

JOYGLOBAL



Tunneling Conveyor Systems





Muck & Spoil Handling Experience To Count On

For decades Joy Global has been designing and manufacturing materials-handling equipment for mining and industrial applications throughout the world.

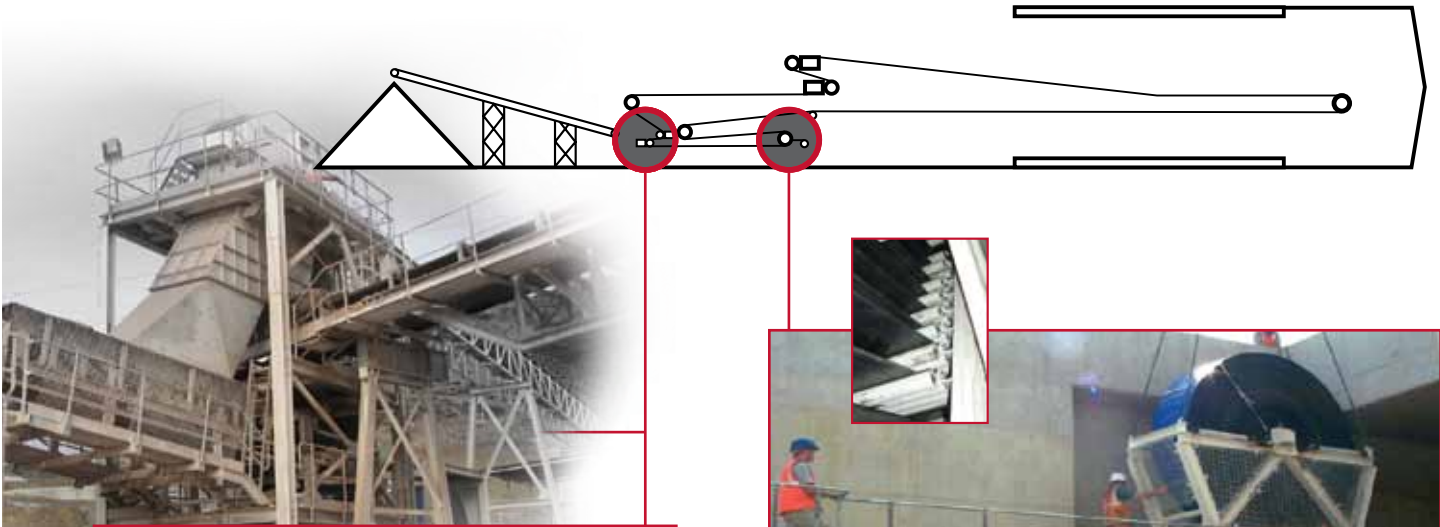


Conveyor systems provide an efficient, reliable, cost-effective and lower-risk method of removing muck and spoil from tunneling excavation sites. Since the late 1980s, when the benefits of using conveyor systems in tunneling projects first became apparent, Joy Global has been a worldwide leader in the manufacture and sale of conveyors designed and built to withstand the harsh conditions associated with tunnel construction. Joy Global's tunneling project reference list, which is available upon request, shows the depth and breadth of Joy Global's experience in providing conveyor solutions for tunneling excavation.

Our facilities, people, know-how, and on-going investment in our business, allow us to continually update our technology so that we can offer our customers the most advanced conveying equipment available. The integration of Joy Global's logistics and service support personnel into Joy Global's worldwide network of Joy Global Services teams further enhances our ability to make our tunnel conveying systems available on a global basis.

Joy Global provides all conveyor-based material handling equipment necessary for removing muck and spoil from tunnel excavation sites. This equipment is specifically engineered to smoothly handle the transport of materials from the tunnel excavation site to the surface and beyond.

Drive Systems, Belt Storage & Belt Tensioning



Drive Systems

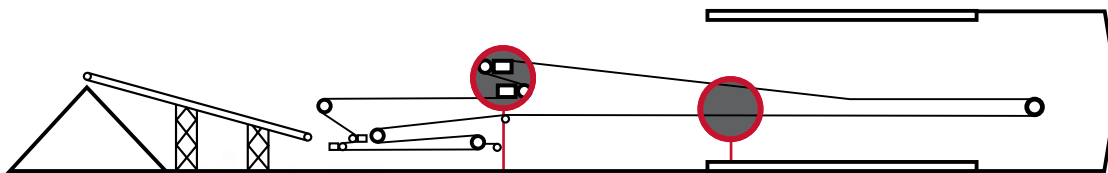
We provide a comprehensive range of drive units, designed to be modular in construction for ease of maintenance and adaptability for re-use from project to project. We utilise energy-efficient electric motors and high quality gear systems to provide long life and minimum operational costs. Our drive pulley design employs high quality externally-mounted bearings and drive surface lagging from bonded rubber to high performance ceramic.

Tensioning and Storage Systems

Joy Global offers large capacity belt storage systems giving typically 400 - 800m of storage, facilitating 200 - 400m of tunnel advance without interruption. In order to reduce the stoppage time associated with belt storage replenishment, the ability to complete two belt splices at the same time can, if space permits, be designed into the conveyor system. Joy Global also offers belt reeling equipment to ease handling and re-reeling operations when belting must be provided in cassette form due to road transportation limitations. Specially designed belt support systems offer better belt control and optimize tensioning requirements. These belt support systems are coupled with the highly efficient Joy Hydraulic Tension Master System, which provides controlled belt release and drive tension management. Both are essential for maximizing speed of tunnel advance.



Conveyor Structure & Booster Drive Systems



Conveyor Structure

Main runs of conveyor structure, incorporating Joy standard components, are designed to suit the client's specific muck/spoil extraction and tunnel mounting parameters. This structure offers ease of assembly and the option of utilising either roof, wall or floor mounting. Systems have been developed for segment lined, shotcreted or unlined tunnel configurations.

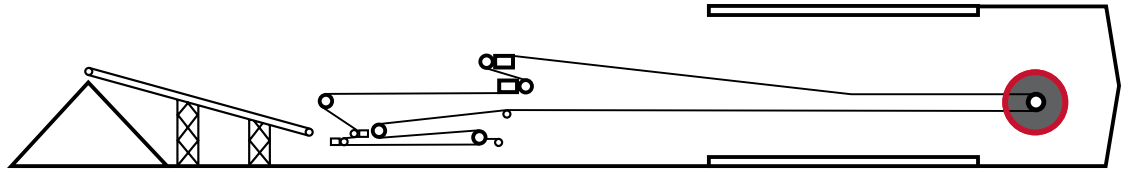


Booster Drive Systems

Joy Global employs the latest control technology to facilitate long distance belt conveying using a tripper booster drive configuration. The tripper power units are installed primarily within the top belt arrangement, but occasionally can be used to add power to the bottom return belt when needed depending on the requirements of the customer's system. Booster drives in long distance continuous conveying allow the use of lower strength belt types and reduce overall belt tension within the conveyor system. The ability to reduce and control tension improves belt security when negotiating tight horizontal curves. Booster drive systems also provide greater flexibility in situations in which final tunnel length could vary. The use of standard or common size power units throughout the conveyor system increases the potential to re-use main components on future projects.

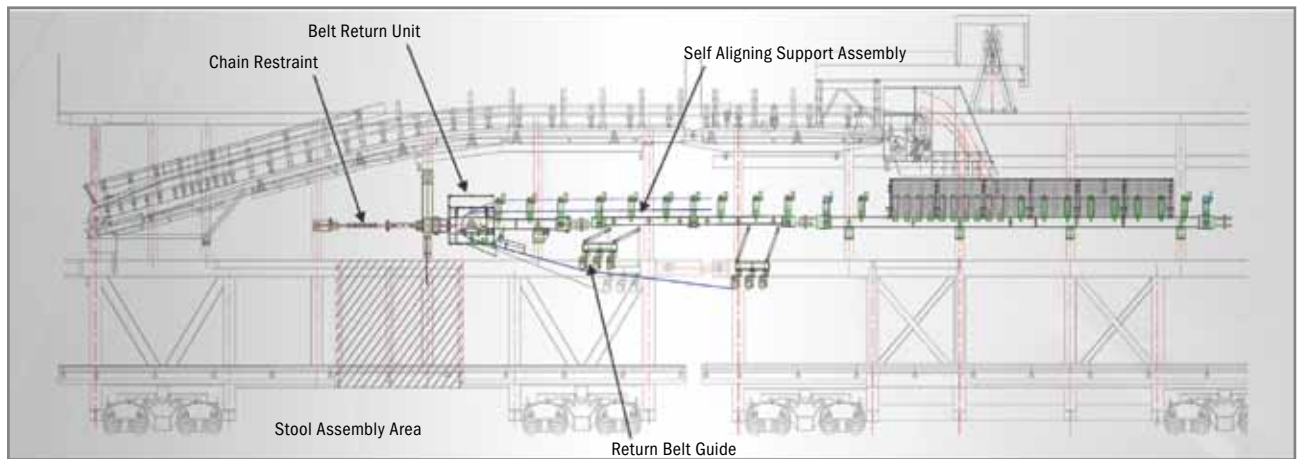


TBM Back-up Interface & Electrical Control Systems



TBM Interface with Conveyor Structure

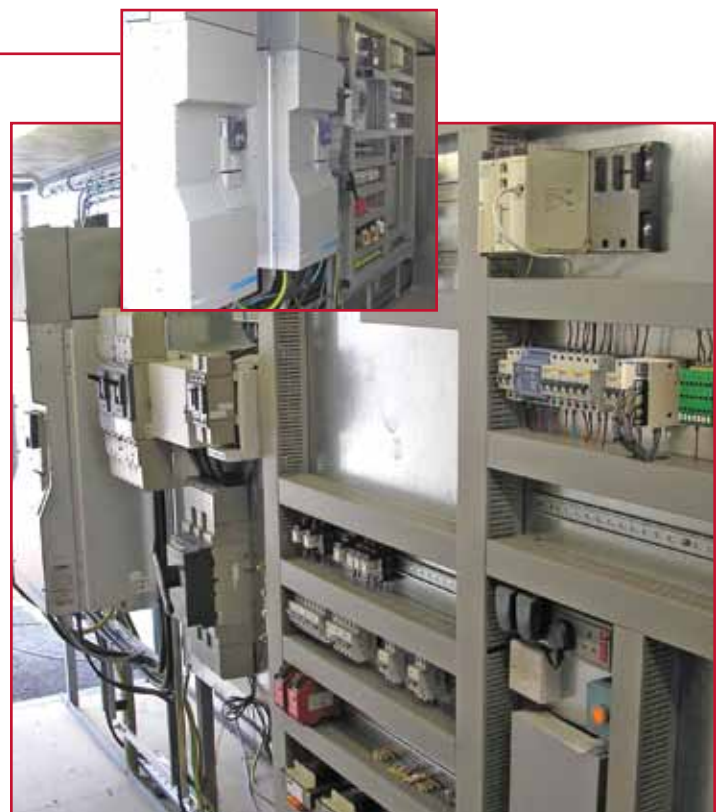
Joy Global has worked with many of the major leading TBM manufacturers, Road Heading and Drill and Blast Contractors. The interface between the TBM and the conveyor structure is paramount to successful tunnel excavation advance. Material loading points and belt return configurations are designed specifically for each installation. Tunnel conveyor structure installation is designed to facilitate conveyor mounting during TBM operation, thus providing for uninterrupted tunnel advance.



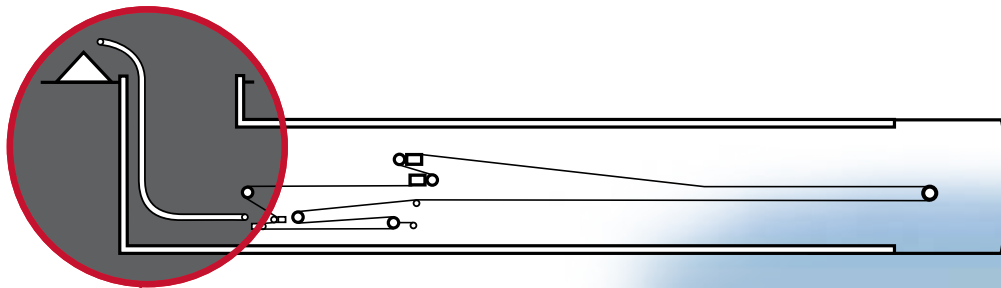
Electrical Drive and Control

Joy Global provides complete electrical packages for tunnel conveyor systems from the interface to the TBM. These electrical packages include Variable Frequency Drive Systems. Belt drive control is achieved by the use of PLC-controlled VFD systems to give total control of starting and stopping. This is particularly important in long conveyor systems.

The PLC VFD combination is essential in the control of tripper booster systems. Precise power input and belt tension control are achieved when Joy Global conveyor modeling software is employed. We can provide a concise data information package encompassing system control logic and complete monitoring of drive systems and all in-built safety protection devices. This improves safety and provides high operational performance.

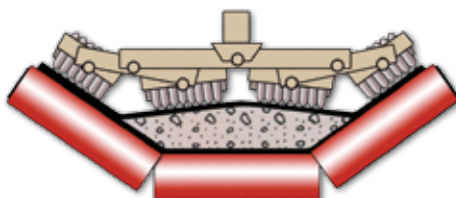


High Angle Conveyors – HAC



Worldwide, Joy's high angle conveyor is a proven option for a variety of steep angle applications. In addition to tunneling, the HAC conveyor has the ability to handle coal, gravel, ores, excavated silts, sand, clay, refuse, municipal sludge and much more.

Customers using Joy's high angle conveyors have realised significant financial savings.



HAC technology has solved many high capacity, steep angle conveying problems, up to and including vertical lifts. The Joy system employs standard idlers and rollers and a simple, but unique, sandwich principle, that overcomes the limitations typically encountered with many traditional methods of conveying.



The Conveyor Alternative



SAFETY

Conveyors are considered a lower risk as they are located close to the tunnel wall or roof area. No dangerous switching of Muck Cars is necessary, which reduces the likelihood of rail traffic accidents.

CONTINUOUS OPERATION

By their nature, Muck Cars are intermittent. Conveyors allow the tunnel excavation process to proceed in a more reliable and, with the exception of belt storage replenishment, almost continuous manner.

FLEXIBILITY

Muck Cars do not enable efficient transportation of certain materials, such as ring segments. Use of conveyors results in reduced infrastructure costs, especially where horizontal and vertical curves need to be accommodated.

PRODUCTIVITY

Large Belt Storage capacity increases TBM utilisation, reduces construction time and results in **lower costs**. The near continuous handling of higher tonnages of muck and spoil is a visible, real time benefit.



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