

WHITEPAPER

HOW TO CHOOSE SMARTER SEALING AND LUBRICATION SOLUTIONS FOR FOOD AND BEVERAGE PRODUCTION



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INTRODUCTION

By today's standards, there are several unique challenges for the food and beverage industry to overcome to consistently provide safe, high-quality products. The stringency of multiple compliance legislation, combined with consumer expectations for ever-increasing variety, provides a complex landscape that rivals most other industries.

At the heart of food and beverage processing sits a small yet vital component: the humble seal.

When it comes to plant production, the major challenge to overcome is meeting hygiene demands. Seals play a major part in ensuring impeccable segregation of a variety of materials. They must be able to achieve this no matter what size, temperature, application, media, pressure or processing speed is required.



DISCUSSION

Common sealing challenges faced in the food and beverage industry

To provide effective and robust sealing solutions, it is first necessary to identify the likely process risks, including:

- The need for aggressive cleaning fluids to flush systems between batches
- Contamination of food products
- 24/7 workload and asset uptime requirements
- Increasingly automated processes which drives further end of process inspections
- The use of industrial lubricants, not necessarily suitable for food and beverage applications
- Harsh conditions: pressure, extremes of temperatures, corrosion, and abrasion
- and the evolving regulatory environment.

To adequately achieve compliance, the integrity of every seal within a production system must be unquestionable. Failure of seals lead to catastrophic outcomes: product recalls, damaged brand reputation, stoppage of plant and equipment and, in worst-case scenarios, public health enquiries as to how an incident occurred.

Some seals need to not only keep food products within a processing asset, it also must keep out non-food products. Others need to keep non-food grade lubrication in while ensuring cleaning or wash down products are kept out. This means that every seal has a lot of work to do.

Why Sealing Solutions Must Conform to a Dynamic Landscape

The complexity of a sealing system requires engineers to utilise ever-advancing technology, bringing upgraded solutions that conform to the strictest of regulatory standards. These include the use of:

- Fluorocarbon plastics
- Elastomers
- Drinking water seals
- Metal detectable materials.

The key to the ultimate sealing solution is to determine the environment and the variables under which seals must perform. Solutions must be designed to suit the application rather than the other way round. One type of seal absolutely cannot fit all cases.

The food and beverage industry has a varied array of applications and processes. From producing beer to chocolate, ice cream to convenience foods, the stresses a seal undergoes is determined by the type of production being carried out.

Selecting the right profile and material for sealing equipment is based on:

- The process it will be exposed to (what is being produced)
- The environment and conditions it will work under (temperatures, lubrication, cleaning fluids, speeds, pressures, corrosion and abrasion and operation)
- The length of time a seal is expected to last.

Of course, the material and seal must also conform to international, national and regional health and safety requirements.

The key thing to remember is that the right sealing solution begins with talking to a seal manufacturer. Determining the engineering specifications is only the start. Variables must also be accounted for, both planned and unplanned. This will allow for the appropriate selection of the initial seals and, further down the line, the replacements that guarantee integrity and longevity.

Maintenance and Industrial Lubricants aren't an Afterthought

When it comes to the lifespan of plant equipment, the seals – while crucial – should not be considered in isolation. Lubrication is an essential element in food processing equipment, as are the use of ongoing maintenance products.

The type of lubrication used has a direct bearing on the lifespan of seals, making it imperative to use the highest grades to prevent premature wear. Oils and

lubricants used within food and beverage applications should depend on specific uses, and:

- Be free from ketones, aromatics and chlorinated solvents
- Contain no heavy metals
- Be able to work effectively in extremes of temperature
- Be water and chemical resistant
- Be biodegradable and environmentally friendly.

Maintenance speciality products must also be the highest quality and the right type. For instance, sealant tape should be pliable, high-density, mouldable and tear resistant. It should also be able to be used with virtually all chemicals and effective in extreme temperatures. Packing should be non-reactive to chemicals, work in a wide pH and temperature range, and able to withstand extensive pressures.

To thrive in such a competitive industry landscape requires organisations to re-evaluate their manufacturing processes regularly. With rapid advances in technology, those who fail to keep up, risk falling behind their competitors. When it comes to seals, partnering with an innovative manufacturer that continuously pushes the boundaries to deliver effective solutions is business critical. Time spent making the right sealing choices will directly impact production, output, and baseline profits.

For over 130 years, A.W. Chesterton Company, a world leader in sealing solutions for the food and beverage industry, has continued to provide innovative and reliable seals for its customers in operations worldwide.

Chesterton® seals have helped production lines around the world to exceed hygiene requirements, solve challenges, avoid downtime and last longer than expected. Let's see how Chesterton's sealing solutions have helped customers solve their unique processing challenges and deliver real value.



CASE STUDIES

SUGAR ROLLER MILL JACK

Sugar roller mills are used to extract juice from sugarcane to produce sugar. A sugar roller mill usually consists of three rollers; a top roller, feed roller and discharge roller.

A hydraulic jack or ram cylinder attached to the top roller, presses the load down on the sugar cane while the cane is extruded through the feed and discharge rollers. Peak performance of the hydraulic jack is critical for optimal juice extraction rate and quantity.

A customer based in the Philippines, was experiencing leakages with their hydraulic jack. They were faced with three options when a leak occurred; carry on with business as usual until the next scheduled maintenance, bypass or turn off the jack until the

next scheduled maintenance with lower throughput, or stop production and have the seal replaced over a 24 hour period with a significant loss to production.

The underlying cause was found to be an existing seal made from a locally produced urethane. As visible in the picture to the right, the seal had drastically shrunk and lost its elasticity. This was leading to a lateral load causing additional wear to the ram and leaks. The customer needed a more appropriate and efficient material for the seal as well as bearing bands on the ram to prevent further wear.



Severely scratched barrel as a result of metal-to-metal contact with the ram



Shrunk piston seal and severely scratched/worn-out bronze surface of ram



Repair of Hydraulic Jack Ram



Reconditioned Barrel of the Hydraulic Jack

Chesterton distributor, Piesco Hydraulics, replaced the defective seal with Chesterton [AWC800 22K Piston Seal](#), combined with [Chesterton 18K GFN bearing bands](#).

Chesterton AWC800 is a diamine-cured thermoset polyurethane. The innovative Chesterton sealing material is shrink-resistant, abrasion-resistant, wear resistant, extrusion-resistant, non-absorbent, and operates with low-friction thanks to its molybdenum disulfide lubrication properties.

The Chesterton 18K GFN bearing bands/MWR Coil TB, prevents side loading and metal-to-metal abrasion on the adjacent metal surfaces on the remaining length of the ram.

Once the AWC800 thermoset polymer seal was in place, shrinking was totally prevented and any metal-to-metal wear between the ram and barrel

was also restricted due to the introduction of wear bands. Instead of shutting down three times per milling season, with the new Chesterton solution, the cylinder lasts for five seasons without leaking.

This led to a range of savings, including:

- more than 40% reduction in the cost of seals across five years
- an equivalent saving of between \$397,000-\$421,000 USD every year in recouped production loss (based on bypassing or stopping until the next scheduled maintenance)
- a hydraulic oil cost saving of close to \$5,800 USD per season
- an effective extraction which created dry bagasse from sugar cane to fuel the boiler. Ineffective extraction creates wet bagasse, which needs additional processing before it can be used as fuel. The efficiency of the Chesterton solution meant no further dewatering costs or alternate fuel costs were required.



Chesterton® AWC 800 22K Piston Seal and 18K GNF/MWR Coil TB Bearing Bands on the Jack Ram



AGITATORS IN CHOCOLATE PROCESSING PLANT

Raw chocolate is a viscous, abrasive compound that can be difficult to seal. As a food product, the sealing methods and operating parameters for chocolate processing must conform to regulations and best practice.

A chocolate factory in the United States wanted to seal their tank agitators with mechanical seals to eliminate chocolate leakage and associated sleeve

wear caused from compression packing. Split seals were recommended to eliminate the need to dismantle the agitators and allow for simple installation. Reducing or eliminating chocolate leakage would save valuable product and reduce the clean-up and special disposal requirements for this operation.

The chocolate processing plant installed four 4.500 inch SC/SC EP Chesterton 442C Split Seals in one section of the facility. The Chesterton 442C Cartridge Split Mechanical Seals were very simple to install and reliable at start up. After installation, the tanks were filled with raw chocolate and agitators were operated. All agitators are now totally leak free.

After several months of leak-free operation, the Chesterton 442C Split Seals have:

- eliminated all previous clean-up and disposal issues
- eliminated the source of previous agitator shaft wear
- led to the customer stating they were very pleased with the ease of installation and performance of the Chesterton 442C Cartridge Split Mechanical Seal.



Agitator fitted with a Chesterton 442C Cartridge Split Seal.



Chocolate tanks sealed with Chesterton 442C Cartridge Split Seal.



PET BOTTLING LINE SEALING

A bottling plant in Germany replaced the bearings on its labelling machine every 6 months. The reason for the frequent change was due to wash out of the previous grease. The label machine was located near a rotating table with 24 mounted rotating plates. The plates rotate the bottles 360° to make sure each of the labels stick. The transmission is done with a timing belt, and the bearing performance is monitored by the customer.

After consultation, the company chose to replace its grease with Chesterton 630 SXCF Extreme-Pressure, Corrosion-Resistant Grease. The Chesterton 630 SXCF Grease is a high-performance food-grade synthetic grease which delivers outstanding results in high-temperature, high-speed and under extreme pressures. Importantly it also has excellent water washout resistance, which would allow the bearings to be used for longer periods of time before requiring a change.

By switching to the Chesterton grease, the company has:

- reduced energy consumption by 20%
- reduced annual maintenance costs down by 14%
- eliminated all unplanned shutdown
- increased production by 400,000 bottles a year.

STEAM PEELER SEALING

A vegetable processing plant had leakage issues with its steam peelers. Steam peelers have a rotating shaft sealed with a stuffing box. The packing set had to be changed monthly and the worn shaft needed to be replaced regularly.

There was prolific wear on the packing set caused by dirt on the vegetables. The customer was using an abrasion-resistant packing which contributed to the shaft wear and allowed high-pressure steam leakage, which ultimately led to bearing issues.

To solve these issues, a 3-ring Chesterton 1730 Mill Pack set was selected to resist abrasion without damaging the shaft. A spring-loaded Chesterton 5150 Rotary Live Loading system has also helped prevent particles from entering the stuffing box by maintaining a constant sealing force. The constant load eliminated the need for repeated gland adjustments.

This has led to a range of benefits, including:

- increased reliability and lower costs through eliminating leakage, shaft wear, and bearing problems
- nine years of running without problems so far
- an effective preventative maintenance program where the customer replaces the 3-ring Chesterton 1730 packing set each year
- improved worker safety due to less adjustments.



Steam peelers remove the skin from fruits and vegetables by exposing them to high pressure and high temperature steam.



CONCLUSION

Thriving in the evermore competitive landscape requires organizations to undertake regular re-evaluation of their manufacturing processes. Technology is advancing at lightning speed, meaning those who fail to keep up; risk falling behind their competitors. When it comes to seals, partnering with a company that is forever pushing the boundaries to bring innovative and effective solutions is a key component of forward planning. Time spent making the right sealing choices directly impacts production, output and baseline profits.

Want to know more?

Visit [Chesterton](#) to discover more about the world of sealing solutions for the food and beverage industry, or send your enquiry to: enquiries.apac@chesterton.com and speak to one of our experts to discover the right sealing solution for your business.