Tightening the belt on conveyor costs

Lengthening the service life of a conveyor belt by choosing the most suitable belt material can provide enormous potential savings. DYNA Engineering's General Manager, Thomas Greaves, explains the various types of conveyor belts, along with their applications and benefits.

WHEN IT COMES TO TEXTILE rubber conveyor belts, also known as fabric belts, there are many different types, specifications, thicknesses, layers and strengths available. Taking the most appropriate characteristics into account when considering which to use will dramatically increase a conveyor belt's service life and reduce replacement/repair intervals.

Conveyor belt covers

Covers vary in thickness to accommodate differing wear rates caused by factors such as material loads, material movement against the belt surface and material impact at the loading points. The top cover is exposed to the material and is generally the thicker cover because it will be consistently worn away from the contact with the conveyed material. The bottom cover is in contact with the pulleys and rollers, so this side is generally thinner as it wears much more slowly.

The greater the load, movement or impact, the higher the rate of wear that occurs for the top cover. Increasing or decreasing the top cover thickness is a trade-off between cost versus life. The aim is to provide a suitable wear life of the belt, without excessive cost, before it needs to be replaced.

The thickness of the covers adds or subtracts from the belt mass. The belt mass has an impact on a range of factors which need to be considered in relation to the structural design of the conveyor. For example, frame, idlers and pulleys will need to be adjusted to accommodate the differences in forces a heavier belt will inflict.

Conveyor belt cover grades

Under the Australian Standard for Conveyor Belting-Textile Reinforced, AS 1332-2000, each belt will be classified into one of the following grades:

A Abrasion Resistant
E Static Electricity Conducting
F Fire Resistant
M General Purpose
N General Purpose
S Static Electricity Conducting and Fire Resistant
Z Special Properties

Each grade has a minimum standard which must be met to qualify for the grade. More than one grade can be used on a single rubber conveyor belt. For example, Grade MA rubber is both general purpose and abrasion resistant.

Abrasion-resistant rubber is used when the conveyed material is very rough and abrasive and causes the rubber to wear from the belt too quickly. Grade A rubber is used when the wear of the conveyor belt would occur too quickly when using general purpose grades. An

DYNA Engineering rubber conveyor belts are available in a complete range of fabric and steel cord construction to meet virtually any material handling application.

example of when you would use Grade A rubber belt would be on an iron ore conveyor. Iron ore is very coarse and wears standard rubber quickly. Even though Grade A rubber is more costly, the cost of removing and installing replacement belts frequently may make it more cost effective to go with a higher-wear rubber.

Static electricity conducting rubber conveyor belting conducts static electricity produced during the transport and conveying process and discharges the electric charge – usually into a grounding path. Minimising sparks from static electricity is a necessity when in the presence of potentially explosive materials such gases, liquids, powder and dust because the risk of explosion can be deadly. A common use of Grade E rubber belting is at an aluminium refinery. Aluminium can commonly discharge excess electrons which can cause a static electricity build-up. Static electricity conducting belts are used to absorb the excess electrons and discharge them safely.

Fire-resistant belting is usually used when transporting heated materials. Rubber has natural properties which can be ignited and burn. Grade F rubber belting has added properties, which increase the ignition temperature and increases resistance to fire. An example of the use of Grade F rubber belts are at underground mines, coal mines and power stations. If a rubber conveyor belt were to catch fire underground, the smoke and air hazards could be potentially fatal. Therefore, fire-resistant belts are used to mitigate the risk. Work at coal mines and power stations involve heat processes. Fire-resistant belts help to reduce the risk of the heated process causing the conveyor belt to ignite.

Some of the most common design considerations are minimum pulley diameters, idlers, belt width and troughability.

Grade M general-purpose rubber is the most common type of rubber conveyor belt and is used when special properties are not needed to suit an application. Grade N rubber is lower quality compared to Grade M. Grade M rubber has greater hardness, is more abrasion-resistant and is superior in strength when compared to Grade N. The only difference between Grade M and Grade N General Purpose is the quality of the rubber.

Grade S rubber conveyor belts are both static electricity conducting and fire-resistant. The reason it exists is because this combination is the most commonly used in the E and F applications described.

Grade Z rubber belting is a specially designed conveyor belt to suit a particular purpose. This grade is used when the rubber properties do not fit in any of the other categories.

Belt fabric/cord (Belt Carcass)

The belt carcass is located in the middle of the conveyor belt, between the top and bottom covers. The carcass is what dictates the strength and elongation of the conveyor belt. Textile belts, as the name suggests, have fabric layers, which make up the carcass of the conveyor belt. Each of the different materials

There are many different belt types, specifications, thicknesses, layers and strengths available.

offer advantages and disadvantages, depending on conveyor application and specifications. The most common fabric types are:

Fabric/Cord	Code
Cotton	C
Nylon (Polyamide)	N
Polyester	P
Glass	G
Aramid (Polyaramide)	A
Vinylon	V
Rayon	R

These fabric types are not mutually exclusive. For example, a commonly used conveyor belt is a PN belt. PN is a combination of polyester and nylon, which have been blended to achieve greater properties than one on its own.

Number of fabric layers

Another factor to consider, which is important to the strength and elongation of the conveyor belt, is the number of layers of fabric within the belt carcass.

Let's compare it to a real-life example. If you stretch a single bed sheet, it doesn't put up much resistance. Now fold the bed sheet twice. You now have four layers. If you try and stretch the bed sheet with four layers, it is significantly harder. It's a similar outcome for textile belts. A number of fabric layers are typically combined to achieve the desired properties.

Adding more layers to the conveyor belt will increase its strength, but it will also affect flexibility.

Design considerations

The specifications of any nominated conveyor belt need to take into account the design aspects of the conveying system where it will be installed. Some of the most common design considerations include minimum pulley diameters, idlers, belt width and troughability.

A common example is the pulley diameters. If the diameters are on the smaller side, the belt flexibility needs to be higher to wrap around the pulley effectively. Too many layers of fabric may cause excessive stress on the conveyor belt which can lead to faster failure rates.

Tensile strength

Tensile strength is the reading of the expected strength of the conveyor belt. This is usually measured in kilo newtons per metre of width (kN/m) in the longitudinal direction (along the belt). Under AS1332-2000, the belt is given a designation to allow engineers to easily identify the specification of the belt. The designation is marked on the belt during manufacture and thus can be easily read to identify the basic specifications and other features of the belt.

For example, a belt designation of PN 1000/3 M 8 3 DYNA 19 would mean it is a Polyester Nylon fabric belt, tensile strength of 1000 kN/m, has three layers of fabric and the covers are made of M grade rubber. The belt has eight millimetres of thick top cover and a three-millimetre thick bottom cover. The manufacturer is DYNA Engineering and the year of manufacture is 2019. B

Grade A rubber is used when the wear of the conveyor belt would occur too quickly when using general purpose grades.