

SANITARY EQUIPMENT DESIGN

Much of the bacteria found in the environment is harmless, but one bacterium, *Listeria monocytogenes*, is a virulent strain and can lead to a serious disease called listeriosis among certain at-risk populations. *L. monocytogenes* is commonly found in water, soil, and the digestive tract of warm-blooded animals, including humans. It also is found in unprocessed foods of animal origin like raw milk, meat, poultry, and fish, or agricultural commodities like produce. Although cooking destroys *Listeria*, it can be found on some processed foods like cheese, ice cream, and processed meats if cross contamination occurs.

Listeria can thrive in cold, moist environments such as those commonly found in home refrigerators and food processing plants. Protein products, such as meat and cheese, are an excellent media or “food” for bacterial growth if contamination occurs. Furthermore, *Listeria* is known to create “biofilms,” web like coatings including bacteria, which are particularly resistant to cleaning.

When sanitation practices are inadequate, *Listeria* can harbor and thrive in niches on equipment used in meat processing plants, such as conveyer belts, slicers, dicers and peelers. Also, machinery used for packaging products may harbor and transfer the bacteria to products. When this occurs, scrupulous sanitation must occur to eliminate *Listeria*.

Both industry and government are working diligently to reduce the incidence of *L. monocytogenes* in foods and prevent its growth and spread in food processing plants. The Foundation made research related to eliminating *Listeria* a top priority. The Equipment Design Task Force (task force) developed operational and equipment sanitary design guidelines to minimize the spread of *Listeria* in meat processing plants. In 2013 the Sanitary Equipment Guidelines were revised. The revised guidelines are located at: www.meat institute.org/ht/a/GetDocumentAction/i/97261.

Equipment Design Task Force

The task force was charged with developing equipment sanitary design principles that meet the expectations of the meat and poultry industries. They identified the critical nature of equipment design in reducing the risk of contamination of food products by *Listeria*. The task force also developed a checklist that equipment manufacturers and processors can use to ensure their equipment meets these principles.

The task force designed the sanitary design principles and criteria in consultation with equipment design in reducing the risk of contamination of food products by *Listeria*.

Optimizing the design and performance criteria for equipment and related systems, as well as establishing industry-wide principles, benefits the entire industry by promoting standardized principles that help reduce contamination and associated recalls. These principles are appropriate for all food equipment.

10 Principles of Sanitary Design

1. **Cleanable to a microbiological level:** Food equipment must be constructed to ensure effective and efficient cleaning. The equipment should be designed to prevent bacterial ingress, survival, growth, and reproduction on both product and non-product contact surfaces of the equipment.
2. **Made of compatible materials:** Construction materials used for equipment must be completely compatible with the product, environment, cleaning and sanitizing chemicals and the methods of cleaning and sanitation.
3. **Accessible for inspection, maintenance, cleaning and sanitation:** All parts of the equipment shall be readily accessible for inspection, maintenance, cleaning, and sanitation without the use of tools.

4. **No product or liquid collection:** Equipment should be self-draining to assure that liquid, which can harbor and promote the growth of bacteria, does not accumulate, pool, or condense on the equipment.
5. **Hollow areas should be hermetically sealed:** Hollow areas of equipment, such as frames and rollers, must be eliminated wherever possible or permanently sealed. Bolts, studs, mounting plates, brackets, junction boxes, nameplates, end caps, sleeves and other such items must be continuously welded to the surface, not attached via drilled and tapped holes.
6. **No niches:** Equipment parts should be free of niches such as pits, cracks, corrosion, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, and dead ends.
7. **Sanitary operational performance:** During normal operations, the equipment must perform so it does not contribute to insanitary conditions or the harborage and growth of bacteria.
8. **Hygienic design of maintenance enclosures:** Maintenance enclosures and human machine interfaces, such as push buttons, valve handles, switches and touchscreens, must be designed to ensure food product, water or product liquid does not penetrate or accumulate in and on the enclosure or interface. Also, physical design of the enclosures should be sloped or pitched to avoid use as a storage area.
9. **Hygienic compatibility with other plant systems:** Any required subsystem, such as exhaust, drainage, or automated cleaning systems, must also meet the sanitary design principles and not create insanitary conditions.
10. **Validated cleaning and sanitizing protocols:** Procedures for cleaning and sanitation must be clearly written, designed, and proven effective and efficient. Chemicals recommended for cleaning and sanitation must be compatible with the equipment and the manufacturing environment.

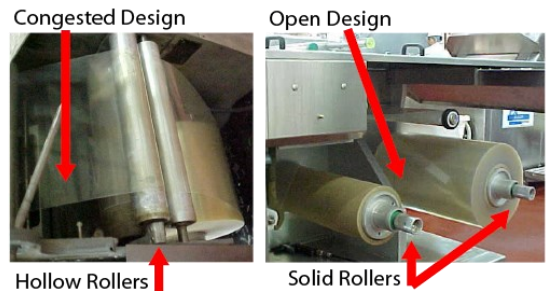
Controlling Pathogens Through Equipment Design

Equipment sanitary design and operation are critical elements to controlling *Listeria* in ready-to-eat meat and poultry processing plants.

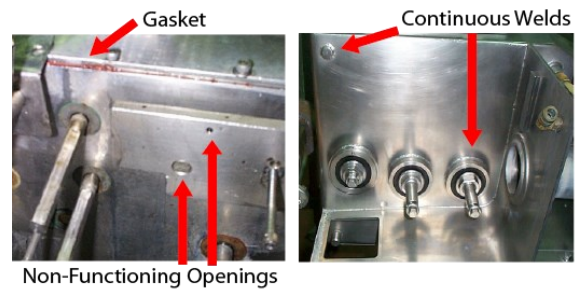
The sanitary design principles will improve design and operation of equipment that is developed in the future, to meet the needs of the ready-to-eat meat and poultry industries. The principles will help the meat and poultry industry in its continuing mission to bring consumers the safest product possible.

Examples of Sanitary Equipment Design

Hollow rollers and congested design allow for harborage of bacteria. The sanitary redesign below features an open design and solid rollers so bacteria have limited opportunity to survive, grow, and reproduce.



From This  To This



The sanitary redesign above also features an open design, along with continuous welds. Continuous welding inhibits bacteria from harboring and growing in niches.