TECHNICAL BULLETIN

TROUBLESHOOTING LOTENSION SYSTEMS

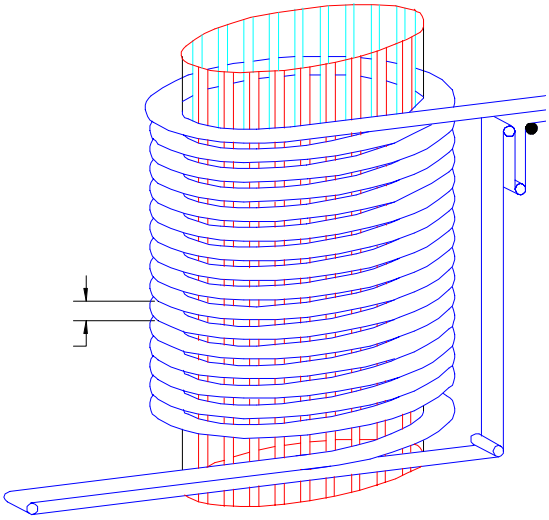
High Tension

♦ Coefficient of friction between belt and support rails is higher than coefficient of friction between belt and cage.

The estimated system tension is also called the "Radius Weight" of the system.
The formula for calculating this is:

Radius x Weight x {f(rail) / f(cage)}.
where f = friction

Unequal friction conditions can alter the system tensions greatly!

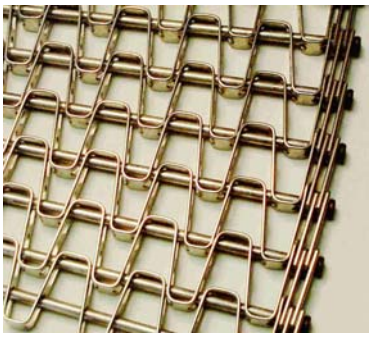


Tier Pitch = Change in elevation over one revolution.

Example:
Assuming a radius to the tension link of 10 feet [3.05 meters], and a combined weight of the belt plus load equal to 10 pounds/ft [14.9 kg/m], with the rail and cage friction both at 0.20, we have a radius weight or tension equal to 100 pounds [445 Newtons].

The chart shows what happens when these frictions are altered.

RAILS	f_r	CAGE	f_c	f_r/f_c	RW	
Normal	0.2	Normal	0.2	1.0	100	[445 N]
Dirty	0.3	Normal	0.2	1.5	150	[667 N]
Normal	0.2	Oily	0.1	2.0	200	[890 N]
Dirty	0.3	Oily	0.1	3.0	300	[1334 N]
Oily	0.1	Oily	0.1	1.0	100	[445 N]
Oily	0.1	Normal	0.2	0.5	50	[222 N]



As you can see changes in the frictional relationships can have a beneficial or destructive influence on the belt and its chances for a long useful life.

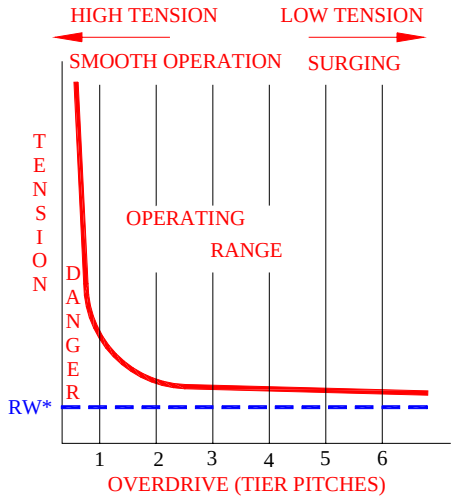
COMMON PROBLEMS AND TROUBLESHOOTING

High Tension ➢ Lack of Overdrive

Another common cause of high system tensions is a lack of overdrive. Often spiral users, in an attempt to make the belt operate smoothly, will reduce the overdrive. What they also accomplish is to create very high belt tension in the system. Often a compromise between smoothness of operation for gentle handling of the product and greater overdrive with its accompanying loping or surging is required. This is accomplished through education of the user.
It is possible to make a good estimation of what the overdrive has been over a period of time by looking at the surface of the cage bars. If the wear marks on the cage bar wear strips are nearly vertical, the system has been operating with no overdrive at all. This mark is made when the same buttonhead remains on the same cage bar for a long period of time as it rises up or drops down the cage surface. A wear mark that is between 30 and 45 degrees to horizontal will indicate an overdrive in the range of 2 to 4 tier heights, or the proper range. It will not be uncommon to see nearly horizontal wear mark indicating a very high amount of overdrive. High overdrives are in NO way harmful to the belt, and if the customer does not object to some surging, the overdrive should not be re-adjusted.

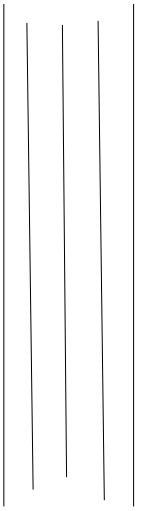
The illustration below will show these markings.

Note the relationship between overdrive and tension *as shown in the following graph:*

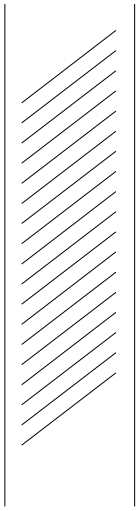


*RW = Radius Weight

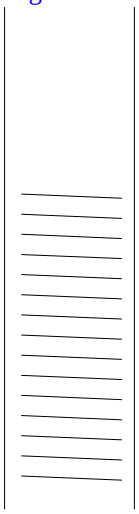
Vertical
Wear Marks
No Overdrive



30 - 45 Degree
Wear Marks
Good Overdrive



Horizontal
Wear Marks
High Overdrive



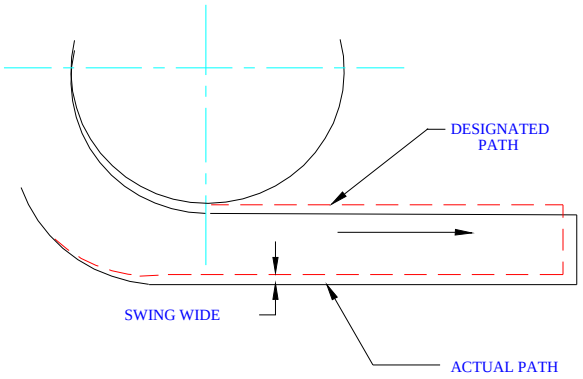
COMMON PROBLEMS AND TROUBLESHOOTING

High Tension

- Hold-downs pinching the belt against the support rails.
- Belt edge impinging on the conveyor structure.
- Hard turning or frozen bearings on a terminal or in the take-up tower area.
- Narrow area of the support structure squeezing the belt.
- A twisted or crushed cage that has a smaller diameter at the mid-section of its height that is not helping to drive.
- Cage diameter too small.
- Damage to the belt that restricts its ability to collapse. Example mesh being mashed in by ice build-up on rolls.
- Damage to the belt that restricts its ability to flex on the terminals.
- Missing cage bar caps, or wear strips missing from the belt supports.
- Rods protruding inward and catching on the cage bars.
- Loss of overdrive due to belt pitch elongation causing higher belt speed with no increase in cage speed. This occurs when overdrive was at lower range of acceptability before stretch.

Jerky Operation

- Surging
- Rod ends protruding in and hanging up on cage bars.
- Stick-Slip frictions
- Chordal action on the small sprocket at the cage drive.
- Drive motor surging or pulsing.



Dirty Systems

Process dirt and belt wear debris may contaminate product and reduce the useful life of the belt if proper cleaning is not practiced by the user. Cleaning practices and schedules are application specific.

Ice Build-Up and Damaged Overlays

Ice build-up on terminals and support structures is a fairly evident problem, but often hard to solve. The apparent solution is to defrost more often or reduce the formation of ice.

Swing Wide

The belt tends to "swing wide" as it exits the spiral cage, following a path that is offset but parallel to the normal tangent line to the cage. This phenomena itself does no damage, but often the belt edge contacts framework that does not leave sufficient clearance for this to occur. The usual reaction of the builders or users is to restrict the path of the belt from swinging wide, typically by use of rollers or shoe guides.
Restraining the belt path can have several adverse effects on belt life:

- The belt can wear through a shoe guide, allowing the edge to snag. This will eventually cause an increase in belt tension and damage the belt edge.
- Outside edge restraints can push individual rods inward, especially with Omniflex and Small Radius Omniflex belts. The rods can be held in this inward position by belt tension. There is then a potential for the projecting rods to catch on the vertical cage bar capping, causing damage to the belt, damage to the cage bar capping, and high belt tension.
- If the belt is pushed into a straight tangent path, the tension carried in the outside edge of the belt is shifted to the inside edge of the belt, resulting in a pronounced tendency for one edge of the belt to lead the other.

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