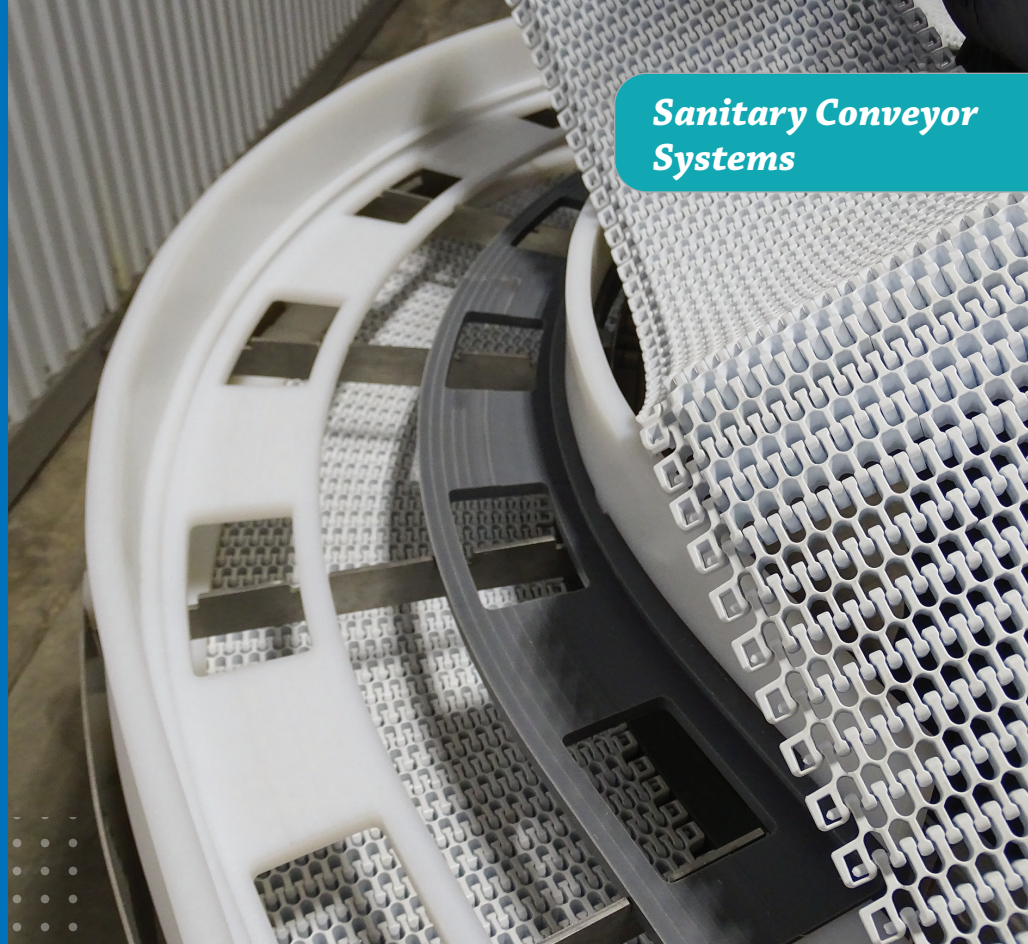


Leveraging Sanitary Conveyor Construction Levels in Food Plant Operations



Discover six levels of conveyor design and construction and its impact on equipment investment, sanitation quality and cleaning efficiencies.

Background: There are a number of unique sanitary conveying needs that vary according to the product being handled and the environment in which it is being produced. Food manufacturers particularly are constantly balancing trade-offs between mounting government regulations, pressure to increase manufacturing efficiencies and budgeting for newer, more sanitary processes and the equipment and systems needed to support those processes.

Few industries work under tighter profit margins than food manufacturing. Budgetary responsibility to maintain satisfactory consumer pricing levels and long-term stability for the company and its employees is a constant challenge. Continuous process improvement programs found throughout the food manufacturing marketplace not only impacts the products coming from food manufacturing facilities, but the equipment used within them as well.

Several engineering and machining advances have facilitated meeting today's continuous improvement challenges in hygienic equipment design. Equipment manufacturers can now produce components that ensure higher sanitation levels by utilizing CAD (computer-aided drafting/ design) software integrated with advanced CNC (computer numerical control) fabrication machinery.

These modern methods produce a highly engineered product with maximum flexibility and manufacturing efficiency. The equipment manufacturers that have invested in these technologies will continue to lead the way to more sanitary designs at affordable costs.

Nercon has developed a set of universal sanitary conveyor standards that can be used in assessing the levels of sanitary conveyor design appropriate to specific areas within a food manufacturing facility. Each of these distinct classifications is defined by the work area, product being conveyed, cleaning considerations, differences in conveyor components and composition, and cost. Below are the six distinct classifications and price points:

- Dry Level I
- Dry Level II
- Wash-Down
- Sanitary Level I
- Sanitary Level II
- Sanitary Level III

Food processors can establish a benchmark from which to be judged during customer audits and for government (FDA, BISSC, USDA and 3A) compliance, as well as those that could be created by future iterations of the Food Safety Modernization Act (FSMA).

Applications

- **Dry Level I**
 - * Primary Packaging
 - » Cartons
 - » Cans
 - » Pouches
 - » Tubes
 - * Secondary Packaging
 - » Cases
 - » Bundles
 - » Trays
- **Dry Level II**
 - * All Dry Level I
 - * Some Baked Goods
- **Wash-Down**
 - * All Dry Level II
 - * Liquid Products
 - » Beverages
 - » Sauces
- **Sanitary Level I**
 - * All Prior Levels
 - * Bulk Ingredients
 - » Dry to Cheese
- **Sanitary Level II**
 - * All Sanitary Level I
 - * Raw Ingredient
 - » Proteins
 - » Vegetables
- **Sanitary Level III**
 - * All Sanitary Level II
 - * Ready-to-Eat

Dry Level I

Areas of the plant where sanitation is not required, typically, a warehouse setting or case handling line dealing with packaged goods being delivered or stored after packaging operations. This conveyor design level can be cleaned using compressed air or a dry cloth.

The focus with conveyors in this setting would center on a rugged, durable design, as opposed to anti-bacterial considerations that would add to the cost. In this economical conveyor design, 12-gauge coated mild steel material is used with bolted construction. Formed angle or pedestal supports will be common, as these bacteria hiding crevices are not an area of concern in this setting.

Instead of stainless steel components and enclosures, durable powder-coated painted frames, NEMA 12 motors, junction boxes and disconnects are used. The trade-off at this level is simple: money is saved in the name of utilizing less expensive equipment for an environment where cleanliness is not a priority.



Dry Level II

Wipe-Down conveyor designs are usually adequate in transporting sealed containers conveying to secondary level packaging operations such as cartoning or case packing. This design may also be used to transport empty containers traveling to (but not in) the filling area. In this environment, the equipment is wiped-down or washed with mild detergents in the event of a packaging leak.

The focus for this design remains on conveyor durability and economy. Dry Level II has the same basic construction as described in Dry Level I, however, investments in stainless steel frames and supports offer better clean-ability for occasional packaging defects. Another significant upgrade is the use of NEMA 4 stainless steel motor and control enclosures, as opposed to the NEMA 12-certified products of Dry Level I.

The price point for the stainless steel Dry Level II conveyor design is 10% - 15% higher than the Dry Level I design, but remains an economical solution with the corrosion-resistant benefits of stainless steel.



Wash-Down (Not Suitable for Sanitary Applications)

A shift into more demanding cleaning environments is the base Wash-Down Conveyor Design. In processing basic, non-cultured food items like bakery items or snack foods, the base Wash-Down design can tolerate low pressure washing with moderate use of corrosive chemicals for cleaning.

Food-grade polymer bearings with stainless steel inserts, are now part of the design and construction of this conveyor. Although the conveyor frame construction is the same as Dry Level II, this design incurs 5% - 10% greater costs due to motor, reducer and bearing upgrades to accommodate the caustic was chemicals.

However, the use of stainless steel frames and NEMA 4X enclosures for the motor and motor controls significantly improve sanitation levels. Sanitary channel supports also reduce hiding places for debris and bacteria. Corrosion-resistant coatings are used on reducers, instead of paint. Additionally, a plastic bearing housing is implemented in favor of its less expensive, but more easily compromised painted steel counterpart.





Dry Level I

Environment:

Minimal/No Moisture

Cleaning:

Dry Wipe-Down or Air Blow-off

Construction:

- 12 GA Mild Steel
- Powder Coated
- Bolted Construction
- Stitch Welds
- Stand-offs - Bolted Optional

Components:

- Guide Rail
 - * UHMW with Sheath
- Wearstrip
 - * UHMW Clip On and/or UHMW with Stainless Steel Sheath
- 2" x 2" Formed Angle Support
- Bearings
 - * Cast Painted Body
 - * Steel Insert
 - * Food Grade Lube
- Painted Motors
 - * Energy Efficient
- Painted IP55 Reducers
 - * Food Grade Lube

Electrical:

Nema 12 Mild Steel Enclosures

Items in Red denote a change in construction or components.



Dry Level II

Environment:

Low Moisture/No Use of Corrosive Chemicals

Cleaning:

- Manual Wipe-Down
 - No Caustics
 - Mild Detergents - OK
 - No High Pressure Sprayers

Construction:

- 12 GA Stainless Steel
- Polished #4
- Bolted Construction
- Stitch Welds
- Stand-offs - Bolted Optional

Components:

- Guide Rail
 - * UHMW with Sheath
- Wearstrip
 - * UHMW Clip On and/or UHMW with Stainless Steel Sheath
- 2" x 2" Formed Angle Support
- Bearings
 - * Cast Painted Body
 - * Steel Insert
 - * Food Grade Lube
- Painted Motors
 - * Energy Efficient
- Painted IP55 Reducers
 - * Food Grade Lube

Electrical:

Nema 12 Mild Steel Enclosures



Wash-Down

Environment:

- Moderate to High Moisture
- Moderate Use of Corrosive Chemicals

Cleaning:

- Low Pressure Spray Wash
- Caustics are OK

Construction:

- 12 GA Stainless Steel
- Polished #4
- Bolted Construction
- Stitch Welds
- Stand-offs - Bolted Optional

Components:

- Guide Rail
 - * UHMW with Sheath
- Wearstrip
 - * UHMW Clip On and/or UHMW with Stainless Steel Sheath
- 2" x 2" Formed Angle Support
- Bearings
 - * Polymer Body
 - * Stainless Steel Insert
 - * Food Grade Lube
- Washdown Painted Motors
 - * Energy Efficient
- Washdown Painted Reducers
 - * Food Grade Lube

Electrical:

Nema 4x Stainless Steel Enclosures


Sanitary Level I
Environment:

- Dry to Wet
- High Use of Corrosive Chemicals to Reduce Bacterial

Cleaning:

- High Pressure Spray Wash
- CIP and COP Procedures

Construction:

- 12 GA Stainless Steel
- Polished #4
- **Open Frame Design**
- Bolted Construction
- **Continuous Welds**
- **Stand-offs - Bolted Standard**

Components:

- Guide Rail
 - * **Removable UHMW**
- Wearstrip
 - * **Removable UHMW**
- **2" x 3" Sanitary Channel Support**
- Bearings
 - * Polymer Body
 - * Stainless Steel Insert
 - * Food Grade Lube
- Washdown Painted Motors
 - * Energy Efficient
- Washdown Painted Reducers
 - * Food Grade Lube

Electrical:

Nema 4x Stainless Steel Enclosures


Sanitary Level II
Environment:

- Dry to Wet
- High Use of Corrosive Chemicals to Minimize Risk of Bacterial Growth

Cleaning:

- High Pressure Spray Wash
- CIP and COP Procedures

Construction:

- 12 GA Stainless Steel
- Polished #4
- Open Frame Design
- **Welded Construction**
- Continuous Welds
- **Stand-offs - Welded Standard**

Components:

- Guide Rail
 - * Removable UHMW
- Wearstrip
 - * Removable UHMW
- **2" x 3" Sanitary Channel Support**
- Bearings
 - * Polymer Body
 - * Stainless Steel Insert
 - * Food Grade Lube
- **Stainless Steel Motors**
 - * Energy Efficient
- **Stainless Steel Reducers**
 - * Food Grade Lube

Electrical:

Nema 4x Stainless Steel Enclosures


Sanitary Level III
Environment:

- Dry to Wet
- High Use of Corrosive Chemicals to Minimize Risk of Bacterial Growth

Cleaning:

- High Pressure Spray Wash
- CIP and COP Procedures

Construction:

- 12 GA Stainless Steel
- **2B Finish**
- Open Frame Design
- Welded Construction
- Continuous Welds
- **Stand-offs - Welded Standard**

Components:

- Guide Rail
 - * Removable UHMW
- Wearstrip
 - * Removable UHMW
- **2" x 3" Sanitary Channel Support**
- Bearings
 - * Polymer Body
 - * Stainless Steel Insert
 - * Food Grade Lube
- **Stainless Steel Motors**
 - * Energy Efficient
- **Stainless Steel Reducers**
 - * Food Grade Lube

Electrical:

Nema 4x Stainless Steel Enclosures

Sanitary Level I (Not Suitable for Unpackaged R.T.E.)

At this section of the plant, Sanitary Level I conveyors are handling more sensitive food products such as packaged ready-to-eat foods, ice cream or other dairy offerings. These applications would demand more extreme caustic wash-down procedures, such as the use of anti-bacterial foams to ensure the environment is as sanitary as possible.

This level of food safety and cleanliness would also demand significant component and construction investments that would include:

- The use of bolted stand-offs for improved cleaning capabilities between areas of guide rail brackets, supports, bearings, splice plates, drop-out covers, electrical disconnects, photo-eye mounts and junction terminal boxes.
- Solid UHMW removable carry way & return, and wearstrips
- Continuous non-pitted welds
- Heavy wash-down duty motors, reducers and chain or belting.
- Optional features include CIP/COP (cleaning-in-place/clean-out-of-place) systems.

Obviously, these increases in sanitation capabilities will expand cleaning efficiencies and meet compliance requirements, but also demand financial investments (approximately 25% more cost than the Wash-Down level) that are in line with such expanded capabilities.



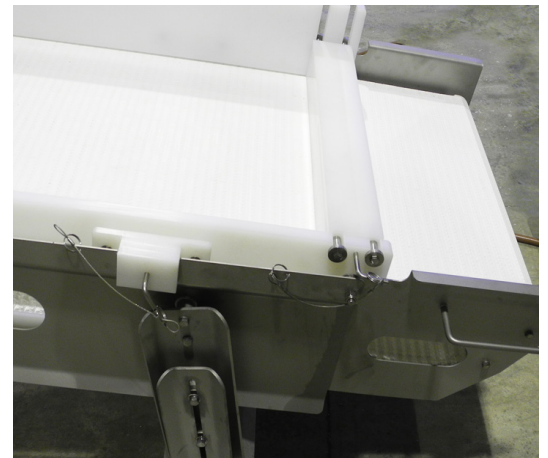
Sanitary Level II (Not Suitable for Unpackaged R.T.E.)

A transition to the extreme levels of sanitary conveyors ensures food processors will be able to meet or exceed material and construction requirements for third-party audits or FDA inspection in handling raw or open food products in stages at which they are most susceptible to contamination.

Implementing the cleaning procedures and purchasing this level of equipment can also serve as a preemptive strike against the potentially more rigid regulations produced by the FSMA (Food Safety Modernization Act.)

Heavily caustic-cleaning agents will be part of standard operating procedures at this Sanitary Level II, as well as COP (clean out-of place/removable) components. This level is associated with additional labor and overhead costs needed for sanitation procedures, but further validates the quality assurances necessary for these types of food production capabilities.

All conveyor frame surfaces and components are stainless steel in the Sanitary Level II design. Additionally, more welded surfaces translate to fewer fasteners and spacers that could potentially serve as hiding places for contaminants. This construction level may be used to convey starched food products or other raw food, with extreme high-pressure caustic wash-down requirements. This level of finishing, welding and components adds 12% - 15% to the cost over the Sanitary Level I design.



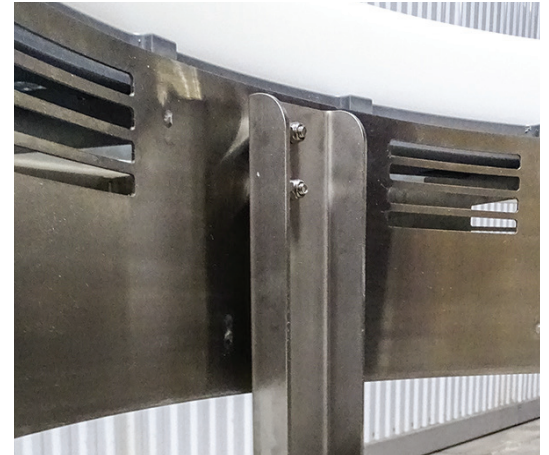
Sanitary Level III

Defined as the same environment as Sanitary Level II, the Sanitary Level III is an open frame design, RA (roughness average) stainless steel material to facilitate removal of bacteria and biofilms. This construction level may be a best choice for pre-cooked and ready-to-eat products, with extreme high-pressure caustic wash-down requirements.

This design is evidence of the trend toward increased cleaning efficiencies, and the prospects of even greater sanitation with the option of homogeneous belting.

This belting, which is available from manufacturers such as Volta and Intralox, features an endless solid polyurethane composition, with low tension. The use of a sprocket and gear drive without hinge points provides optimal sanitation levels in handling raw foods, reducing maintenance and costs.

The labor impact alone of the additional welding, this level of construction results in a premium of 10% - 15% higher in cost than the Sanitary Level II design.



Conclusion

Defining and positioning six levels of conveyor construction allows Nercon to streamline engineering processes and to create the right solution at the right price points for the manufacturer/processor. The levels outlined in this white paper are meant to help food manufacturers leverage conveyor construction types when investing in food plant automation equipment by establishing a perspective on matching the right equipment with the right production application.



Chain design utilizes off set sprocket teeth in a double row to minimize sprocket to belt contact. This allows easy water access to the hinge areas of the chain through the oblong openings.

Examining dynamics used to describe different levels of sanitation should aid operations throughout the plant, enabling efficient, effective and safe operation. These principles should not only play a role in equipment investment strategies, but in helping plants to better control costs, ensure product quality and prevent the negative ramifications tied to unsanitary production such as public health risks, recalls, fines and loss of business.

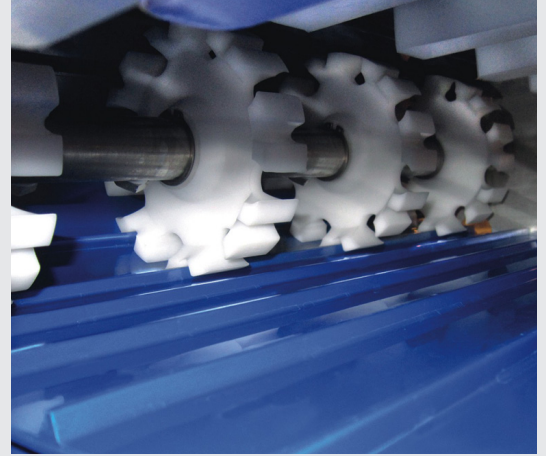
Nercon supplies sanitary conveying equipment that is engineered and built to the food processor's specific requirements needed to meet governmental regulations. Recognizing compliance can be different among plants in the same corporation as well as plant-specific cleaning procedures and processes, Nercon's approach is to build conveyor systems that help the processor meet all food safety requirements and increase cleaning effectiveness and efficiencies.

CIP and COP Sanitary Conveyor Options Help Food Manufacturers Improve Cleaning Efficiencies

There are two significant trends affecting sanitary conveyor construction: One, governmental compliance regulations continue to be more stringent and two, companies are looking to improve hygienic cleaning efficiencies. These CIP and COP options can help food processors meet their food safety goals and significantly speed-up sanitation processes.

- Chain Lift with Lever
- Chain Release Take Up
- Lift-Up Idle Ends
- Sanitary Design Covers
- Removable Wear-strips and Returns
- Removable Guide Rails
- Chain Wash Tank
- Spray Nozzles
- Clean-Out Holes

Clean-in-Place Option (CIP)



The positive drive belt has integrated drive bars molded into the bottom of the belt, allowing the belt to be driven by sprockets with very low tension. The belt offers a smooth homogeneous surface and allows for CIP (clean-in-place) or SIP (Sanitize in Place) processes.

Clean-Out Of-Place Options (COP)



Removable Wear-strips



Removable Guide Rails



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