

# CONVEYOR SYSTEMS

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 **TERRATEC**

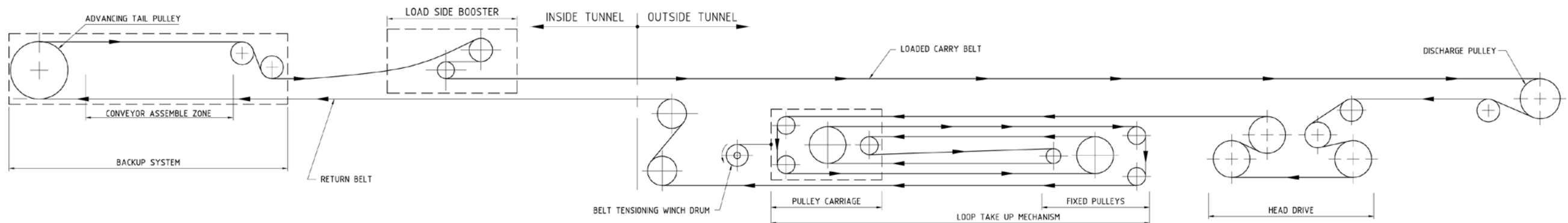
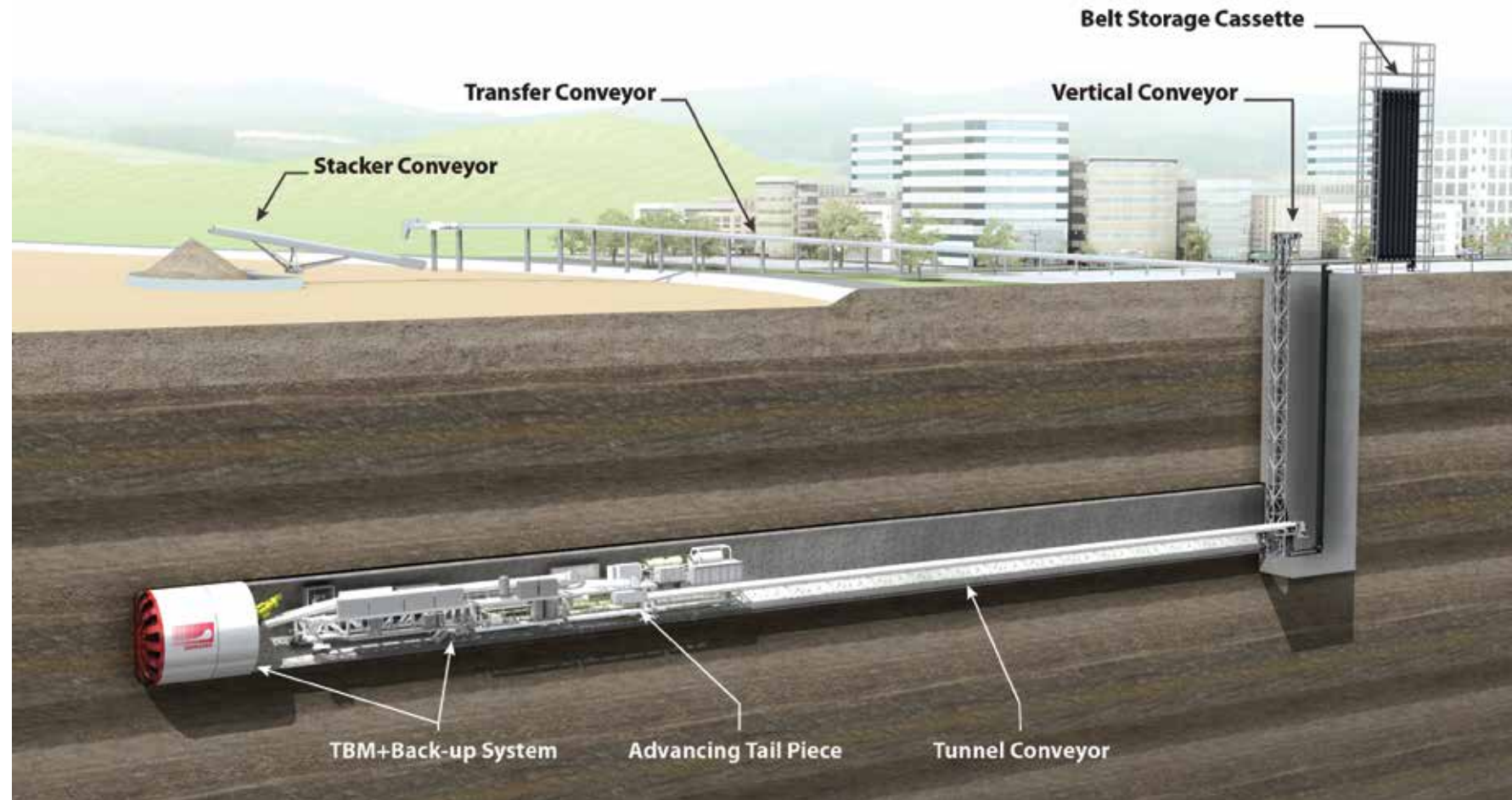
# CONVEYOR SYSTEMS

The success of the construction of a tunnel not only depends on the selection of the most suitable tunnelling machine, but also on the most efficient system to evacuate the spoil excavated by the TBM out of the tunnel. Disruption in the evacuation works very often leads to the TBM boring availability and subsequently, stoppage of the overall production of the project.

The use of a Conveyor System has numerous advantages, especially when tunnels are long, slopes are steep or the space for unloading spoil is limited in the tunnel portal. Conveyor Systems have many benefits over evacuation by Muck Cars in terms of productivity, safety, operation and maintenance costs.

Since 1990, TERRATEC has designed and built sophisticated continuous conveyor systems specifically for individual tunnel and TBM conditions. These systems include continuous conveyor systems in the tunnel, transfer systems, vertical conveyors and stacker systems at the tunnel portal.

TERRATEC Conveyor Systems have been successfully installed on its own TBMs or TBMs manufactured by other suppliers, to convey either hard rock or soft soil, with excellent results in numerous projects for different applications.



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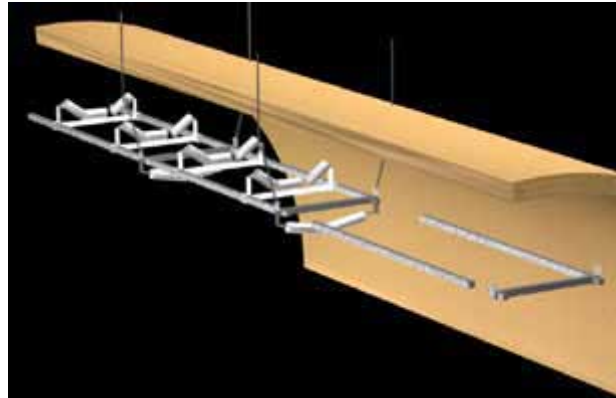
TERRATEC's in-house Engineers detail design each component ensuring the smooth and synchronized operation of all the conveyors working at the project site.

TERRATEC's Continuously Advancing Conveyor Systems can be side wall or crown mounted. The crown mounted type can be installed in tunnels as small as 3.0m in diameter. This unique design allows the one system to traverse very sharp horizontal curves in small diameter tunnels.

The carry and return roller sets are wider than standard for the size of belt to allow increased tolerance for belt wander and additional control in horizontal curves. Roll Vee return idlers are used throughout to control return belt tracking.

TERRATEC's unique and patented design of the Advancing Tail Piece levels the Tunnel Conveyor by an active hydraulic system to match the steering/rolling position of the TBM. This allows the smooth negotiation of any horizontal and vertical curves.

TERRATEC's Belt Storage Cassette is custom designed, Horizontal or Vertical Type, for each project, depending on the available space at the Jobsite. Generally the Belt Storage Cassette can store 500m of belt, which will allow the TBM to bore 250m of tunnel without any interruption. Terratec's Winch Drives use Flux Vector Control Technology with control hardware and software logic that ensures close to perfect control of take up tensions.



## OVERLAND CONVEYORS

For efficient spoil removal from the Tunnel, the conveying system must be in continuous use in the Tunnel Portal. Normally a further system of Static Conveyors is needed to take the muck from the Tunnel Conveyor up to the planned location of the Muck Pile. The Overland Conveyor system typically comprises an Inclined or Vertical Conveyor, Transfer Conveyors and a final Stacker Conveyor.

Our well known Field Service Team is very experienced in the operation and maintenance of Tunnel and Overland Conveyor Systems either for Hard Rock or Soft Ground applications. TERRATEC will provide the assistance to the End User at site enabling rapid setup and effective commissioning of the complete Conveyor System. This will allow the TBM to be fully operational from the early stage, eliminating unnecessary extra costs or delays.



## 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 allowing precise, repeatable muck loading.



## CASE STUDY: TUNNEL CONVEYOR FOR HARD ROCK OPEN-TBM

<b>Project Name:</b>	Blue Mountains Sewage Tunnel
<b>Location:</b>	New South Wales, AUSTRALIA
<b>Year:</b>	1994
<b>Client:</b>	McConnell Dowell - Obayashi JV
<b>Tunnel Diameter:</b>	3.4m.
<b>Tunnel Length:</b>	13,500m.
<b>Min. Curve Radius:</b>	300m.
<b>TBM Type:</b>	Open Type Hard Rock TBM
<b>Belt Width:</b>	610mm
<b>Capacity:</b>	430 TPH

TERRATEC was contracted by McConnell Dowell Corporation (Australia) and Obayashi Corporation (Japan) Joint Venture to supply a Continuously Advancing Conveyor System which comprised of a single length of conveyor, approximately 13,500 meters between final centres, and driven by six (6) hydraulic drives of 75kW each. The conveyor line included several extended horizontal curves, one approximately 900m long covering an arc of just less than 90°. The conveyor also included a point change of direction and a fixed stacker.

With the success of this Project, TERRATEC currently holds the World Record for Tunnelling Production within a 3.4m diameter tunnel with its patented Continuously Advancing Conveyor System. Following are the current statistics:

<b>Best 8-hour Shift</b>	77m
<b>Best Single Day</b>	172.5m
<b>Best Single Week</b>	703.3m
<b>Best Calendar Month</b>	1,759m
<b>Best 4 Consecutive Weeks</b>	2,166m

The excavation of the tunnel not only achieved world records, but the entire project maintained a first-class safety record and was completed ahead of schedule and under budget. "THE TERRATEC MUCK REMOVAL SYSTEM WAS AN INTEGRAL ITEM IN OUR RECORD BREAKING SUCCESS" (Mr. David Logan, Manager of McConnell Dowell Corporation).



## CASE STUDY: TUNNEL CONVEYOR FOR METRO EPB-TBM

<b>Project Name:</b>	Perth Metro Rail
<b>Location:</b>	Perth, AUSTRALIA
<b>Year:</b>	2005
<b>Client:</b>	Leighton - Kumagai JV
<b>Tunnel Diameter:</b>	6.9m.
<b>Tunnel Length:</b>	1,500m.
<b>Min. Curve Radius:</b>	135m.
<b>TBM Type:</b>	Earth Pressure Balance (EPB) TBM
<b>Belt Width:</b>	800mm
<b>Capacity:</b>	700 TPH

TERRATEC was approached by Leighton Contractors (Australia) and Kumagai Corporation (Japan) Joint Venture to design, manufacture and supply the TBM Back-Up Conveyor and Overland Conveyor System to suit the Mitsubishi supplied Earth Pressure Balance (EPB) TBM at 6.9m diameter.

The requirement of the integral Conveyors System was to be capable of operating 24 hours per day continuously in an environment containing high humidity and temperatures, abrasive dust and wet paste.

The TBM generated up to 300 cubic metres of spoil per hour and the conveyor was required to traverse a 135m turn radius in both left and right hand curves. Overall the Conveyor System had to transport approximately 65,000 cubic metres of material during the excavation of the tunnels. The material excavated by the EPB-TBM was saturated sand and stiff silty clay which was treated regularly with conditioning agents such as polymers and foams.

Because of the location of the excavation of the tunnel being in the central business district of Perth, Western Australia, the surface conveyors were required to have covers over the system to reduce dust and muck being visible by the general public.





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