

# TERRATEC MARKS ANOTHER MAJOR MILESTONE IN BANGKOK



*TERRATEC marks its latest milestone on the Orange Line metro project, in Bangkok, Thailand, with the breakthrough of the Westbound running tunnel on Contract E3.*

**R**ecently, TERRATEC joined workers and officials in celebrating the breakthrough of the 6.39m diameter S70 EPB machine by contractor Italian-Thai Development PCL (ITD) on one of three underground civil works contracts for the first 23km-long (East Section) phase of the Mass Rapid Transit Authority of Thailand's (MRTA) Orange Line Project.

The Westbound running tunnel

breakthrough on Contract E3 took place a full month ahead of schedule putting the project on a good footing for the upcoming Eastbound running tunnel drive.

Contract E3, which was awarded to ITD in May 2017, totals over 6km of TBM driven tunnel and three underground stations, extending from Hua Mak to Khlong Ban Ma. The S70 machine began mining

westwards from the Khlong Ban Ma station box on January 12, 2019, and quickly got up to speed following its initial drive. By late-March, the TBM was achieving progress rates of up to 18 rings per day and had already undertaken its first intermediate breakthrough. July 2019 marked the TBM's best month of progress, achieving a total advance of 663.4m and a best day's performance of 40.6m.

The TERRATEC S70 TBM was designed to tackle the variable soft ground geology of the city – which ranges from soft and medium to stiff and very stiff clays, with lenses of dense sand and the potential for high pressure groundwater inflows – as well as the need to mine through numerous diaphragm wall shafts and, potentially, concrete piles.

*"Due to extensive project planning we were well prepared for the 3.3km long drive and any challenges had pretty much been solved on paper before the TBM commenced," says Bunjerd Emnuch, TERRATEC's Tunnel*

*Manager. "The only remaining challenge was obstruction cutting. The TBM had to cut through 10 diaphragm wall panels during break-ins and break-outs with only two cutterhead interventions."*

In order to handle these challenging conditions, the TBM's soft ground cutterhead features a spoke style and the addition of back-loading knife bits to assist break-in and break-out of the shafts. In addition, the machine is fitted with an active bentonite face support injection system and double gated screw, to ensure face stability and mitigate settlement during excavation in

areas of flowing sands and high groundwater pressure.

As the machine progresses along the alignment, it has been installing a precast concrete segmental lining consisting of five x 1200mm wide Universal style segments plus key, with an internal diameter of 5.7m. These are being produced by ITD at the same factory used for segment manufacture during its MRT Blue Line underground works contract five years ago, which also employed a TERRATEC machine.

In total, TBM tunnelling operations for ITD's Orange

Line (East) contract are expected to last approximately two years and are being assisted at all times by TERRATEC's highly-experienced Field Service staff – who's quality after sales support service has created very loyal client-base in Thailand – to ensure optimum performance and successful project completion.

*"We have worked closely with TERRATEC since 2012, when we won our MRT Blue Line extension contract," says Prakin Arunotong, Senior Vice President of ITD's MRT Business Unit. "TERRATEC has a very similar working*

*style to our own and because of this we consider our partnership with them as more of an 'Alliance' than that of the traditional contractor-TBM manufacturer relationship."*

The S70 TBM is now being prepared for Contract E3's 3.3km long Eastbound running tunnel drive and is currently expected to relaunch sometime next month (April 2020).

Bangkok's new Orange Line will eventually total about 35.4km with 26.2km aligned underground with 23 underground stations and another 9km and seven stations on elevated structures.

When complete, in 2023, the Orange Line will provide a vital transportation link from Bangkok's city centre to districts in the east, reducing traffic congestion and paving the way for improved accessibility, economic growth and new residential and commercial opportunities along the alignment.

TERRATEC has delivered seven TBMs to Thai projects in recent years (representing almost every machine currently being operated in the country), and continues to make great progress, with a number of major milestones being celebrated over recent months.



## TERRATEC EPBMS GEAR UP FOR NEW ISTANBUL METRO LINE

**T**ERRATEC is pleased to announce that it now has a total of nine machines working concurrently on Istanbul's Metro system, in Turkey. The on-site assembly of two 6.56m diameter Earth Pressure Balance Tunnel Boring Machines (EPBMs) is currently underway for the Ümraniye-Ataşehir-Göztepe (UAG) Metro line, which is being constructed by the by the Gulermak, Nuroil & Makyol JV.

These EPBMs, along with another pair of sister machines that have already been assembled for this project,

are all due to be launched and mining by mid-May.

The 13km-long Ümraniye-Ataşehir-Göztepe (UAG) line, along with its 11 new stations and NATM-built connections, will form a second north to south rail corridor under the densely-populated Anatolian side of Istanbul and will be located entirely underground at an average depth of 30m.

The robust TERRATEC TBMs have versatile mixed-face dome-style cutterheads with an opening ratio of about 35% that have proven to

work extremely effectively in Istanbul's mixed geology – which includes low-strength sandstones, siltstones, limestones and shales – as well as other state-of-the-art features such as VFD electric cutterhead drives, tungsten carbide soft ground cutting tools that are interchangeable with 17" roller disc cutters, high torque screw conveyors and active articulation systems.

These machines (S66 and S68) – along with their sister machines (S65 and S67) – will be all be launched from Finans Merkezi Station, which is the

mid-point of the line.

As the four TBMs progress north and south on a 24hr basis, they will install 1,500mm wide by 300mm thick pre-cast concrete lining rings, which consist of five segments plus a key. Mucking will be via continuous conveyor with TBM and materials supply provided with the use of Multi-Service Vehicles (MSVs).

The Ümraniye-Ataşehir-Göztepe (UAG) project is one of one of a number new metro

lines currently being built in the city that will increase Istanbul's current 145km Metro network to more than 480km.

Members of the JV were so impressed with the performance of the TERRATEC machine used on the Mecidiyeköy-Mahmutbey Metro, which is being built by the Gulermak, Kolin & Kalyon Joint Venture – and the progress of two other 6.56m diameter EPBMs that were delivered in 2017 to the Şenbay Madencilik-Kolin-Kalyon

Joint Venture for the Dudullu-Bostancı Metro Line – that they were keen to employ a further four TERRATEC machines on this latest project.

*"Terratec is excited to be providing yet more machines to these metro projects in Istanbul," says TERRATEC Sales & Marketing Director, Bruce Matheson. "We are confident they will perform as well as previous machines have in the city and we look forward to breaking more records for on-time delivery,*

*Gulermak, Nurol & Makyol JV is currently completing TBM testing on-site for the new Ümraniye-Ataşehir-Göztepe line, the latest addition to Istanbul's metro expansion.*



*quick assembly and excellent production rates."*

Elsewhere in the city, four 6.56m diameter EPBMs are also making good progress for the Halkali-Yeni Havalimani Metro JV (consisting of Cengiz İnşaat, Kalyon and Kolin) on the Halkali-Istanbul New Airport metro line, which was awarded to a consortium comprising Özgün Yapı and Kolin by the Turkish Ministry of Transport and Infrastructure (AYGM).

The 31km-long line, along with 6 new stations and connections, will form the western-leg of the new

M11 Line that runs from the recently opened third International Airport on the European side of the city southwards to Halkali (which will also be the final terminus of the new Marmaray railway).

On the other leg of the new M11 line (the 37km-long Gayrettepe-New Airport metro line that is being constructed by the Kolin-Şenbay consortium), the refurbished TERRATEC S42 machine put in a solid performance on its section of the project last year, achieving a best day of 33 rings (46m). It is now being prepped for its third project in the city.

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