White Paper

Food Safety with Sanitary Design: Key Considerations for Product Inspection

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Sanitary Design: Key Considerations for Product Inspection Equipment

With a stringent focus on food safety by both regulating bodies and savvy end consumers, companies must make sanitary design of production line equipment a top priority.

It is imperative to keep food safety top of mind during the purchase decision to help guard against costly product recalls and the damage of a brand's reputation.

Today's headlines are full of examples of products tainted with bacterial and physical contaminations. It's not enough to follow good hygiene practices in the plant, a company must also choose a knowledgeable supplier that understands their needs and can provide a sanitary designed product inspection system to work from the ground up. This ensures the equipment is suited to its environment and is fully integrated into the production line.

A company can't afford to lose production time due to lengthy machine washdowns and maintenance cycles. That is why it is imperative an inspection system achieve the highest level of operational efficiency all while meeting industry standards and governmental regulations. From the first moment equipment is installed, it should add value to the operation. So carefully select a supplier who is an expert with integration and installation, to guarantee that productivity is considered at every stage of the process.

What is Sanitary Design and What Risks are we Trying to Mitigate?

Food safety is a key consideration in all food and beverage production environments. In addition to consumer welfare, the issue of product recalls can have serious financial implications and are commonly attributed to either microbiological or physical contamination. Regulatory bodies globally are constantly introducing more stringent guidelines in the interest of consumer wellbeing and retailers are rightly ensuring that their own codes of practice are geared towards protection of their brands and customers. Consumers too are increasingly well informed where food safety is concerned, and the expectation is that all products entering the retail supply chain are 100% safe for consumption, free of contaminants and microbiological risks. Given the legislation and guidelines that are in place, coupled with social media platforms, that provide an instant outlet for complaints should a product fall below expectations, it is not possible to take food safety anything other than seriously.

As a result of this focus on food safety, the sanitary design of production line equipment is now taken firmly into consideration when purchasing decisions are made – particularly where products that do not undergo secondary processing are concerned. A large variety of products are cooked, reprocessed or altered significantly before reaching consumers, which in many cases will sterilize the product. In the meat and poultry industry, however, a large percentage of products are in a raw state when they reach retail shelves. Form may be altered, such as grinding for hamburgers or deboning and trimming chickens, but they are not subject to a secondary process that will render the product 100% sterile.

Production line machinery must therefore be designed in such a way as to mitigate the risk of microbiological contamination as much as possible, created by elements such as the harborage of product, for example, and also to facilitate the necessary washdowns required throughout the production cycle in a fast and efficient manner. A system designed using sanitary design principles should provide a higher level of food safety and also add an extra layer of protection against costly product recalls, and it is this element that has led many manufacturers both inside and outside of the meat and poultry industry to adopt sanitary designed systems as standard.

The 10 Principles of Sanitary Design (EDTF)

The latest guide on sanitary design from the Foundation for Meat & Poultry Research and Education, produced by their Equipment Design Task Force (EDTF) in 2014, can be found on the North American Meat Institute (NAMI) website . It is regarded as a high quality benchmark in terms of outlining what sanitary design should mean to both manufacturers and customers, and can be used as a roadmap for suppliers looking to quantify whether a system will be compliant with these design best practices.

The 10 principles of sanitary design are:

1. Cleanable to a microbiological level

Food equipment must be constructed to ensure effective and efficient cleaning over its lifespan. The equipment should be designed to prevent bacterial ingress, survival, growth and reproduction on both product and non-product contact surfaces of the equipment.

Figure 1: Smooth, regular surfaces help to prevent microorganism growth.

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.

Figure 2: Contact surface materials should be corrosion resistant, non-toxic and non-absorbent.

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.

Figure 3: Equipment designed to increase accessibility for cleaning is vital and reduces downtime by making cleaning easier and quicker.

4. No product or liquid collection

Equipment should be self-draining to assure that liquid, which can harbor or promote the growth of bacteria, does not accumulate, pool or condense on the equipment.

Figure 4: Framework should be rounded or inclined at 45 degrees, and flat under surfaces that are difficult to see or clean should be avoided.

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 items must be continuously welded to the surfaces, not attached via drilled and tapped holes.

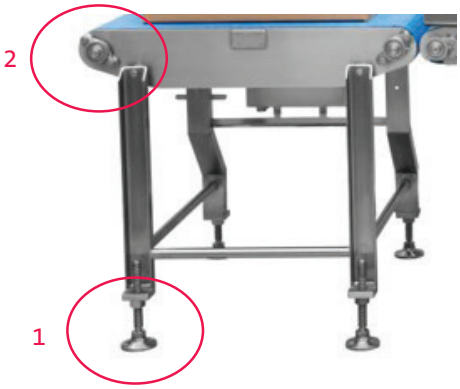

Figure 5: (1) No hollow areas in frames and rollers. (2) No Hollow areas at or above the product contact zone.

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.

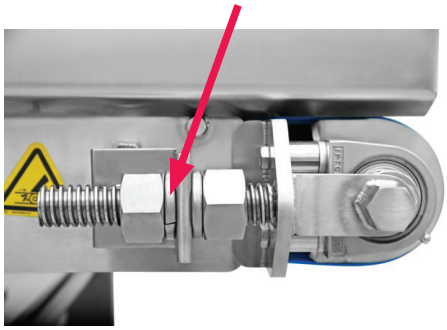

Figure 6: Example of a bolted joint with gasket.

7. Sanitary operational performance

During normal operations, the equipment must perform so it does not contribute to unsanitary conditions or the harborage and growth of bacteria.

Figure 7: Buttons on control panels should be easily cleanable so as not to create a microbial harborage.

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 that product residue or water 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 or residue accumulation point.

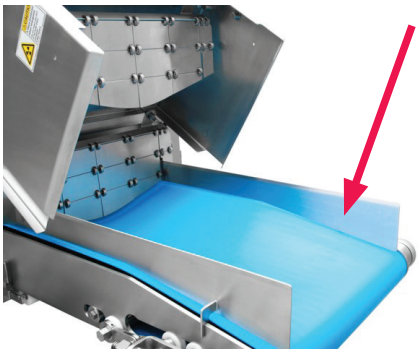

Figure 8: Example of sloped belt construction.

9. Hygienic compatibility with other plant systems

Equipment that requires additional sub systems, such as exhaust, drainage, or automated cleaning systems, does not create sanitary design risk because of the soil load, operational conditions, or standard sanitation operating procedures. Consideration is given to exhaust duct design, the ability for drain lines to remove effluent effectively (especially when dealing with vessels), and the effectiveness of CIP systems for the process. This means the team completing the checklist is taking a look at the equipment and its supporting systems together, versus individually, and evaluating how they will likely function as a system. Principles 1 through 8 are the basis for completing the principle nine elements.

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.

3. International Standards are a Serious Business

There are a number of regulatory and advisory bodies that focus on the hygienic design of production line equipment. The major players in this field are:

European Hygienic Engineering & Design Group (EHEDG)

The organization provides a forum for food processing equipment manufacturers, users and legislators to debate and discuss all issues concerning hygienic design and to further enhance food safety and quality. The group is proactive in terms of research and development and the identification of areas where knowledge of hygienic design is insufficient.

Food & Drug Administration (FDA)

The FDA is responsible for protecting public health in the US. Through the implementation of its Food Safety Modernization Act (FSMA), the FDA aims to ensure the food supply is safe by shifting the focus from responding to contamination to preventing it.

NSF International

NSF develops public health standards and certification programs to protect the world's food, water, consumer products and environment. The organization's mission is to protect and improve global human health, including providing certification services for meat and poultry processing equipment.

North American Meat Institute (NAMI)

NAMI was created in 2015 through the merger of the American Meat Institute (AMI) and the North American Meat Association. It is a preeminent source of information, education and services that enable meat and poultry companies to provide safe, nutritious and sustainable products to consumers globally.

3-A Sanitary Standards

3-A aims to enhance product safety for consumers of food, beverages and pharmaceutical products through its sanitary standards and accepted practices. Its mission is to develop a best in class knowledge center for hygienic design and to become the foremost resource for hygienic equipment standards.

4. Designing X-ray Inspection Equipment from the Ground Up

The best approach to designing a sanitary system is to start with the 10 principles of sanitary design and work outwards depending on that system's intended application. To work from the ground upwards ensures that system is well-suited to its environment and that it is effective and productive when integrated into the production line. It is not advisable to attempt to adapt an existing system for a purpose it was never intended to serve, as inevitably there will be some drawbacks. These could manifest themselves in any number of ways, such as greater downtime associated with washdown procedures, for example.

When comparing a system designed specifically for a certain application with one which has been adapted the differences are very noticeable, but the advantages to procuring the former must be looked at and considered with a long term approach in mind. What we mean by this is that a system which has been adapted may carry a smaller price tag at the outset, but a system designed for purpose will have a far more attractive Total Cost of Ownership (TCO), at the same time delivering a far greater incremental value.

In order to achieve these attractive TCO figures while ensuring the very highest levels of food safety, a number of areas must be addressed where sanitary design is concerned.

4.1 Harborage Areas

Areas where product is liable to collect are known as harborage areas, which should be avoided due to the likelihood of bacteria forming as a result. This is a critical element, as according to the Center for Disease Control and Prevention (CDC), some 48 million people get sick each year as a result of a foodborne illness . Bacteria that cause human illnesses are termed pathogenic and those most likely to be found in commonly slaughtered livestock and poultry include Salmonella, Listeria and E-coli. When sanitation practices are insufficient, bacteria can harbor and thrive in many common pieces of equipment used in meat processing plants, such as conveyor belts, slicers, dicers and peelers. Machinery used for further downstream processing, including packaging products, may also harbor and transfer bacteria to products.

If we look at the fifth principle of sanitary design – Hollow areas should be hermetically sealed – these harborage areas can be avoided. Systems that have been designed to the 10 principles will invariably incorporate robust construction features, such as open instead of closed structural shapes with connections which are cut and then welded together, rather than bolted, making their design more sanitary by eliminating food debris collection points altogether.

4.2 Ease of Sanitation

X-ray product inspection systems must have the necessary robustness required for the environment while also applying the technology in a controlled manner to ensure accurate and reliable results. Further, the design must be executed in such a way that it can achieve both of these requirements over the life of the product. These elements may appear conflicted, but it is perfectly possible to achieve a balance through the correct design and to facilitate the fast and efficient washdown routines required to remain compliant, safe and also to minimize downtime.

Systems are available on the market today that have been specifically designed to be placed into environments where daily routine washdowns and sanitation procedures are required. They are easy to disassemble and reassemble, and can be thoroughly sanitized by a single operator in just a few minutes. Everything has been thought through to make the sanitation process as fast as possible without compromise and systems are capable of withstanding the impact of repeated use of cleaners and pressurized water.

As an example, for poultry manufacturers it is possible to install product inspection systems that reduce the number of surfaces product comes into contact. This is achieved through inclined infeed and out-feed conveyors, which eliminate the need for radiation shielding curtains that can cause harborage issues and prolong sanitation

procedures. In some instances, interlocked hinged louvers which can easily be lifted to allow access to the conveyor, eliminate the need to dismantle traditional heavy louvers to clean inside the machine. This feature reduces the time and labor needed for daily sanitization and assembly, increasing uptime. The hinged louvers also decrease the possibility of damaging or losing equipment pieces during cleaning shifts, enhancing overall safety and productivity.

Figure 9: Equipment must be capable of withstanding rigorous, high-pressure, high-temperature wash down procedures.

Ease of sanitation contributes hugely to overall TCO, as the man hours saved and their relation to overall productivity over a system's lifespan are significant.

4.3 Ease of Inspection Once Cleaned

Of course, it is critical that once sanitation procedures have been carried out that systems are inspected to ensure they have been sanitized effectively and in line with regulatory and in-house requirements. Part of the design process, therefore, is to ensure that machines are very easy to inspect in these instances.

The very latest systems have been designed to enable line of sight inspections that are very time efficient, while contoured surfaces minimize potential harborage areas and allow for fast and efficient visual inspection during cleaning. It is this ease of inspection that further contributes to low TCO figures, as the man-hours saved contribute hugely to enhanced production time, and therefore savings.

4.4. Is Sanitary Design the Same as IP69?

The short answer to this question is no. While many manufacturers associate sanitary design with IP69 ratings, there is a certain level of confusion that exists that is important to straighten out ahead of any purchasing decision. Having an IP69 rated machine does not guarantee a manufacturer has a sanitary machine. IP stands for Ingress Protection, and it is purely an indicator of how well that system's cabinets and enclosures can withstand being washed down to a certain specification without leaks etc. The IP rating has nothing whatever to do with the sanitation of the machine and how well it has been designed in terms of hygiene.

There are systems available on the market that are IP69 compliant but not sanitary in design, which comes back to the level of sanitation that a manufacturer requires in order to remain compliant. However, most systems designed to the 10 principles of sanitary design will conform to IP69 standards. It is very important to understand the difference and to check with your equipment supplier to ensure the correct levels are adopted for your own application and environment.

5. Selecting the Correct Level of Sanitary Design for Your Operation

Machines that have been manufactured to the strict industry standards outlined are designed to minimize the risk of microbiological contamination and to eliminate harborage areas. However, the design of a product inspection system must also be very operationally-centric in order to provide methods for user operation, maintenance and cleaning.

The ongoing challenge for manufacturers in the food and beverage industry is to define the correct amount of hygiene and sanitation for their specific environment while still remaining profitable, protecting the consumer and the brand, and at the same time remaining compliant with governmental standards and regulations. Here, working with expert providers of product inspection systems can enable the correct system for your operation to be selected and integrated. By choosing a system that has been designed specifically for your application and that has been tried and tested in a large number of similar facilities, manufacturers have the ability to remain compliant, profitable and at the same time ensure the safest possible products are sent into the retail supply chain.

6. Conclusion – the Importance of Working with an Expert Equipment Provider

As with all production line equipment, product inspection systems come in many different guises, and it is vital to select a machine that will work for your individual operation from the very first minute of operation. In order to guarantee this, it is advisable to select an equipment supplier that is capable of working in partnership with you, ensuring at all times that they gain a complete understanding of your operation, your needs and requirements and then recommending a system that will be entirely suitable to your needs.

Expert suppliers have extensive experience with the integration and installation of product inspection systems also, and will work closely with you as a manufacturer to ensure any downtime associated with the process is kept to an absolute minimum. Product inspection systems should add value to your operation from day one, and by selecting a supplier carefully you can ensure that the productivity of your operation is considered and taken care of at every stage of the process.

Importantly, expert suppliers take sanitary design firmly into account when developing systems and are able to achieve the highest levels of efficiency and accuracy while enabling full compliance with industry standards and governmental regulations. It is easy to think that because a system contains such complex technology as x-ray that compromises must be made when it comes to sanitation. No such compromises should be made, as no such compromises are necessary.

Footnotes

[1] https://www.meatinstitute.org/ht/a/GetDocumentAction/i/97261

[2] https://www.cdc.gov/foodsafety/foodborne-germs.html

www.eaglepi.com

Eagle Expert Hub Blog

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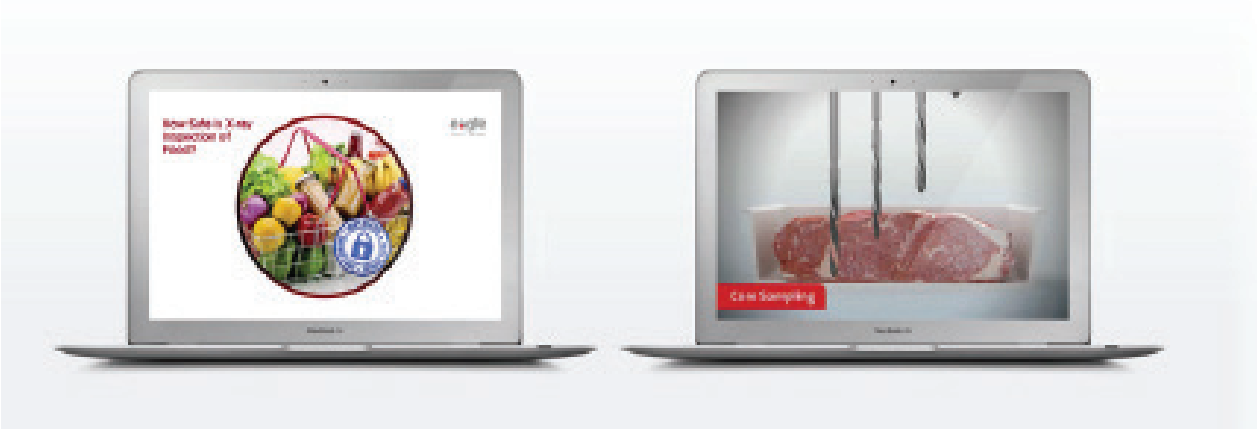
The Eagle website is packed with current industry relevant information. You will also find a knowledge center with white papers, webinars, videos, essential user documentation, animations, data sheets and case studies that showcase the latest issues, trends and innovations in food inspection technology.

As experts in product inspection technology, we will continue to develop our knowledge center to serve as a reliable source of information for industry professionals, providing a variety of data that will help you understand product inspection technology and applications specific to your industry.



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