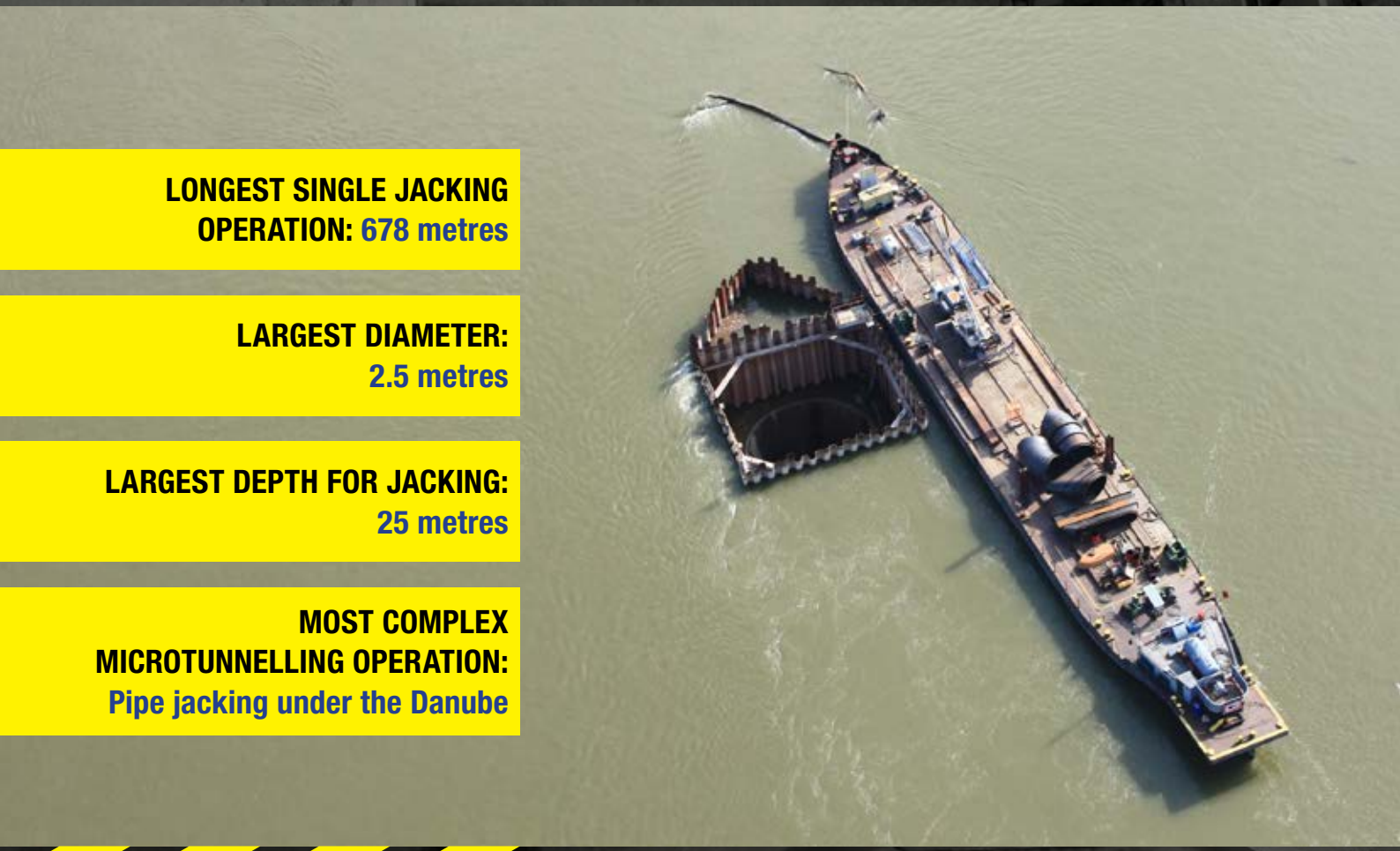
## CASE STUDY: **PUBLIC UTILITY CONSTRUCTION WORKS UNDER THE DANUBE**

In connection with the Budapest Central Sewage Treatment Plant project, Colas Alterra constructed the main pipelines underneath the Danube. Jacking operations were supported by four shafts with a diameter of 10-12 metres and a depth of 25 metres, respectively. Due to the considerable depth and the jacking distance of 500 metres, heavy-duty pumps had to be put in place for conveying the extracted slurry to the surface. In case of AVN equipment, the jacking operation covers the following main steps: Through high-pressure nozzles, water is injected into the excavation chamber. Meanwhile, the knives fitted onto the cutterhead mill concentric circles into the soil, and create the so-called annular gap, which is filled with the bentonite slurry pumped in through the automatic lubricating system.

### THE TWO 1.6-KM-LONG, 1,400-MM-DIAMETER SEWAGE LINES WERE BUILT WITH MICROTUNNELLING METHODS.

During the excavation phase, the soil is transferred into an intermediate chamber, where a screen filters the soil crushed by water and a steel grinder. The screen is connected to a slurry feedback line. In order to avoid drops in pressure, the system is supported by a number of pressure booster pumps. Pressure boosting is regulated through the design of the hydraulic system. During jacking, the so-called Universal Navigation System (UNS) helped keep the machine precisely on course. The UNS relayed the data into the control container, where the operator followed the process, and made adjustments, if required.





**LONGEST SINGLE JACKING OPERATION:** 678 metres

**LARGEST DIAMETER:** 2.5 metres

**LARGEST DEPTH FOR JACKING:** 25 metres

**MOST COMPLEX MICROTUNNELLING OPERATION:** Pipe jacking under the Danube

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