CONVEYORS

Chain Conveyor

An endless chain transmits power from a motor to a carrying surface or unit. The carrying unit can be quite varied. Specific examples of chain conveyors are flight conveyors (flights are "blades" attached perpendicular to the chain), apron conveyors, bucket conveyors, and slat conveyors. An apron conveyor is similar to a slat conveyor, the only difference being the partial overlapping of the slats in the apron conveyor to provide a continuous moving surface.

Examples of chain conveyors

Used for moving materials continuously over a fixed path (point-to-point)

TYPICAL CONVEYORS

1. Belt Conveyor
2. Roller Conveyor
3. Wheel Conveyor
4. Chain: Flight, Apron, Bucket, Slat
5. Chute Conveyor

Belt Conveyor

The belt conveyor is an endless belt moving over two end rollers at fixed positions and is used for transporting materials

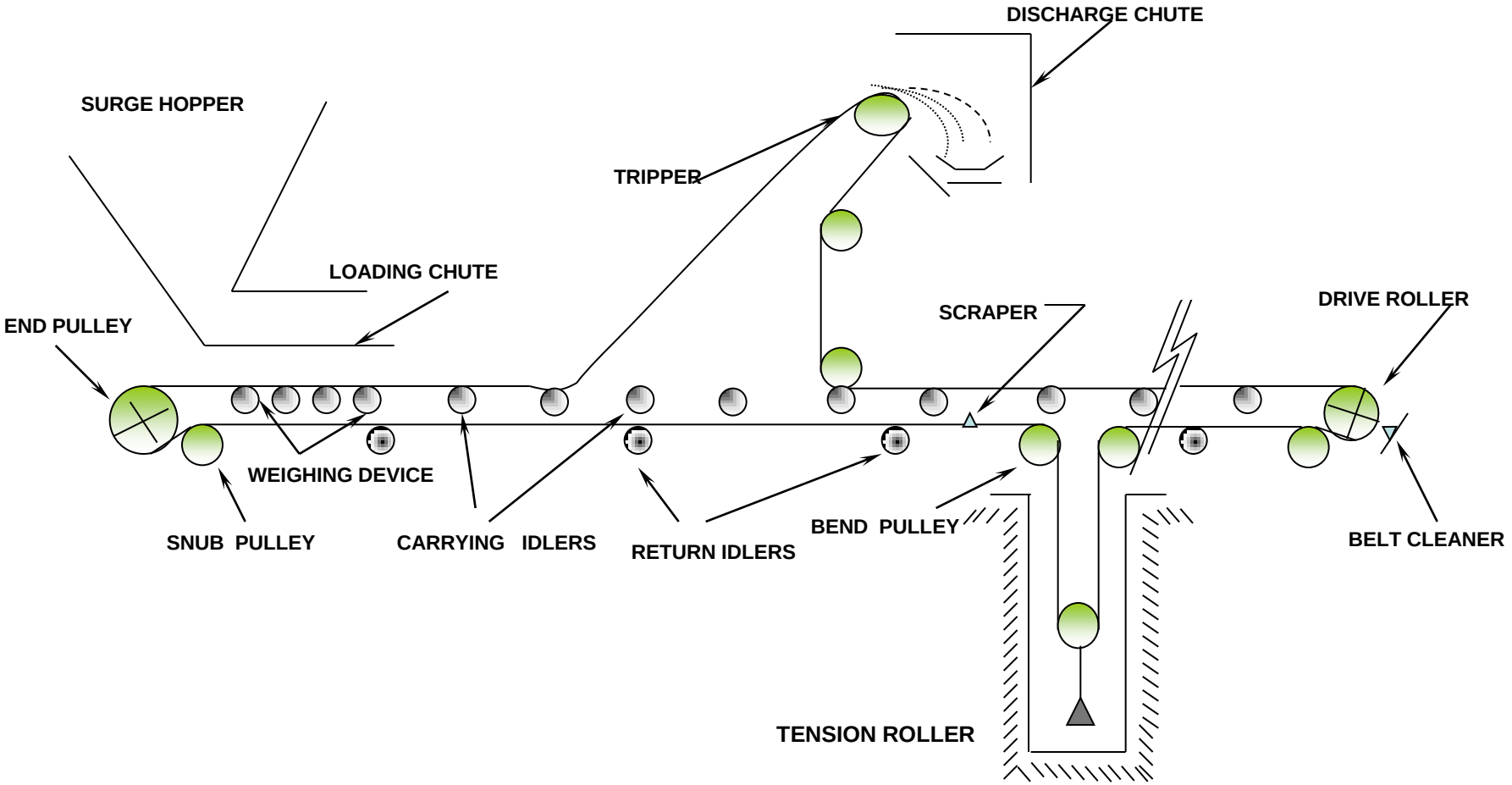
The main components of a belt conveyor are:

- The belt
- The drive rollers that imparts power to the belt .
- The idlers, which form the supports
- The tension rollers that tension and can track the belt
- The structure or frame

Other components include:

1. Loading or feed chute that directs product on the conveyor.
2. Surge hopper and feeder, which controls the supply of product at a uniform rate.
3. Continuous weighing device for constantly measuring the product load being carried
4. Discharge chutes to feed product off the conveyor to a receiving point.
5. Tripper arrangement to discharge material sometimes at different discharge point when required
6. Belt scrapers and cleaner that keeps the underside of the belt free from product.

Components


DISCHARGE CHUTE
SURGE HOPPER
TRIPPER
LOADING CHUTE
END PULLEY
SCRAPER
DRIVE ROLLER
WEIGHING DEVICE
SNUB PULLEY
CARRYING IDLERS
RETURN IDLERS
BEND PULLEY
BELT CLEANER
TENSION ROLLER

ADVANTAGES

1. Adjustable speed
2. High capacity (moving a large number of items)
3. Permits other activity (processing & inspection)
4. Versatile (floor or overhead)
5. Temporary storage of loads between work stations
6. Automatic load transfer (less supervision)
7. Straight line paths or aisles are not required

DISADVANTAGES

1. Fixed paths serve limited areas
2. Bottlenecks can develop
3. Hinder movement of mobile equipment on factory floor

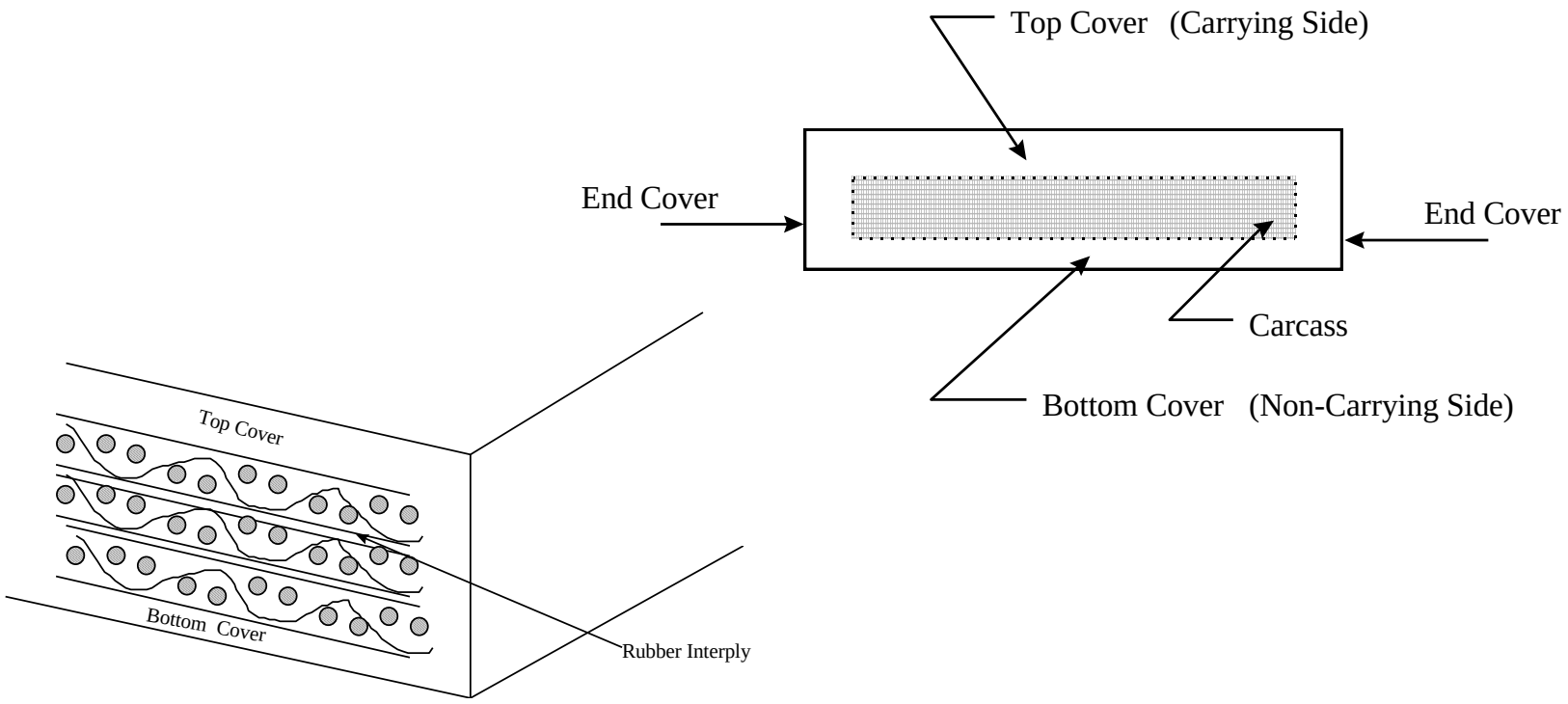
Conveyor Belt Material

Essential Belt Properties

The belt works as a load-carrying element. It may be used for different kind of material transportation at a higher speed (6-8 m/s). For this purpose the belt need to have the following essential properties:

1. Flexibility
2. Transverse rigidity
3. Low mass per unit length
4. High strength
5. Simplicity and inexpensive
6. Longer life
7. Wear resistant
8. Fire resistant
9. Should not stretch under normal working stresses, i.e., low relative elongation.

Cross section of a multi ply conveyor belt.



Construction of conveyor belt.

Joining Conveyor Belts

Conveyor Belt Vulcanising

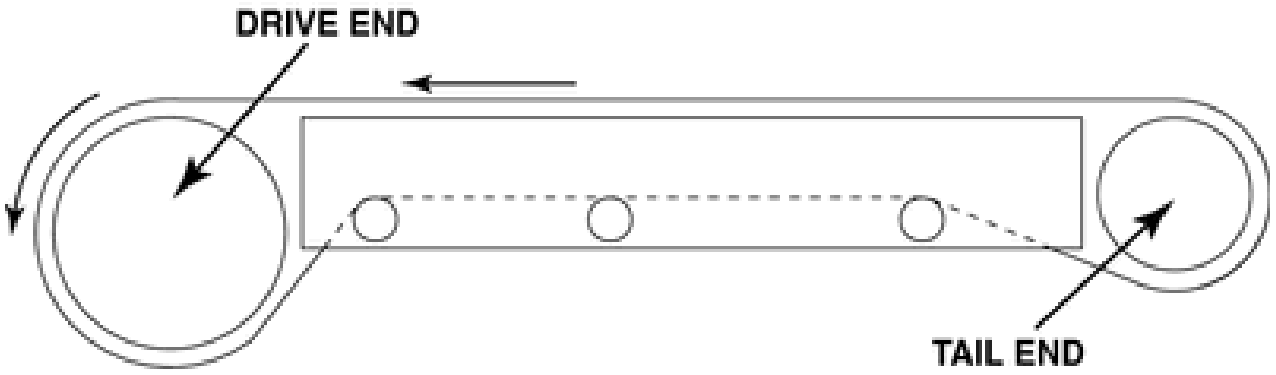
Vulcanising is the means of joining a rubber conveyor belt. Hot vulcanising is a joint that is a much better bond that will last the life of the belt.
Cold bond may be used sometimes in confined areas or at height where having to carry the vulcanising equipment.

Mechanical Conveyor Belt Jointing

Flexco, is an American manufacturer that supply a wide range of mechanical fasteners to suit most belt types. They can be used when the belt material is not suitable for vulcanising such as PVC.

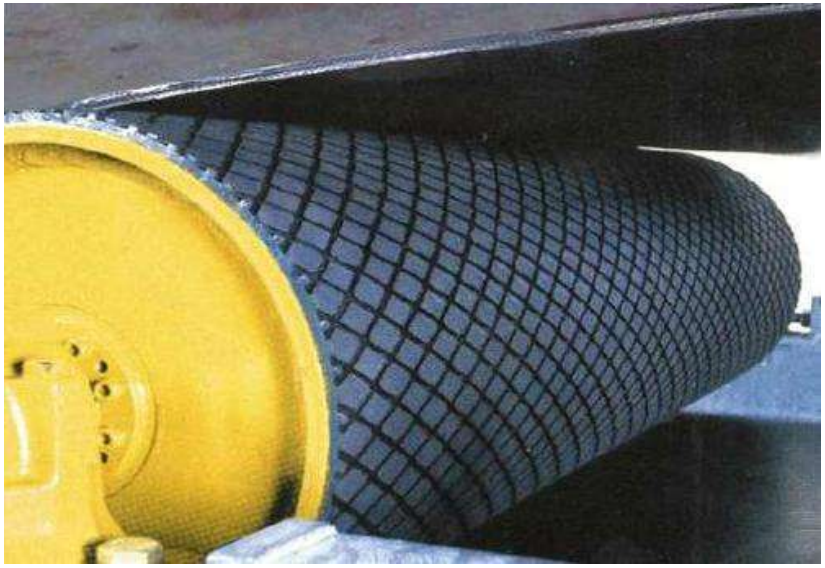
Belt Conveyor Drive Systems

The conveyor drive is normally located at the end to which the belt moves.



The longest belt conveyor system in the world is in the Western Sahara. It is 98 km (61 mi) long. The drive and tail roller are a very important part any system that need to be square to the belt direction and provide maximum drive torque to belt, very often these days via a shaft mounted gearbox arrangement

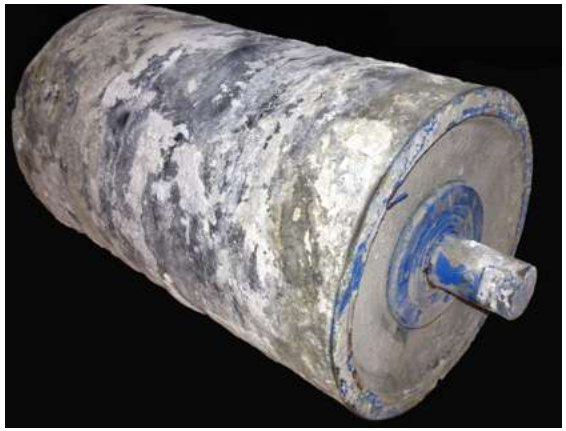
The drive roller is larger in the center than the ends, this helps keep the belt in the center and is referred to as a "Crown“ profile.
Some drive pulley are completely covered with vulcanized rubber and is called "lagging". This greatly reduces the roller from slipping under the belt.



As the conveyors is driven through a drive roller, the head drive is preferred to the tail drive because of lower belt stress. They come in a variety of designs that suit the particular system.

Product build-up

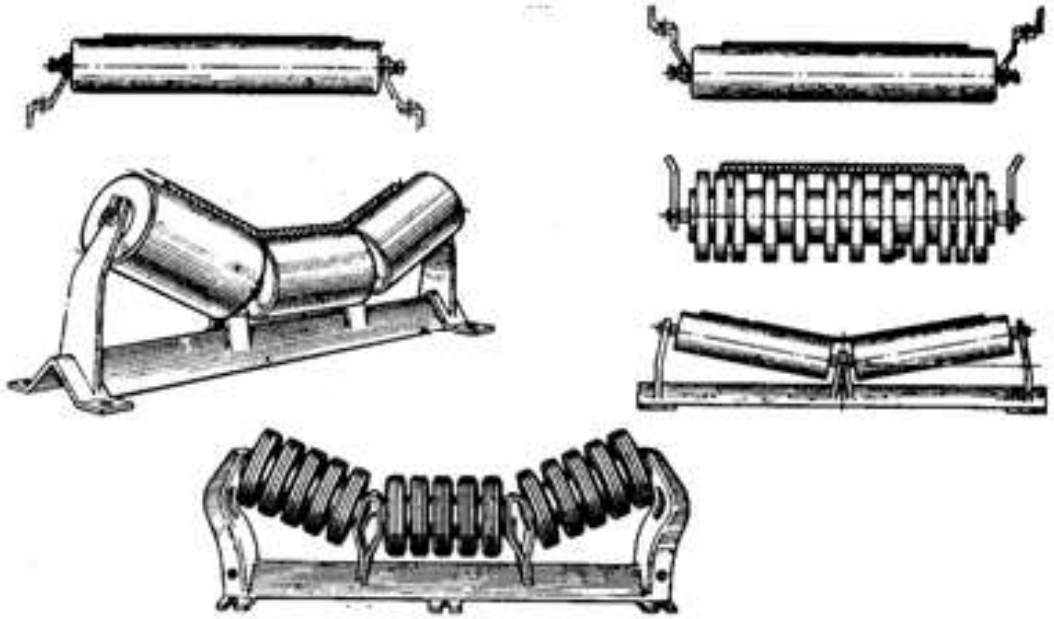
Material build-up on conveyor rollers, primarily on the return rollers which contact the underside of the conveyor belt, account for an ever changing tracking problem.



As the product builds-up on the rollers, the conveyor belt will start track badly due to build-up. Not only is the build-up a problem, but also the carry back which is deposited under the conveyors and has to be constantly removed.

Idlers and Support Rollers

Idler and support roller are also and integral part the conveyor in that the support the belt were the product comes on and is transferred, they form the belt into a trough and then provide return support under the frame structure of the conveyor.

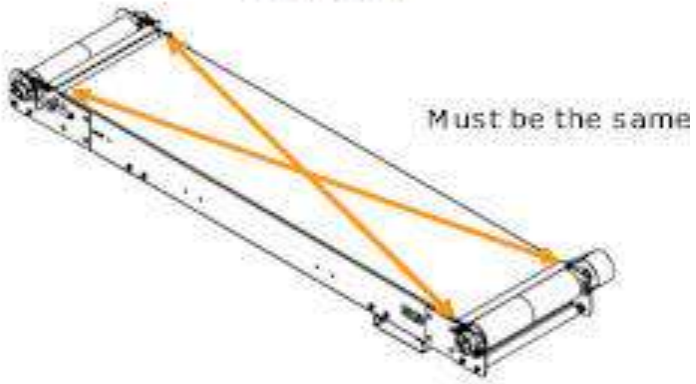


Typical idlers and support rollers

Belt Tracking

First item you check is the bed for square. which is done by measuring corner to corner. (Figure 1)
Make sure that the bed is level from end to end and side to side. If there is more than one bed, run a string from the center of each end to make sure there is no bow in the bed set up. A banana type bow can cause tracking problems. (See Figure 2)

Figure 1 - Check to make sure it is square



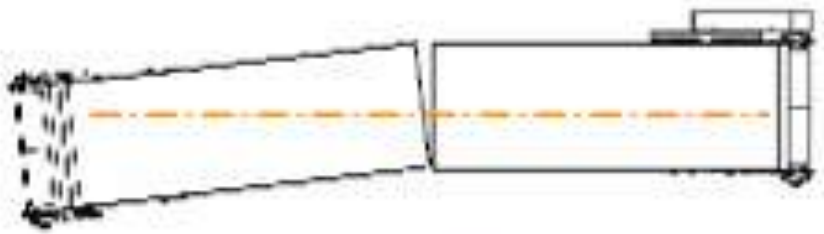
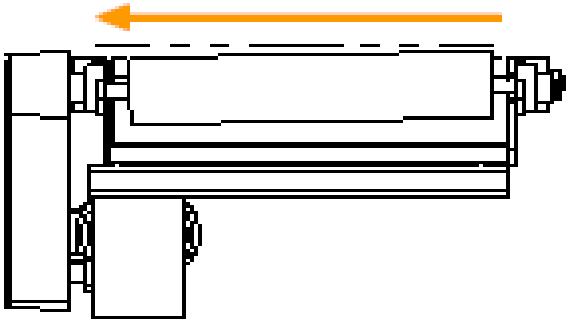


Figure 2 - Banana

Make sure the drive and take-up pulleys are level with the bed. If the pulleys are not level the belt will track hard to the “low” side. Loosen the bearing bolts on the side that the belt rides toward and adjust the pulley “up” to move the belt toward the center of the pulley. (See figure 3). After you are sure that the conveyor is level and the pulleys are level with the conveyor your next check is the belt tension.

Figure 3

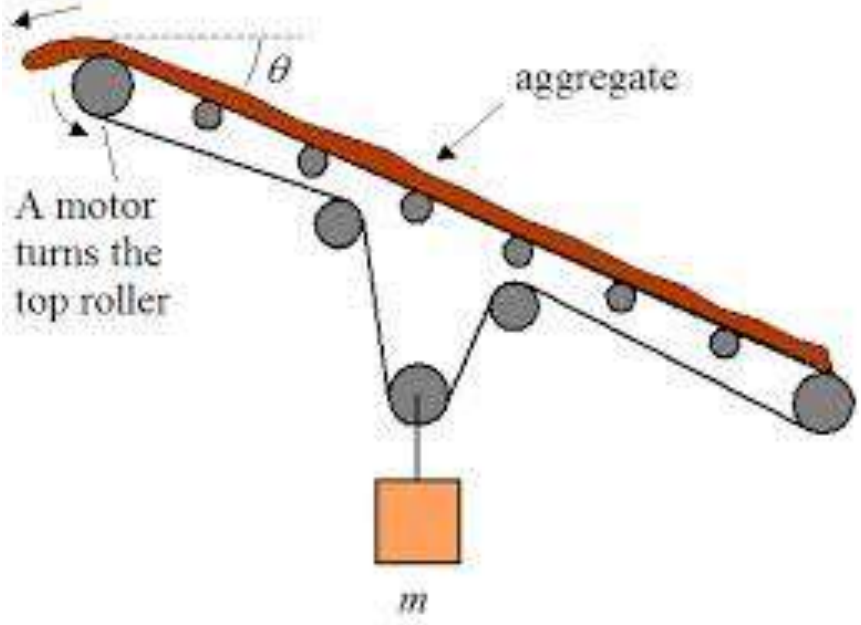


Belt will track to the left if the pulley is tilted to the left as shown

Poor track can have a very detrimental effect on a conveyor system. Apart from damaging the belt, it can also damage guide rollers and bearing, the inlet and discharge chutes and also lead to product getting on the underside of the belt that then builds up on the drive, tail and tensioning rollers.

Tensioning Support Systems

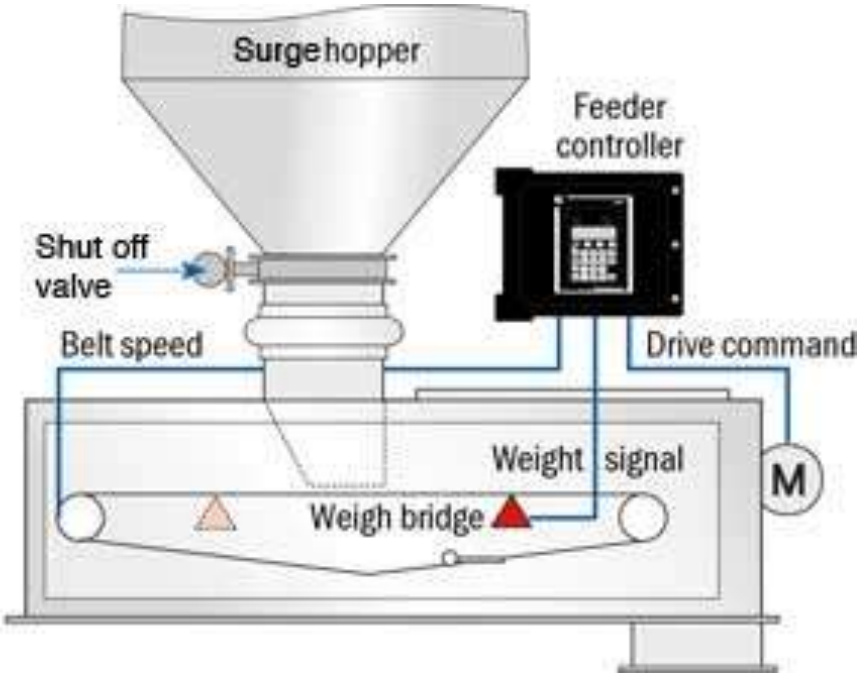
Belt tensioning is very often provided by a suspend weight arrangement, enough weight is added to ensure the belt drive does not slip under full load, but too much weight can over-stress the system and damage belts and roller bearings.



A typical tensioning systems

Product Flow Control

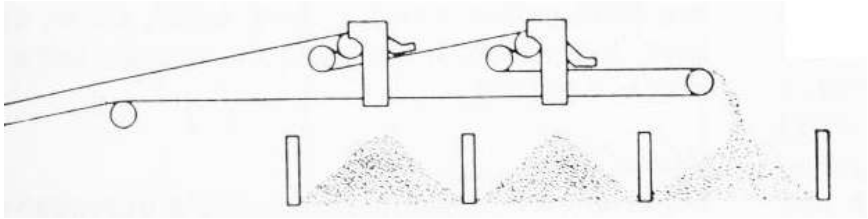
Loading product on to a conveyor is very often done using a feed chute arrangement along with surge hopper control to regulate the amount of product. The feed rate is detected by a load cell weighing device under the inlet area of the belt and linked by a control unit to the surge hopper to control the flow.



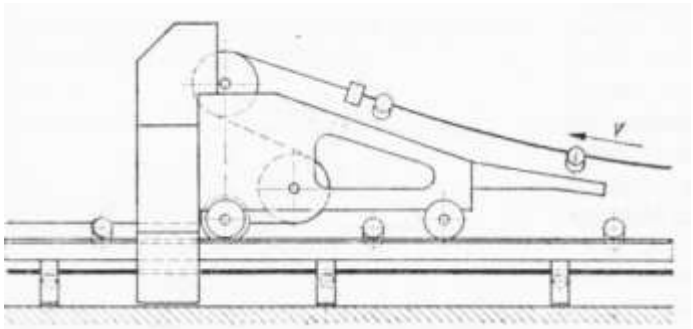
Conveyor Tripper Discharge Arrangement

Product discharge from a conveyor does not have to be solely at the end of the belt but can be at different stages along the belt by using and elevated movable discharge chute or by means of a discharge plough arrangement .

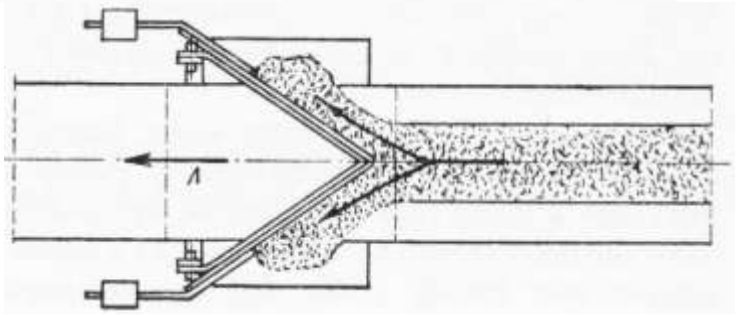
Discharge from the belt



Discharge from fixed tippers



Discharge from moveable tippers



Discharge by ploughing

Discharge Plough

Elevated Discharge Tipper Chute

Belt Cleaning and Scraper's

Several systems are used to keep the conveyor belts clean of product. They usually have a discharge scraper along with cleaning ploughs or brushes on the underside of the belt to keep it clear of product.

Discharge Scraper

Rotary Brush Cleaner

V- Plough

Self-adjusting unit eliminates the need to readjust to accommodate blade wear. Can also be positioned directly behind the head pulley to dump debris at the transfer point.

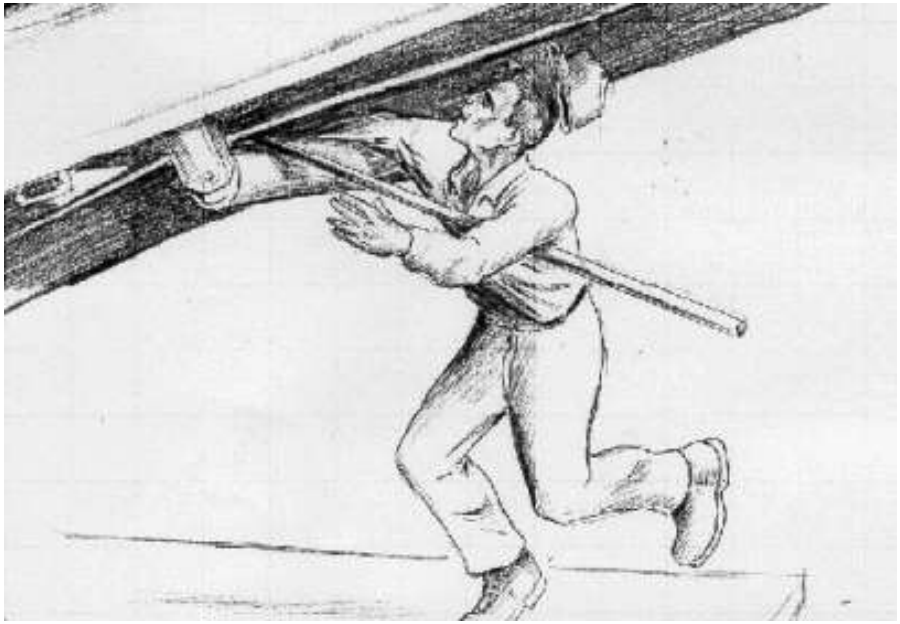
Diagonal Plough

The diagonal deflector plough is installed on a 45° angle across the belt to discharge debris to one side of the belt.

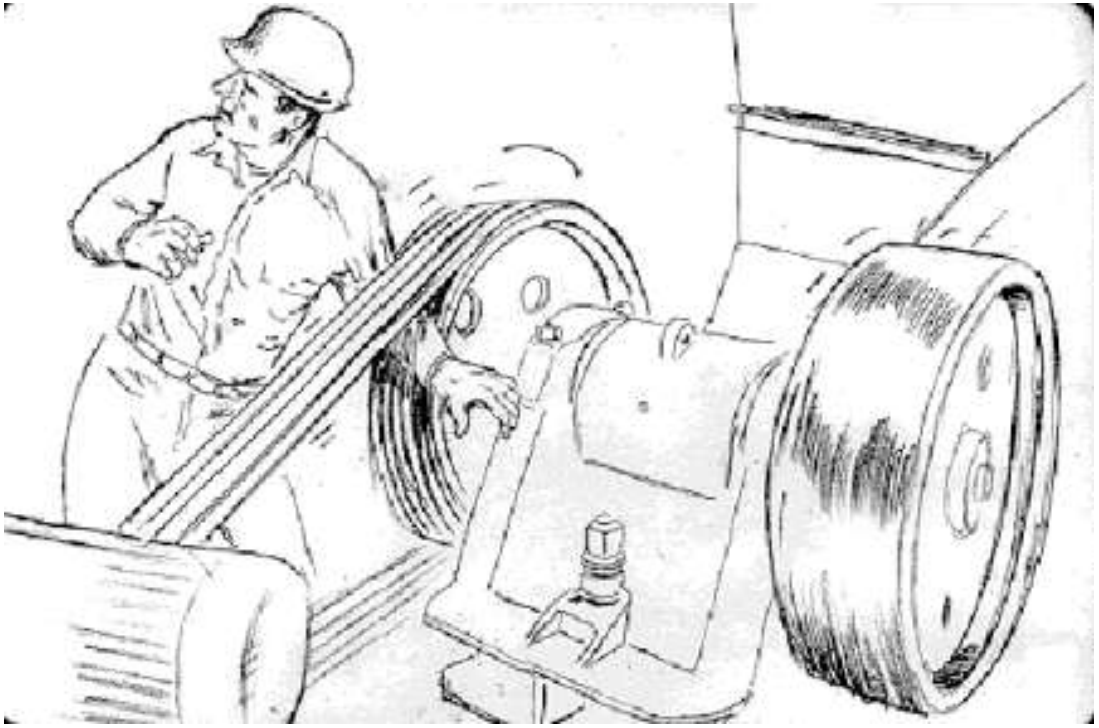
Conveyor Belt Safety

Conveyor belt safety is somewhat out of the ordinary in that the equipment is usually very large and minimal guarding. There is usually a stop or trip wire running the full length of the belt and conventional guards fitted to the drive, tail and tensioning rollers. In some maintenance activities it may be necessary to run the units while working on them and great care must be taken.

Stop or trip wire running the full length of the conveyor belt



March 18, 1999, a 56-year-old superintendent with 4 weeks mining experience was fatally injured at a sand and gravel operation. The victim was using a metal bar to clean mud off of a return roller underneath a conveyor belt when he was caught and drawn into the pinch point.



July 14, 1998, a 63 - year old operator with 7 years of mining experience was fatally injured at a sand and gravel conveyor. The victim was attempting to clear debris built during maintenance work at the main drive. He was caught and drawn into the drive belts, the guard had been removed and was laying nearby.

Belt Conveyor Maintenance

Along with all the usual mechanical maintenance requirement for rotating equipment, drive couplings and bearings etc.

By far the most usual maintenance activity is to do with the service or change-out sized or damaged support rollers. Belt replacement are usually carried out by specialized contractor.

Damaged support rollers after in service seizure

Discharge from fixed tippers overflow following flow control failure by seized damper valve

Other Types of Conveyor Systems

Roller Conveyor

It consists of rollers attached to side rails supported by a steel frame.
The load is carried on the rollers, each of which rotates about a fixed axis.
The type of roller (steel, rubber, and wood) and the spacing of rollers depend on the type of load to be carried.
It can be gravity-operated or power-driven.
They can be gravity-operated or power-driven, some of the rollers are driven by chains or belts to provide the motion for the material on the conveyor

Examples of a roller conveyor

Wheel Conveyor

It consists of wheels attached to side rails supported by a steel frame. The load is carried on the wheels, each of which rotates about a fixed axis. It can be gravity-operated or power-driven. Wheels can be made of steel, aluminum, or plastic. Most flat-bottomed surfaces will convey satisfactorily on wheel conveyors. If the part does not have a flat surface, it may ride in a box or on a small pallet.

Examples of wheel conveyors

Chain Conveyor

An endless chain transmits power from a motor to a carrying surface or unit. The carrying unit can be quite varied. Specific examples of chain conveyors are flight conveyors (flights are "blades" attached perpendicular to the chain), apron conveyors, bucket conveyors, and slat conveyors. An apron conveyor is similar to a slat conveyor, the only difference being the partial overlapping of the slats in the apron conveyor to provide a continuous moving surface.

Examples of chain conveyors

Chute Conveyor

A chute conveyor is a slide, generally made of metal, which guides materials as they are lowered from a higher-level to a lower-level workstation. The shape of the chute can be straight or spiral to save space.

The End
Any Questions ?