wirebelt

Maintenance Guide and Reference
for Flat-Flex® Conveyor Belts

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Introduction

Today's processing or production plant faces some serious challenges: to produce more product, in less time, and at lower costs. The reality is that 'down time' costs money.

Proper maintenance is essential, and to avoid this is false economy .... because the extended belt life created through proper maintenance can help prevent unplanned 'down time'.

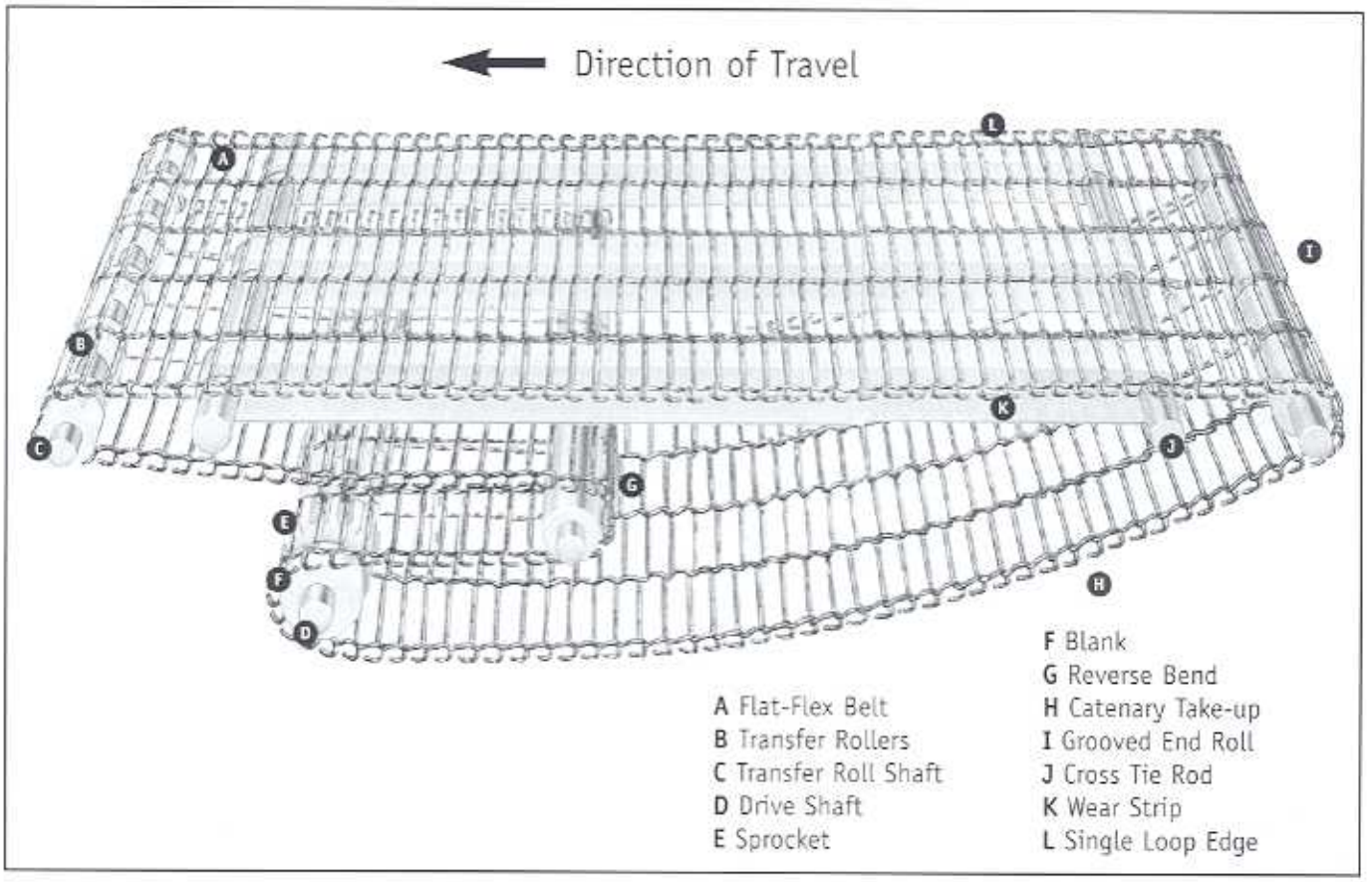
Effective maintenance training is another important issue. If maintenance personnel are unaware of correct belt installation and operating procedures, they will unknowingly create the circumstances that lead to premature belt failure.

Therefore, the purpose of this Maintenance Guide is to assist the personnel who have responsibility for maintaining your company's conveyor systems to maximise their Flat-Flex belt life by avoiding premature belt failure from preventable causes.

For the optimum belt life, use only genuine Wire Belt Flat-Flex® and use only genuine Wire Belt sprockets. DO NOT join to belts of other manufacturers; DO NOT fit sprockets obtained from any other source.

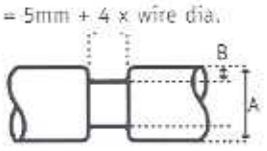
Parts of The Conveyor System

The illustration below shows the various parts or components of the conveyor system that have a direct impact on the belt's operation. It also defines the 'terms' that will be used throughout this Maintenance Guide to refer to the various conveyor components.



Top 10 Reasons Belts Fail Prematurely

End Roll Grooves



Note: Shaft deflection must be less than 1.6mm

Grooved End Roll/Reverse Bend Specifications

Pitch & Wire Diameter	Min. Roll Diameter A (mm)	Depth Groove B (mm)	Min. Reverse Bend Diameter (mm)
4.24 x 0.89	12	3.0	43
4.30 x 1.27	12	3.0	43
5.64 x 0.89	12	3.5	57
6.0 x 1.27	16	4	60
6.35 x 1.27	16	4	64
6.40 x 1.40	20	4	64
7.26 x 1.27	16	4	73
7.26 x 1.57	19	4	73
9.60 x 2.08	25	5	96
12.0 x 1.83	29	6.5	120
12.7 x 1.83	29	6.5	127
12.7 x 2.34	38	6.5	127
20.32 x 2.34	38	6.5	203

While it is difficult to define belt life, the modes of failure are known. By understanding the three primary mechanisms of failure, you should be able to identify the factors that maximise belt life. The three primary failure mechanisms for conveyor belts are: Yield, Wear, and Fatigue.

Most failures are caused by yield, which occurs when a belt is permanently deformed (bent). These failures are usually due to accidents or misuse.

Wear occurs as the joints hinge, or the belt rubs against other components. This results in a slight loss of material and weakening of the affected zone.

Fatigue is the growth of microscopic cracks in a material caused by repeated loading and unloading. Fatigue failures are often confused with the belt becoming brittle.

Each of the following ten causes of belt failure contain one or more of these mechanisms:

1. **Accidents to the conveyor machinery and belt** - Accidents should be minimised. (Yield Failure)

2. **Too much tension on the belt** - Flat-Flex is a low tension system. You only need to use enough tension to engage the drive sprockets correctly. (Fatigue and Wear Failure)

3. **Improper clearance between belt joints ('Z-bends'), drive sprockets, blanks and/or grooved end rollers** - The Z-bends should never make contact with any conveyor component. A minimum 3mm to 5mm clearance is needed. There also needs to be sufficient clearance between the Z-bends on the underside of the belt and the bottom of the grooves in the transfer rollers. (Wear Failure)

4. **Transfer or Reverse Bend radii too small** - This causes unnecessary stresses in the Z-bends. (Fatigue and Wear Failure)

5. **Installing the wrong drive sprockets** - Substituting other commercially available spur gears and sprockets will cause belt climbing and snapping. Only Flat-Flex sprockets purchased from Wire Belt are specifically designed to fit and pull the belt properly.

6. **Drive sprockets out of alignment** - The drive sprocket teeth must be perfectly aligned and the layout correct (see page 9) so that they all pull together smoothly to avoid fatigue on individual wire strands. (Fatigue Failure).

7. **Contact between the Z-bends and wear strips** - If the belt joints on the underside of the belt run over any portion of the wear strips, this will produce wear and fatigue.
(Wear and Fatigue Failure)

8. **Using the wrong mesh belt for the current application** - Products and processes change over the years. The conveyor and belt that were designed for a specific product and process several years ago, may no longer be appropriate for the demands of your current application. The consequences of product loading and belt speed on belt life need to be re-evaluated on an ongoing basis.

9. **Belt installed and run 'upside down'** - There is a smooth ('top') side to Flat-Flex belts and an 'underside' where the Z-bends form a distinct 'ridge'. The smooth side should always be 'up' for the belt to run properly.

10. **Installing the belt 'backwards'** - The single or double loop edges on the belt should curve back and away from the direction of belt travel. If the belt is installed backwards, the loops can catch (for example on clothing) and cause accidents.

Repair or Replace?

Deciding whether you should repair or replace a Flat-Flex belt is one of the most important maintenance decisions. The following guidelines will help you.

1. **Belts should be inspected at the end/beginning of the operating day** or shift (i.e. whenever the conveyor is stopped). Plan to include preventive maintenance during your scheduled shut downs.

2. **It is generally advisable to replace a used belt when it begins breaking up all over its surface.** In this case, the breakage is the result of fatigue and the belt is beyond repair. Splice clips can be used for temporary emergency repairs until the next scheduled maintenance shut-down when a new belt should be installed. (See page 6).

3. **If a belt has been previously repaired because of damage due to snagging or jamming, it can still be repaired again** by splicing in a new section of belt. (See page 6). This type of repair may be done several times before you need to replace the belt... as long as the belt is not exhibiting signs of breakage due to fatigue. Of course, it is also recommended that you try to correct or eliminate the cause(s) of the jamming or snagging immediately to prevent further damage to the belt.

4. **Distorted or broken wire** strands should be straightened or repaired promptly to prevent a failure from occurring.

5. **Down-time costs money.** It is always advisable to have a spare belt on hand.

6. **If a belt is repeatedly breaking (or wearing) in the same place**, it is critical to determine the cause for the wear and take corrective action. Always check the belt tracking, tension and drive sprockets for proper fit and alignment. Check for rubbing on the side faces of the sprockets, blanks, wear strips and grooved rollers. (See chart page 4 for the proper groove depth). Also check joining strands for straightness.

7. **Always check the conveyor components for signs of wear.** Maintain correct clearances to the belt joints at all times.

8. **Flat-Flex belts will experience minimal stretch from use.** Check and adjust the tension on a regular basis. Use only enough tension to properly engage the drive sprockets. (See page 10).

9. **You should always use the heaviest mesh** consistent with your product and application.

Installation and Belt Splicing

Tools you will need:
New Belt
Cord or Wire
Heavy Duty Wire Cutters
Wire Ties
Pliers
Allen Keys
Straight Edge
Safety Glasses

Extended belt life begins with correct installation. Many premature belt failures can be traced to installation problems. Splicing is a skill like any other. It can be learned through training, and it improves with practice. Another major factor in faster, easier splicing is having the right tool for the job (see box at left).

Reminder: Minimise bending the wire strands at the Z-bends. Do your necessary bending in the straight sections of the wire strands. In addition, always take your splicing strands from a new roll of belt rather than from a used belt.

1. Before you Begin Splicing

If you are ***installing*** a new belt:
- Disconnect the power to the conveyor system
- Release all tensioning mechanisms
- Thread the belt onto the conveyor
- Check to be sure that the smooth side is 'up'
- Check to be sure that the edge loops curve back in the direction opposite to the direction of belt travel
- Cut to length then tie the two ends of the belt together with cord, twine or wire ties
- Remove a strand or two from the new belt to use for full strand splicing

If you are ***repairing*** a belt:
- Disconnect the power to the conveyor system
- Release all tensioning mechanisms
- Tie together with cord, twine or wire, two undamaged strands that span the damage.
- Cut out the damaged portion with wire cutters; pick up and dispose of wire pieces immediately
- Orient the new piece of belt correctly by checking the edge loops and Z-bends, then matching everything exactly. (It is easy to install the piece upside down and/or backwards if you aren't careful).
- Secure the new piece of belt in place with wire ties, and cut off excess belt
- Remove a strand or two from the new belt to use for full strand splicing

Important Note: If a belt has damage in more than one place on account of fatigue, do not try to repair it. Install a new belt. Also never save old belts to use for repairs because they have already been weakened from use. Purchase extra new belt to use exclusively for repairs.

2. Begin splicing in the Centre (See Diagrams A & B)

Lay the strand down between the two belt edges and check to see that the edge loops are going in the same direction as the belt's edge loops. (The strand must also be 'right side up' for it to lay flat. You will know immediately if you have installed the splice strand 'wrong side up' and will have to start again).
BEND the strand from each side enough to INSERT the ends into the two spaces next to the centre space (See spaces B and D on diagram A) INSERT the strand ends into the centre space of the opposite edge (See space 3 on diagram B)
Pull the ends of the strand through until the centre space 'locks' in place (You should be pulling the strands toward you)

Use pliers to STRAIGHTEN the wire in the centre space (Once the centre is connected you may remove the ties holding the belt edges together)

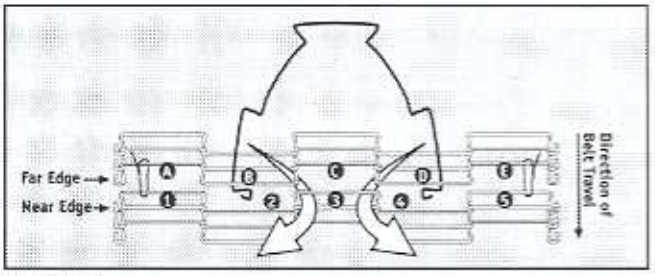


Diagram A

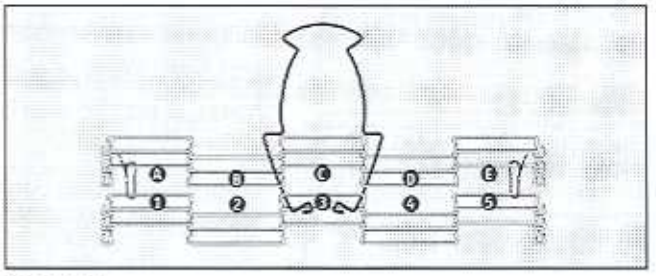


Diagram B

3. Weave strand to one side (see diagrams C through G)

BEND one end of the wire up and INSERT it around the Z-bend in the next space on the edge of the wire closest to you (See space 5 on diagram C). Always try to avoid bending the wire at the Z-bend!
BEND the wire toward the centre and INSERT around the Z-bend next to the centre space (See space D on diagram D)
Pull the strand wire through the mesh and STRAIGHTEN it with your pliers
Repeat these three moves until you reach the side edge of the belt
Using your pliers, connect the strand's edge loop to the belt's edge loop (on the near edge).
Connect the edge loop on the far edge of the belt to the strand's edge loop
STRAIGHTEN the strand with your pliers

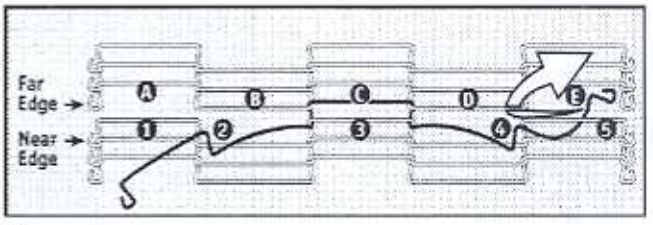


Diagram C

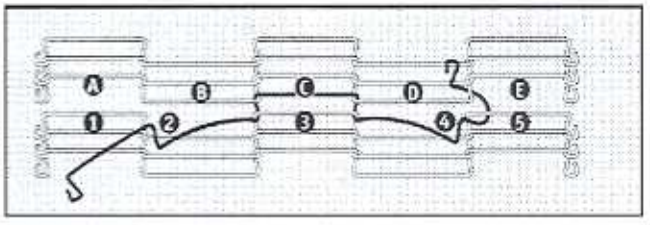


Diagram D

4. Weave Strand to the other side (see diagrams C through G)

Repeat the steps in 3. going in the opposite direction, weaving to the other side edge of the belt. If you are installing a new belt, you are finished splicing

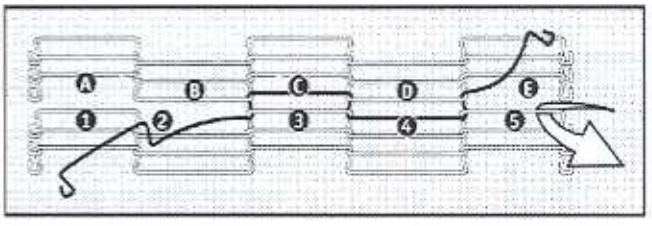


Diagram E

5. For repairs, splice other belt edge in same way

If you have questions concerning splicing or maintenance of your Flat-Flex belts, contact Wire Belt Technical Sales.

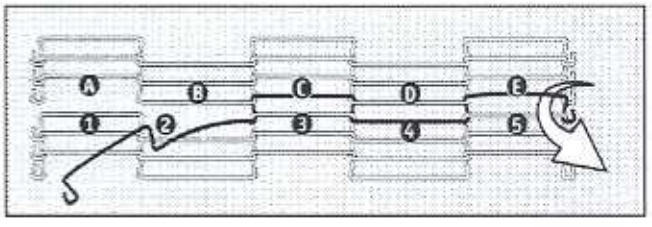


Diagram F

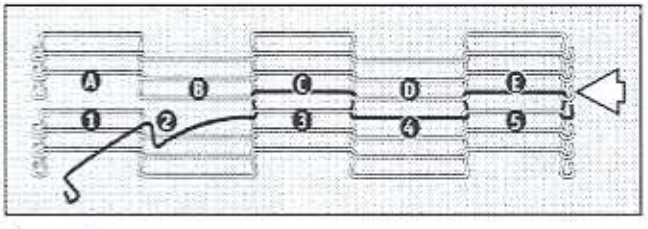


Diagram G

Installing Splice Clips

Splice clips are a convenient, time saving method that is recommended for making temporary, emergency repairs to damaged belts. Some customers also use this method for installing belts because it is faster and easier than the full strand splicing method. However, this is not recommended because it is inherently not as strong as a full strand splice, and it leaves spacing gaps in the belt surface. These gaps could be a problem depending on the nature of your product or application.

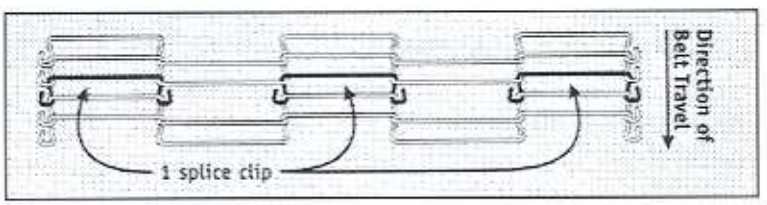
How Many Clips?

$$\text{Number of clips} = \frac{\text{No. of spaces} + 1}{2}$$

Important Note: Splice clips cannot be used if your drive shaft is set up in the 'Alternative Style' sprocket arrangement (see page 9). You must either rearrange your sprocket placement into 'Standard Style' (only in odd numbered spaces) ... or use full strand splicing.

1. Before you begin splicing:

- Disconnect the power to the conveyor
- Release all tensioning mechanisms
- Tie the two edges together with wire, twine or wire ties
- Cut out the damaged strand or portion of the belt
- Check to be sure that smooth side of belt is 'up'
- Plan out the number of splice clips by laying them out in position across the belt.
- Make certain that no two end loops on the clip hook around the same Z-bend and that all end loops point away from the direction of travel.



Single loop edge belt

2. Begin installation with the centre space

Insert the appropriate type of splice clip into the centre space on the end of the belt. If installing a single clip, use needle nose pliers to grip the splice clip, and hook the two ends around the Z-bends on either side of the centre space.

3. Install the next splice clip on an outside edge space

Use the same procedure as 2.

4. Install the same type of splice clip on the opposite edge in the same way.

5. Install the remaining splice clips.

6. Re-adjust the belt tension.

Note: If a belt has damage in more than one place on account of fatigue, do not try to repair it. Install a new belt. Never save old belts to use for repairs or try to reuse splice clips because they have already been weakened from use. Purchase extra length of new belt to use for repairs.

Drive Shaft Sprocket Alignment

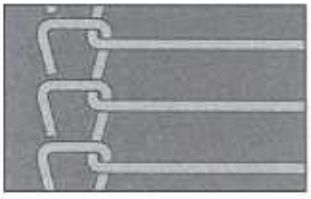
Flat-Flex conveyor belts use a no-slip, positive drive design. In a well designed conveyor system, the drive shaft is positioned so that the loaded portion of the belt is being pulled by the action of the drive sprockets.

You should check your conveyor system to ensure that your drive shaft is configured with the appropriate number and size of drive sprockets.

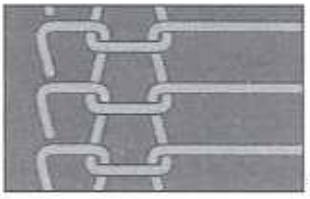
The following are guidelines for correct sprocket arrangement:

1. Use the correct number of sprockets, as shown below.

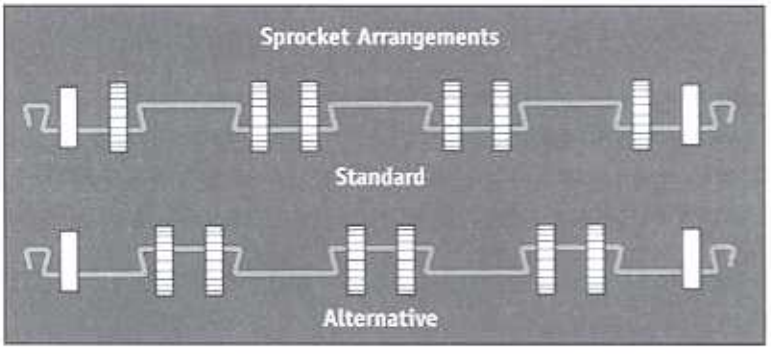
2. Use the most appropriate style of sprocket arrangement for your application. However, you cannot use splice clips for assembly or repair with the Alternative style arrangement. The end loops of the clips will strike the sprockets as the belt moves over them and break off.



Single loop edge

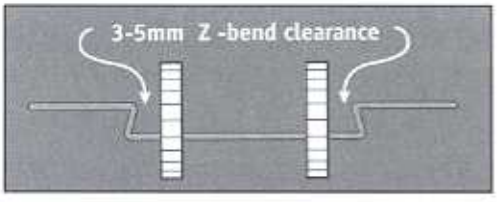


Double loop edge



Important Note: Never mix the placement of sprockets. They should either be all in odd-numbered or all in even numbered spaces.

3. Allow sufficient clearance between the sprockets and Z-bends. A major cause of premature belt failure is repeated forced contact between the Z-bends and the sprockets which causes fatigue at the belt joints.



4. Use blanks and wear strips to support the belt edges. The edges of the belt should be supported on all shafts and the conveyor bed.

5. Align the sprocket teeth across the belt. In order to drive the belt with even tension, all sprockets must drive the same strand. It is critical for the sprocket teeth to be perfectly lined up across the width of the belt for good belt life. Use a straight edge to check the alignment.

Calculating the number of sprockets

The number of sprockets required to drive your belt depends on the number of spaces across the belt. Here's how to calculate it:

1 Belts need one less sprocket than the number of belt spaces, plus two blanks.

2 Note: Two exceptions to these rules:
A) a single space belt uses only two (2) sprockets;
B) a three space belt requires four (4) drive sprockets and no blanks.

Tension Adjustment

Control of the belt length is vital to maintaining sufficient tension. Flat-Flex is a low tension belt. Too much tension will inevitably cause premature belt failure. However, the concept of 'how much tension is enough' is not very precise. So-called 'proper tension' is different for every machine! Therefore, tension adjustment is very much a matter of experience and judgement.

The following guidelines may help you determine the correct tension:

1. Use the minimum amount of tension which allows the drive sprockets to smoothly engage the belt strands. The belt should neither slip nor jump off the drive sprockets. (This can happen if excess belt length accumulates loosely on the return path).

2. Understand your conveyor's tensioning mechanisms. All conveyors should have some provision for adjusting the belt tension and to facilitate installation of new belts. However, different machines use different tensioning methods. The simplest is the catenary take-up. Conveyors longer than 8 metres may use gravity, spring, hydraulic, or pneumatic type tension adjustments. Consult the manufacturer's documentation or their Customer Service Department for more information on the tensioning mechanisms and their adjustment.

3. Always check for 'sag' in the return path. Whatever the tensioning method designed into your conveyor by its manufacturer, there should always be some 'sag' in belt take-up. Be sure to check under the conveyor for this 'sag' whenever you adjust the tension.

Sanitation Procedures for Food Processors

Safety Reminder

Whatever cleaning products are being used at your facility, always be sure to read the directions carefully and use only as directed. Wear appropriate safety equipment as recommended by the manufacturer when using any harmful liquids.

Flat-Flex belts constructed of Type 1.4310 stainless steel have been approved by the USDA/FDA for direct contact with food. In addition, the USDA has published regulations for the proper cleaning and sanitising of wire belts to eliminate the dangers of contamination from bacteria and other potentially harmful substances.

Several types of cleaning/sanitising agents have been approved by the USDA/FDA for use in food processing applications including: caustic, chlorine-based, acid products, alkaline foam cleaners, etc. The chart below discusses some of these products.

Several methods are typically used to apply these cleaning and sanitising agents: brushes, scraper bars, high pressure air/water hoses. Whatever method is used to apply the cleaners, ALWAYS be sure to rinse off cleaning fluids thoroughly. Chlorinated cleaners will damage stainless steel. The open mesh design of Flat-Flex belts aids in this task by providing maximum flow through.

Important Note: Always handle the belt gently when cleaning it, trying to avoid bending or pulling on the individual wire strands. Avoid forcing cleaning rods and brushes under the belt surface. If you do happen to bend or distort a strand or two while cleaning, straighten it immediately with needle nose pliers.

Product	Description	Application
General Cleaners	Excellent for removal of blood, greases, oils, fats and other soils; soft metal safe.	Manual brush cleaning.
Soft Metal Safe Alkaline Foam Cleaners	Formulated to remove blood, greases, oils, fats and proteinaceous soils that adhere to equipment.	Foam, spray, soak or high-pressure cleaning.
Alkaline Foam Cleaners	High performance, chlorinated cleaner, that is used in diluted form (not soft metal safe)	Foamer.
Heavy Duty Caustic Cleaners	Formulated to remove tough soils like proteins, fat, grease, oils, blood that is cooked on or hardened on processing equipment surfaces (not soft metal safe)	Circulation soak tank.

Trouble Shooting Guide

Problem	Possible Cause(s)	Solution(s)
Belt not tracking properly	• Sprocket teeth mis-aligned • Conveyor frame not square • Support rolls not squarely aligned • Drive shaft not aligned • Uneven product loading • Belt improperly spliced • Belt is 'wrong side up'	• Check alignment and adjust • Realign conveyor frame • Realign support rolls • Realign following alignment instructions • Correct loading method • Reinstall following splicing instructions • Reinstall belt with smooth side up
Belt runs to one side	• Sprocket teeth mis-aligned • Conveyor frame not square • Support rolls not squarely aligned • Transfer roll not functioning properly • Drive shaft not aligned • Uneven product loading • Uneven tension • Belt improperly spliced	• Check alignment and adjust • Realign conveyor frame • Realign support rolls • Change to grooved end roll • Realign following alignment instructions • Correct loading method • Adjust tension so it's equal on both sides of frame • Reinstall following splicing instructions
Belt wears edges	• Not enough clearance • Conveyor frame not square • Shafts not locked down • Sprocket teeth mis-aligned • Belt expansion from high temperature	• Adjust clearance between belt edge and on side rail • Realign conveyor frame • Use collars on outside of bearings to prevent lateral shifting • Check alignment and adjust • Adjust clearance between belt edge and side rail to allow for heat expansion
Belt slips on sprockets	• Insufficient tension • Sprockets not properly installed or aligned • Worn sprocket • Drive sprockets too small • Insufficient belt wrap	• Adjust tension take-up • Check sprocket alignment; adjust if needed • Replace sprocket • Replace with larger diameter sprockets from Wire Belt, or increase wrap • Increase wrap around drive sprockets up to between 120° to 180°
Belt blackening	• Frozen/stuck roller • Too much tension • Load too high • Improper/inadequate cleaning • Too much metal to metal contact	• Free roller; reduce or eliminate steel-to-steel contact • Adjust tension take-up • Change to heavier mesh belt • Install continuous spray cleaning device on conveyor • Replace metal parts, where possible, with suitable plastic alternatives.
Splice clips breaking	• Alternative style sprocket arrangement used (sprockets in even spaces) • Belt improperly spliced • Clips and/or strands not straightened after splicing • Sprockets not properly installed or aligned • Uneven tension	• Adjust to Standard style arrangement (sprockets in odd spaces) • Reinstall following correct procedure. • Straighten any bent clips and/or strands using pliers • Check sprocket alignment and adjust if needed • Adjust tension so it is equal on both sides of frame
Belt surges	• Belt not supported on frame • Load too high • Uneven product loading • Wrong type of wear strips	• Install supports on return path • Change to heavier mesh belt • Correct loading method • Change to different type/material/ design wear strip

Problem	Possible Cause(s)	Solution(s)
Excessive wear strip wear	• Abrasive cleaner used • Load too high • Not enough wear strips • Wrong type of wear strips	• Install spray wash on belt to reduce grit build-up • Change to heavier mesh belt • Install more wear strips • Change to different type/material/ design wear strip
Damage to flights	• Product jamming on loader • Flights getting caught on frame support • Flights rubbing on return path	• Check hopper/chute infeed sides and correct jamming • Check for obstructions on frame and correct • Allow sufficient clearance with frame; indent flights
Belt edges curling up	• High temperature • Too much tension • Belt joints unsupported • Load too high	• Use crowned belts (a speciality belt); Call Technical Sales for information and pricing • Adjust tension take-up • Adjust sprockets/blanks/rollers to within 5mm of Z-bends • Change to heavier mesh belt
Excessive belt wear or poor belt life	• Contact with other equipment • Support rolls not rotating • Too much tension • Uneven tension • End roll/reverse bend too small • Wrong type of wear strip • Abrasive cleaner used • Load too high • Speed too high • Belt improperly spliced • Frame not level	• Eliminate contact • Check bearing and replace if needed • Adjust tension take-up • Adjust tension so it is equal on both sides of frame • Check for correct minimum diameter • Change to different type/material/ design wear strip • Install spray wash on belt to reduce grit build-up • Change to heavier specification belt • Reduce running speed • Reinstall following splicing instructions • Correct affected area
Excessive sprocket wear	• Too much tension • Abrasive cleaner used • Sprocket teeth mis-aligned • Not enough drive sprockets • Sprockets not properly installed or aligned • Load too high • Belt speeds too high • Shaft(s) bent	• Adjust tension take-up • Install spray wash on belt to reduce grit build-up • Check alignment and adjust • Add more sprockets • Check sprocket alignment and adjust if needed • Change to heavier mesh belt • Reduce speed • Check shafts and replace if needed
Belt jumps on sprockets	• Worn sprockets • Wrong size sprockets • Belt is 'wrong side up' • Product build-up between belt and sprockets • Too much tension • Incorrect drive shaft layout • Sprocket teeth mis-aligned	• Replace using Wire Belt sprockets • Replace with correct sprocket of correct dimensions for pitch and wire • Reinstall belt with smooth side up • Install wiper on return belt to prevent product getting trapped; install side guards on frame • Adjust tension take-up • Reposition sprockets • Realign sprocket teeth using a straight edge

Inspection and Installation Check List

Yes	No	Before you begin splicing
☐	☐	01. Power to conveyor is disconnected.
☐	☐	02. Wearing safety glasses.
☐	☐	03. Correct replacement belt selected.
☐	☐	04. Correct tools on hand.
☐	☐	05. All tensioning mechanisms released.
☐	☐	06. Belt threaded onto conveyor correct (smooth) side up.
☐	☐	07. Loop edges curve back away from direction of belt travel.
☐	☐	08. Belt edges tied together with wire, twine, plastic wire tie.

After splicing/installation completed

☐	☐	09. Check drive sprocket alignment for 3 to 5mm clearance with Z-bends.
☐	☐	10. Check sprocket teeth alignment (Not needed if shaft 'keyed').
☐	☐	11. Check position of wear strips and adjust if making contact with Z-bends.
☐	☐	12. Check belt tracking in grooved end rolls and transfer rollers.
☐	☐	13. Adjust tension, and tighten all fixings.
☐	☐	14. Check for proper disposal of old wire and all wire pieces.
☐	☐	15. Test tracking by running belt without product; adjust belt.
☐	☐	16. Tools returned to proper storage location.

Conveyor safety check

☐	☐	17. Are operating instructions clearly listed and posted.
☐	☐	18. Are safety guards adequate to prevent accident and injury?
☐	☐	19. Are limit switches and alarms working?
☐	☐	20. Personnel know location of emergency stop/control switches?

Routine maintenance inspection/evaluation

☐	☐	21. Check belt surface for bent or broken wire strands; straighten or repair immediately.
☐	☐	22. Check splice clips (if used) for wear/damage.
☐	☐	23. Check all conveyor components for excessive wear (drive sprockets, blanks, wear strips etc.); replace if needed. .
☐	☐	24. Check sprocket alignment for 3 to 5mm clearance.
☐	☐	25. Check sprocket teeth alignment (Not needed if shaft 'keyed').
☐	☐	26. Check position of wear strips and adjust if making contact with Z-bends.
☐	☐	27. Check belt tracking in grooved end rolls and transfer rollers.
☐	☐	28. Check tension; adjust tension mechanisms as necessary.
☐	☐	29. Check that conveyor frame is level, square and secure.
☐	☐	30. Test tracking by running belt slowly without product.