

Run Dry...

Get the FACTS first



REXNORD



In many industries, conveyors have been successfully running dry for over 20 years using Rexnord superior materials such as the patented XL and LF acetal-based materials and more recently, HP™ and PS® acetal-based materials.

However, you need to get the FACTS first from.. **Rexnord®**

Run Dry is not an all-or-nothing proposition

Application Engineers from Rexnord FlatTop can help you to determine when it's practical and cost effective to run conveyors dry and when it may be best to run with water, a dry lubricant or water and soap lubrication. Our experience has shown that a significant portion of the conveyors in bottling and packaging plants can be converted to run with dry lube, run completely dry or run with a dramatic reduction in water and soap consumption.

Running dry is not only a chain issue. Many other factors need to be taken into consideration such as:



- **Conveyor cleanliness**
- **Container stability**
- **Increased component wear**
- **Hard water deposits**
- **Chemical compatibility of cleaners and lubricants**
- **Product damage**
- **Conveyor pulsation**
- **Horsepower draw on motors and energy consumption**

Functions of lubrication

- Reduce friction
- Allow relatively instable containers to slide
- Extend wear life of chains and components
- Reduce energy consumption
- Keep friction at a constant level
- Wash away debris
- Clean conveyor systems
- Reduce noise
- Dissipate static charge

Advantages and disadvantages of lubrication alternatives:

Conditions:	Run Dry	Water	Water and Soap	Dry Lubricant
Reduces chain wear	●	●	●	●
Enhances product stability	●	●	●	●
Reduces energy consumption	●	●	●	●
Acts as a rinse (i.e. spilled product)	●	●	●	●
Reduces bacteria growth	●	●	●	●
Resists hardness scale build-up	●	●	●	●
Does not leave deposits (i.e. limescale, etc.)	●	●	●	●
Does not need drip trays	●	●	●	●
Does not need distribution systems	●	●	●	●
Prevents static electricity build-up	●	●	●	●
Prevents chain dust issues	●	●	●	●

● Not effective ● Somewhat effective ● Effective ● Very effective ● Extremely effective

Benefits of water and soap lubricants

Running conveyors with plain water, a dry lubricant or no lubricant at all seems like a good idea since it saves the cost of soap and/or lubricants. However, there are many factors to consider before making the decision to turn off the traditional method of water and soap lubrication. The benefits of running conveyors with water and soap are:

- Flushes debris or spilled product away continuously. With water and soap lubrication conveyors are kept relatively clean
- Provides a lower friction, helping to minimize product damage due to backline pressure
- Helps reduce bacterial growth on conveyors
- Minimizes or eliminates hard water deposits, such as calcium
- Helps wash off the residual chemicals that are left on the chain after routine cleaning procedures
- Reduces load requirements for motors and drives

Benefits of run dry



RUN DRY - Rexnord® has helped plants to run dry for over 20 years with superior, patented materials such as LF, XL, HP™ & PS®

- Dry floors for improved safety
- Reduced corrosion on equipment, bearings, motors and floor areas
- No slime or soap scum build up on or under the conveyors improving cleanliness
- No need for drip trays
- Reduced sanitation frequency due to bacteria problems
- No false rejection from bottle inspector due to foam on bottom
- No soap residue in labelers or packers causing package damage
- No wet lubricant carry-over onto trays and foils
- No mold growth and more stable pallets
- No need for bacteriostatic additives in waste water system
- Water consumption is reduced or eliminated
- Environmentally friendly



WATER AND SOAP LUBRICATION offers many benefits such as keeping the conveyor clean, providing lower friction, helping to minimize bacterial growth, reducing hard water deposits and diluting harmful chemicals.

Benefits of dry lubricant

A dry lubricant system has many of the same benefits of a run dry conveyor with the added benefit of a lower coefficient of friction. A dry lubricant is applied by an automatic system with dosing units that put very little lubricant on select areas of the conveyors. The lubricant can be water or oil based with teflon, silicone or solid micro-particles. The preferred lubricant is an oil and water emulsion. The most critical part of the process is how the lubricant is applied on the chain. This is typically accomplished with the use of brushes, shoes or spray nozzles. The benefit of spray nozzles is the absence of contact with the chain eliminating the possibility of trapped dirt or debris. The lubricant can also be applied to the inside of a curve for side-flexing conveyors. There are many dry lubricant products on the market which have been specifically formulated for either plastic or metal chains and container types.

Some systems using Rexnord® plastic chains with a dry lubrication use as little as 10 liters of lubricant per line, per year! The success of using a dry lubricant depends on many factors such as:

- Container stability
- Friction between chain and container
- Speed
- Layout
- Electrostatic charge
- Wear life of the chain
- Wear resistance of the chain
- Dry-in of cleaning agent
- Product damage
- Reduced limescale deposits
- Product spillage
- Wear surface lubrication



DRY LUBRICANT offers many benefits such reduced water consumption, improved safety, and clean products into the labelers or packers.

Conveyor Cleanliness

One reason conveyors require the use of soap today is to help keep conveyors clean. Non-lubricated conveyors must be cleaned periodically to prevent spills and debris from increasing friction. The Rexnord® patented superior materials such as LF, XL, HP™ and PS® resins are easily cleaned.



WATER AND SOAP LUBRICANTS offer a continuous cleaning process. Conveyor cleanliness considerations must be taken into account when planning on reducing or eliminating water and soap lubrication.

Container Stability

When lubrication is not an option, the customer must review the stability of the product conveyed. Rexnord has developed a formula to calculate the critical friction coefficient.

Critical Friction Coefficient (F_c): $F_c = R/HS$

R = Radius of the container base

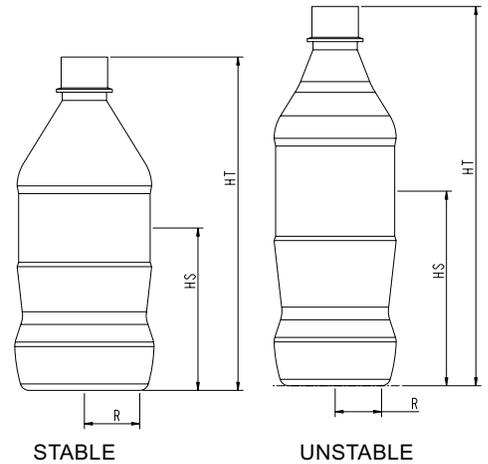
HS = Height of the center of gravity

HT = Height of the container

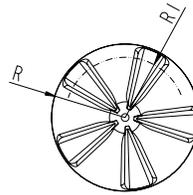
F_w = Friction between chain and wearstrip

If $F_c > F_w$ the application is considered stable

If $F_c < F_w$ the application is considered unstable



For Petaloid bottles: R becomes R_1



Under perfect conditions the decision to run PET without lubrication depends on bottle stability and friction of the chain. A general rule of thumb to follow is:

If $F_c < 0.17$ lubrication is necessary

If $F_c > 0.25$ dry run is possible

If F_c is between 0.17 and 0.25 run dry is only possible under strict conditions

Conveyor Pulsation

Under certain conditions, long or slow running conveyors may pulsate. With reduced lubrication, this condition may increase and could cause product tippage. Pulsation can be reduced by selecting chain and wearstrips with the lowest coefficient of friction or reducing the length of the conveyor.

Product Damage

Plastic or aluminum containers dent or damage easily from contact with other containers or conveyor guiderails. Containers may scuff as they move along the conveyor line. A conveyor chain may run satisfactorily without lubrication, but the real issue is whether the containers will maintain their attractive appearance when backline pressure increases after lubrication is reduced or eliminated. Controlled product flow is also a consideration - integrated controls and drives can improve performance and extend component life by reducing the amount of container accumulation.



PRODUCT DAMAGE
such as scuffing can occur without proper review

Increased Chain Wear Due to Hard Water

Before running conveyors with only water lubrication, Rexnord® recommends measuring water hardness to assess potential degradation in chain performance. Water contains minerals such as calcium and magnesium and the higher the mineral concentration, the harder the water is. Hard water causes scaling, also known as limescale. Limescale are the hard mineral deposits left behind when water evaporates. Limescale can decrease the life of the chain and other wear components such as sprockets and wearstrips. These deposits will build up around the link and pin and become the main abrasive component for the chain, accelerating joint wear and chain elongation! Sprocket tooth wear can also be expected due to limescale abrasion. Increased sliding friction may mean more frequent component replacement. Know for certain, if water is used as a lubricant, wear due to hard water deposits will be a major concern. Hard water scaling is NOT an issue with run dry or dry lubricant lines.

Water hardness measures the total concentration of Ca (Calcium) and Mg (Magnesium) and can be controlled by the addition of chemicals and by large-scale softening with zeolite resins. Water softeners, also called ion exchange units, have several pros and cons.

Pros:

- Relatively inexpensive
- Removes ions from water prior to being sprayed on the chain
- If water is efficiently recycled, recharging of the softening tank will be required infrequently

Cons:

- Additional salt in the wash water could cause secondary issues at the plant or with the groundwater
- Softening tank will need occasional maintenance to add a salt block for cleaning
- The resin is not an inexhaustible exchange site; it will have to be run on an alternative backwash cycle



EVIDENCE OF HARD WATER
can often be seen by the limescale deposits on the sides of the conveyors and components.



INCREASED COMPONENT WEAR
such as joint wear or elongation
can be a result of water scale.

Water treatments can be obtained from lubricant suppliers to provide an alternative to water softeners. Chelating agents can also be added to the lubrication water for prevention of hard water deposits. See Rexnord Hard Water Recommendations for more detailed information.

Compatibility of Cleaners and Lubricants

When conveyors are cleaned, oftentimes with strong alkaline or oxidizing chemicals, residual chemicals are left on the chains. With water and soap, the chain is being continuously rinsed. By eliminating water and soap there is no longer this additional rinse and the cleaning chemicals will have more contact time with the chain - potentially even drying and concentrating to a point where they destroy the chain through chemical attack. It is strongly suggested that prior to removing water and soap or changing to a dry lubricant, customers need to evaluate their cleaning chemicals, concentrations, cleaning frequency and rinse time to find a way to sanitize the system regularly without being detrimental to the chain performance.

General guidelines for cleaning solutions are:

1. Recommend pH of 4-10. Strong caustic agents should not be used with plastic chains
2. Avoid chlorine (bleach), ammonia or iodine
3. With plastic chains, avoid phosphoric acid (found in many stainless steel cleaners)
4. Refer to the corrosion resistance guide in the Engineering Manual (8rxEM-en) to determine the compatibility of cleaners used on chain and other conveyor components

It is extremely critical to THOROUGHLY rinse all cleaning agents completely off of the chain and conveyor frame. Make sure that the underside of the chain is also rinsed thoroughly. Failure to follow the chemical compatibility guidelines and these instructions could result in chain damage and/or failure due to chemical attack.



All cleaners and lubricants must be compatible with the chain, wearstrips and sprocket materials (see item 4 above). It is critical to have an integrated cleaning and lubricant plan for the success of any process. If there are compatibility issues or concerns, contact Application Engineering or your cleaner and/or lubricant manufacturer for assistance. It is recommended to ask the manufacturers for cleaner recommendations that are compatible with the specific lubricant.

CLEANING CAUTION NOTES:

1. Keep water, steam and chemicals away from electrical disconnects, motors, photo eyes, etc.
2. It is recommended that steam not be held on chains for prolonged periods. Chains may deform or become permanently damaged.
3. Before working inside conveyor frames or coming in contact with conveyor components, always make sure all drives are locked out and tagged.
4. If conveyors are going to sit idle for long periods of time before start up, they should be covered with plastic or drop cloth to minimize dirt and debris that can settle into chains and tracks.
5. Before start up, remove any tools, fasteners, or other items that may have been left behind. Thoroughly clean chain, wearstrips, and tracks with air hose or high pressure water spray.

Extending Chain Life

General Cleaning Recommendations

Dirty and sticky chain or conveyors can cause increased container backline pressure and damaged containers.

Without the continual cleaning action of water and soap lubrication, dirt, debris and spilled product (such as syrup, beer, soda, etc.) may build up on the chain and in the conveyors causing increased wear of the chain, wearstrips, sprockets, return rollers and corner tracks due to increased friction. Therefore a thorough and regular cleaning procedure is one of the critical success factors of any dry run conveyor. It is critical to clean the entire conveyor system when changing

from one process to another. This cleaning should be done to eliminate slime, bacteria, etc., that can be found within the conveyor. In addition it is recommended to review and revise cleaning practices when changing from one process to another. Not following or lack of proper cleaning SOP's (Standard Operating Procedures) comprises success .



Recommended Cleaning Frequency

- Completely Dry Lines - These lines should be washed down daily to obtain maximum sanitation and performance. At the very minimum, rinse daily and thoroughly sanitize weekly.
- Partially Lubricated Lines (Water or Dry Lubrication) - Thoroughly sanitize these lines weekly.

Methods of Cleaning

1. Periodic high pressure water rinse should prove satisfactory. Spray the chain in place on each conveyor, both on the carry and in the return sections. This is usually done with the conveyors running. For easy access to the undersides of the chains in the carry and return ways, some manufacturers provide "clean-out" holes in the side frames.
2. Warm water and mild soap are commonly used to clean the conveyors
3. Foaming agents or other chemical cleaners may be used if they are compatible with the conveyor materials. Carefully follow the instructions provided by the manufacturer to determine proper concentration of solutions and proper, safe use and disposal.
4. Some PET bottle conveyor cleaners or combination "cleaner/lubrications" are applied continuously or intermittently. Several types of automatic application systems are available.
5. In extreme situations, it may be necessary to periodically clean the chains with a brush. Clean the chain in place on the conveyor, both on the carry and in the return sections.

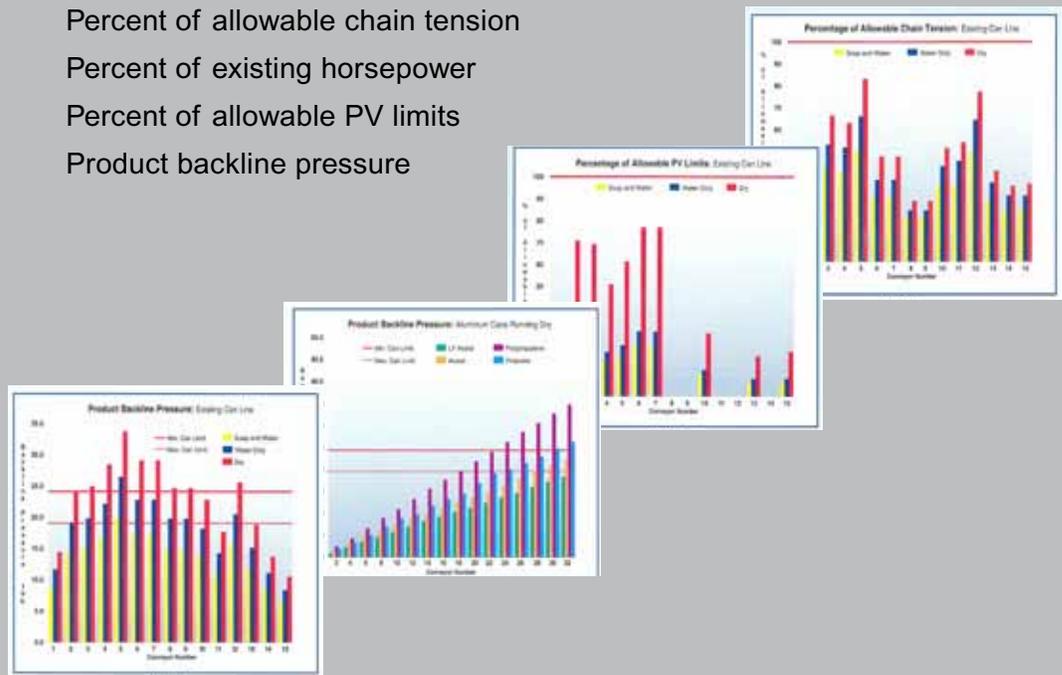
Run Dry with Confidence

Don't wait to find out what running dry means to your operation. Application Engineers from Rexnord's FlatTop Division can help you to determine where it's practical and cost effective to run conveyor lines dry and where it may be best to lubricate.

Start with the facts...Rexnord can help perform a comprehensive survey of the conveyor lines in your plant, including layout, length, width, speed, motor horsepower and other details. This data will be analyzed and compiled into an easy to use format so that you can clearly see the limits of each parameter for running dry.

The four important criteria are:

- Percent of allowable chain tension
- Percent of existing horsepower
- Percent of allowable PV limits
- Product backline pressure



Based on the data collected, we can recommend which conveyors are candidates to run dry or which may need some form of lubrication. Running dry is seldom an all-or-nothing proposition as in the following success stories.



1982....

LF and XL Material - The world's original long life and low friction chain material

1993....

HP™ Material - The world's first high speed and run dry chain material

2005....

PS® Material - The world's fastest running and longest wearing chain material

Today....

Dry running application expertise made available from years of field experience

Platinum Series® Success Story

High Speed Filler Discharge Conveyor

A major soft drink manufacturer installed Rexnord PS (Platinum Series) chain as an upgrade for a high speed PET bottle conveyor. The PS chain required far less lubrication to operate at the same level as the previous HP (High Performance) chain. After 90 days of running with the PS chain, the Plant Manager stated that the filler discharge conveyor was using 2/3 less lubrication per shift. The plant monitored the motor amperage draw as a means of testing the friction levels in the conveyor system. The final result was that the PS material could operate at high speeds with far less lubrication than HP in the same application. The amperage remained the same and subsequently dropped slightly over a 90 day period. The chain has been running successfully since 2005 showing how Rexnord's superior materials can help to decrease or eliminate lubrication requirements.



Dry Lubricant Success Story

Dry Lubricant Reduced Bottler's Annual Water Consumption by 675,000 Gallons (2,558,925 Liters)

A large carbonated soft drink bottler was running well but they wanted to convey bottles without using lubricant dilution water. A leading dry lubricant manufacturer applied a new chemistry that is "neat" and requires no lube dilution water. The dry lubricant was dispensed with traditional spray nozzles using a touch-free application technology. Improvements were seen in both lubricity and bottle mobility, leading to operational gains. Removing the media for microbiological growth meant cleaner nozzles, conveyors and drip pans. Production workers at the plant enjoyed the dry environment and the safer, water-free floors. The plant saw hard dollar savings in the cost of water, softener and effluent treatment. The water cost for the plant per thousand gallons (3,791 liters) (in/out) was \$6.31. By removing the lubricant dilution water the plant reduced water consumption by 675,000 gallons (2,558,925 liters) and saved \$4,260 annually. Additional savings on softener treatment and effluent treatment totaled \$970. The total gross hard dollar savings realized by the plant was \$5,230 on an annual basis.

World Class Customer Service

For more than 100 years, the dedicated people of Rexnord have delivered excellence in quality and service to our customers around the globe. Rexnord is a trusted name when it comes to providing skillfully engineered products that improve productivity and efficiency for industrial applications worldwide. We are committed to exceeding customer expectations in every area of our business: product design, application engineering, operations, and customer service.

Because of our customer focus, we are able to thoroughly understand the needs of your business and have the resources available to work closely with you to reduce maintenance costs, eliminate redundant inventories and prevent equipment down time.

Rexnord represents the most comprehensive portfolio of power transmission and conveying components in the world with the brands you know and trust.

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WORLDWIDE CUSTOMER SERVICE

AUSTRALIA

Rexnord Australia Pty Ltd
Picton, New South Wales
Phone: 61-2-4677-3811
Fax: 61-2-4677-3812

BRAZIL

Rexnord Correntes Ltda.
Sao Leopoldo - RS
Phone: 55-51-3579-8022
Fax: 55-51-3579-8029

CANADA

Rexnord Canada Ltd.
Scarborough, Ontario
Phone: 1-416-297-6868
Fax: 1-416-297-6873

CHINA

Rexnord Conveyor Products
(Wuxi) Co. Ltd.
Shanghai
Phone: 86-21-62701942
Fax: 86-21-627019433

FLATTOP EUROPE

Rexnord FlatTop Europe b.v.
's-Gravenzande, The Netherlands
Phone: 31-174-445-111
Fax: 31-174-445-222

After Hours/Emergency Phone:
31-174-445-112

Rexnord Marbett®, S.r.l.
Correggio (RE), Italy
Phone: 39-0522-639333
Fax: 39-0522-637778

RMCC Deutschland Kette GmbH
Aßlar-Werdorf, Germany
Phone: 49-6443-83140
Fax: 49-6443-831420

Rexnord FlatTop France
Orly Cedex
Phone: 33-1-4173-4220
Fax: 33-1-4173-4229

MEXICO

Rexnord FlatTop
Toll-Free Phone: 001-888-808-7787
Fax: 1-262-376-4720

UNITED STATES

Customer Service
Phone: 1-866-REXNORD
(1-866-739-6673)
Fax: 1-614-675-1898
E-mail: [rexnordcs\(state\)@rexnord.com](mailto:rexnordcs(state)@rexnord.com)
Example: rexnordcsohio@rexnord.com

Rexnord FlatTop North America
Grafton, Wisconsin
Phone: 1-262-376-4700
Fax: 1-262-376-4720

Rexnord International - Power Transmission
Milwaukee, Wisconsin
Phone: 1-414-643-2366
Fax: 1-414-643-3222
international2@rexnord.com

ALL COUNTRIES NOT LISTED

Rexnord FlatTop Europe b.v.
's-Gravenzande, The Netherlands
Phone: 31-174-445-111
Fax: 31-174-445-222

After Hours/Emergency Phone:
31-174-445-112

