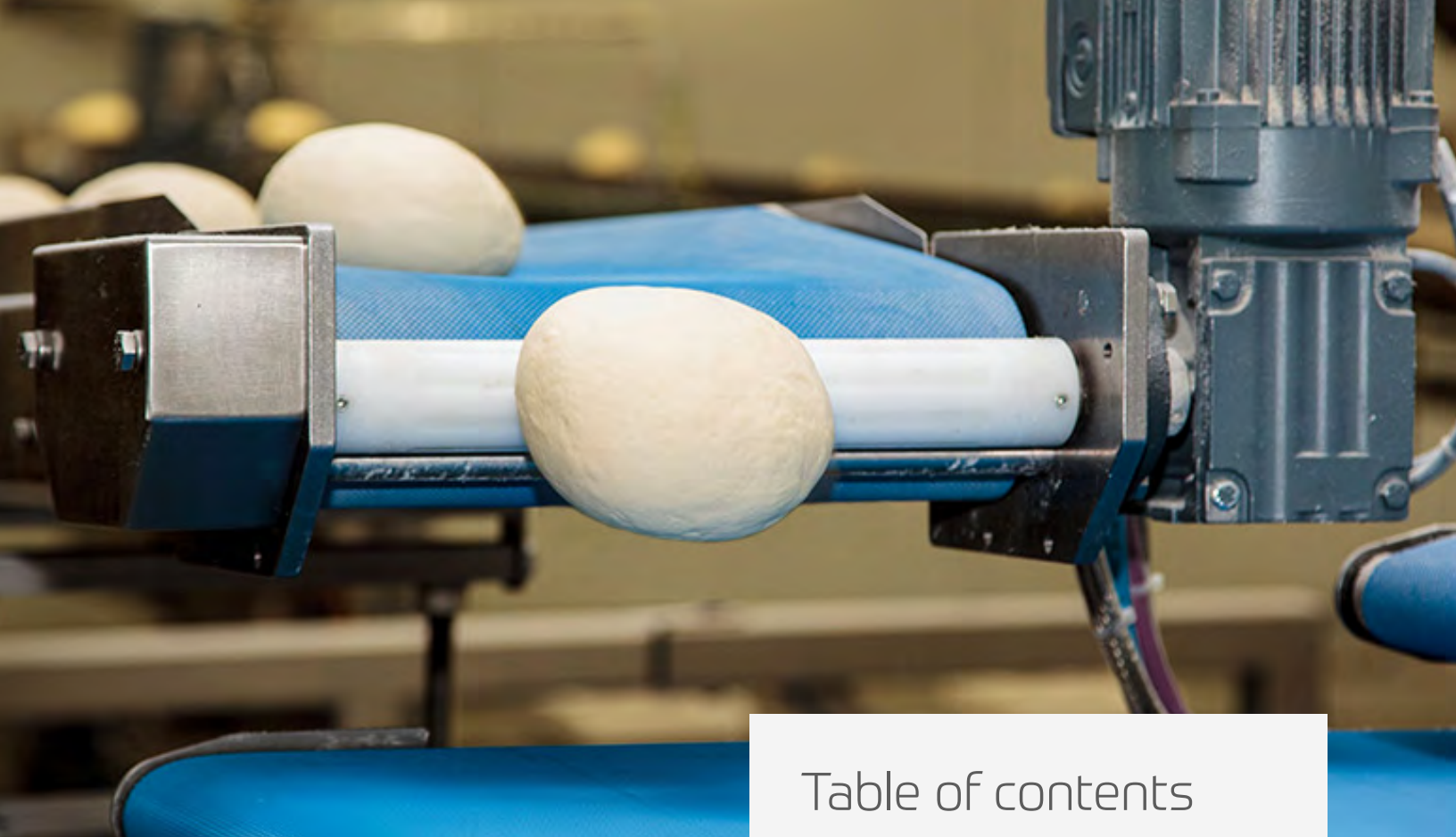




WHITE PAPER

GUIDE TO CONVEYOR BELT MAINTENANCE & REPAIR



Whether you're a maintenance or engineering manager at a snack food plant or oversee conveyor belt repairs at a distribution center, you know even the best-designed conveyor belts may need repairs to get to a replacement window and avoid a break down. It's the nature of the rigorous work conveyor systems do. Educating your team on how to efficiently repair belts and prevent future damage is advantageous for maintenance and engineering managers — ensuring your plant can quickly return to full operating capacity.

In this guide, we'll walk you through three important elements of conveyor belt maintenance: Conveyor belt repair, troubleshooting tracking issues and tips for an improved maintenance program. Implementing these practices at your facility will ensure your conveyor belts last their full lifetime.

Table of contents

SECTION 1 **3**

Conveyor belt repair:
Vulcanization, metal fasteners
or cold curing?

SECTION 2 **6**

Troubleshooting conveyor
belt tracking

SECTION 3 **10**

Tips for better conveyor
belt maintenance +
printable checklist





SECTION 1

Conveyor belt repair: Vulcanization, metal fasteners or cold curing?

When a conveyor belt starts to show signs of wear or has a potentially catastrophic breakdown, you need to know which repair methods are available. Here we'll describe types of conveyor belt damage and common repair methods, then explain the important distinction between food and non-food belt repair.

Types of conveyor belt damage

Any damage to a belt is undesirable, and certain types of damage are more progressive towards immediate failure than others. Strings and frays can be trimmed and the belt can continue to run, though a repair or replacement may be warranted soon. Rips, tears and fingers or metal lacing popping loose on a splice means imminent catastrophic failure.

Another way to evaluate conveyor belt damage is with [a rule of thumb from the NIBA](#): If no more than 25% of the belt width is involved in the damage, a repair is practical. When more than 25% of the width of the belt is damaged, a full resplice or replacement is preferable.



Repair methods

These are the main methods used to repair a damaged belt.

VULCANIZATION

Vulcanization — the use of heat, time and pressure to resplice a belt — is the most reliable conveyor belt repair method, as it creates the highest return to original belt strength. The vulcanization technique depends on the type of belt cover material: Thermoset rubber covered or thermoplastic covered.

Thermoset rubber belt cover examples are natural rubber, SBR, neoprene and nitrile and are common in non-food applications. Thermoplastic belt covers include PVC, polyurethane and polyolefin and are used in applications with direct food contact. For more information on the difference between these belt cover materials, [check out this resource from the NIBA](#).

To repair belts with thermoset rubber covers, low heat (around 250 degrees Fahrenheit) vulcanization and an hour cooling period is used. For thermoplastic covers, high heat vulcanization is used (325 to 375 degrees Fahrenheit) with a cool time of around six minutes.

Vulcanization is the best and most dependable repair method for its speed and reliable return to original belt strength. When a thermoset rubber covered belt is damaged, this is the first choice for maintenance managers. However, it should be noted that when there is cover damage on a food-grade belt (a.k.a. thermoplastic covered belts), the damage is almost always non-repairable for sanitation concerns; in those scenarios, replacement is the best option.

METAL FASTENERS

A second option for conveyor belt repair, metal fasteners are quick and easy to apply. On the downside, metal fasteners offer considerably less strength than vulcanization, and there is also potential for lacing to pop up. This can cut workers, the product, or even break off and end up in the production line — making them unsuitable to repair food-grade belts.

Metal fasteners are a good back-up repair option for non-food-grade belts and should be used only to provide a temporary solution until the belt can be vulcanized or replaced. Given their risks for safety and belt reliability, metal fasteners are not meant to act as a permanent solution.

A resplice is the most reliable conveyor belt repair method.



COLD CURING (COLD VULCANIZATION)

The final and least desirable repair method is cold curing (also known as cold vulcanization). The two-part cement is made up of a base compound and a curing agent. Under time and pressure, the curing agent solidifies and bonds with the surface.

Cold curing is used only when space constraints in the plant don't allow vulcanization equipment to access the belt. This method is the least desirable, however, because you must wait 24 to 36 hours for the curing agent to set, and the cement creates a stiff, rigid surface that poses issues at transfer points. This repair method should only be utilized by maintenance managers if no other repair option is viable and immediate replacement isn't possible.

To summarize, vulcanization is the first choice for maintenance managers for repairing belts, with metal fasteners providing a quick-fix option until there is a window of downtime for vulcanization or replacement. Cold curing or cold vulcanization is a last resort repair method.

Cold curing or cold vulcanization is a last resort repair method.

A note on repair vs. replacement

The aforementioned repair methods are not meant to take the place of getting a new belt, though that may seem more appealing to maintenance managers than spending money on a whole new belt. But vulcanization, metal fasteners and cold curing are best used as a temporary solution until you can find a window of time to replace the belt. This saves you from the future liability of catastrophic belt failure and a hit to overall plant reliability.

As noted in the vulcanization section, there is an important distinction between repairing food-grade and non-food-grade belts. Belts conveying non-food products can be repaired with vulcanization, metal fasteners or cold curing without concerns for sanitation. But with food-grade belts, the liability of a cover repair is extremely high. The belt must be extremely clean (free of oils, contaminants and foreign materials) to resplice, and your exposure to inspection services and product recalls outweighs the benefits. With [food-grade belts](#), replacement is the safest option.





SECTION 2

Troubleshooting conveyor belt tracking

Tracking is essential to an efficient and reliable conveyor system. It's also an extremely complex part of conveyor belt maintenance, as a multitude of ever-changing factors can affect the quality of belt tracking.

Conveyor belt technicians are your most knowledgeable resource on solving a tracking problem. But there are simple components of your conveyor system you can troubleshoot beforehand. After briefly going over the importance of conveyor belt tracking, we'll describe the basic elements of a tracking system and potential causes of mis-tracking. With this information, you'll play an active part in keeping your belts running straight.

Why conveyor belt tracking is important

Simply put, all of the key factors of a highly efficient and productive plant are in jeopardy if you can't track your belts. If you don't address mis-tracking, the risks for your plant include:

- Limited belt life and higher belt turnover
- Signs of wear on belts causing food safety inspectors to call for belt replacements
- Increased waste
- Product recalls
- Reduction in throughput

By addressing mis-tracking, you can prevent these issues from hurting your plant's reliability.

All of the key factors of a highly efficient and productive plant are in jeopardy if you can't track your belts.

What makes up a tracking system?

Conveyor belt tracking is influenced both by the parts making up the conveyor system and the mechanical forces at work, such as friction, contact force and arc of contact with the pulley. The mechanical parts that influence tracking include:

FABRIC DESIGN OF THE BELT

The fabric design of the belt will either be multifilament or monofilament. Multifilament belts have a four-bend axis (can bend left, right, forward and backward) and are only seen on turns, troughing belts or in [package handling plants](#). Most belts are monofilament and they only bend at two axis points (forward and backward).

INSTALLATION TENSION

Tension is an essential part of tracking. The key is to apply the least amount of tension for the conveyor belt to run. Installation tension depends on the fabric design of the belt: For example, monofilament belts are installed at half of one percent tension.

However, when belts are installed the general practice isn't to measure out the tension to a percentage — most maintenance managers will simply tighten the belt until it starts to run. This isn't incorrect and often works; however, if there is a tracking issue, checking the actual percent tension will be valuable.



DRIVE PULLEY

A high coefficient of friction between the belt and drive pulley will allow for lower tension and longer wear life for the entire conveyor system. The drive pulley's face should also be 5 to 10% wider than the belt width. The location of the drive pulley also affects tracking. The most efficient placement is to put the drive in an area where it pulls the load — this is known as the head drive. A center-located drive is also common as it allows for flexible placement of the drive on the return side of the conveyor. A tail drive location is undesirable and difficult on belts because the tension on the system must be higher.

A well-designed conveyor system should keep these factors (coefficient of friction, pulley width and drive pulley location) in mind well before a product ever hits the application line to ensure tracking capabilities.

TRACKING MECHANISMS

A variety of mechanisms can be added to a conveyor system to improve tracking. These aren't a replacement for conscientious fabric design, installation tension and drive pulley placement; they are all part of a larger tracking system. For maximum influence on tracking, tracking mechanism should be located at the highest degree of tension prior to the drive.

Crowned pulleys are a common tracking mechanism for monofilament belts. Belts under 18 inches wide use radial or conical crowning, and belts 18 inches or wider use trapezoidal crowned pulleys. Other tracking mechanisms include:

- V-guides
- Snub rollers
- Tilt rollers
- Edge guides
- Pulley flanges
- Nip rollers
- Pneumatics

These elements all make up a successful tracking system. Familiarizing yourself with tracking terminology will be useful when issues arise, which we'll go over how to handle next.

Coefficient of friction, pulley width and drive pulley location are key to a well-designed conveyor system.



What to do when your belt is mis-tracking

Conveyor belt technicians will be your best resource for conveyor belt tracking issues. But when you initially notice a tracking issue on a belt, there are simple elements you can check before you call your conveyor belt technician.

THE FIRST ROUND OF VERIFICATION SHOULD INCLUDE:

- ☐ Is the fabric design of the belt (monofilament vs. multifilament) correct for the application?
- ☐ Is the belt installed at the correct tension?
(Signs of improper tension include slippage and slack in the belt.)
- ☐ Is the pulley located at the head drive or center of the belt?
- ☐ Is your tracking mechanism located at the highest degree of tension prior to the drive?
- ☐ If using crowned pulleys, are they crowned based on the construction of the belt?
- ☐ Is the belt traveling in the correct direction?
- ☐ Is the belt running at the correct speed?
- ☐ Is the splice straight?
- ☐ Are transfer points and reverse bends operating correctly?
- ☐ Are you front loading the belt (as opposed to side loading, which can throw off the tracking)?
- ☐ Are pulleys and rollers running at right angles to the belt running axis?

If all these elements check out, the next round of verification should go through your sanitation practices. The importance of belt cleanliness with regard to drive, proper tracking response and belt life cannot be over emphasized.

THE SECOND ROUND OF VERIFICATION SHOULD INCLUDE:

- ☐ Is the belt free of debris?
- ☐ Is a regular sanitation program in place?
- ☐ If belts are removed for cleaning, are they re-tensioned when returned to the belt?

If, after reviewing these tracking basics, you still haven't figured out what's causing your tracking issue, this is the time to [call your conveyor belt technician](#). Using their thorough understanding of conveyor belt tracking and hands-on experience, they will solve your tracking issue and get your belts running reliably straight.





SECTION 3

Tips for better conveyor belt maintenance

As with any mechanical system, maintenance is to be expected. But improving your self-inspection process and prepping for emergency repairs won't just improve your maintenance program — it is the key to having an increase in productivity and maintaining the reliability of belt performance. Follow these simple steps to improving your plant's maintenance program.

First, understand your plant's unique maintenance needs

Before you make major changes to your maintenance program and self-inspection process, it's valuable to take time to define your plant's unique needs. The maintenance plan for a glass processing plant (where belts undergo intense wear and tear) will be concerned with repairing belts until they run to failure. A bread plant's self-inspection will be sure to include looking for fraying on belts to prevent replacement requests from sanitation inspectors. Understanding the needs of your conveyor system will not only help you make a better maintenance plan — it will make it easy for your conveyor belt technicians to understand exactly what you expect out of your belts.



General conveyor belt maintenance and self-inspection tips

The following tips can find a place in almost any conveyor belt self-inspection. They will help you catch problems earlier, preventing unnecessary downtime and improving overall system reliability.



REVIEW SANITATION PRACTICES.

Are sanitation crews cleaning with solvents appropriate for the belt material? Are they re-tensioning belts when they're returned to the pulleys? Sanitation and belt life go hand in hand — make sure you're doing it right.

CHECK FOR VISUAL SIGNS OF DAMAGE.

Are there strings or frays on [conveyor belts](#) or loose pieces on [plastic modular belts](#)? Are the belt covers starting to wear? These may be signs of impending catastrophic failure — make a note to repair or replace soon.

MAKE SURE BELTS ARE TRACKING CORRECTLY.

Is the belt installed at the correct tension? Has the conveyor system been cleared of debris? Go through the checklist in [Section 2](#) to eliminate causes of mis-tracking. Tracking is essential for reducing unnecessary wear on belts, maintaining belt life and ensuring a highly efficient plant.

BACKSTOCK NECESSARY SPARE PARTS AND BELTS.

What must-have parts ([sprockets](#), [drives](#), [cleats](#), [motors](#)) do you need to have in-house? Be smart about what you backstock — if you have six machines running the same belt, stock two belts in your inventory, as you're unlikely to have catastrophic failure on all six belts at once.

PREP FOR EMERGENCY REPAIRS ON CRITICAL BELTS.

Which application lines in your plant are critical? Stock emergency repairs, such as mechanical lacing or cold curing cement, for those belts so productivity isn't lost.

TRACK BELT LIFESPAN.

Are belts lasting as long as they historically have lasted? This varies from plant to plant and line to line — some belts are replaced every shift in the meat industry, whereas belts are replaced every 5 to 10 years at distribution centers. A belt not lasting its typical lifespan is a red flag for a mechanical issue with the conveyor system that needs to be addressed.

Implementing any or all of these conveyor belt maintenance tips is valuable for maintenance managers looking to improve their maintenance program. By using this checklist, you can ensure your belts last their desired lifetime and your plant maintains high throughput and reliability.



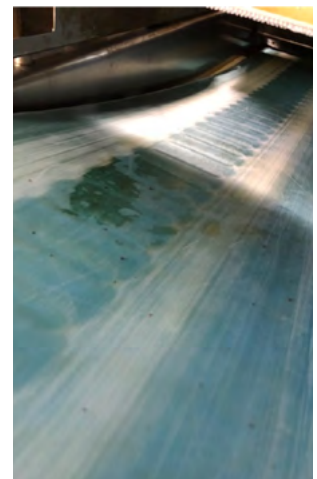
Case study: Keen maintenance program leads to thousands in annual savings at food plant

At a plant processing raw potatoes and carrots, the maintenance manager noticed a belt with an unsatisfactory belt lifespan during his self-inspection. The hydrolift discharge conveyor conveying raw potatoes and carrots undergoes exposure to sand and dirt during processing and needs to withstand a high load. Unfortunately, the belts, pins and sprockets weren't holding up under these abrasive conditions. The on-site maintenance team was making repairs three to five times per month, and replacing entire sprockets multiple times a year — causing unnecessary downtime and ballooning maintenance costs.

Once the maintenance manager realized he needed to address the belt lifespan issue, he contacted his conveyor belting expert at MIR. After reviewing the belt and conveyor system, MIR made suggestions for a better-fit belt and modifications for the conveyor bed. MIR's technicians removed the angle iron and shifted the snub roller down one inch on the conveyor bed. For the belting, MIR recommended an endless SuperDrive H Material belt that maintained the system's positive tracking and food-grade sanitation level while minimizing maintenance concerns. SuperDrive H Material belts are easy to install and — most importantly — have a long operating life.

The potato and carrot processing plant spent around \$15,000 annually on maintenance for the hydrolift discharge conveyor with the previous belting. The new SuperDrive belt ran without need for replacement for three years — a major improvement from multiple repairs and replacements every year. On maintenance spending alone (factoring in the cost for conversion), the plant saved \$42,000 over three years. In addition, the plant's business at the time came in at less than \$5,000 annually. After the belt upgrade and modifications had been running for three years, the plant hit \$105,000.

In this case study, updating the conveyor system to a better-fit belt led to significant savings and higher revenue. With an astute maintenance self-inspection plan, maintenance managers can play an active role in catching issues early on and begin finding efficiency-improving solutions.



Conveyor belt maintenance checklist

Maintenance managers can engage with this printable checklist when creating or updating a maintenance plan and self-inspection process. Use this as a starting point for customizing the checklist to your plant's unique maintenance needs, helping you reach maximum efficiency.

SANITATION PRACTICES

- ☐ Sanitation crews are cleaning with solvents appropriate for the belt material.
- ☐ Sanitation crews are re-tensioning belts when they are returned to pulleys.
- ☐ Necessary CIP systems (scrapers, scrubbers) are installed.
- ☐ Belts are free of debris.
- ☐ Sanitation practices meet necessary FDA/USDA/3A standards.
- ☐ _____

VISUAL SIGNS OF DAMAGE

- ☐ There are no strings or frays on fabric belting.
- ☐ There are no loose pieces on plastic modular belts.
- ☐ Cleats, sidewalls, and other add-ons are sturdily attached to belts.
- ☐ There are no signs of cover wearing on belts.
- ☐ _____

BELT TRACKING

- ☐ The belt is installed at the correct tension.
- ☐ The belt is traveling in the correct direction.
- ☐ The belt is running at the correct speed.
- ☐ The belt is front-loaded.

- ☐ Pulleys and rollers are running at right angles to the running axis.

- ☐ _____

BACK STOCKING

- ☐ Necessary backstock quantities of:
 - ☐ Sprockets.
 - ☐ Drives.
 - ☐ Motors.
 - ☐ Cleats.
 - ☐ Belts.
- ☐ _____

EMERGENCY REPAIRS

- ☐ Maintenance team has emergency repairs of:
 - ☐ Mechanical lacing.
 - ☐ Cold curing cement.
- ☐ Maintenance team has conveyor belt repair technician on-call for repairs and replacements.

BELT LIFESPAN

- ☐ A belt lifespan tracking program is in place.
- ☐ If a belt isn't meeting its typical lifespan, a plan is in place to discuss with conveyor belting supplier.





Talk to a conveyor belt expert

Maintenance and engineering managers know their conveyor systems inside and out and are the first line of defense for troubleshooting problems. Use this guide to improve your maintenance program and troubleshoot basic conveyor belt performance issues.

And when complex maintenance issues arise [our experienced conveyor belt technicians are available 24/7](#). The conveyor belting experts at MIR are well-versed in solving the complex problems of conveyor systems. They'll repair belts efficiently, offer tips to improve tracking capabilities and free up your time to focus on meeting throughput goals and improving plant productivity. [Start a conversation with a conveyor belt expert today](#).



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