The principal function of belt tracking control is to monitor and adjust belt alignment to ensure that acceptable tracking tolerances are maintained. Two types of technical solution can be employed to achieve this:

(i) passive belt tracking control by form locking
(ii) active belt tracking control by force locking

Passive belt tracking control
A typical example of this technique is form locking between V-ropes, which are bonded on the steel belt, and pulleys or tracking sheaves.

Active belt tracking control
A number of different techniques can be used to achieve active belt tracking control through forced locking:

Head pulley (Fig. 1)
Using this method, the head pulley (around which the steel belt turns) can be turned on its vertical axis to correct any belt misalignment.

Tilt roller (Fig. 2)
In this example, a tilt roller positioned shortly before the head pulley is used to achieve accurate alignment of the belt.

Tape skew (Fig. 3)
The tape skew technique allows one or more rollers to be turned around a central axis to correct any misalignment of the steel belt.
Active belt tracking control
Principal function

By head pulley (drum)

Pulley movement

Belt misalignment

By tilt roller

Counter roller

\[ \Delta (L_1 - L) \text{ very small} \]

Fig. 1

By tilt roller

Steel Belt

Belt misalignment

Tilt roller movement

Fig. 2
Active belt tracking control
Principal function

By tape skew (angle)

Fig. 3

Active belt tracking: belt edge sensor with pneumatic controller
2. Belt tracking control (passive) by head pulley (drum) and edge rollers

The tracking of long steel belts (with all belt speed ranges) can be effected by means of a suitable geometrical design of the head pulley and so-called spring loaded belt edge guided rollers (see Fig. 4).

Intermediate tracking with rollers on the belt edge between the terminals is used for conveyors where the drum center distance is more than 20 to 30x the belt width. This type of belt tracking is used for long conveyors such as those used in sorting systems (e.g. belt width = 600 mm; drum center distance = 250 m), or where steel belts are exposed to some temperature deviation. Edge rollers should never be placed any nearer to the drum center than 10x the belt width.

3. Belt tracking control (passive) by true-tracking V-ropes

A very efficient method of guiding/tracking steel belts is the use of V-ropes (see Fig. 5).

The V-ropes can be either of rubber, which is fixed to the steel belt by a special bonding system, or they are designed as spiral ropes, which are normally welded to the steel belt. They provide forced guidance of the steel belt by true-tracking sheaves. This type of belt tracking is mainly used for belt coolers on which chemical products are solidified (resins, hot melt adhesives, waxes etc.), or in the oil and gas industries (sulphur, bitumen etc.). For a drum center length greater than 30 or 40x the belt width, support rollers with guiding grooves or spring loaded belt guide rollers could be used.
4. Belt tracking control (active)

Pneumatic or servo-hydraulic by pulley and tilt roller

For applications where environmental conditions have more effect on the steel belt (e.g. high temperatures, aggressive vapor/sublimates etc.), active belt tracking is preferable: this can be controlled by head pulley, tilt roller tracking or a combination of the two, and both are available in pneumatic and servo-hydraulic versions.

The principles are virtually the same, i.e. analogue recording of actual belt displacement compared with the set value of the belt position (normally central). This displacement is transmitted as an adjustment signal via a controller to an adjusting mechanism, which corrects any deviation.

Pneumatic control (Fig. 8 & 10): belt displacement is sensed directly as a path and transmitted via a mechanical rod system to a pneumatic controller. The path signal is converted (by a baffle plate principle) into an adjustment pressure which, using a regulating cylinder, turns the tilt roller or head pulley to reverse the belt deviation.

Servo-hydraulic control (Fig. 9 & 11): the main differences are that belt edge sensing is via a position transducer and adjustment is carried out through a PLC (software) or electronic controller. This version is preferable for applications where high belt tension is used.

The electro-mechanical version (Fig. 7 and Fig. 9) works in a similar way to the servo-hydraulic variant, the main difference being that a spindle-drive, actuated by a gear motor, replaces the hydraulic cylinder. It is particularly suitable for coffee freezer and bake oven applications.

When automatic belt tracking control techniques are used, an alternative to the water drop-edge effect of the V-rope has to be employed, i.e. the hydrodynamic water retainer (Fig. 6), where water ‘creep’ to the upper belt side is prevented by hydrodynamic/adhesive effects.
**Belt tracking control (passive)**

- **Edge rollers**
  - Application: Long conveyors

- **V-rope (rubber)**
  - Application: – non-aggressive environment
  - – ambient temperature < 90°C

- **Spiral-rope (steel)**
  - Application: – more aggressive environment
  - – higher ambient temperatures

**Hydrodynamic water retainer**

- Application: For belt coolers with active belt tracking control
Belt tracking control (active) by electro-mechanical actuation, with PLC-controller

Application:
- Extreme environmental/conditions (e.g. bake ovens, coffee freezing)
Belt tracking control (active) and belt tensioning

Pneumatic belt tracking by tension pulley

Pneumatic control cylinder (by diaphragm)

Tension diaphragm cylinder

Pneumatic controller

Active set pressure for pneumatic control cylinder

Fixed set pressure for tension pneumatic cylinder

Air supply pneumatic controller

Set pressure

Compressed air

Application:
- more aggressive environment
- higher ambient temperatures
- wide belt speed range

Fig. 8

Pneumatic control panel for active belt tracking

Active belt tracking by pneumatic actuation
Belt tracking control (active) and belt tensioning
Servo-hydraulic belt tracking by tension pulley

Application:
- high belt tension
  (e.g. double belt press)

Electro-mechanical actuation can be used as an alternative to servo-hydraulic actuation.
**Belt tracking control (active) and belt tensioning**

Pneumatic tilt roller tracking

**Application:**
- more aggressive environment
- higher ambient temperatures
- wide belt speed range

**Fig. 10**
Belt tracking control (active)
Servo-hydraulic belt tracking control by tilt roller

Application:
- high belt tension (e.g. double belt press)

Note:
electro-mechanical actuation can be used as an alternative to servo-hydraulic actuation.