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Emerging
Technologies
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Emerging Technologies Will Improve Food Safety

New technologies, and some new uses for existing ones, have the potential to make food safer.

By Food Processing

Food safety technology isn't just about new ideas. It's often about the best way to apply new ideas – or even ideas that may not be so new.

One of the hottest topics in food safety is blockchain technology, because of its potential to revolutionize traceability. Walmart responded to the E. coli outbreak in romaine lettuce last year by requiring suppliers of leafy greens to use blockchain for “end-to-end traceability” by Sept. 30, 2019 – that's just months from now.

Blockchain is a technology that encrypts data and makes it traceable and unalterable throughout a customized network. Food companies are already using blockchain to establish product traceability. A pilot program in the United Kingdom registers individual cattle at birth and uses blockchain to literally track them all the way to the consumer's refrigerator. Similarly, Cargill instituted a blockchain-based program for whole turkeys about two years

ago that allows consumers to trace birds back to the farm.

However, at a recent conference, Sean Leighton, Cargill's global VP of food safety, admitted that this was more to impress consumers than to enhance food safety. “More of a way for the consumer to say, ‘Oh, cool, look what farm my turkey came from.’” He noted that Cargill is embarking on another, more promising, blockchain project, which he described as a partnership with Intel “carving out part of the blockchain hyper-ledger fabric for food supply-chain activities.”

But Leighton said blockchain is not a panacea, notably because it's a tool to enhance transparency – which is not the same thing as trust. If there is high trust among all parties involved in information-sharing, there is little or no need for transparency – and thus, no need for blockchain, he said. He also noted blockchain is unnecessary if there are only a couple of

parties involved, or if the transaction record ever has to be amended (which blockchain is expressly designed to forbid).

THE WHOLE TRUTH

Whole genome sequencing (WGS) is another example where the issue is not so much the technology itself as the ability and willingness to use it.

The ability to determine the complete DNA sequence of a microorganism's genome in one process enables new degrees of traceability in foodborne illness outbreaks. As the DNA database of PulseNet, the network of laboratories administered by the Centers for Disease Control and Prevention, grows in both volume and detail, illness will in theory be able to be traced back to the source faster and more accurately than ever.

The state and local laboratories in PulseNet are almost all equipped to do WGS testing, Robert Tauxe, the CDC's director of the division of foodborne diseases, said recently. The CDC anticipates having whole genome sequencing in place finding related disease clusters by the end of May. In collaboration with the FDA and the USDA, all DNA sequencing data will go to a large, open database maintained by the National Institutes of Health.

Tauxe noted that finding matching genetic strains is not automatic proof that an illness was caused by a certain food; it takes work

by epidemiologists and field investigators to nail down the links. It must be traced back through the supply chain, which often takes time. In the meantime, the CDC is forced to issue a broad warning about a certain food product type.

Tauxe referred to last year's outbreak of E. coli in romaine lettuce. It was initially traced to 22 genetic types of the organism, but WGS tests narrowed it down to two - both of which were found in samples of water taken from an irrigation canal in Yuma, Ariz.

CLEANING UP

Not all tech advances in food safety are in rapidly developing fields like information technology and genetics. Some are basic and mundane - like getting workers to wash their hands and their footwear. But such measures are highly effective, even vital. Technology has emerged over the past few years to make those tasks easier, and to make it easier to ensure compliance. A couple of new technologies promise to take those efforts to a new level.

PathSpot (www.pathspottech.com) is a complete sanitation and compliance system that can actually gauge how thoroughly employees sanitize their hands - and keep track of it on an individual basis. After employees wash and dry their hands, they're scanned with technology that can detect the presence of

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foodborne illness pathogens like salmonella. Within two seconds, the system notifies workers if they have washed up adequately.

An optional feature lets the system register individual workers and identify them each time they wash their hands through facial recognition software. Data on the effectiveness of hand-washing by individual, location, shift and other parameters is collected and displayed on a dashboard.

Sanitizing footwear has long been an imperative in certain processing facilities, such as meat slaughter plants. But it's messy, time-consuming and often inconsistent. A new system promises to do it without liquids – and better.

Clean Beam LLC (www.clean-beam.com) uses pulsed ultraviolet light, which it calls “DryZap! Technology,” to sanitize shoes and boots. It claims to achieve a 6-log reduction in microorganisms, compared with a 2-log for most chemical baths – all in three seconds per treatment.

Another tech innovation is being formed out of a technology that didn't make much of an impact its first time around: Google Glass.

Google brought out the glasses, which can flash information from an online connection within the wearer's field of vision, as a consumer product about five years ago. It bombed, but NSF International, the safety standards agency, is partnering with Google to bring out an industrial version soon that can be used as a safety tool.

NSF started a company called EyeSucceed (www.nsf.org/services/by-company/eyesucceed) to develop the glasses. It could be used during audits of suppliers and others to call up, with a voice command, specs for a given product while the user is looking at it – or even call someone, through a built-in phone module, to discuss the situation. It could also be used for training, to impart step-by-step instructions for processes – and to detect when someone doesn't follow safety procedures like washing hands or wearing gloves.

CASE STUDY

Thermal Energy Storage in an Ammonia Refrigerated Low-Temperature Warehouse

Viking Cold Solutions, Inc. conducted a Measurement and Verification (M&V) study of its thermal energy storage (TES) technology installed in an industrial low-temperature cold storage warehouse. The objectives of the M&V study were to determine the effectiveness of TES on energy efficiency and temperature stability with an ammonia-based refrigeration system.

The M&V study concluded that TES provided a 43% decrease in peak period consumption and a 29% decrease in peak demand while improving overall temperature stability by 50% in a low temperature warehouse.

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By Viking Cold Solutions, Inc.

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FACILITY & ELECTRICITY RATE PLAN

The host site for the M&V study was a frozen food distribution center owned and operated by Dreisbach Enterprises in Richmond, California. The patented TES system was installed in a 93,000

square foot low-temperature freezer, part of a facility also comprised of medium-temperature refrigerated storage, dry storage, and office space. Refrigeration for the low- and medium-temperature cold storage rooms was provided by a central ammonia refrigeration plant composed of multiple staged screw compressors and water-cooled condensers.

The rate plan consisted of:

- Peak Period - the entire 13-hour period of increased energy costs from 8:30 am to 9:30 pm, Monday through Friday
- Partial Peak Period - 8:30 am to 12:00 pm and 6:00 am to 9:30 pm Monday through Friday
- Full Peak Period - 12:00 pm to 6:00 pm Monday through Friday
- Off Peak Period - 9:30 pm to 8:30 am Monday through Friday and weekends
- Summer season is May through October; Winter season is November through April (with Partial Peak pricing 8:30 am to 9:30 pm Monday through Friday during winter)

The utility rate plan for the facility was Pacific Gas and Electric's (PG&E) E20 schedule, which includes time-of-use pricing. Pricing for kWh consumption and peak kW demand varies across three distinct rate periods each day, and seasonally from summer to winter. Peak period consumption charges and peak demand charges account for nearly 50% of annual energy costs at the Dreisbach facility.

Phase Change Material (PCM) is a substance with a high latent heat of fusion which remains near a constant temperature while storing and releasing large amounts of energy. During its transition between solid and liquid states, Viking Cold's PCM absorbs up to 85% of heat infiltration and maintains more stable temperatures to better protect food product. This environmentally-friendly, food-safe PCM is engineered by Viking Cold to freeze and thaw at the desired temperature setpoint of the customer's freezer.

M&V STUDY DESIGN

This M&V study was designed to isolate the temperature and energy benefits of TES in low-temperature cold storage facilities. Three operational variables were measured: Temperature as a function of time, Power Consumption (kWh), and Power Load (kW). TES systems have been implemented in many other facilities with significant positive results, this study was designed to understand the efficacy of

TES under the conditions and challenges of large ammonia refrigerated freezers.

To establish the baseline performance of the freezer, all refrigeration equipment ran under normal operating conditions without Viking Cold intervention for three weeks. During this period, the controls equipment measured and captured temperatures, energy consumption, peak demand, and refrigeration equipment status.

Upon completion of gathering baseline data, the TES modules containing phase change material were installed in the freezer (see Image 1). The TES modules were installed on top of the highest cross members of the product storage racking in the direct airflow path of the refrigeration evaporator fans.

The integrated control system was configured to optimize the operating sequence of refrigeration. Multiple temperature sensors within the freezer provide new inputs to the existing refrigeration control sequence to effectively leverage the thermal energy stored in the TES modules. Proprietary algorithms calculate how to best manage the refrigeration system to minimize energy consumption while maintaining stable desired temperatures inside the freezer. The key strategy to reducing energy ...



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New Packaging Challenges Demand New Inspection Solutions

By Mettler Toledo

As new food packaging types and new materials are introduced, they can create new challenges to systems designed to detect product contamination by foreign bodies such as metal and glass. Food manufacturers need to be aware that these challenges may require new or revised inspection systems to protect consumers.

New packaging formats are booming. Demographic change, changing consumer shopping and consumption habits and changing demands from retailers are driving innovation in food packaging. An increasing number of single-person and smaller households and the trend away from the big shopping trip towards more frequent, spontaneous shopping trips are all driving increasing demand for smaller packaging units. Consumers also want greater convenience, with food that is easy to prepare, and they want food manufacturers to be environmentally conscious by

using recyclable packaging materials and functional packaging that contribute to a reduction in waste.

At the same time, the retail sector's demands for practical, appealing food packaging go far beyond the traditional function of protecting the product. Retailers also want good barrier properties, resistance to damage during shipping and taste neutrality. They demand convenience, with shelf-ready packaging that is stable, stackable and available in multiple sizes to serve the widest range of buyers across all channels. Retailers also require the low package weight and minimal material use to minimize shipping cost, waste and potential environmental impact.

INCREASING DEMANDS ON FOREIGN BODY INSPECTION

This wave of new and more diverse types of packaging and materials, from a dramatically increased use of flexible

packaging to new barrier packaging materials, present packagers with a range of new challenges. They introduce more complexity into detecting potential physical contaminants on production and packaging lines. Food manufacturers today must be sure that their product inspection systems can adapt to a change in packaging as quickly as possible and with a high degree of automation, using high-performance software and intuitive user interfaces to keep changeover times short and overall equipment efficiency high.

This is leading, in turn, to a wave of inspection systems designed to meet the new challenges. Newer highly automated inspection solutions — providing quick access to stored product profiles in databases and simple setup procedures for new product targets — minimize the risk of operating errors. Inspection systems featuring improved interactive, touchscreen-based HMI user interfaces are better able to guide operators efficiently through more demanding setup, changeover and operating processes.

OPTIMIZING FOREIGN BODY DETECTION

Factors such as the size and location of a contaminant, the speed of the production line, the product packaging material and the difference in density between the contaminant and the product all influence the sensitivity and performance of metal

detection devices and X-ray inspection systems. The ability to detect contaminants at an early stage of processing and production is important, before value has been added through processing and packaging, to deliver the most cost-effective result. In many production processes, raw materials supplied in liquid, paste or slurry format and pumped through pipework systems before being mixed and blended are more homogeneous and easier to inspect than the processed food product.

The contaminants in such incoming materials also tend to be larger and easier to detect. Early detection and removal of foreign bodies protects the production equipment downstream from possible damage by these larger contaminants during further processing, while product loss and food waste are also minimized.

Choosing a system for inspection further downstream on the production line requires more expert knowledge. Inspecting for aluminum contaminants in non-metal packaging, for example, is done most effectively with a metal detector. Aluminum is a lightweight metal and a good electrical conductor, but its radiographic absorption is low compared to other metals such as ferrous and stainless steel. This causes a ...



Download the complete white paper **here**.

The Alfa Laval Twin Screw Pump Delicately Robust



The Alfa Laval Twin Screw Pump is designed for process flexibility and precision engineered based on decades of proven technology. The pump is capable of handling both product transfer and Cleaning-in-Place (CIP) – and can move seamlessly between the two. Low pulsation characteristics and superior solids handling capability reduce the risk of product damage, thereby improving product quality. Superior suction performance provides installation flexibility and increases product recovery.

The pump, with its robust and reliable platform, meets the highest hygienic standards, simplifies maintenance and increases process uptime.



www.alfalaval.us/twinscrew

Choose the Right Aseptic Mixproof Valve for Higher Productivity, More Uptime and Lower Operating Costs

By Alfa Laval

How global demand for healthy convenience products is boosting the aseptic processing market

Global demand for aseptic processing and packaging is increasing, spurred by changing consumer preferences. Increasingly, consumers are more aware of and concerned about what they are putting into their bodies. They want to be sure that the products they use are of high quality, safe and convenient to use, and free of harmful microorganisms.

Moving from batch production to continuous processing will help manufacturers engaged in aseptic processing meet rising demand. Aseptic double-seat mixproof valves are essential components to meet demand in the dairy, food and beverage industries.

The new Alfa Laval Aseptic Valve will help manufacturers ensure sterile processing,

gain greater flexibility, increased product safety and lower total cost of ownership.

SAFETY FIRST

Product safety, convenience and longer shelf life are driving global consumer demand for dairy, food and beverage products that use aseptic processing and packaging techniques. Consumers are now demanding healthier dairy products, foods and beverages that have great taste, texture, appeal and are safe to eat. They also want clean labels that are simple and easy to understand and natural ingredients without added chemicals or preservatives. This is especially true of dairy products, fruit juices, baby foods, soups, sauces, fruit purees and nutrient-rich foods.

Choosing the right aseptic mixproof valve is critical to optimal process efficiency. On the one hand, manufacturers must ensure full protection against the intrusion of harmful micro-organisms while ensuring product

quality and safety. On the other, they must build greater flexibility into processing lines to be able to produce more commercially sterile products at less cost.

BEST VALUE FOR MONEY

Alfa Laval has introduced the new Alfa Laval Aseptic Mixproof Valve to its range of Alfa Laval mixproof valves. This aseptic double-seat mix-proof valve provides manufacturers the best value for aseptic processing in the long run due to:

- Better flow characteristics in the leakage chamber
- Easier cleanability
- The ability to withstand pressure peaks
- More cost-effective parts replacement than other aseptic double-seat mix-proof valves
- No risk of clogging due to product particles or seeds

Initially, the Alfa Laval Aseptic Mixproof Valve range will include these valve sizes: ISO 51 mm (2"), 63.5 mm (2½") and 76.1 mm (3").

The Alfa Laval Aseptic Mixproof Valve provides manufacturers with best-in-class valve flow characteristics during processing, cleaning and sterilization.

ENGINEERED TO REDUCE TOTAL COST OF OWNERSHIP

Compared to other aseptic double-seat mix-proof valves, the Alfa Laval

Aseptic Mixproof Valve reduces the overall total cost of ownership by up to 45%. Estimated savings are based on a comparison of the capital expenses and maintenance costs of an Alfa Laval Aseptic Mixproof Valve (2½") and an aseptic mixproof valve (DN65) from another manufacturer over a five-year period.

Costs for parts replacement to ensure hermetic sealing is a good example of how the Alfa Laval Aseptic Mixproof Valve can deliver tangible savings. During the first year of operation, parts replacement, including labor, on the 2½" Alfa Laval valve cost about 70% less than parts replacement on the DN65 valve with steel bellow from another manufacturer. Savings like these make the Alfa Laval Aseptic Mixproof Valve the better investment in the long term.

FLEXIBLE, MODULAR DESIGN

Modularity makes it easy to configure the Alfa Laval Aseptic Mixproof Valve for use in any sterile processing application. It also gives manufacturers greater flexibility to meet changing requirements. Choose a standard valve body and a tangential valve body or use two standard valve body types. It is also easy to mount in either a horizontal or vertical position. There are one- and two-step actuators ...



Download the complete white paper [here](#).

How CLEAN is your STEAM?

Did you know?

Steam is an ingredient if it comes in direct contact with your food and beverage process.

How do you know if you are using the right grade of steam in your current process? Partner with Spirax Sarco. Our steam quality audit can help you minimize your risk of steam contamination by identifying potential sources and suggesting cost effective solutions and best practices.

The result? Better steam quality and a better product.

For more information about steam as an ingredient in your food and beverage manufacturing, or to schedule a steam system audit, contact us.

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Steam: The Secret Ingredient for Better Food & Drink

By Spirax Sarco USA

Although the word “steam” never appears among the ingredients listed on food and drink labels, maybe it should, given how critical the quality of steam used in food and beverage manufacturing is to the quality of the end product.

While steam is generally assumed to be sterile, that doesn’t necessarily mean it’s pure or “clean.” It may still contain chemicals or other contaminants that affect the taste, smell and safety of your food products.

Your company adheres to rigorous sourcing, handling and storage standards for labeled ingredients because you want your products to taste great and pose no health hazards. Shouldn’t you apply equally stringent standards to the quality of the steam you use to process them?

RECIPE FOR HEALTHIER STEAM PROCESSING

Here are six critical ingredients your process needs to produce quality steam for food and beverage manufacturing:

1. Installing and maintaining the right steam processing equipment

All equipment is designed to operate within certain parameters. Be sure your plant or filtered steam processing equipment incorporates the specifications, design and controls needed for your applications and that it’s correctly installed. This, coupled with regular maintenance, will help you consistently generate steam of appropriate hygienic quality.

2. Minimizing the potential for boiler carry-over

Boiler carry-over can be triggered by a number of operating factors and may contain high levels of water treatment chemicals, total dissolved solids and other contaminants. Avoid this by:

- Setting the correct boiler water level and operating at the right pressure
- Modulating boiler water level controls if on/off boiler controls are currently fitted
- Further enhancing modulating controls through direct linkage to a steam flowmeter

- Limiting how low boiler pressure can drop with ‘surplusing’ controls
- Using a steam accumulator, steam ‘banking’ and boiler sequencing
- Using ‘slow-opening’ controls to bring your plant online
- Installing automatic TDS controls

3. **Controlling chemical additives**

Adhere to FDA and 3-A Culinary Guidelines for food approved chemicals and dosages to treat boiler water and the steam that comes in contact with your product or process. Failure to comply can result in product spoilage and possible regulatory fines or penalties.

4. **Quickly identifying and removing contaminants in condensate**

The practice of returning condensate from around the plant to reduce energy, water and chemical consumption may allow steam to pick up scale, corrosion, detergent residue, and other possible chemical cross-contaminants. Regular testing of samples taken from fittings just ahead of food processing applications will help you catch any impurities quickly. But intermittent testing only catches contaminants present in a particular sample taken at a particular time. For consistently clean steam, install contamination detection equipment in your condensate return system.

5. **Installing a clean steam generator and using it wherever steam quality is critical**

Clean steam systems use a second steam generator, fed by distilled, deionized or de-mineralized water. They also include anti-microbial design and finishes and are made of high grade stainless steel, which doesn’t corrode. Together, these elements eliminate the risk of contamination by boiler chemicals, particulates or other hazards.

6. **Conducting regular quality control assessments**

Don’t wait for problems to occur. Save money and avoid downtime, product waste and headaches by implementing regular assessments with a steam equipment expert like Spirax Sarco.

FOOD FOR THOUGHT:

When it comes to food and beverage manufacturing, steam contamination can be a recipe for disaster. If impurities spoil the taste or endanger the safety of your product, your company can suffer consequences ranging from public relations problems to market share loss, fines, lawsuits and even business closure. Take action now to ensure that your steam process is beyond reproach.



Download the complete white paper **here**.