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Tunnelling History - an 11m TBM Excavates and Erects for the Construction of Escalator Tunnels

ПОЗДРАВЛЯЮ!

CONGRATULATIONS!

LOVAT congratulates “Mosmetrostroy” on the successful completion of the first of several planned escalator access tunnels for the Moscow Metro System. This is the first drive in tunnelling history where a large diameter EPB TBM has excavated, mucked and erected tunnel lining on a 30° decline for the construction of escalator tunnels.

The 11 metre diameter mixed ground EPB TBM “Victoria” is currently being disassembled within itself inside the tunnel and transported back through the tunnel it mined and to the surface. The TBMs sacrificial skins, will be left in place to support the tunnel wall during TBM disassembly.

The ground conditions encountered, in conjunction with the 30° decline, posed unprecedented design challenges, in particular stabilizing the TBMs centre of gravity. To overcome this challenge, modifications were made to the cuttinghead overcut diameter such that the mounting of the main drive was offset upwards in a vertical direction. This development eliminated a gap between the TBM outer surface and the ground at the invert, which in turn kept the TBM from sinking at the invert. In addition, the modifications implemented allowed the TBM to operate within the confines of the designed tunnel axis tolerances.

A main design challenge with regards to material handling was the delivery of the 7.25 tonne concrete segments down the 30° tunnel. A mine-type cable hoist system was implemented to deliver materials from the tunnel portal to the TBM backup system. This required a large segment car to be lowered by cable into the tunnel. The car was custom designed to handle the large segments and other materials, while ensuring safety of the personnel working within the TBM.

Due to the decline of the tunnel and the pressurization requirements of the face a double screw conveyor and pumping system was deemed as the most viable method for muck extraction, as opposed to traditionally used belt conveyors. The final design was a primary and secondary screw conveyor, in conjunction with an advanced muck pumping system. This was developed specifically for the application; the coupling of the primary & secondary screw conveyor and muck pumping system classify as an important technological advancement on LOVAT TBMs.

LOVAT Technicians were on hand providing full support to ensure the successful completion of the initial drive, and will continue to provide assistance for the remainder of this unique tunneling project.

Ground conditions encountered during excavation consisted of mixed ground, dolomite, limestone and soils including clay, marl, loam and sand. The entire tunnel alignment is below the groundwater table, which consists of three differing aquifers of varying elevations above the invert. Maximum ground and water pressure along the alignment was 4.5 bar.

This project represents a significant advancement in the tunnelling industry, a technological breakthrough for both LOVAT and the tunnelling industry. Moreover, this project is a prime example of LOVATs continuous search for new ways to expand the boundaries of TBM technology.