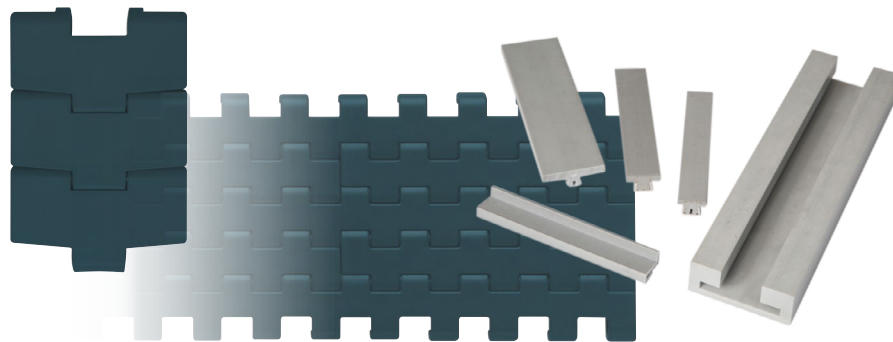




SYSTEM PLAST® DRY RUNNING LINE CONSIDERATIONS



Achieve Productivity and Sustainability with a System Plast® Run Dry Solution

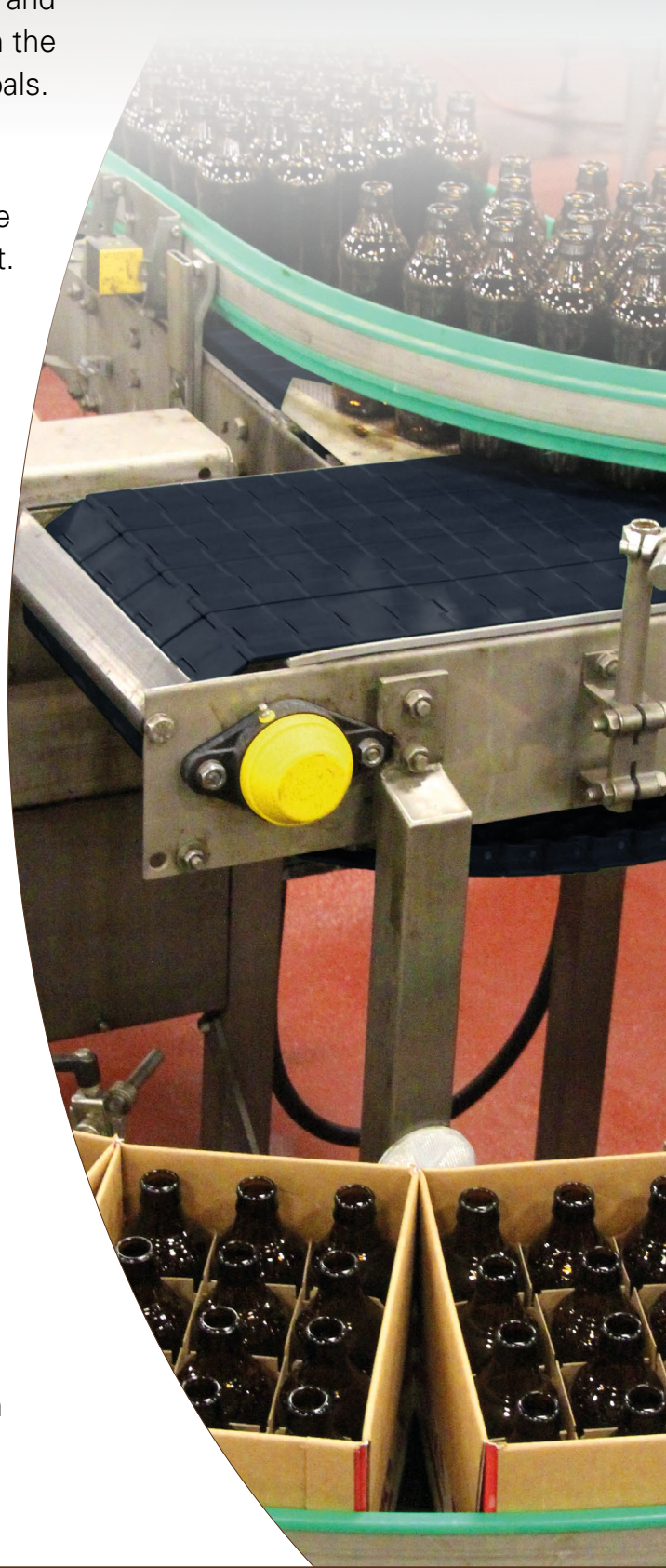
WHAT DOES IT MEAN TO “RUN DRY?”

Historically, operators were limited to excessive soap and water or the precise amount of dry lubricant to obtain the conveyor performance needed to meet production goals. System Plast® products offers innovative technology to help manufacturers reach their goals with a dry running solution that also helps reduce costs, improve productivity and decrease the environmental footprint. Using components with a reduced coefficient of friction, such as NG™ Evo chains and belts and Nolu-S™ wearstrips, enables end users to reduce or eliminate their conveyor lubrication, thus providing a true “dry running” conveyor. The low-friction characteristics of NG Evo components also result in reduced power consumption, increased wear life, reduced dust generation (compared to competitive acetal products) and the ability to run at higher speeds.

WHAT CAN YOU ACHIEVE WITH A SUCCESSFUL RUN DRY RETROFIT?

Success depends on the objectives set at the start of the process, and these objectives can differ from project to project:

- Same, or improved, product handling performance
- Reduction of bacteria growth due to the removal of wet lubrication
- Easier maintenance and conveyor access due to absence of drip trays and a dry working environment
- Reduced time to inspect and maintain equipment
- Water savings. Site-specific parameters.
- Saving money by eliminating soap or dry lubrication



Running dry will only be successful with the right strategy and execution.

BENEFITS OF RUNNING DRY WITH SYSTEM PLAST® CHAINS, BELTS AND WEARSTRIPS:

- Improved worker safety and little to no floor erosion
- Cost savings on water, waste water treatment, soap usage, and/or dry lubricant
- Improved hygiene due to reduced bacteria growth
- Improved maintenance access -> no drip pans needed
- Reduced corrosive equipment wear
- No false rejects due to foam on products at inspection
- No water / foam on labels
- No moisture on packaging material
- Improved / smoother container handling

Running dry also requires diligence:

- Maintain normal maintenance procedures
- Establish ideal cleaning frequency for desired performance:
 - Start with weekly schedule and reduce where possible
- Running dry is a philosophy which brings cost and environmental benefits; however it requires commitment and awareness. It is possible with almost any product material.

Based on our years of experience, these 5 steps can help you determine if running dry is right for your application and business.

Step 1: Awareness

Step 2: Cost Advantage

Step 3: Engineering

Step 4: Proposal

Step 5: Implementation

STEP 1. AWARENESS:

To change the facility's culture, it is important to create awareness.

To successfully convert to run dry, everyone in the company - from the managers to the operators and the engineers and maintenance crew - must be bought in to the investment.

To change the culture, everyone must understand:

- It is more than just switching off the lubrication or changing the chains and belts. It requires a different mind-set at all levels to make it successful
- It requires a new approach to balance different aspects of the operation, and practice has shown that it will work!
- To run dry, a new sanitation schedule needs to be found and maintained. For example, the naturally dry parts of the line (typically prior to the filler and after the labeler), generally require less attention and cleaning. Sections with carry-over water require more attention and cleaning.

STEP 2. COST ADVANTAGE:

Investing in dry-run technology will pay dividends, with the return on investment (ROI) converting into recurring annual savings. Hygiene and safety are more difficult to translate into real money, but the savings on soap and water (and wastewater treatment) are usually quite significant. For many retrofits, the ROI of switching from wet lubrication to a completely dry line is 1 year or less. If considering ROI for a new line, the marginal extra cost for the premium solution with NGE and Nolu-S™ far outweighs the expenses associated with spray nozzles, dosing equipment and drip trays.

STEP 3. ENGINEERING:

During the engineering step, a technical feasibility study is done in detail.

Using the System Plast® Engineering Calculator (SPEC), we evaluate the product loading and conveyor speed of the application. This allows us to confirm the dry-running conveyor meets our standards with regards to PV limits, transfers, wet / semi wet / dry sections, etc.

Specific situations like twisters, machine infeed and discharge locations, conveyor length, and other variables are vetted, with an alternative solution proposed if necessary. In some cases, it may be necessary to perform an on-site audit to fully understand the situation and give the correct recommendations.





STEP 4. PROPOSAL:

Once the technical details of a run-dry application are evaluated, the System Plast® products engineering team will work together with the end-user (or OEM, for new lines) to determine the best course of action for the given installation. If needed, special solutions will be presented in a detailed product proposal.

STEP 5. IMPLEMENTATION:

Execution means training the people who work on and around the line, monitoring the project during installation / commissioning, and following up with the facility after start-up. This will help to ensure that the initial principles are preserved, the efficiencies are reached, and the savings are achieved!

Let's Take the Next Steps Together

Is running dry right for you? Based on our years of experience, these are other technical variables you should consider. Let us help you engineer the right solution for your facility.

To effectively run without lubrication, your team must embrace the proper culture for a run dry solution, which includes:

- Proper Cleaning Schedule
- Container Characteristics
- Process
- Mechanical
- Employee Engagement

Cleaning:

Every application is different with respect to the conveyed container characteristics, type of line, local circumstances, etc. There are some general guidelines, but it is essential to find a balance when maintaining and cleaning the system. It is important not to carry over spilled product. Instead, keep the product spillage as close as possible to the filler. Typically, the rinsers / blowers following the filler are sufficient. However, if there is product leakage further down the line, it is more difficult to contain and leaks may be overlooked. Less effort is required to clean, however, a strategic, focused cleaning plan is still highly recommended. "Bacteria can swim but can't crawl!" There will be less slime proliferation and fewer issues with scaling in applications where the rinsing/ cleaning water is particularly hard.

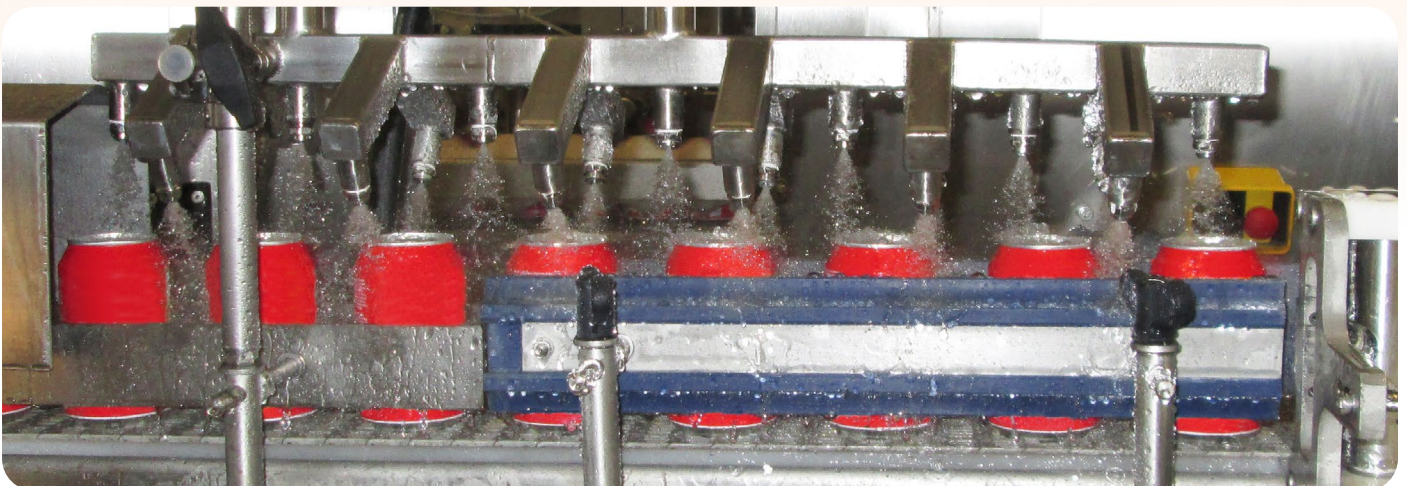
We strongly recommend having a water rinse at the filler discharge, especially when running sugary beverages.

We suggest putting a blower after the rinse to remove the excess water and beverage residue to quickly make the line as dry as possible: the dryer, the better!

As a general rule, the first 3-4 conveyors after the filler/seamer (including the outliner) should be connected to the CIP (Clean In Place) system of the filler/seamer. This will ensure they are automatically cleaned and sanitized every time the filler/seamer is cleaned.

When cleaning the line, it is always important to follow the recommendations from the cleaning agent supplier and to make sure that all cleaning chemicals are completely and thoroughly rinsed from the conveyor. Take care to also rinse between the carry and return.

Rinse water should be soft (< 60 mg/L of CaCO₃) to avoid mineral scaling when the water evaporates. In some instances, the product itself may have a high mineral content - often the case with spring water. Residues contain calcium and other minerals that leave an abrasive film that causes increased component wear. All the more reason to have a proper rinse and blower immediately after the filler/seamer exit to avoid propagating the minerals down the line.



Container Characteristics:

Typically with beer cans, there is an excessive amount of water carry-over after the seamer, making the rinser and blowers after the seamer more or less standard at a brewery.

In applications where the product is being bottled or canned at lower temperature (typically beer and soda) there will be condensation on the bottles. This will cause the sections after the filler to be invariably wet. Similarly, a pasteurizer, warmer or cooler is expected to have a blower at the discharge to reduce carry-over water. If not, we recommend installing one there to prevent as much water as possible from traveling beyond this position in the line. Smart cleaning - not more cleaning, is the basic approach. Do cleaning where and when necessary, such as when bottles or cans appear to leak or when glass bottles break.



The characteristics of the container materials influence the behavior on the conveyors. These variables always need to be taken into consideration, especially when creating a dry-running line. Where the instability of low-quality PET bottles was previously masked by soapy lubrication, it may show different behaviour without the soap when running on NG Evo chains or belts. Some variables to consider:

- Quality of PET:
 - Quality of raw material
 - Colorants
 - Other additives
 - Design/ settings of blow molding machine
 - Geometry of bottle base
- Quality of cans:
 - Steel / aluminum
 - Type and quality of varnish
 - Design
 - Material thickness
 - Product orientation (ex: if inverted for date code application)
- Quality of glass:
 - Raw material; origin
 - New or returnable
 - Design
 - Surface of bottle
 - Coatings

Points of note: the behavior on inliners/ outliners when glass bottles impact one another, and the stability of PET bottles.

Process:

When designing a new line for running dry, consider these items to optimize performance:

- Wider conveyors → slower speeds
- Keeping the curve close to the idler wheel for side-flexing applications
- Machine infeed/discharge should use straight-running chains instead of side-flexing
- Increase length of inliners/discharge conveyors, when required
- Shorter length per drive → less back line pressure
- Optimized line controls
- Use curves instead of 90° transfers with unstable bottles
- Side guides with lower friction and easier adjustability

When retrofitting an existing conveyor, the layout is already established. In this case we tend to look at transfers, side guides, etc to optimize and reach the highest possible efficiency.

Choosing the correct conveyor materials is also very important, especially when compared to lines using lubrication. To successfully run dry, it is one of the most important choices to make.

Using a chain or belt material that has improved chemical resistance helps to expand cleaning options.

Regal Rexnord's proprietary NG[®] Evo chain and belt materials, made from engineered polyester resin, offer all of these advantages when running dry!

Elongation wear is substantially less over time when using NG[®] Evo components as compared to the typical acetyl chains seen in the industry (Figure 1).

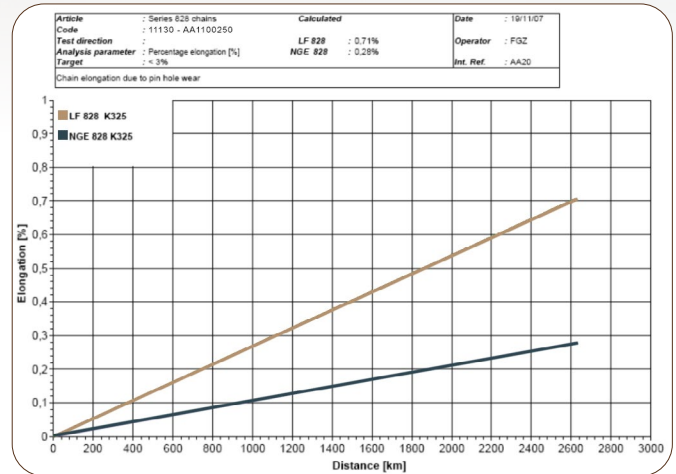


Figure 1

The blue line is the wear rate of the NG Evo chain. The brown line is the wear rate of the acetal chain.

Reducing energy costs is also an important factor when considering a run-dry application. In this instance, Nolu-S[™] wear strips offer that advantage. Studies have shown a 10.8% lower amperage draw when using NG Evo with Nolu-S wearstrips, as compared to the standard UHMWPE wearstrips. When installing new chain or belts we also recommend replacing the wearstrips and sprockets to optimize wear life. In dry circumstances it is extremely important to reduce friction in curves. This yields improvements with power consumption, PV limits and wear life. In these applications, Nolu-S (or Nolu-SR[™] for abrasive applications) components have a proven record to be the optimum solution.

An independent lab study has shown that the Nolu-S components have a consistently lower Coefficient of Friction than UHMWPE wearstrips when used with our NG Evo chain / belt material (Figure 2).

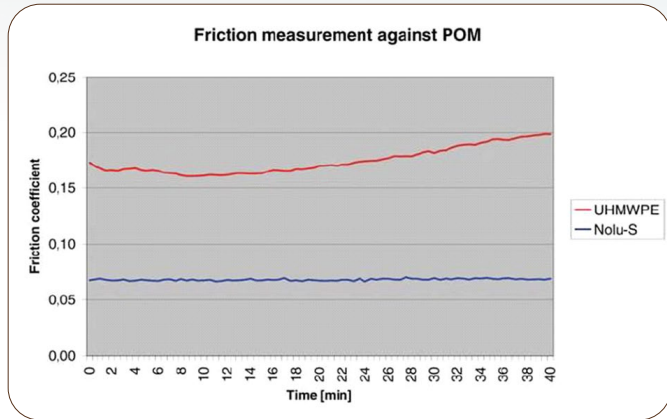


Figure 2

Controls optimization is also an important variable to consider. Proper controls can balance the flow of bottles, reduce accumulation pressure and reduce the time the belts are running under full accumulation (improving service life). When the controls are set correctly there will be reduced pressure on the bottles and the side guides, easier transfers, reduced wear and even reduced power consumption. Keeping the side guides in good repair and positioning them properly will ensure smooth product flow, especially at more critical positions like transfers and inliners/ outliners. Here a Nolu-S side guide will reduce friction

against the bottle/can and improve product handling. As an additional advantage, it has a proven record to avoid scarring the surface of delicate cans. In the return section, our rollers are rubber coated to ensure sufficient grip on the belt. Rubberized rollers will maintain rotation more consistently, keeping the carry surface of the chain/belt in good working order and preventing scalloping, which can lead to product handling concerns. Every project can be assessed individually, but we generally advise to use a belt rather than a chain because belts offer optimum product support and are a more rigid solution with additional wear potential. This is an advantage in more aggressive environments. Modular belts are also more maintenance friendly, since the assembly process does not involve a hammer and a punch. In the case of aluminum cans, the presence of aluminum oxide dust (especially when the chemical balance in of the pasteurizer is not optimum) requires the use of a belt with an open structure so the abrasive aluminum oxide can pass through the belt during normal operation and be flushed away during proper cleaning. In case of glass, it's important to create escapes in the side guide to avoid large shards of broken glass from getting stuck under the carry surface.

Mechanical:

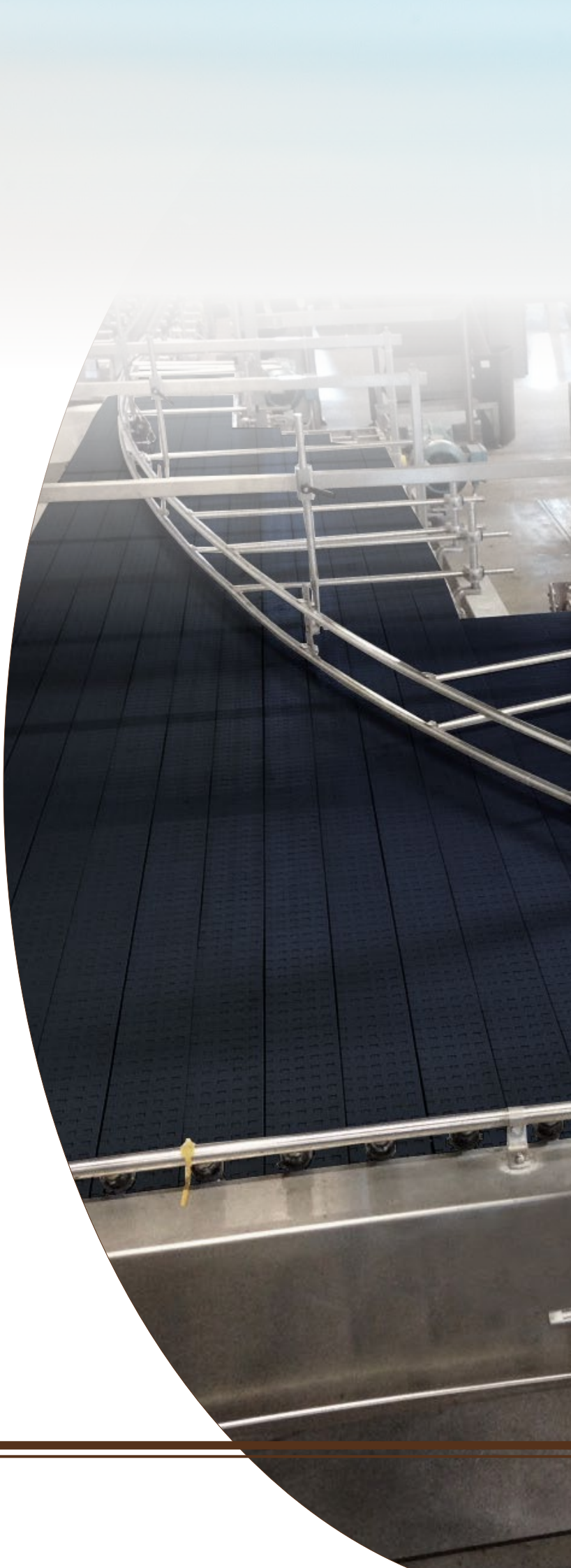
Whether running dry or with lubrication, it is always wise to make sure the conveyors are mechanically in good working order. Often you find a chain hitting an obstruction like a cable tray or a protruding bolt which negatively affects performance and service life. To ensure the best possible operation, we recommend inspecting conveyors prior to operation to ensure:

- Perfect alignment of conveyor sections
- Smooth wear strip transfers that are chamfered where necessary
- Side guides are securely fastened at the correct position and angle
- Proper alignment and timing of sprockets and idlers
- Smooth, straight transfer into all curves

Employee Engagement

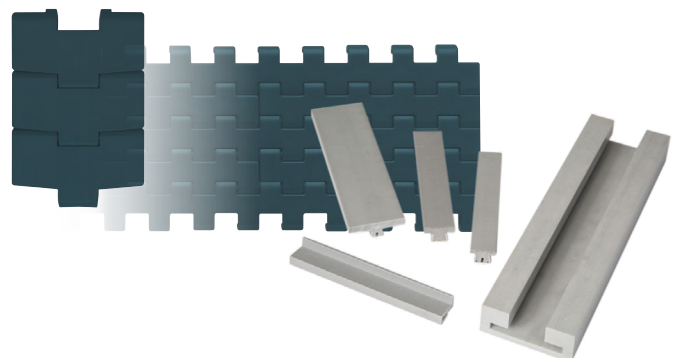
Plant personnel should be aware of the goal to run dry and receive training that Regal Rexnord can provide on proper cleaning and maintenance techniques. In many cases, it is necessary to change the culture of a facility to successfully implement a dry-running line.

When the operators and maintenance crew see or hear a disruption on the line, they should focus on resolving the root cause and not jump to the conclusion of reintroducing lubrication. Ideally, a daily checklist should be implemented to quickly inspect the lines and ensure proper operation. When making an inspection routine, issues will be discovered more quickly and can be resolved before they become a chronic problem.





The System Plast® products engineering team has tirelessly focused on developing materials and solutions to help you and your production facility be successful. We are here to help you with developing a run-dry chain, belt, and wearstrip solution that can reduce the use of unnecessary lubrication, improving safety and your facility's operating efficiency. Contact information for your regional engineering team can be found on the back page of this brochure. We look forward to hearing from you and working with you to develop the best solution for your application!



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