

Sanitary Machine Design 101

Comprehensive Guide on Hygienic Design for Food Filling Systems



In the heavily regulated processed food industry, establishing and practicing a strong food safety culture is integral to business success. The risks of ignoring hygiene checks, or taking food safety lightly are so severe, that the slightest misstep could threaten the survival of your business. Contamination in your production line could happen due to several reasons. For example:

- Residue of cleaning agents.
- Presence of unwanted microbes or pathogens.
- Stray hairs, plastic pieces, broken glass, etc., that could accidentally adulterate the food.

Recent research indicates that in the US alone, there are an average of 700 food recalls every year due to chemical, biological or physical contamination. This includes meat, fish, poultry, and other processed or frozen, ready-to-eat products. Often, the sheer speed and range of product distribution causes local incidents to quickly evolve into international emergencies. Although food audits and quality checks usually detect potential issues, ensuring proper sanitation across the supply chain will help prevent contamination in the first place. This would mean practicing the

highest levels of hygiene for both, your food filling machinery and your facility.

At Multi-Fill, we specialize in a wide range of food filling solutions and are a recognized leader. All our food fillers and batch feed systems are compliant with the manufacturing standards stated by major regulatory bodies, such as ANSI, FDA, USDA and CE. In this two-part series, our product experts throw light on various aspects of sanitary machine design. Part One will cover the basic principles of sanitary machine design, and how food safety standards continue to evolve. In Part Two, we will cover the key benefits of sanitary machine design, and critical considerations while selecting such equipment for your production line.

Food Safety Standards Continue to Evolve

The 'Blue Book' created by the United States Department of Agriculture (USDA) was one of the earliest documentations on food safety guidelines, in addition to the ones released by certain food companies and engineering firms. In 2002, the American Meat Institute (AMI), now known as North American Meat Institute (NAMI) developed 10 principles for sanitary equipment design, which we will cover in detail in the next section. During that decade, several other food manufacturers and regulatory bodies contributed to additional food safety standards for generic food groups, as well as specific food industries. For example:

- In 2001, the US Food and Drug Administration (FDA) released the "Food Safety Guidelines for the Fresh Cut Produce Industry".
- In 2009, the Grocery Manufacturers' Association (GMA) modified NAMI's principles to better address low-moisture food operations. The "Industry Handbook for Safe Processing of Nuts" specifically addresses peanut and tree nut shellers, hullers, processors, and manufacturers.
- AIB International (American Institute of Baking) facilitates food safety for grain-based products and plays a critical role in promoting sanitary machine design and operations, as well as food integrity, globally.
- Other institutions who have developed standards or guidelines for food manufacturing or processing equipment include the American National Standards Institute (ANSI), 3A, National Science Foundation (NSF), and the European Hygienic Engineering and Design Group (EHEDG)

Additionally, the FDA's Food Safety Modernization Act (FSMA), which came into effect since 2011 has been instrumental in transforming food safety

systems and focusing on prevention of food contamination. While adoption of the various guidelines is voluntary, compliance with FSMA is mandatory. This has promoted many fresh-cut and produce processors to take a closer look at various aspects of their operations, including their food filling solutions.

Know the Basic Principles of Sanitary Equipment Design

Although originally designed to minimize the spread of Listeria in meat processing plants, NAMI's principles of sanitary equipment design are quite universal and apply to all types of processed food facilities. They focus on the equipment and machines that could potentially harbor pollutants, and address machine hygiene, in terms of both, design and maintenance.

Use these guidelines as a checklist while upgrading or purchasing equipment for your production line.

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2. **Materials Compatibility:** What is the construction material used in the equipment? Is it easy to clean, and compatible with the materials or chemicals used during food processing and sanitation?

3. **Accessibility:** Does the equipment design allow for cleaning and sanitation systems to easily access every part of the equipment? Does the accessibility aspect extend to ease of maintenance and inspections as well?

4. **No Product or Liquid Accumulation:** Does the equipment include self-draining capabilities? This is critical to ensure that any liquid that can harbor or promote bacterial growth does not pool or condense on any of its surfaces.

5. Sealing of Hollow Areas: Does the equipment feature any frames or rollers? If yes, are they permanently sealed? Are the brackets, bolts, studs, mounting plates, junction boxes, end caps, and sleeves properly welded to the surfaces? If such components are attached via drilled and taped holes, you may want to think twice about purchasing such equipment.

6. No Niches: Is the equipment free of cracks, gaps, pits, crevices, grooves, protruding ledges, bolt rivets, or open seams? These areas potentially harbour pathogens and are difficult to sanitise.

7. Sanitary Operational Performance: Does the equipment maintain high standards of sanitation while operational? Well-designed machines will not contribute to bacterial harbourage or growth.

8. Well-Designed Maintenance Enclosures: Are the interfaces, such as switches, push buttons, and touchscreens located in a position where product residue or water cannot penetrate or accumulate?

9. Production Line Compatibility: When the equipment is operational, does it ensure hygienic compatibility with other systems in the production line, such as the electricals, hydraulics, drainage, and ducting systems?

10. Validated Cleaning and Sanitizing Protocols: Have the equipment manufacturers provided clearly written, 'proven-effective' procedures and protocols for cleaning and sanitation? Such pointers could help you maintain your own documentation and records for the cleaning and sanitization protocols in your production line. This is a critical requirement for FSMA compliance. FDA inspectors review your documentation and ask additional proof to ascertain that you are carrying out proper machine sanitation.

Follow the Sanitary Design Principles for Facilities

Equipment design hygiene cannot successfully prevent food contamination, unless it extends to your plant or production facility. In 2004, NAMI's Facility Design Task Force (FDTF) released the "Sanitary Design Principles for Facilities". These 11 principles serve as an excellent reference point while designing or renovating your processed food facility.

1. Establish distinct hygienic zones within the production area.

2. Strategically control the movement of personnel and materials to reduce hazards.
3. Control water accumulation inside the facility.
4. Regulate the room temperature and humidity.
5. Monitor and control the room's air flow and air quality.
6. Ensure that your site elements facilitate sanitary conditions.
7. Let the building envelope facilitate sanitary conditions.
8. Cleverly plan your spatial layout and interior design to promote sanitation.
9. Ensure that the building components and construction simplify sanitation.
10. Design utility systems in a manner that they prevent contamination.
11. Ensure that sanitation is integrated into every aspect of the facility design.

Gain a Competitive Edge with Sanitary Design Equipment and Facilities

Following the principles of sanitary equipment and facilities will help you develop robust, at-source protection against the various chemical, biological and physical food contamination risks. In fact, like all forward-thinking companies, it's important to not stop at the guidelines.

Use a variety of resources, including experienced designers, third-party consultants, or other specialists, who can ensure sanitary design success for your specific processed food setup.



In 2007, Peanut Corporation of America faced one of the largest food recalls of all times. They recalled over 3,200 products, and eventually filed for bankruptcy. The virulent salmonella strain that contaminated their products led to 8 deaths and 600 people were ill across 46 states in the US and Canada.

While this was an extremely severe case, even the most minor contamination issue in processed food production and food filling systems can create havoc for your brand or business. From negative publicity, loss of credibility, and recalled stockpiles, to customer attrition, expensive lawsuits and hefty fines, you may have to deal with several disasters all at once. However, sanitary machine design minimizes the risks of food contamination, and helps you maintain product quality and consistency, as well as brand reliability.

The principles of sanitary design apply to the food processing equipment, as well as the actual plant or facilities where the production takes place. Essentially, sanitary design is about:

Minimizing the scope for any form of food contamination

Maximizing the ability to maintain hygienic equipment, food filling systems, and facilities

At Multi-Fill, we understand the importance of applying sanitary design principles to food equipment. All our food filling machines are compliant with every feature of sound sanitation. In Part I of the Sanitary Machine Design 101 blog, our machine design experts discussed the various food safety standards, and basic principles of sanitary equipment design. In this blog post, we take a closer look at how the advantages of sanitary machine design extend beyond tackling food contamination.

We also offer some suggestions on how to go about purchasing sanitary design equipment and food filling solutions for your processed food facility. MULTI-FILL works actively with customers to improve on a continuous basis.

Why Invest in Sanitary Machine Design?

From the surface design and materials compatibility, to cleaning accessibility and draining facilities, sanitation-friendly food equipment includes all the features that prevent contamination and aid hygiene. Sanitary machine design is not only a prerequisite for food safety, but it also offers several other benefits to your business:

- **Lower Operating Costs:** Sanitary design equipment and facilities clean faster, require fewer chemical cleaning agents, and demand less labour. Their wastewater treatment requirements are also low.
- **Higher Productivity:** Well-designed, sanitation-friendly machines operate in a manner that reduces scrap and improves yield, allowing you to optimize your resources, increase asset utilization, and improve productivity.
- **Improved Personnel Safety:** Sanitary design equipment pays a great deal of attention to accessibility for cleaning, maintenance, and inspection purposes. Since it tries to make every part of the machine convenient to disassemble or reintegrate, there is also a sharp focus on reducing any operational hazards. This in turn promises greater personnel safety.
- **Protection for Your Brand Reputation:** Sound sanitation minimizes the possibility of food contamination, helping you deliver consistently good quality products, and protecting your business from any potential brand erosion.

Investing in Sanitary Equipment Design

Here are some aspects to keep in mind while investing in sanitary machine design for your food filling systems and other equipment:

- **Terminology for Making Enquiries:** Many of us tend to use the words 'sanitary design' and 'food-grade equipment' interchangeably. However, 'food-grade' may mean different things in the context of equipment construction. To avoid confusion, make enquiries for 'sanitary machine design' or 'sanitary design equipment'.
- **Pricing:** Depending on the type of machines you need and the standards you choose to adhere to, the price of equipment could be vastly different. For example, a machine that lists itself as 'stainless steel commercial' usually means that it features stainless steel construction or components, instead of normal carbon steel. However, such a machine may not necessarily be compliant with your required sanitary design standard. While stainless steel equipment will cost about 25% more than the carbon steel products, sanitary design equipment will probably cost double that of stainless-steel ones.
- **Evaluation Criteria:** While evaluating and shortlisting the equipment, ensure that:
 - The food contact surfaces are smooth, non-toxic, impervious surfaces, free of any sharp corners or crevices.
 - The equipment components are easy to disassemble for cleaning, maintenance and inspections.
 - The equipment features, particularly in food filling solutions, include adequate ventilation and self-draining facilities, in order to prevent formation of condensation, odour, or mould.
 - The equipment conforms to the standards stated by the various domestic and international regulatory bodies that are applicable to your industry.

Boost Your Production Quality with Multi-Fill's Sanitary Design Filling Machines

Multi-Fill's state-of-the-art volumetric filling machines and batch feed systems offer the best of sanitary design elements. Not only are our machines extremely easy to clean and disassemble, they prevent products or materials from accumulating food on the contact surfaces, minimizing the possibilities of food contamination.

Additionally, Multi-Fill machines are:

- Compliant with the manufacturing standards stated by major regulatory bodies, such as FDA, ANSI, CE, and USDA.
- Versatile, compact and highly customizable, with filling capabilities of up to 120 cpm.
- Compatible with a wide range of conveyor systems, including intermittent or continuous motion, single or multi-lane containers, and horizontal or vertical bagging systems.
- No tools needed for assembly, disassembly or cleaning.

With innovative designs, smart features, and clean and accurate portioning and dispensing, we serve a wide range of clients across the processed food industry. This includes companies that deal in cooked rice, cooked pastas, prepared salads, cut vegetables and fruits, shredded meats, whole grains, and pet foods.

For high-speed, sanitary-design, volumetric filling solutions at competitive prices, rely on a recognised industry leader, such as Multi-Fill.

Multi-Fill is represented in Oceania by **HBM Plastics & Packaging Technologies Pty Ltd**

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