

# TERRATEC DELIVERS A ROCK SLURRY TBM FOR MUMBAI SEWAGE DISPOSAL PROJECT



*TERRATEC delivers a 3.85m diameter Rock Slurry TBM for Mumbai Sewage Disposal Project-Stage II, PST-1 in India.*

**T**ERRATEC is pleased to announce the delivery of a 3.85m Rock Slurry Machine for the Mumbai Sewer Disposal Project (MSDP) Stage-II – PST1 in Mumbai, India by J Kumar and Michigan Engineers Private Ltd. (MEPL) Joint Venture and the client Brihanmumbai Municipal Corporation (BMC).

TERRATEC is the sole supplier for Mumbai's sewerage segmental tunnels, providing

two Tunnel Boring Machines (TBMs) for the project. These TBMs include a Rock Slurry TBM and a Rock EBP TBM, which will be used for the construction of Mumbai Priority Sewer Tunnel (PST-1) spanning 5.8 kilometers and Priority Sewer Tunnel (PST-2) covering a distance of 4.7 kilometers.

The primary objective of the sewer tunnels in Mumbai is to improve the quality and reliability of wastewater

collection, treatment, and disposal processes, while also minimizing the environmental impact caused by wastewater. These tunnels are designed to create a healthier and enhanced environment for the residents of Mumbai by implementing more efficient and sustainable wastewater management methods.

The TERRATEC Rock Slurry TBM is equipped with a Slurry System which controls the pressure in the excavation

face by injecting slurry into the Cutter Chamber where the slurry is mixed with the excavated material. The mixture is pumped out of the tunnel to a separation and recirculation plant.

The machine is designed to handle various geological conditions along the tunnel alignments consisting of weathered/fresh breccia and basalt. The TBM has 23 rings of 15" replaceable disc cutters and a high-speed main drive which is capable turning the cutter head at up to 8 revolutions per minute. The TBM is equipped with an active articulation system to accommodate a minimum curve radius of 250mR. The

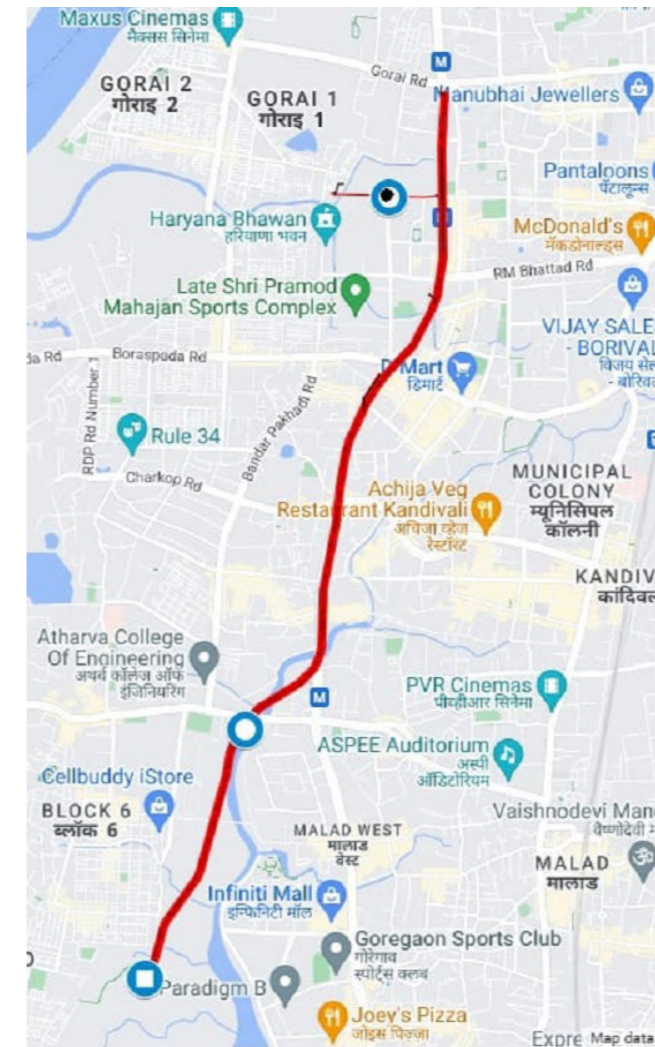
TBM's main drive is hydraulic due to size constraints and the installation of a shield integrated man lock.

The TBM is using 5+1 universal type segment design with reinforced concrete segments that are 200mm thick and 1200mm wide. Slurry removal and treatment is via the TERRATEC Slurry Transportation System and Slurry Treatment Plant.

The Slurry Transportation System efficiently manages the discharge of the slurry by utilizing a Centrifugal Slurry Pump. This system removes excavated ground spoils and cuttings by transporting them to the surface through

a network of pipelines and hoses. Subsequently, the slurry is directed to the Slurry Treatment Plant, equipped with advanced mud treatment technology. Additionally, the plant features a remote-control maintenance system, enabling cost-effective long-distance excavation.

The project encompasses various infrastructure components, including the expansion of sewage collection networks, construction of new pumping stations, establishment of wastewater treatment facilities and implementation of treated effluent disposal systems. Once operational, these treatment plants are expected to recycle



The MSDP – Stage II Priority Works project consists of several sections, a sewer tunnel along Link Road, extending from Don Bosco Junction to the existing Malad Pumping Station. Additionally, a branch sewer tunnel will connect from the Gorai Pumping Station and another sewer tunnel will run from the existing Malad Pumping Station to the proposed Malad IPS at Malad WWTF.

The project also involves the construction of associated shafts and upstream connections. These infrastructure additions will effectively reduce the volume of wastewater flowing into the current collector sewer, enabling the decommissioning of the existing pumping stations located at Gorai, Shimpoli, Charkop, and Malad.



a staggering 2,464 million litres of sewage per day. Apart from meeting the city's substantial water demand, these initiatives will significantly reduce water pollution levels and contribute to the rejuvenation of Mumbai's Mithi and Oshiwara rivers.

In another related development, the Mithi River Water Quality Improvement Tunnel project recently witnessed the successful deployment of the refurbished TERRATEC 3.14 EPB TBM. This machine, previously utilized for

the completion of the Mumbai Sewer Disposal Project (MSDP) Stage-II Priority Works, achieved a breakthrough in mid-June under the joint venture of J Kumar Infraprojects and MEPL. The 3.14m EPB TBM demonstrated remarkable progress, with a monthly advancement of 370m, a commendable feat considering its size.

## A FLEET OF JIMT/TERRATEC EPBMS GEAR UP FOR TAIWAN'S TAOYUAN MRT GREEN LINE

On behalf of JIM Technology (JIMT), TERRATEC is proud to announce the delivery of the last two of four 8.38m diameter Earth Pressure Balance Tunnel Boring Machines (EPBMs) that will be used by FUTSU-OBAYASHI-CEC Joint Venture (FOC JV) for its underground works contract on Taoyuan MRT Green Line Contract GC03, in Taoyuan city of Taiwan for the Department of Rapid Transit Systems, Taoyuan.

FOC JV has purchased a total of Four Earth Pressure Balance Tunnel Boring Machines (EPBMs) from JIMT for Contract GC03. The first two 6.24m diameter

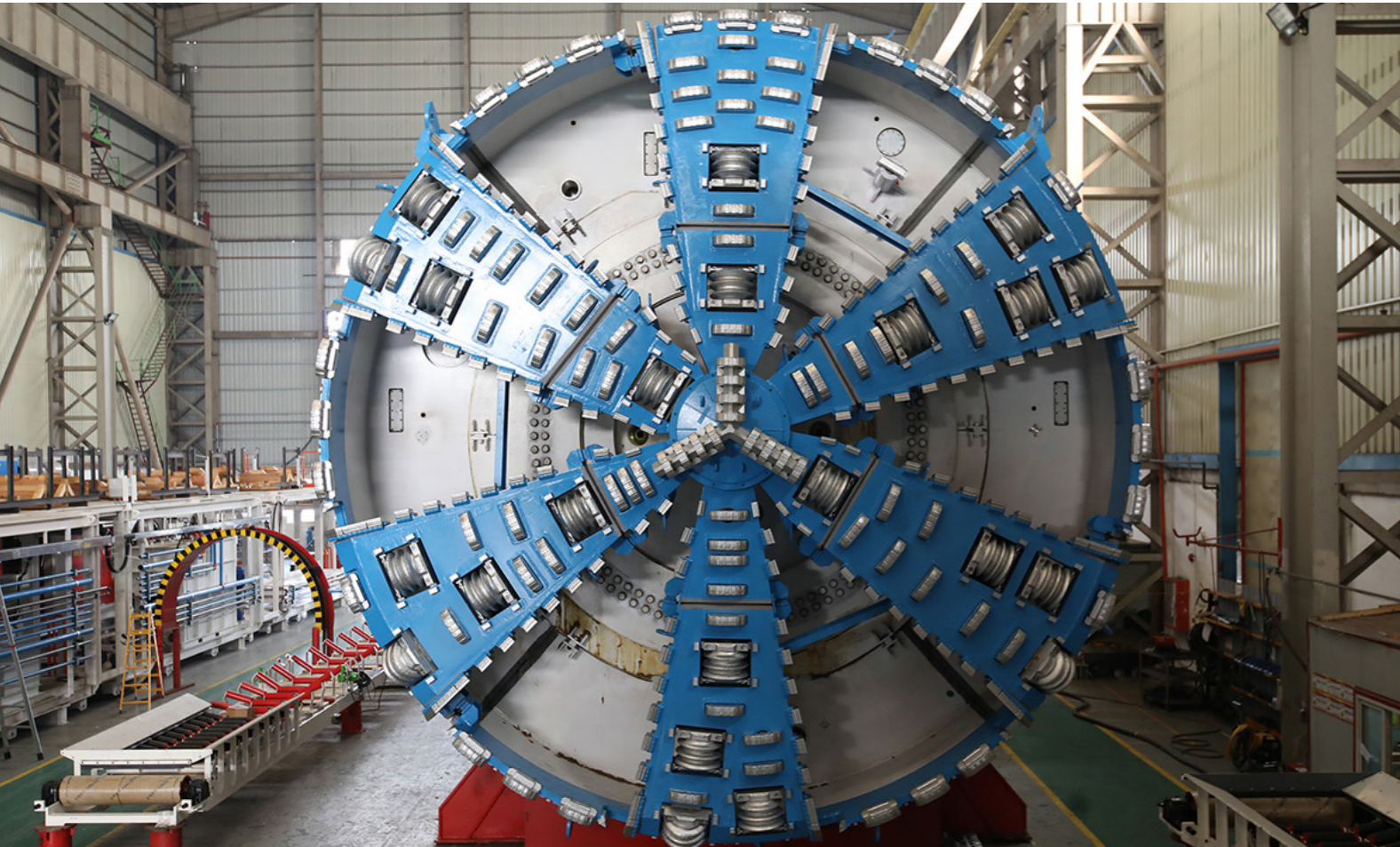
EPBMs have completed their Factory Acceptance Tests (FATs) in 2021. The remaining two 8.38m diameter EPBMs have just passed their Factory Acceptance Tests.

JIMT & TERRATEC are proud to be the sole provider of all seven new TBMs for the project. In 2021, a 6.24m diameter Earth Pressure Balance Tunnel Boring Machine (EPBM) was delivered to BES-DAIHO-OKUMURA JV for its underground works contract on Taoyuan MRT Green Line Contract GC02. Two other 6.24m diameter EPBMs were produced in JIMT facilities in Japan and had passed the FATs as well. A total of three

6.24m diameter EPBMs had been delivered for Contract GC02. Since 2018, TERRATEC is a member of JIMT Group which is the company created by three Japanese industrial giants: IHI Corporation, Mitsubishi Heavy Industries and JFE Engineering Corp. to merge their TBM divisions, thus combining their technology and experience of over 4,000 TBMs delivered since 1939 of every type and size up to 16 metre in diameter, for both Japan and Overseas projects.

Out of seven TBMs, five of them were produced in TERRATEC factory, with key components

*On behalf of its group company, JIMT, TERRATEC delivers the last two of four EPBMs that will be used by FUTSU-OBAYASHI-CEC JV (FOC JV) for the underground works on Taiwan Taoyuan Mass Rapid Transit (MRT) Green Line GC03.*



coming from Japan. The performance and quality have been evaluated as equal as made in Japan by Obayashi Corporation, Japanese contractor. In addition, TERRATEC factory complies with the requirements of Japan's Official Development Assistance (ODA) policy that Japanese technologies and/or equipment are substantially utilized.

Taoyuan MRT Green Line is a rapid transit line of the Taoyuan Metro which consists of 6 lines. The MRT Green Line has a total of 21 stations (10 underground stations and 11 stereoscopic stations), with a total length of 27.8km. Contract GC03 includes 4 underground stations with two drives of 2.6km of up & down tunnels. The main drive is planned from

the launch shaft and both TBMs will excavate from Daxing West Road Intersection Station (G10) to Taoyuan Main Station (G07) through Minguang Road Station (G09) & Yong'he Market Station (G08). Tunneling work will start in 2nd half of 2023.

The two versatile 8.38m EPBMs have robust spoke type with outer ring cutterheads designed to work effectively in the geology which includes sandstone and boulder that is expected on this contract. It is designed to smoothly discharge large boulders through the ribbon-type screw conveyor. Other features include VFD electric cutterhead drives, disc roller cutters and reinforced cutting tools for gravel layer, high torque screw conveyors, active articulation

systems and state-of-the-art guidance and control systems. As the TBMs progress, they will install 1,200mm wide by 350mm thick reinforced concrete lining rings, which consist of six segments plus a key. Muck cars will be used. Taoyuan MRT Green Line is anticipated to complete in 2026.

Taoyuan City government plans to connect the Taoyuan Airport Line, the MRT Green Line, the Green Line to Zhongli, the MRT Brown Line, the Sanying Extension Line to extend the Bade section, and the underground Taoyuan Railway to form a ring-shaped track system. Through connecting the six lines, the City MRT system will provide a mass, fast and convenient travel service for the overall urban redevelopment.

# TERRATEC EPB TBM IS ROCKING AT MITHI RIVER

**T**ERRATEC 3.14m diameter Earth Pressure Balance Machine (EPBM) was previously used on the Mumbai Sewer Disposal Project (MSDP) Stage-II Priority Works in Mumbai, India by Contractor Michigan Engineers Private LTD (MEPL). Upon the completion of the initial project, the machine was refurbished and upgraded. The work was carried out by MEPL's team with TERRATEC providing the necessary parts and supervision. Presently, the machine is now delivering great results on the Mithi River Water Quality Improvement Project for J Kumar Infraprojects -

MEPL Joint Venture and the client Municipal Corporation of Greater Mumbai (MCGM).

Designed to improve water quality in Mithi River, the project is to curb the pollution load entering the river. The Mithi River in sewerage zone 3 runs 17.8 kilometres through densely populated residential and industrial areas. The upgraded machine was launched in Dec. 2022 and has been making excellent progress. It has completed 70% of its first 1840m long drive from Dharavi to Kurla Garden. The machine is currently the

smallest hard rock EPB TBM operating in the country. TERRATEC EPBM is designed to handle various geological conditions along the tunnel alignments consisting of mixed ground and basalt hard rocks. The TBM has 25 rings of 17" rear replaceable disc cutters and a high torque, high-speed main drive. The TBM is equipped with a fully active articulation system to accommodate a minimum curve radius of 250m. The TBM's main drive is hydraulic due to size constraints and the installation of a full hyperbaric man lock.

*TERRATEC 3.14m diameter EPB TBM is making excellent progress for Mithi River Water Quality Improvement Project in Mumbai, India.*



The TBM is using 4+1 universal type segment design, with mechanically actuated erectors installing reinforced concrete segments that are 200mm thick and 1000mm long. Muck removal, segment transport and machine supply will be by TERRATEC rolling stock and battery locomotives.

The machine upgrade includes a new type of segment feeder and concentrated polymer injection system for water control and spoil conditioning in rock sections. The backup has been reorganised, additional facilities put on the decks and some new features added to improve the machines operation.

Mithi River is an open sewer that flows through densely populated residential and industrial areas of Mumbai. It is also one of the oldest river systems in India. Wastewater and industrial waste were dumped into the Mithi River. The Mithi River Water Quality Improvement Project aims to control the pollution load entering the river.

TERRATEC has been chosen for the underground tunnel package in Surat Metro Rail Project due to TERRATEC's continuing success on projects such as Phase III & IV of the Delhi Metro, Lucknow Metro, Pune Metro, Kanpur Metro, Ahmadabad Metro

and Mumbai Metro. This is a result of tailor-made robust TBM design, prompt onsite assistance, readily available stock of TBM spares, and highly-skilled specialised TBM support throughout tunnelling operations.

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