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## Stainless Steel Powertrains Provide Peace of Mind



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An Altra Industrial Motion Company

# Stainless Steel Powertrains Provide Peace of Mind

Hardly a day passes without a new FDA recall of some food product. And, despite the signing of the Food Safety Modernization Act into law in 2010, the most sweeping reform in food safety in more than 70 years, the number of Americans falling ill from food contamination infections continues to rise at an alarming rate – about a 45% increase in the last three years alone.

## Drivetrains

While there are many causes of food poisoning, food processing equipment design plays a part. Motor and speed reducer drivetrains are found on all types of conveyors and equipment in food processing plants producing everything from beef and poultry to processed ready-to-eat products – in fact anything that people or their pets consume for nutrition or pleasure. So, food processing equipment design, engineering and materials can play a big part in a plant's drive for food safety excellence. Anything that can be done to minimize contamination and reduce the costs of sanitizing these units is a worthy investment.

Since powertrain components are subject to severe high pressure, high temperature and corrosive solutions during washdowns, the materials from which they are constructed, the protective coatings used, and how they are physically designed are key factors in whether they contribute to the problem or are part of the solution for safer food.

Manufacturers of stainless steel drivetrain components maintain that they are part of the solution. This is supported by the experience of OEMs that provide specialized equipment for the food processing industry, almost all of which is fabricated from washdown-ready stainless steel.



This 26' long by 102" wide custom mixing system consists of five sections, each section features a 4' wide by 4' long belt conveyor which transfers product to a 4' wide cleated inclined conveyor. Boston Gear Stainless Steel 700 Series speed reducers were mounted to 3/4 HP stainless steel motors on all ten conveyor drives in the system.

*Photo courtesy of Coastal Manufacturing.*

## FDA Compliance

The FDA issued 22 sanitation-related food product recalls for a recent two-month period. These recalls covered olives, nuts, peppers, cheese, pomegranates, pretzels, sunflower seeds, snack mixes, cherry tomatoes, breakfast cereal, smoked salmon and pet food. That's quite a list for just two months.

Clearly one of the major roles of the FDA is to ensure that the American public is not exposed to contaminated food products. Food processing plant managers operate in a state of constant vigilance to ensure compliance with the FDA regulations for food safety. This is what keeps them up at night. They specify equipment that, in turn, ensures compliance with FDA regulations and brings them peace of mind.

OEM companies that supply drivetrains to the food industry are aware of this situation and design their equipment to allow the food plant to comply with the appropriate FDA standards.

## Washdown Environment is Hard on Drivetrains

Equipment in a typical food processing plant may run between 16 to 20 hours a day, 365 days a year. During the regularly scheduled daily downtime, the plant and its equipment must be cleaned and sanitized. For speed reducers and motors, as with other pieces of equipment in the plant, this involves high-pressure, high-temperature washdowns using corrosive solutions.

The type of coatings used on drivetrain components can vary widely depending on the manufacturer and the application. In many cases, the use of cast iron components with a protective coating will be perfectly acceptable. In other cases, aluminum will do the job.

However, extremely harsh washdowns can cause severe damage to the protective paints and coatings used on typical cast iron and aluminum drivetrain components. Chips of dislodged coatings and paint can enter the food process stream. Exposed cast iron and aluminum housings can result in rust drippings, which can also cause processed product contamination (yes, aluminum can rust when exposed to a harsh chlorine environment).

Speed reducer shaft seals are often subject to the adverse environment and may start to leak. Cleaning solution can enter the speed reducer or its drive motor causing degradation of the lubricant or damage to drive motor windings leading to future failures and growth of bacteria in the warm, damp interior of the equipment.



This slightly inclined conveyor transfers raw leaf products from a sorter and dumps the product into the first of a series of large wash tanks. The 5' wide x 15' long conveyor operates at 180 ft. per minute and is routinely subjected to high-pressure washdowns. A Boston Gear Stainless Steel 700 Series speed reducer was mounted to a stainless steel motor to meet the requirements of this challenging environment.



For decades, the food processing and packaging industries have relied on the proven technology of Boston Gear 700 Series worm gear technology for long-lasting, high-quality performance. The Stainless Steel 700 Series takes that trusted performance to new levels by providing maximum corrosion resistance in the most challenging, caustic washdown environments.



Boston Gear stainless steel motors are value engineered for superior performance in harsh washdown environments where high-pressure caustic solvents and cleaners are utilized to help meet FDA bacteria and food contamination guidelines. Exterior construction consists of 300 Series stainless steel housing, end bells, output shaft, and conduit box. Motors are UL/ULC certified and conform to 2007 EISA efficiency standards. All units feature Class F insulation, Class B rise @1.15 service factor, and epoxy-encapsulated windings. Internally-locked bearings eliminate unwanted axial movement. Other features include double lip shaft seals, rubber gasket seal on conduit cover, O-rings between end bells and housing, smooth exterior with no mounting feet.

## Drivetrain Component Design and Materials

As in most engineering applications, specifying the correct equipment for the expected duty and environment will result in a long-lasting, trouble-free design.

Many drivetrains on food processing equipment feature belts, chains and external gears enclosed in a cover for safety. All of these provide very attractive homes for all types of bacteria and other contaminants. One solution is to utilize hollow shaft reducers, which allow conveyor drive rollers to mount directly to the reducer, eliminating the need for these bacteria harboring components.

Cast iron and aluminum speed reducers and motors are widely used in the food processing industry. Their lower initial cost compared to stainless steel models makes them attractive. However, if the life cycle cost is considered, that picture can change drastically. If the use of stainless steel reducers and motors helps to avoid a single line shutdown due to coating failure that could cause a contamination risk, the cost of the lost production may pay for the stainless steel several times over. Because of this, many manufacturers are moving to all stainless steel speed reducers and drive motors.

However, besides the consequences and cost of a coating failure shutting down a production line, there is also the cost of keeping the line running. In one case, a poultry processor had laborers come in each weekend to paint and repaint gearboxes that had chipped paint or rust. This was done for each gear reducer at least once a year depending on the frequency of washdown. The cost of two of these re-coatings would have more than covered the cost differential between the gear reducers they were using and stainless steel gear reducers.

## Stainless Steel Drivetrains

There are many grades of stainless steel, so care must be taken to select the correct type for the severe washdown environments in food processing plants. Typically, 300 grade stainless steel is used – 304 for shafts and 316 for housings, collars and flanges because of its resistance to pitting in corrosive environments. Ideally, all drivetrain components should be made of the correct grade of stainless steel, without the use of any painted parts. The equipment is only as good as its weakest part. So, don't degrade a quality stainless steel drivetrain by using less durable materials in its assembly.

The main advantages stainless steel offers food manufacturers are:

- No fear of rust or paint chips entering the food supply
- Smooth surface, unlike cast iron, that will not harbor bacteria
- Eliminates the possibility of rust providing homes for bacteria
- No regular recoating is required
- Because of its clean, stain- and rust-free appearance, it does not attract FDA/USDA scrutiny

## OEM Experience with Stainless Steel Drivetrains

This is where the rubber meets the road – field applications experience.

Coastal Manufacturing, a recognized industry leader, supplies custom designed equipment for food processing applications. According to Mark Hoffseth, a Coastal sales engineer, “Many of our customers face food safety audits that inspect every inch of their facilities and equipment, inside and out. Issues such as paint flaking or rust dripping in close proximity to a food contact area are unacceptable.”

This equipment is typically used in production 16 to 20 hours/day with the remaining hours used to sanitize with a combination of high pressure water, acids, and sanitizing agents. Hoffseth says, “In our experience, no carbon steel products, regardless of how robust or cutting-edge the coating or plating, have ever held up in this environment over time. There is no easy way on this one, we have tried virtually every ‘corrosion-resistant’ surface available, and stainless steel is the only long-term solution.”

Hoffseth explained that when so-called “corrosion resistant” products fail, it is often much more costly to repair than with a stainless steel product. This is because, as they are failing, they are typically corroding and seizing onto the piece of equipment that they are mounted to. This can result in a far more difficult removal process, often damaging adjacent parts and components. Coastal has a 175-ton press in its shop, and there have been times when that press had to be used to remove seized, corroded parts. Typically, if that amount of force is required to remove a corroded part, there is often damage to other attached parts.

When asked about Coastal’s customers’ concerns regarding energy efficiency, cost of ownership, etc. Hoffseth said, “While these issues are important to everyone, I would say those are second-tier concerns. Food processing customers are mostly concerned with ‘is it food safe?’ and ‘is this machine going to corrupt or harbor any product?’ In most of the food and pharmaceutical areas that we work in, any equipment that contains corrosive parts is unacceptable. No question.”

Coastal had used painted speed reducers from Boston Gear and other manufacturers for at least 20 years and decided to standardize on Boston’s stainless steel units about 10 years ago. Hoffseth told us, “We have tried just about every brand of reducer – either due to customer specification or, often, because we are given other products to try out and there are some quality competitive reducers out there. But over the years, we have not found one that can beat the quality and availability of Boston Gear.”

Hoffseth acknowledged that Coastal has a very large number of Boston Gear stainless steel units in the field. While all parts wear and eventually require rebuilding or replacement, he said that the stainless steel Boston Gear reducers have the lowest maintenance requirement of any component they use. “We install them and forget about them, typically never having to hear about them or work on them again. For us, the bottom line is Boston has a quality product and has never missed a delivery due date. That’s the kind of company we want to work with, as that is the kind of company we are.”



Coastal Manufacturing utilized a Boston Gear stainless steel speed reducer mounted to a 2 HP stainless steel motor for a 23 ft. tall leaf product elevator. Lettuce product is fed into a hopper at the bottom of the unit, then lifted and distributed to upper level scale feed shaker conveyors which transfer the measured product to a vertical bagging machine. The customers’ sanitary food processing operation could not tolerate paint chipping and flaking often associated with coated reducers used in harsh washdown environments.

## **Boston Gear SS700 Stainless Steel Speed Reducers**

For decades, the food processing and packaging industries have relied on the proven performance of Boston Gear 700 Series worm gear technology. The Stainless Steel 700 Series Speed Reducer takes that trusted performance to new levels by providing maximum corrosion resistance in the most challenging, caustic washdown environments.

Boston Gear recently redesigned its 700 Series Worm Gear Speed Reducer for poultry, meat, fruit and vegetable processing applications that need, not only long-life materials, but specialized design advantages to withstand the corrosive chloride salts and high acid levels in most washdown solutions.

A unique rounded housing, which replaced the traditional flat-top design, eliminates fluid pooling on the unit. The housing is made from 316 stainless steel. Exposed hardware is shielded by smooth-surface covers that help prevent particle and bacteria accumulation. A redesigned, two-piece mounting base protects against contamination and fluid pooling below the unit and has the same footprint of the standard 700 Series for easy replacement.

To prevent miniscule niches that can host microbial contamination, even the nameplate has been laser marked to provide a smooth uninterrupted surface. A reinforced O-ring seal protects against direct hits from high-pressure washdown spray nozzles. All models are NSF International certified.

Efficient ground gearing combined with a large internal oil reservoir, filled with H1 food-grade lubricant (Klubersynth UH 1 6-460) and sealed for life, allows a wide range of operating temperatures and extended service life.

Mike Stegmann, product manager for Boston's SS700 Series, pointed out some additional advantages, "World class SS700 worm gearing is extremely durable with efficiencies that can exceed 90%, while providing high resistance to impact loading and reduced backlash. Units provide a high ratio reduction in a compact enclosure."

Bottom line, stainless steel reducers and motors provide the highest resistance to corrosive washdown solutions. Specifying or installing stainless steel drivetrain components will also contribute to fewer sleepless nights.

Stainless Steel 700 Series speed reducers from Boston Gear feature specialized design advantages when used in caustic washdown environments with corrosive chloride salts and high acid levels. A unique rounded housing made from 316 stainless steel eliminates fluid pooling on the unit. Exposed hardware is shielded by smooth-surface covers that help prevent particle and bacteria accumulation.



## The Best Gets Better

For many in the chicken processing industry, the Boston Gear SS700 stainless steel worm gearbox has become a reliable solution for installations where washdown challenges exist. The SS700 is designed to enhance the sanitation efforts of customers through the elimination of flat surfaces and the elimination of holes or labels where moisture and bacteria can gather all within an efficient stainless steel design that includes a stainless axial face seal and food-grade lubrication. Alone in the gearbox industry, the Boston Gear SS700 carries NSF International certification.

For one leading chicken processing plant, however, this was not quite enough. The cleaning and sanitizing process at their facilities involved pressurized washdowns that far exceeded normal industry washdown conditions.

The personnel performing this task are trained in how far to hold the spray nozzle from the equipment. But sometimes equipment design, or physical clearances, or other reasons cause them to move the nozzle closer to the equipment. Now, anyone who has used a high pressure water nozzle to clean siding or a concrete driveway knows what happens when you get too close to the surface to be cleaned. The jet starts to score the surface – you can carve your initials in your driveway if you wish with the jet. The high pressures they used would require special measures to protect the output shaft seals.

The engineering team at Boston Gear stepped up to the challenge and developed a high-pressure seal option that could withstand the rigors of the intense washdowns performed at this facility. The new seal option incorporates an additional stainless exterior seal for rigidity, but also has a housing modification that maintains the seal joint as well as preserving the smooth exterior of the gearbox. This stainless cover rotates with the shaft while providing protection to the double-lipped seal in the unit.

This added protection has withstood pressures up to 1000 PSI for over 200 hours without allowing water to damage the integrity of the oil. The new gearboxes have been installed and are successfully operating at their facilities. By being responsive to the voice of their customers, Boston Gear has been able to increase productivity by reducing downtime in an industry where production must keep pace with an “insatiable” demand.



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## About Altra Industrial Motion

Altra Industrial Motion (NASDAQ:AIMC) is a leading multi-national designer, producer and marketer of a wide range of electromechanical power transmission products. The company brings together strong brands covering over 40 product lines with production facilities in nine countries.

Altra's leading brands include Boston Gear, Warner Electric, TB Wood's, Formsprag Clutch, Wichita Clutch, Industrial Clutch, Ameridrives Couplings, Kilian Manufacturing, Marland Clutch, Nuttall Gear, Bauer Gear Motor, Stieber Clutch, Twiflex Limited, Bibby Turboflex, Matrix International, Inertia Dynamics, Huco Dynatork, Lamiflex Couplings, Ameridrives Power Transmission, Delroyd Worm Gear, Warner Linear and Svendborg Brakes. For information on any of these technology leaders, visit [www.AltraMotion.com](http://www.AltraMotion.com) or call 815-389-3771.



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