Food Facility Sanitary Design: 40 years of improvements

Food manufacturing is a business that approaches capital investment considering market opportunity and risks, return on investment and capital constraints. But companies also have a duty to protect the public by meeting stringent food safety requirements. Over the past 40 years, consumers, retailers, regulators, the CDC and other national and international jurisdictional agencies have sharpened the focus on sanitary design of food manufacturing processes and facilities.

And to some extent, the bar is set higher because of product trends over that same period. 40 years ago, food sold in cans usually had a robust kill step—retort--that achieved 7-log reduction of any pathogens remaining after filling. And if it went bad, the lid domed and we threw it out! Frozen food—such as the iconic TV dinner—prohibited growth of pathogens. Now, however, fresh chilled distribution, products produced without a kill step, and intervention by people or processes after the kill step have increased risk. Customers expect clean labels without strange sounding chemical preservatives, such as the carboxymethylcellulose and the dreaded Sodium Nitrite. Even organic and local trends have increased the challenges by delivering food ingredients to the facility that may have higher bio-loads, i.e. more dirt, less culling, less washing, etc., than in the past.

A short history of sanitary design:

During the Reagan years, the U.S. Department of Agriculture (USDA) stopped approving construction drawings. Sanitary design responsibilities shifted to manufactures. The Food and Drug Administration's (FDA) cGMPs (current good manufacturing practices) were not as prescriptive as the USDA's had been at that time. Kraft had the best standards for sanitary design of equipment and ran training courses for vendors and design firms. Buyers could specify "The Kraft Standard" as an option on many pieces of food processing equipment.

In 2002, the AMI (now the North American Meat Institute, or NAMI) led two task forces which built on the designs promoted by Kraft and expanded the discussion to bring in best practices from leading manufacturing and facility design firms. Updated in 2014, the equipment checklists are available on the NAMI website. The facility design guidelines are available from consultants and design firms as well as from Commercial Food Sanitation. Building on these efforts, the Grocery Manufacturers Association, the American Institute of Baking and other groups adjusted the approaches for low-moisture foods, produce, dairy, nut processing, and other sectors.

Standards, checklists, guidance documents, and certifications are also promoted by other groups. 3A and Pasteurized Milk Ordinance (PMO) standards are well established for the dairy industry. And American National Standards Institute (ANSI) and NSF develop standards for equipment. The European Hygienic Engineering and Design Group (EHEDG) certifies equipment. ISO, and World Health Organization (WHO?) are also active. Global Food Safety Initiative (GFSI) has managed well-organized and accredited groups of auditors who inspect the facilities and award certifications. Two of those, SQF and BRC, are quite common in the US. And that is enough jargon and abbreviations for now!

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In 2009, after inadequate sanitary practices at the Peanut Corporation of America led to a 46-state outbreak of Salmonella poisoning including nine deaths, the issues of food safety and sanitary facility design were elevated to a heated national debate. That led to the FDA's Food Safety Modernization Act (FSMA), signed into law in 2011.

The FSMA does not detail requirements for equipment or facility design. Rather, operators, primarily use Hazard Analysis and Risk-Based Preventive Controls (HARPC) techniques to identify the required changes or investments. These can be numerous and vary widely as circumstances warrant. Captive boot programs, renovations to improve employee entrance vestibules and new "CIP-able" equipment (i.e., equipment that can be cleaned-in-place) go a long way to meeting FSMA goals but are not directly required by the regulations.

Sanitary Facility Design Best Practices

The previously mentioned NAMI principles are commonly referenced for new construction, remodeling, and renovation of food processing plants. The principles are:

1. Distinct hygienic zones are established in the facility.
2. The movement of personnel and materials flows is controlled to reduce hazards.
3. Water accumulation is controlled inside the facility.
4. Room temperature and humidity are controlled.
5. Room airflow and room air quality are controlled.
6. Site elements should facilitate sanitary conditions.
7. The building envelope must facilitate sanitary conditions.
8. Interior spatial design promotes sanitation.
9. Building components and construction facilitate sanitary conditions.
10. Utility systems are designed to prevent contamination.
11. Sanitation is integrated into facility design.

These principles, along with the various guidelines, regulations and certifications, promote sanitary design best practices. Just a few examples:

- Most food plants clean with water and sanitizers; floors must be designed for proper draining.
- Site grading must direct water away from buildings.
- HVAC systems must control humidity, temperature, airflows and quality, with strategies ranging from filtration to room-to-room pressure monitoring.
- Ceilings and HVAC supply diffusers in food processing areas must not allow condensation.
- Surfaces should be hard, nonporous and resistant to any chemicals that will be used to clean the facility.
- Any building openings, such as wall or roof penetrations for utility conduits, pipes, or ductwork, must be sealed to prohibit insects or rodents.
- Horizontal surfaces or ledges that hold dust should be avoided.
- All objects should be placed away from walls and elevated above floors to simplify cleaning.
- Adequate lighting must be provided both for safe operations and inspection.

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- Cavity spaces should be avoided by, for example, constructing walls out of Insulated Metal Panels.
- Coves at the floor/wall interface facilitate effective cleaning.
- Very detailed attention to high risk building elements, such as the zone where concrete floor, floor drains and floor coatings meet, is critical.

It is difficult! Get the right team!

The best designers are aware of the tradeoffs among capital and operating costs, durability and maintenance, asset utilization, yield, line efficiency, and risk. There are good, better and best approaches; It isn't written down in a book. The best, experienced team includes capital project managers, designers, builders, operations, QA, product cost accountants, brand management and others**.**

Stay current!

The food sector continues to evolve and change to improve our food supply. New processes such as High-Pressure Pasteurization are being introduced. The sector has the problem that many who know these topics are retiring. Cost pressures reduce investment in training and seminar attendance. College curricula on these topics are not widely offered. But the underlying public health priorities remain strong. Join food safety organizations, attend those webinars, subscribe to the newsletters and make the effort to keep current. Thank you.

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