

# TERRATEC Tunnel Boring Machines

Incorporated in 1990, TERRATEC is the world-renowned Australian designer and manufacturer of Tunnel Boring Machines, Raise Boring Machines, Micro Tunnel Boring Machines, Rail Based Products (Rolling Stock, locomotives), Conveyor Systems and other custom-made products for tunnelling and mining industry. TERRATEC's success is based on the experience and excellence of its engineering team. The team includes engineers with over 40 years' experience in the design and manufacture of tunnelling and mining machines who have also worked on some of the world's largest underground projects. TERRATEC is fully managed by Engineers and this gives quick and efficient solutions to meet the customer expectations. Today, TERRATEC is well placed to meet the growing global market, demanding the highest Quality and Reliability of Equipment for fast and efficient execution of projects anywhere in the World.

## Tunnel Boring Machines

A Tunnel Boring Machine (TBM) is a machine used to excavate tunnels with a circular cross section through a variety of soil and rock strata. TBMs can bore through any geological strata ranging from hard rock to sand and mixtures of soil & rock. Tunnel diameters range from a metre (done with micro-TBMs) to 19.25 m. Tunnel boring machines are used as an alternative to drilling and blasting methods in rock and conventional "hand mining" in soil. TBMs have the advantages of limiting the disturbance to the surrounding ground and producing a smooth and well finished tunnel wall of accurate dimensions in line with the project demands via Metro rail, Hydro Power Tunnels, Pipe laying. This significantly reduces the cost of lining the tunnel, and makes them suitable to use in heavily urbanized areas. As modern tunnels are longer and wider, the cost and time savings become more significant when TBMs are employed.

has deployed 8 TBMs in Delhi to expand Delhi Metro's network. TERRATEC is also in the process of manufacturing one hard rock TBM for Laos and another for the Istanbul Metro in Turkey.

## Hard Rock TBM

During the last twenty years, TERRATEC has been providing Hard Rock Tunnel Boring Machines for different types of geological conditions, from soft shale to extreme hard and abrasive quartzite.

## Hard Rock – Open TBM

The Open TBM is the most traditional Hard Rock TBM. It is the fastest and most effective to bore tunnels in healthy Hard Rock formations. During the boring operation, the rear part of this TBM, called the Gripper Device, is firmly anchored to the tunnel walls by two large gripper pads while the front part of the TBM, containing the Cutter Head, is extended by the action of 2 or 4 hydraulic cylinders called the Propel or Thrust Cylinders.

## Hard Rock – Double Shield TBM

For the rock formations that contain unstable or faulty zones, using a Double Shield TBM is the safest and most efficient way to excavate tunnels. Double Shield TBM propulsion is also achieved by using a Gripper Device, but unlike Open TBM, the Front and Rear parts of Double Shield TBM are completely shielded. The TBM installs a concrete lining ring formed by precast segments to perfectly protect the tunnel from the surrounding ground as the Cutter Head excavates, allowing excellent advance rates.

## Hard Rock – Single Shield TBM

When rock strength is low and the tunnel walls cannot react against the action of the Gripper Pads, the excavation of the Rock has to be done with a Single Shield TBM. The Single Shield TBM reacts against the concrete lining ring to advance forward, and due to this, installation of segments and excavation cannot be done simultaneously.

## Soft Ground TBM

For tunnelling projects in soft-ground geology with small overburden, generally carried out under cities, the TBM has to control accurately the pressure in the excavation face, which must be higher than the one inside the boring machine.

## Soft Ground – Earth Pressure Balance Machine

The Earth Pressure Balance Shield Machine (EPBM) evacuates the material through a Screw Conveyor. The pressure in the front of the machine is controlled by regulating the advancing speed of the shield and the evacuation flow. The EPBM can work with or without pressure in the front in stable layers. TERRATEC is supplying 8 EPBMs to assist the expansion of New Delhi's Metro network.



TERRATEC has a prominent TBM presence in India, Laos, Thailand, and Dominican Republic. Specifically in India, TERRATEC

**Soft Ground - Slurry Shield TBM**

The Slurry Shield TBM is suitable for excavating soils with high water content. This TBM is equipped with a Slurry System which controls the pressure in the excavation face by injecting pressurized 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.



**Micro Tunnel Boring Machine (MTBM)**

Microtunnelling, or Pipe Jacking Method, is a trenchless solution for constructing small diameter tunnels, used especially for projects that require the tunnel to cross under dense traffic roads, railways, rivers, etc. This method is mainly used for pipe laying for sewerage system.

This technique installs concrete Pipes, by a Pushing or Jacking Frame installed in the Launching Shaft. A special Boring Machine or Shield, called the Micro Tunnel Boring Machine (MTBM), is attached to the head of the Pipe that follows the path of the tunnel as it is being bored.

TERRATEC MTBMs are suitable for the construction of tunnels with an inner diameter ranging from 500mm up to 2,800mm. TERRATEC has deployed an MTBM for the Delhi Jal Board in India.

**Rail Based Equipment**

The success of the construction of a tunnel not only depends on the most suitable tunnelling machine or method for the expected conditions but also an efficient system to remove the spoil out of the tunnel and bring in consumable items such as segments, grout, foams and oils. If a conveyor system is installed as the primary method of spoil removal then the machine still needs to be supplied with the consumable items.

**Rail Based Equipment – Locomotives**

TERRATEC battery locomotives are designed to provide the tunnel with the most reliable material handling solution possible whilst introducing the minimum amount of impact on the tunnel environment.

**Rail Based Equipment - Rolling Stocks**

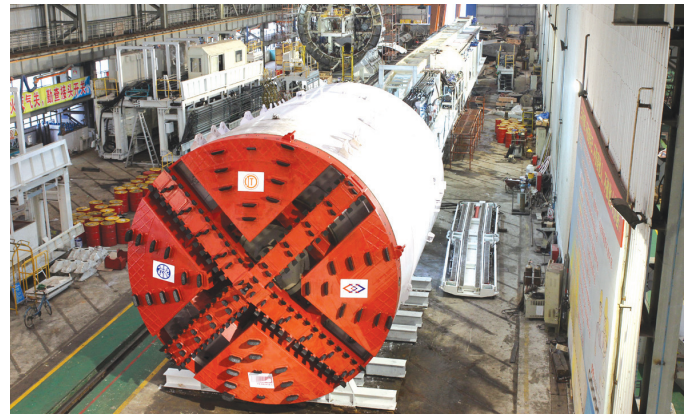
TERRATEC has in its last 25 years provided all types of rolling stock from flat cars to crane cars, from muck cars to grout cars if using an integrated chassis solution TERRATEC can provide the chassis only and the drawings for the manufacture of the muck boxes or flat car decks locally (this reduces shipping costs and time while engaging the local community where your fabricators are located). There are many options to be considered.

**Conveyor Systems**

The success of the tunnelling or mining work depends not only on the selection of the most suitable boring machine, but also on the most efficient system to evacuate the spoil to the surface. Interruption in the evacuation works very often leads to the interruption in the boring availability and subsequently, to stopping the overall production.

**Conveyor Systems - Continuously Advancing**

TERRATEC has designed and built sophisticated continuous conveyor systems specifically for individual tunnel and TBM conditions. These systems include continuously Advancing Conveyor Systems in the tunnel, transfer systems, vertical conveyors and stacker systems at the tunnel portal.



Especially when tunnels are long, when slopes are steep or when the space for unloading spoils is limited in the tunnel portal, the usage of a Conveyor System has innumerable advantages over evacuation by Muck Cars in terms of productivity, safety and operation and maintenance costs.

**Conveyor Systems - Bunker Conveyor**

For mining applications or tunnelling by conventional methods, TERRATEC's Bunker Conveyor is the perfect solution to evacuate the muck due to its robust, simple and reliable design. The TERRATEC Bunker Conveyor is designed to be pulled along a monorail as the tunnel advances. It is equipped with a telescopic hopper which facilitates the load of the muck into the conveying system. The filling of each truck is radio controlled by the operator so the exact amount of muck is loaded every time.

For further details contact: Terratec Ltd,  
Email: [info@terratec-india.com](mailto:info@terratec-india.com), Web: [www.terratec.co](http://www.terratec.co)