

Belt conveyors – the better way

Reap operating cost savings and efficiencies in the handling of bulk materials with electrical belt conveyors, a cost effective and reliable alternative to haulage trucks.

The inherent advantages of belt conveyors have made them one of the most widely used methods for transporting bulk materials in the industrial, commercial and agricultural sectors.

They continue to improve and adapt and, as their underlying technology advances, become ever more capable of handling complex and customized applications. Now, conveyors are available in a variety of shapes, sizes and materials, all made to fit the product they are moving and the space they are moving in.

- Belt conveyors move large quantities of material over long, roadless distances at a fast speed
- They have a wide range of applications where drive technologies vary from low, single digit kilowatts (kW) to several thousand kilowatts
- They run cross-country, up steep inclines from underground or open pit mines, to and from storage areas, to processing operations and to load-out devices or end use points
- They move materials as either portable or fixed belt conveyor units

Lower operating costs, safety, reliability, versatility and an almost unlimited range of capacities are amongst the many advantages of using electrical belt conveyors instead of alternative transportation methods such as haulage trucks.

The right choice

Choosing the most appropriate belt conveyor for your specific product and operation is crucial:

- The type of material the belt is made of is vital to the success of its application; whilst
- Having the wrong belt can significantly affect throughput, downtime and safety.

The most appropriate belt depends on you knowing your product and “how it will convey” – please consider:

- The size, weight and distribution of your product
- The material the product is made of
- How the product will be loaded onto the belt conveyor (i.e. will there be impact loading?)
- The speed at which the product will be conveyed
- Whether the product’s orientation will change

- Whether the product will travel on an incline and / or decline
- The environment in which the conveyor will operate (hot or cold, wet or dry, inside or outside, corrosive or non-corrosive)

Once you have chosen the appropriate type of belt, also consider the specifications of how the belt should be cleaned and maintained, replaced or modified, and the costs associated with these measures.

The world's fastest conveyor belts run at a speed of 15 meters per second and operate on the world's biggest spreaders at the lignite mines of RWE AG, a leading German-based power generation and energy trading company.

Types of belt conveyors

The list below is not intended to be complete but a guide to the most common types used in industry today.

General purpose belts

This wide category of belts is typically made of an inner structure and an outer cover - materials used include rubber, PVC, urethane, neoprene, nylon, nitrile, polyester, leather and others. Features of this category of belts include:

- High friction for inclining / declining
- Low friction for accumulation
- Oil resistant
- Cut resistant
- Food grade
- Electrically conductive
- High temperature resistant
- Cleated (for bulk handling)
- Troughed (for bulk handling)

Plastic belting and chain

Plastic belt conveyors are often lightweight, durable and wear resistant. This category of belts is applied in the following fields:

- Food production
- Packaging
- Pharmaceuticals
- Manufacturing

Hinge metal belting

Hinge metal belting is incredibly durable and often used for machine chip and scrap removal. Applications for this category of belting include:

- Wet or dry operations
- High temperature operations
- Machine tool chip removal
- Whole plant chip and scrap removal
- Die cast operations
- Parts handling
- Packaging operations
- Inspection
- Stamping operations

Woven wire belting

Woven wire belting is commonly used in very high / low temperature environments and during drying processes. Applications for this category of belting include:

- Food processing:
 - Washing
 - Baking
 - Dewatering
 - Blanching
 - Cooking
 - Freezing
 - Pasteurizing

- Glass and ceramics:
 - Firing
 - Decorating
 - Enameling
 - Annealing
 - Fiberglass curing

- Electronics:
 - Glass to metal sealing
 - Thick film firing
 - Drying of printed circuit boards

- Metalworking:
 - General conveying
 - Heat treating
 - Quenching
 - Annealing

Flat wire belting

Flat wire belting has a flat surface that makes it, amongst others, ideal for food handling. Applications for this category of belting include:

- Canning and food preparation
- Baking and freezing food
- Parts cleaning
- Parts painting and drying
- Product sorting, assembly and packaging
- Parts transfer

Belt conveyor systems in mining applications

Belt conveyor systems continuously transport all forms of material, including excavated and crushed rock, in an efficient manner over long distances, passing through curves and rough relief areas.

Apron feeders

- Apron feeders are designed for use in demanding material handling and processing applications and cover a range of mineral commodities, as well as various types of ore, coal and aggregates.

Belt feeders

- Belt feeders are mainly designed for material flow regulation.

Mobile conveyor bridges

- Mobile conveyor bridges operate as flexible links between mining machines and bench conveyors and increase the operating range of a system.

Mobile transfer conveyors

- Designed to handle a wide range of capacities of various bulk materials, mobile transfer conveyors are "multi-use" equipment that are used to both increase the performance and flexibility of many mining operations.

The world's longest conveyor belt moves phosphate ore from Bou Craa, a Moroccan-controlled mine in the interior of Western Sahara, over a distance of nearly 100 kilometres to the Atlantic seaboard.

Evaluating conveyors: A comparison

Companies are facing rising operating costs in increasingly competitive environments. Improving energy productivity and reducing costs by optimising processes have become a business imperative.

How do mining companies, for instance, decide whether to invest in a fleet of trucks or install long-haul belt conveyors?

There are rules of thumb that dictate the breakeven point for these technologies based on the length of travel and a mine's annual output, but a more rigorous approach is to calculate the net present value (NPV) of the cost per ton of material per kilometer.

There are other considerations too:

Belt conveyors –

- Are expensive to acquire and install – they cost thousands of rand per meter.
- Must be carefully planned, installed and continuously monitored to prevent snags, belt slippage and poor traction, which will result in high operating costs and lower productivity.
- Must be extensively maintained, including sending personnel into a mine's pit to perform manual checks of equipment.
- Are driven by multi-kilowatt motors, which must be appropriately sized with a considerable power safety factor to account for parasitic loads.
- Require additional infrastructure such as crushing units to ensure proper belt loading and distribution.
- Can never be out of service – a single point of failure can cause unplanned and expensive downtime. (Mines mitigate this risk by installing online condition based monitoring equipment to continuously check on the health and provide early warnings of problems with motors, gears, and head/tail pulleys).
- Can take a more direct path overland and do a better job of negotiating rough, road less terrain.
- Are suitable to convey almost any type of bulk material over long distances at high speed, thereby reducing operating costs and improving operational efficiency.
- Consume less energy and are not reliant on the availability of diesel fuel.
- Need less labour and incur less operating costs in this regard (systems are automated and reduce the need for manual intervention).
- Operate without noise.
- Have long conveying paths.
- Have long lifespans.
- Have high operational reliability.

- Generate less dust and occupy less space
- Are not recommended for lightweight bulk material that can be carried away as dust or spilled from the belt along its path.

Trucks -

- Are expensive to acquire – they cost millions of rand each.
- Are dependent on a reliable supply of diesel fuel to operate.
- Are only about 50% efficient because half the time they are carrying empty loads - a truck of several hundred tons will burn approximately 230 litres per hour regardless of its load.
- Are labour intensive and incur more operating costs in this regard.
- Need flat roads and a dispatch system.
- Are ideal for operations that lack fixed haulage distances.
- Are dependent on fixed road haulage routes.
- Require extensive maintenance, including expensive tyre replacement and sending personnel into a mine's pit to perform manual checks of equipment.
- Can be out of service - there are usually multiple spare trucks at any given mine site.

Belt conveyors are generally more cost effective (on a lifecycle cost basis) than both road and rail transport for throughputs of up to five million tons per annum over horizontal conveying distances of up to 40 kilometers

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Credits:

Bastian Solutions

<https://www.bastiansolutions.com/blog/index.php/2013/12/12/conveyor-belt-types-and-applications/>

Tenova

<http://www.tenova.com/product/mobile-transfer-conveyors/>

Emerson Process Experts

<https://www.emersonprocessxperts.com/2013/04/age-old-question-trucks-or-conveyors/>

Mcshane

<https://www.mcshanemetalproducts.com/blog-post/trucks-conveyor-systems-which-is-better/>

Phoenix

http://www.phoenix-conveyorbelts.com/pages/world-records/fastest/fastest_en.html