What if... you could use innovative conveyor technologies to reduce costs and increase sustainability in food and beverage production?

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Production managers are being challenged to reduce energy costs, water usage and downtime while enabling greater efficiency. In many cases, the conveyor systems that could contribute to those efforts rely on outdated technologies that limit the improvements that can be achieved.

Fortunately, new technologies have emerged that are designed to reduce water usage, increase energy efficiency and minimize downtime in high-speed food and beverage production environments. All achievable by examining the total concept which consists of five key factors, cleaning, process, mechanical components, product and the human factor.

This e-book from Regal Power Transmission Solutions reviews the impact these new technologies are having and showcases some of the food and beverage manufacturers that have successfully adopted them.

The first three sections focus on the issues of sustainability, downtime and efficiency respectively, while the final two sections provide information on the technologies being used to effect change and how to assess your own environment to determine whether an upgrade is warranted.
Improving Sustainability by Decreasing Water Use
RUNNING DRY BECOMES A REALITY
Manufacturing plants today have three options for keeping conveyor systems running smoothly: water and soap lubrication, dry lubrication, and running dry (no lubrication).

Water and soap lubrication of steel chains became the most common approach as production speeds increased. Water and soap reduce friction, flush away product spillage, dissipate heat and reduce chain wear. However, water reclamation costs, worker safety, water availability issues and corrosion have caused many manufacturers to seek alternatives to this approach.

One alternative is dry lubrication. This involves using a mineral oil with lubricating additives instead of soap and water. This can save a significant amount of water but is, by its nature, more delicate than soap and water lubrication. Dry lubrication also requires additional equipment for supplying lubricant to the conveyor. If not used precisely, it can result in wear-paste build-up, causing premature wear, noise pulsation and hygiene issues.

The third choice is to run dry using specially developed materials and smart design chains, belts and components. Using these New Generation technologies, production managers can eliminate the problems associated with soap and water and dry lubrication, including safety, corrosion, and excessive rejects. At the same time, costs are reduced and sustainability is improved by cutting water usage and water reclamation costs. Regardless of which method is selected, it is critical to maintain proper cleaning and sanitary support of the system.

DID YOU KNOW: In 2014, Coca Cola Company used about 305 billion liters of water to produce approximately 162.6 billion liters of product

What if you could eliminate soap and water lubrication?

* Reference http://www.coca-cola.com/stories/setting-a-new-goal-for-water-efficiency/
BREWERS RUN DRY

Breweries have been among the first adopters of technologies that reduce water. In fact, some have already replaced water and soap lubricated stainless steel chains with run dry concepts, while others are seeking to extend dry-run operation to more of the production environment.

Here are four stories of brewers who have taken the “plunge” into running dry:

- One large Dutch brewery was using an acetal chain on a high-speed inliner in the can line but found rapid chain wear increased maintenance costs and downtime. They replaced the acetal chain with a New Generation chain specifically designed for dry-run operation at high speeds. The switch increased chain life by 500 percent and allowed the brewery to maintain production volumes and increase total line efficiency.

- Another brewer replaced soap and water lubrication in their inspection and coding zone with a dry-run chain system. After two years of running dry, the chain showed no measurable wear while significantly reducing water reclamation costs.

- A brewery in Holland replaced their soap and water lubricated stainless steel chain with dry running NG belts to save on water and energy consumption. The change also improved the hygiene standard of the line and the accessibility of the conveyors by eliminating the drip trays.

- Redhook Ale Brewery in WA converted its bottling line to a dry running System Plast™ New Generation™ (NG™) conveyor chain and Nolu®-S wear track. The operation has eliminated 111,000 gallons of water and 675 gallons of soap for lubricating stainless steel chain, and produced savings on energy, maintenance, damage to bearings, sensors and concrete floors. Kurt Schmidt, Maintenance Manager for Redhook, says “The dry conveyor stands on its own merit by reducing slip hazards, energy, maintenance, water, soap and chemicals to treat discharge water. Even with a partial installation, we have cut water use 60 percent and eliminated cleaning the conveyor after every shift.”

DID YOU KNOW: in 2014, The Price of water in Germany was approximately €1.60 ($ 1.75) per cubic meter (1000 Liters)

PROVEN RELIABILITY AND EFFICIENCY IN BEVERAGE MANUFACTURING

While dry-running technologies have gained acceptance based on their ability to reduce water consumption, they have also demonstrated advantages in the areas of reliability and product quality, as these manufacturers discovered:

- A mineral water plant in Europe changed from lubricated stainless steel to dry running belts to reduce water usage and water reclamation costs. The result not only accomplished their sustainability and cost reduction objectives, but also improved product handling. The efficiency of the dry-run belts allowed the line to increase production by 60 percent.

- A coffee producer in the UK had to change their acetal chains after nine months due to the effect of abrasive glass particles and the coffee powder on the chain. They switched to NG chains and have been running dry for several years with little or no wear.

- An Irish spirits bottler moved from water and soap lubrication to dry running NG chains because the existing chain was damaging the expensive glass bottles. The switch to a dry running chain eliminated chain-related product damage and improved quality.

- Constellation Brands (formerly Vincor Canada), the nation’s largest producer and marketer of wine and related products, increased line output yields payback in six months by installing NG chain. Plant Maintenance Manager Jorge Larraguibel states “...we have additional savings on soap, water, preventive maintenance, labels, and spare parts inventory. By eliminating the soap buildup that can breed bacteria, we also facilitated our HACCP certification. We are enjoying intangible improvements as well, such as lower noise level in the plant, reduced slip hazard and improved cleanliness.”

What if there was another option besides Stainless Steel?
Reducing Maintenance Costs and Increasing Uptime
MAINTAINING HIGH PRODUCTION LEVELS
The pressure to continually increase production volumes has stressed older conveyor systems and increased maintenance requirements. For manufacturers, this creates two problems: higher costs and increased downtime.

Chain wear is one of the biggest issues. Many manufacturers who attempted to cut water usage by moving to dry-lubricated acetal chains have been disappointed with the wear rates of these chains. Replacing the chains not only adds to costs but cuts into production times.

In addition, conveyor technologies that have difficulty adapting to product size changes, or don’t enable desired production speeds can have a measurable effect on production volumes. Cross blocks, cam followers and gearmotors, if performing poorly, can all increase downtime. Newer designs of these products can eliminate the problems that some manufacturers have long considered to be included in the “cost of production.”

Heineken N.V.’s global sustainability strategy, known as “Brewing a Better Future,” produced a company-wide reduction of 20 percent in water use between 2008 and 2013. Playing a role in that improvement are NG™ conveyor chain/belts and NOLU®-S wear track. “We have experienced a wide variety of gains from the System Plast™ dry running conveyor,” said Mr. Cok Duivenvoorden, Technical Line Manager at Zoeterwoude. “Specifically, we have improved plant safety and hygiene with dry equipment and floors. Maintenance is easier because of the cleanliness and better access where drip trays have been removed. We have reduced costs for water, lubricating chemicals and wastewater discharge. Dry operation is easier on conveyor bearings and frames, yet still reduces energy consumption because of the low-friction components. System Plast NG chain lasts up to five times longer than low-friction acetal in some of our applications. And when installed to replace worn-out conveyor, the new chain pays for itself in as little as a year.”

DID YOU KNOW: In the food and beverage industry, the cost of downtime is estimated to be about $150 per minute and can vary between approximately $5,000 and $10,000 per hour

NEW SOLUTIONS TO OLD PROBLEMS: REDUCING DOWNTIME CASE STUDIES

Food and beverage manufacturers understand that downtime is lost revenue. Yet, eliminating some of the common causes of downtime resulting from today’s high-speed productions environments can be challenging. Here are three examples of solutions provided by System Plast™.

- A large brewer in Australia had serious problems with the wear life of the stainless steel chain on a line carrying empty glass bottles at speeds of 197 feet per minute. The abrasive glass particles limited chain life to one year, creating additional downtime to accommodate the chain replacement. Replacing the existing chain with a chain featuring hardened pins created a significant improvement in the overall line performance. After 14 months of operation, the new hardened chain shows almost no wear on the pin or plate. With the new chain, the brewery no longer has to shut down annually to replace the chain.

- A European bottler had issues with the cross blocks used in its dryer line. The blocks didn’t grip properly and were unable to keep the dryer heads at the proper angle, resulting in uneven drying. In addition, the bottles were guided by steel rods that did not allow for easy adjustment to accommodate different bottle types. The bottler replaced the cross blocks with a newer block design that provided better gripping power.

- A can manufacturer was using a raised rib belt that created disturbances in the product flow as cans were transferred onto large buffer tables. Product losses were high and the service life of the belt was poor, increasing downtime. Replacing the rib style belt with a small pitch flush grid belt reduced product damage and extended belt life, reducing downtime cutting maintenance costs significantly.

- On a filler line that conveys 5 different sized plastic bottles, double rail guides with hand knobs change-over would take an average of 4 hours (with change-over occurring at least twice per week). SpeedSet™ Brackets solve conveyor line change-over problems quickly. The benefit of SpeedSet is preset conveyor guide rail adjustability that is fast and accurate without the need for tools. SpeedSet is fast because a simple push on the end knob moves the rod, clamp, and guide rail. Within seconds, each rail holding point can be adjusted, saving valuable time on line change-overs.

"SYSTEM PLAST™ SOLUTION"

"APPLICATION"

"SITUATION"

"DESCRIPTION OF PROBLEM"

"REMARKS"

"RESULTS"

"KEY CUSTOMER NEED(S) AND BENEFITS"

"APPLICATION SOLUTIONS FOR BEVERAGE"
REducing downtime and costs
Here are three more examples of manufacturers who have been able to reduce downtime and maintenance costs by implementing new conveyor technology:

- A beverage plant wanted to improve overall plant energy efficiency beyond the use of energy efficient motors and also wanted to reduce inventory of spares. The plant had hundreds of C-Face worm gear reducers but were concerned about the time to retrofit with more efficient right angle drives. With Hub City HERA – High Efficient Right Angle gear drives, the plant manager quickly saw that 4 basic HERA units used in conjunction with plug in shafts and base kits were backward-compatible to the worm gear reducers in his plant. He made the decision to change the gearboxes out over a 6 month period and achieved a 40% increase in energy savings, and inventory reduction of 50% for spare gearboxes.

- A food manufacturer was receiving complaints of bread particles in the back of the bearings, creating contamination issues. The existing bearings were replaced with a new bearing design that included a rear seal that eliminated the need for additional sealing. The contamination issues were resolved without requiring additional sealing that could interrupt production.

- A beverage bottling plant was experiencing failure on the standard cam followers used in a case packer. Excessive corrosion was resulting in reduced bearing life, which required that cam followers be replaced every three months. Replacing the standard cam followers with stainless steel cam followers eliminated the downtime associated with quarterly replacement schedule.
Improving Energy and Production Efficiency
LOWERING ENERGY COSTS, INCREASING EFFICIENCY

When it comes to conveyor technologies, friction and poor product handling are the enemies of efficiency.

New materials are available today that can significantly decrease coefficients of friction, reducing chain pull and driving down energy costs. These new technologies are enabling some manufacturers to reduce their energy costs while achieving higher production rates.

Product handling problems can also impact efficiency and increase waste. Properly positioned guides, grippers, wear strips and correct choice of material can all be used to improve product handling and enable desired production rates to be achieved consistently.
ELIMINATING PROBLEMS THAT REDUCE EFFICIENCY
Achieving efficiency gains can deliver a powerful double benefit for manufacturers: reduced costs and increased output. These manufacturers found the solution in some unexpected places.

- A bakery facility producing 24,000 hamburger buns per hour, 24 hours a day, six days a week, was experiencing problems with chain wear and pulsation on a spiral conveyor used to cool the buns after the oven process. Standard UHMWPE wear strips made the belt pulsate and required lubrication at several points to keep the tension in the belt within limits. Replacing UHMWPE bar cap underneath the chain with a low friction NOLU®-S bar cap, reduced chain pull and pulsation, improving product handling and increasing the wear life of the belt.

- A stainless steel gripper chain used by a glass manufacturer to elevate different sized glass bottles to a high-level palletizer in the plant was contributing to high energy bills and experiencing excessive wear. A new gripper chain with New Generation flights reduced power consumption by 60 percent and allowed the manufacturer to maintain its 7x24 production schedule. No noticeable wear was found on the chain. The GS1 style grippers improved the grip on the different sized bottles and thus improved efficiency. Continued ...
A soft drink producer was experiencing irregular bottle tilt and orientation on an air conveyor with a folded stainless steel neck guide, causing blocking in the curves and inclines. In addition, increased air pressure was required to keep the bottles flowing at all times. Applying Nolu®-S neck guides eliminated the bottle jams and excessive downtime and allowed air pressure to be reduced by 50 percent. Significant savings were made on power costs and production efficiency was raised by as much as 75 percent. The new material also prevented bottle scratching and enabled faster production speeds.

A large brewing company filling 42,000 one way glass bottles per hour was using soap and water lubrication, but was dissatisfied with the slippery work environment. In addition, the drip pans made it difficult to access the conveyors for inspection and maintenance. The solution was found in a dry-running belt, which was installed in several conveying sections before and after the labeler. The extremely low friction delivered by the new chain material resulted in smooth flow of bottles and the high wear resistance gives the belts a long service life in abrasive glass conditions. The investment in the new belt was paid back in approximately six months.
The Technologies Driving Change
BETTER MATERIALS, IMPROVED DESIGNS

As demonstrated throughout this e-book, new conveyor technologies are enabling food and beverage manufacturers to increase sustainability, reduce costs and increase efficiency. Here is more information on the solutions the manufacturers profiled here have employed:

> SYSTEM PLAST NOLU®-S WEAR STRIPS AND GUIDES

Nolu-S is a blend of UHMW and a solid lubricant that maintain excellent wear characteristics while reducing coefficients of friction to improve efficiency. Its self-lubricating properties make it ideal for applications requiring reduced friction, noise reduction, and higher dry-running speeds.

> SYSTEM PLAST NG EVO CHAIN

NG™ Evolution (NG™evo) chain and belt material is an advanced low-friction resin that greatly reduces the coefficient of friction and provides a sustainable advantage over “industry standard” materials. Designed for “dry running”, its improved sliding properties enable reduced power consumption, increased wear life, reduced dust generation and the ability to run at higher speeds.

> SYSTEM PLAST SIDEFLEXING CHAIN

This patent pending side flexing belt features a universal design that enables use in left hand, right hand and “S” turns – all with the same product. Efficient transport of individual or packaged products throughout curved conveyor sections is provided while maintaining product orientation, thus reducing the possibilities of product jams or damage while conveying. Its modular width design and various clip retention methods also create design flexibility.
> **SYSTEM PLAST EXTRA PLUS STAINLESS STEEL AND HB PIN**

The Extra Plus stainless steel chain with HB pin was designed for high speed and heavy duty applications that require excellent corrosion resistance, superior surface finish and the highest surface hardness available. It features vacuum hardened stainless steel for outstanding wear life.

> **SYSTEM PLAST CHAIN WITH GS1 STYLE GRIPPERS**

Gripper chains are ideal for elevators, lowerators, rinsers and washers for bottles, jars, cans, crates and boxes. The System Plast chain with GS1 style grippers is ideal for environments where chemical cleaning and rinsing is used, delivering exceptional durability, optimum grip and low noise levels.

> **2120 LBP BELT**

The ½” pitch of the LBP (low back pressure) 2120 belt provides product support and also allows for product accumulation while continuing forward conveyance. The ½” pitch allows for small bead diameters and small pitch between rollers, and a ¾” diameter nose bar return can be used to greatly reduce the head to tail transfer distance. This improves product stability and lessens the opportunity for packaging damage.

> **ROLLER TOP BELT**

The 2253 Roller-Top (RT) belt in 1” pitch is designed to allow extreme flexibility in product movement. The ability to change product orientation, direction, speed, and spacing with ease allows the conveyor layout to be simplified, improving the handling of packages, safety, and energy efficiency.
> **SEALMASTER® PN GOLD MOUNTED BALL BEARINGS**

PN Gold mounted ball bearings feature a high phosphorous, electroless nickel-coated steel insert with high performance triple lip seals. Available in a variety of housing styles in 316 series stainless steel or high strength composite material. PN Gold mounted ball bearings provide outstanding performance in demand corrosive wash down environments.

> **Need bearings in a corrosive washdown environment?**

> **HUB CITY HERA GEARBOX**

The Hub City HERA gearbox is up to 40% more efficient than standard worm gearing and dimensionally interchangeable to up to 4 sizes of worm drives for inventory consolidation. The Increased Torque Density and Efficiency of HERA also allows for downsizing of units and motors. It is available in both cast iron and stainless steel versions, and filled with PAG460 premium synthetic lubricant for enhanced efficiency (Meets USDA H1), and Viton Double Lip Seals protect against leaks at higher temperatures. Up to $550 savings per year with each increment of motor HP.

> **Does 40% efficiency gain sound good?**
> **BROWNING INTELLIGEAR DRIVES**
Intelligear drives combine advanced open loop vector technology with the convenience and reliability of a variable frequency drive mounted to the conduit box of a gearmotor. Compared to mechanical variable speed drives they provide reduced maintenance costs, higher uptime and a wider constant-torque speed range. They are much simpler to install than wall-mounted inverters as they do not require programming and are factory wired and tested.

> **GROVE GEAR BRAVO WORM GEAR REDUCERS**
The modular design of Grove Gear Bravo worm gear reducers offers rapid availability from the factory – assembled to order from stock components. It features an aluminum housing, 1.18-3.35 center distance, lightweight & compact design ideal for small spaces, and is dimensionally interchangeable with many competitive designs. Grove Gear offers both standard and non-standard custom gear reducers in both single and double reductions. Unique ratios and metric motor flange options are also available.

> **GROVE GEAR ELECTRA (EL) WORM GEAR REDUCERS**
The Electra (EL) Aluminum Housing dissipates heat better than cast iron reducers, resulting in lower operating temperatures. It is a direct replacement to the original Electra-Gear design, with a clean and paint-free finish that is available in a polished option (Platinum EL Series). The center distance sizes are 1.33-6.00.
Assessing the Opportunity
QUESTIONS TO CONSIDER
Here are some questions you can ask to determine whether your environment can benefit from new conveyor technologies:

1. Do you have an initiative to reduce water usage in the manufacturing process?
   *System Plast has developed a solution with the unique materials of NOLU®-S and NG™ Evo Chains that could offer an alternative to traditional components requiring water to assist in reducing the coefficient of friction.*

2. Do you experience high wear rates on belts and guides?
   *By utilizing NOLU-S and NG Evo Chains in combination, there is a significant increase in belt fatigue factor as a result of the lower friction which directly correlates to improved wear life.*

3. Is product flow smooth throughout the process or are problems occurring in curves and other areas?
   *System Plast offers NOLU-S and SR wear and guide solutions to assist in reduced product pulsation and squealing through curves.*

4. Are guides or other conveyor technologies creating product damage?
   *System Plast has a family of product support products like NOLU-S guides, Bead and Roller railing, and dynamic transfer plates that assist in the reduction of product damage during conveying.*

5. Does your plant have an initiative to improve conveyor energy efficiency?
   *Hub City HERA – High Efficiency Right Angle gear drives offer 90% efficient drives that are backward compatible to many industry standard worm gear drives that are less efficient.*

6. What is the Best Practice for achieving optimum results?
   *Optimum results can only be obtained by applying all aspects of the line operation, such as recommended cleaning regime. The selection of the correct chain and component material is one of the important aspects.*

FOR SOLUTIONS: Learn more about optimizing your conveyor on our interactive beverage line for cans, glass, and PET bottles!

FOR MORE SOLUTIONS: Visit Regal Power Transmission Solutions at www.RegalPTS.com
APPLICATION CONSIDERATIONS

The proper selection and application of power transmission products and components, including the related area of product safety, is the responsibility of the customer. Operating and performance requirements and potential associated issues will vary appreciably depending upon the use and application of such products and components. The scope of the technical and application information included in this publication is necessarily limited. Unusual operating environments and conditions, lubrication requirements, loading supports, and other factors can materially affect the application and operating results of the products and components and the customer should carefully review its requirements. Any technical advice or review furnished by Regal Beloit America, Inc. and its affiliates with respect to the use of products and components is given in good faith and without charge, and Regal assumes no obligation or liability for the advice given, or results obtained, all such advice and review being given and accepted at customer’s risk.

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