

Special Report: Sanitary Equipment Design

Designed for Safety

Food safety has never been more critical than it is now. Every baker and snack manufacturer needs to know what equipment is available that meets the highest sanitation standards and latest trends in sanitary equipment. Find out what several food safety and sanitary equipment specialists have to say about new advances in the market and what customers can expect from them.

Lauren R. Hartman, Editor-in-Chief

It's not easy to control allergens and pathogens on equipment running in any production facility, but it has to be done to reduce the chance of having a food safety problem, and must be in accordance with new Food and Drug Administration (FDA) food safety guidelines. With cases of salmonella, listeria and E.coli outbreaks and large food recalls, food safety is a very real concern. That's why sanitary production equipment design is integral to food safety. But challenges exist in creating such equipment within budget and with as much energy efficiency as possible.

In many ways, it pays for bakers and snack manufacturers to use the latest technology and processes to lower food safety risks. It also pays to keep pace with associations that have a presence in Washington. The American Bakers Association (ABA), Washington, D.C., for example, filed comments in August with the FDA on how bakeries are addressing preventative controls in their facilities in response to the FDA's request for information, as bakeries move forward with implementation of the Food Safety Modernization Act. The ABA notes that "key elements for any agency preventative control guidance should contain flexible guidelines to meet the needs of

individual baking companies, both large and small, recognizing that bakeries have different issues and resources, and that a 'one-size-fits-all' approach isn't appropriate."

The association also points out that guidance should be science-based and cost-effective, specifically relative to hazard analysis, process controls, validation, sanitation requirements, allergens, environmental monitoring, microbial testing, food defense and the impact on small bakers.

Future issues

Likewise, the American Institute of Baking International (AIB), Manhattan, Kan., looks at how current and potential future issues are driving machine design improvements. "Manufacturers of low-moisture foods have serious concerns over microbiological contaminants and disease-causing pathogens," says Jon Anderson, head of Occupational Safety and Health Administration (OSHA), Washington, D.C., and compliance and educational product development at AIB International. "The need for control of allergenic foods during production has also become a driving force



Photo courtesy of Sani-Matic, Inc.

in equipment design improvements. Just as important, the end user of equipment, or the food manufacturer, is beginning to make significant demands for improved design in production equipment."

In the past, higher performance was always the top priority, he says. But now, there is more discussion about safe design. "Sanitary design is beginning to establish a significant foothold in the discussions and decision-making processes when it comes to buying new machinery," he says.

The recent, well-publicized foodborne illness issues have been hard lessons in the need for efficient design and prevention of pathogenic contamination, Anderson points out. "Certain companies have been involved in costly, time-consuming efforts to correct and eliminate the source of contamination. They realized that recog-

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nized and common design characteristics could help prevent such issues or at least make the resolution of problems more economical and less invasive in terms of the consumer's trust with a particular type of product or company's brand name."

When it comes to purchasing equipment, a most important factor to consider is efficiency, Anderson says. "Many companies operate on a 24/7 basis, and the window of opportunity to deep clean is extremely narrow. The more efficient a piece of equipment is in terms of time saved during cleaning, the more time is provided to production. But food manufacturers know the need for production time doesn't preclude the need for effective cleaning to remove soil, microbes and pathogens and to prevent allergen contamination. Food manufacturers look at equipment design to provide a time-efficient ability to break down the equipment, clean and sanitize and return the equipment back to production, ensuring safe and quality foods."

AIB noticed that major food manufacturers and retailers expect maintenance personnel and engineers at a supplier's location be given training, education and a working knowledge of effective sanitary design to added or existing equipment. "Major manufacturers want to see that at a fundamental level, suppliers understand sanitary design, and use these concepts when purchasing equipment or building their own production equipment," says Anderson. Purchasers are also concerned about the cost of downtime, from both a labor and materials perspective and in terms of lost production time.

Gale Prince, who leads Cincinnati-based Sage Food Safety Consultants, which tailors specialized food safety consulting services to organizations looking to improve food safety measures, maintain regulatory compliance and protect their brand identity, says that as firms look for greater efficiencies (such as maximizing equipment usage and reducing downtime), they are also looking to reduce liabilities and protect their customers and their financial health.

"The cost of a product recall for a

food manufacturer is enormous," he says. "Those that think of a recall in terms of product costs only are very short-sighted... the expenses of a recall can add up to many times more than the value of the product."

"Food firms have identified design deficiencies as a contributing factor in product contamination, of which some have led to product recalls," he adds. "Some design deficiencies have made it difficult or nearly impossible to adequately clean equipment. Currently, the leading cause of food recalls is microbiological contamination or food allergens, both of which require very detailed and precise cleaning methods. However, the labor costs of cleaning and sanitizing are a major reoccurring expense that firms have recognized with some of the equipment currently in use."

Time, cost to clean

Gabe Miller, senior technical engineer at Sani-Matic, Inc., a Madison, Wis., supplier of assorted washing and cleaning systems, says the two main issues driving sanitary equipment design is the time required to clean processing equipment and the cost of cleaning it, including the labor, water, energy and chemicals. "Everyone recognizes that [production] equipment must be properly cleaned, and the liability of poor sanitation is too significant to overlook, but they need to clean faster and at reduced cost," Miller points out. "Customers

Photo courtesy of Sani-Matic, Inc.



require processing equipment to meet industry sanitary design standards and want it to have 'clean-in-place' features where possible to minimize labor and time."

So what are snack food and bakery equipment manufacturers doing now to address these concerns?

Sani-Matic adapted conventional cleaning systems to new process applications that are suitable for parts traditionally cleaned by hand or in tanks. The M223 cabinet washer, for instance, uses eight gallons of water to wash parts in an automated 10-minute cycle and was developed to be cost-competitive with manual cleaning systems.

An electrochemically activated water (EAW) system uses sodium chloride to generate cleaning detergent and sanitizer on-site. This eliminates the cost and safety issues of purchasing bulk concentrated chemicals for cleaning and sanitizing, Miller says. Also new is the TS-5 tanker spray system for over-the-road tankers, which improves the cleaning process using less water, time, energy and chemicals. The TS-5 can dramatically boost tanker cleaning versus traditional drop-in sprays, according to Miller.

"Manufacturers who develop the most cleanable process equipment that's also cost-competitive will have a significant market advantage," he adds. "The big challenge is that many process equipment manufacturers often don't understand design requirements for CIPability. The designers understand process requirements such as mixing, drying, blending, etc., but the design requirements for cleaning are very different and sometimes in conflict."

Detachable parts and belting

Kevin Lemen, vice president of sales and marketing at Douglas Machines Corp., Clearwater, Fla., a manufacturer of automated washing and sanitizing equipment, sees a trend toward washing detachable scale parts and conveyor belting. "Both trends are being driven by a need for quick turnaround and compliance with food safety and labeling initiatives," he says.

"Labor savings is another strong motivator

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for investing in this type of equipment.”

Lemen cites a white paper relating to his company's scale parts washers. He says the company-produced paper explains that food processors are turning to manufacturers of automated washing equipment to overcome issues associated with labor- and time-intensive washing. Specialized wash racks have been developed to hold specific parts in the proper orientation to spray arms to maximize cleaning effectiveness and protect them while cleaning and in transport. The other task has been to maximize wash rack capacity, so many parts as possible can be washed in a batch.

Roll-in type batch washers with specialized wash racks for buckets, feeder pans and chutes are also effective, he says. Each wash cycle is followed by a 30-second sanitizing rinse at 180-190°F to provide sanitizing without the use of expensive chemicals. The rinse water is routed back

to a recirculating washtank. The primary benefits of automated washing systems include developing a standard operating procedure; offer consistent results time after time; save water, labor and energy; minimize turnaround time; clean and sanitize in one step and extend parts life.

Other special features

In September 2010, Bühler Aeroglide, Cary, N.C., which produces dryers, ovens, roasters, toasters, blanchers and coolers, among other equipment, initiated a comprehensive study by visiting several customer sites, driven by its food and feed customers who were concerned by the heightened focus on sanitation. “We met with engineers, operators, mechanics, cleaning personnel and food safety delegates,” explains Steve Blackowiak, food safety manager for Bühler Aeroglide.

After compiling more than 400 responses, the company created a list of features and improvements to use in the development, design and manufacture of a new, improved drying system that addresses specific areas related to food safety and sanitation. Nearly complete in its development and engineering, the new sanitary dryer system will be installed in February 2012, Blackowiak says.

Remaining cost effective, the new features include an open structural frame formed from stainless steel, which prevents moisture from entering hollow tubes that could otherwise allow moisture to enter. Other attributes include sanitary door panels with continuous welds on inner and outer skins; new water

collection troughs that inhibit wash water from accessing the plant floor or adjacent wall; new options for water collection; a “slab” floor construction that's easy to clean and promotes water runoff; sanitary dryers with a new conveyor design that eliminates conventional roller chains and traveling side guides and a lightweight design.

The basic sanitary model will be available with modules that can be supplemented to meet specific customer needs. For example, cus-

tomers can add modules such as Sanitary Plus (a wash system for the conveyor bed), the basic sanitary dryer (a CIP option) or a Validation module, which offers validated kill steps and sanitizers.

“Sanitary designs that reduce horizontal shelves and minimize cracks and crevices reduce the places for debris and/or bacteria to accumulate,” adds Blackowiak. “Reducing accumulation shortens the cleaning time and bacteria risks. Customers focus on costs to clean equipment, which has had an impact on our sanitary design. When a dryer is cleaned, obviously it cannot produce any product, so downtime is very costly.”

“Production facilities are starting to incorporate more washdown features in the flooring and walls and equipment is being upgraded to more corrosion-resistant materials like plastic and stainless steel,” says John Kuhn, director of marketing for Dorner Manufacturing. The Hartland, Wis.-based company produces a variety of sanitary conveyor automation solutions that Kuhn says are evolving every day. These include conveyors for dry areas and wipedown and washdown systems available in both aluminum and stainless steel.

“Each time equipment is manufactured, suppliers and customers are working on ways to make the equipment more sanitary,” he adds. “The equipment is engineered to be more hygienic in order to make the sanitation process fast and effective. These changes are the result of the more consistent production area sanitation requirements.”

Plus, Dorner's washdown products have tip-up tails that provide quick access to the internal frame for sanitation, Kuhn says. “On our dry conveyor platforms, we have developed the *SmartSlot* that creates a smooth side on the exterior but allows for the fast attachment of automation components. In other words, the conveyors won't have T-slots that can catch product debris.”

Dorner's top-selling sanitary equipment is the *AquaPruf*, which is designed for fast, effective sanitation that often saves on the cost associated with daily washdowns, Kuhn says. “We also continue to invest



Photos courtesy of Douglas Machines Corp.

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in smart conveyance. These features go beyond sanitation into conveyors that are easier to implement, communicate with and interface with emerging technologies and packaging.”

Opportunities today and tomorrow

AIB's Anderson says the greatest opportunity for equipment manufacturers would be to design and build equipment that can be easily cleaned and sanitized in a way that will control pathogens and allergens in low-moisture foods produced in a dry-clean environment. “The challenges in equipment design include the need to avoid conflicting interests with food safety, employee safety and OSHA compliance,” he adds. “Improving accessibility within machinery and allowing for thorough cleaning while preventing exposure to moving parts and hazards to employees will be a big help to the end user.”

Tim Talbert, food expert at materials handling equipment manufacturer Triple S Dynamics, Dallas, says that all stainless-steel, passivated equipment designed according to USDA 3A dairy/pharmaceutical standards is becoming popular. Such equipment is increasing food safety and decreasing food spillage. In terms of production facilities, the trend is to have production cycles with reduced changeover/cleanup times.

“Customers want to minimize [the amount of] painted surfaces required, including those on drive motors and reducers,” says Talbert. “They also want exposed foodstreams to be covered, so as to prevent accidental contamination from allergens or foreign material such as paint chips. We're meeting these needs with stainless-steel conveyors that include stainless-steel drive assemblies and stainless-steel motors. We also feature stainless-steel support frames with round or diamond-set tubes that eliminate flat surfaces where dust and/or water could collect, as well as round standoffs for bearings and other mounted components. This eliminates tight crevices that are difficult to clean.”

Triple S is currently testing a pan-cleaning device for its horizontal-motion conveyors. The device is powered by the

conveyor pan motion and removes food dust and residue from product contact surfaces of the conveyor pan,” Talbert says.

Triple S typically has many questions for customers who want a high degree of sanitation, he adds. “We ask if their conveyor will be installed in a washdown area, if they will use caustic cleaners and if so, they may need 316 stainless-steel [components] instead of the more traditional 304 stainless-steel,” he says.

The company also notices great opportunities with food processors that haven't traditionally used dairy- or pharmaceutical-grade equipment to handle finished product at the packaging end of the line. “And though we have been manufacturing the *Slipstick* accumulator for more than 20 years, more customers are switching to them because their gentle horizontal conveying motion minimizes product degradation and the seamless conveyor pan eliminates cracks, crevices and moving parts in the foodstream.”

Ensuring that food contact surfaces can be easily accessed and cleaned without the use of tools is tricky, Talbert says, because typically, tools can only be used by maintenance personnel and in most cases, the equipment is cleaned by the line operators. “Also, lead times on the purchase of some stainless-steel components can be very long and can cause challenges when trying to meet project delivery schedules,” he adds.

In addition, while some design improvements can be executed with no impact to costs, others will be more expensive, attests Buhler's Blackowiak, such as finish requirements that will involve more labor.

Design standards activities

AIB says three ongoing activities have an impact on

design standards and the understanding of design criteria. They include a review and update of the current Baking Industry Sanitation Standard (BISSC). The standard is officially referred to as the ANSI/ASB/Z50.2-2008 Sanitation Standard for the Design of Bakery Equipment. Prince's Sage Food Safety Consultants has been retained to facilitate the review and modification of the standard per committee consensus. Working groups formed to generate suggestions for modifications of the standard expect to have a completed draft of a revised standard by February 2012.

“Work has begun on ‘revamping’ the BISSC, which has been around since the 1940s. Spurred on by recent recall and regulatory activity, trade associations such as ABA, AIB, ASB [American Society of Baking], BISSC and BEMA have joined together to revitalize the standard, which gives guidance to equipment manufacturers and designers on industry expectations for design-based cleanability. Since equipment cleaning is a reoccurring cost over the life of the piece of equipment, the cleanability it provides is a selling point. But designers need to work with the maintenance personnel and production employees in designing the equipment to see the cleaning challenges their equipment brings forth.”

Machinery manufacturers can also attend a series of equipment design seminars such as the “Equipment and Plant Design Workshop for Allergen/Pathogen Control” which provides an overview of equipment design and the issues that poor design and maintenance create. (For more details, contact AIB at www.aibonline.org or www.bema.org).

Another activity is a certified equipment design seminar for BISSC certification, which provides a practical and applied approach to design standards, allowing participants to review the criteria line by line, requirement by requirement, giving them the ability to apply design concepts to their equipment and then apply for certification under the BISSC seal. **SF&WB**



Photo courtesy of Triple S Dynamics