

Abstract No 11

Abstract for CATT Trenchless Technology Road Show

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Brief biography of Dr. Gerhard Lang

Gerhard's background is in civil and mechanical engineering. After working for Herrenknecht as project manager he finished his PhD in Civil and a MBA in International Marketing and went to work for Amiantit. Since 2008 he is back with Herrenknecht as Business Development Manager for Utility Tunneling focusing on North America.

Title

Single- and Multimode Segment Liner Technology for Small Diameter Tunnels

Segment Lining Technology becomes more popular for small diameter tunnels worldwide. The intriguing benefits are the flexibility for curved alignments and long distance drives. In comparison to standard Micotunnelling and Pipe jacking no intermediate jacking stations are needed, no bentonite lubrication and most importantly less loads on the liner, since the thrust loads are transferred into the surrounding soil by the last built segment rings and the cementitious grout around.

Depending on the geological and hydrological profile along the alignment different excavation methods can be engaged. The one with the widest range is the Slurry, Hydrosshield or Mixshield system which basically relies on a well designed bentonite slurry to provide the tunnel face stability and to transport the soil in separate lines inside the tunnel to the surface. In EPB mode (Earth Pressure Balance) the original soil is being used for positive tunnel face support and therefore is only applicable in geologies with proper soil composition with certain fine content or the absence of groundwater.

Once no groundwater can be encountered along the tunnel route open-face TBMs can be use. In order to conclude the different full-face systems Hard Rock Single Shield and Double Shield TBMs need to be mentioned.

For longer drives in varying ground conditions multimode systems have proven successfully which combine 2 or 3 of the above mentioned modes.

For small diameter tunnelling, due to the lack of cross sections to accommodate the required components, the slurryfier box system has proven successfully in various projects. It combines the EPB and Slurry TBM technology by a slurryfier box, which is mounted to the outlet section of the screw conveyor. Slurry lines connected to the box allow a safe transport of the excavated material even when encountering higher hydrostatic pressures.

Segment liner machines have been used starting at 2,0m internal diameter whereas larger diameters enable a more convenient operation for the construction personnel inside the machine.

For sanitary sewer installations, a corrosion resistant liner embedded in the reinforced concrete mix during the poring of the segments has recently proven successfully at a tunnel project in Ontario. The so-called Combisegments can be installed as single liner and thereby save time and money during the construction.

The presentation will cover the various technologies for segment lining including multiple case studies.