

Delivers the last two TBMs **FOR PHASE-III OF DELHI METRO**



On 22nd of November 2013, Terratec delivered the last two of eight (8) TBMs for Delhi Metro Phase III. The TBMs were officially unveiled at a ceremony that included representatives from the client, a joint venture between Hindustan Construction Company Ltd. of India and Samsung Engineering & Construction Group of Korea.

The TBMs will be utilized by the Client for the execution of part of the tunnelling works of CC-34 Project, particularly for the tunnels between Dashrathpuri and Palam Stations and the ones between Janakpuri West St. and the beginning of the Cut & Cover Section from where the DMRC Phase-IV may start after completion

of current one. The machines are now being transported to India and the JV is planning to launch them around February 2014.

The TBMs are to excavate in typical Delhi soil, mixing silt, sand and clay in different proportions without presence of rock. For this the JV selected a Ø6.52m EPB Tunnel Boring Machine with a classic soil configuration and equipped with a Spoke-Type CutterHead with a 57% opening ratio, which has been proven to be very efficient to excavate this type of soil in previous DMRC Phases. TERRATEC has designed the CutterHead to allow the cutting tools to be exchangeable for 17" roller disc cutters, making the TBM to be able to bore through

the D-walls and cope with the presence of any unexpected obstacle on its way, such as old wells or foundations.

The segment lining will be made of RC segments with an outer diameter of 6,350mm, inner diameter of 5,800mm and width of 1,400mm. The total combined distance that each TBM will bore to is approximately 1,900 metres.

Once these two TBMs are launched at the site, there will be a total of eight TERRATEC Tunnel Boring Machines excavating in Delhi through all 2014 and part of 2015.



Terratec Raise Borer makes **BIG ADVANCES IN ARGENTINA**

After its transportation from the factory in Australia to the mine site located in Argentina, TERRATEC's Raise Boring Machine TR2000 has commenced operation at the mine site in the month of September. Since then the machine has already achieved big advances in its initial months of operation.

The Raise Boring Machine was procured by Minera Santa Cruz, affiliated to Hochschild Mining, the leading silver and gold mining business developer in North, Central and South America. The group, founded in 1911, started its operations in Argentina in 2007.

The initial raise boring works have been done on the surface for ventilation purposes, under tough weather conditions with temperatures reaching -30°C, as the mine is located in the province of Santa Cruz, in the Argentinean Patagonia.

From the start of operation in September until the first week of December, Hochschild Raise Boring Team has completed with the TERRATEC TR2000 five (5) shafts with lengths varying from 100 to 200 metres and with reaming diameter of 1.8 and 2.1 metres. Each raise was completed in a time between 8 and 13

working days, including both the pilot hole and the reaming. The TR2000 achieved peaks of advance between 15 and 17 metres in one single shift of 10 hours on each of the five shafts, which has set a production record in the history of the mine.

TERRATEC Raise Boring Machines have been working in the Americas since 1999, with rigs currently operating all over the region from Canada to Argentina. The company's regional office for Latin America is located in Panama from where it provides sales and after sales services to the Clients.



MICROTUNNELLING SYSTEM COMPLETES HALF OF ITS WORK IN DELHI

As India develops, the population of the major cities keeps increasing and consequently the country needs to attend the growing demand for water supply and sewage. This is why Delhi Jal Board (DJB) -the government institution which manages the water supply, sewerage and drainage within the National Capital Territory of Delhi- is currently laying a 59km long sewer at the depth of 6 to 18 metres along the Yamuna river. The target is to contain pollutants from being released into the river by the three major drains, sending the untreated sewage to the existing Treatment Plant and allowing only treated effluent into

the three drains. The Project is divided into six packages, the works of two of them -Packages 4 and 5- were awarded from DJB to the Joint Venture formed by the companies DS Construction, Fegshun and Wabag. In order to complete part of the pipe jacking works of the Package 4, the JV acquired from TERRATEC a DN1600 Microtunnelling System composed of a Slurry MTBM, Slurry Transport System, Main Jacking Station, Intermediate Jacking Stations, Lubrication System and Separation Tank.

The pipes being used with TERRATEC MTBM have an inner

diameter of 1,600mm, outer diameter of 1,965mm and a length of 2,500mm. The tunnelling drives are planned to have a maximum distance between shafts of 300m, for what Intermediate Jacking Stations are being used when required.

TERRATEC is providing to the JV not only the equipment, but also a comprehensive package of services at site, which includes the dispatch of key engineers and operators to assist the contractor during the execution of the tunnelling works.

As of December 2013, the JV has completed satisfactorily a total of



about 900 metres in six drives with TERRATEC machine, having achieved some of the project records such as completing a drive of 196 metres in only 7 days or advancing 52.5 metres in one single day. To complete the DN1600 works of this Package 4, the Pipe Jacking System has yet to bore another 900 metres, which are expected to be completed in the next six months, subject to the schedule and progress on some other project critical works.

Once the project is completed, the biochemical oxygen demand of the Yamuna -an indication of its pollution levels- will come

down from a massive 40 parts per million (ppm) at present to about 12 ppm. This will benefit about 70% of Delhi, as the water from Yamuna river will then be used extensively for horticulture and cleaning purposes.

TERRATEC has an important presence in India, especially in Delhi, where it is involved not only in the supply of Microtunnelling Systems and Services, but also the large Tunnel Boring Machines (TBM) for the construction of the Phase-III of Delhi Metro, where a total of eight EPB Tunnel Borers of 6m diameter have been delivered during 2013.

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