

Ensuring Product Quality and Safety in the Dairy Industry

Introduction

Processing and distributing dairy products necessitates a high level of quality control and strict adherence to regulatory requirements. It is paramount that dairy products are safe for consumption, free of a range of potential bacterial and physical contaminants. The packaged product weight must meet specifications, too.

The goal is always to keep consumers safe and protect the brand's reputation while managing pressures to contain costs and operate efficiently.

A further complication is the expanding range of packaging materials on the market, such as shelf-stable, biodegradable, metalized and transparent properties and variations in sizes from individual portions to the large multipacks sold to club stores.

Fortunately, product inspection technology has advanced to keep pace with these changes. Product quality and safety can be ensured by using equipment to detect contaminants and weigh package content at various locations throughout the processing stage. These machines are configurable to specific application needs, and are easy to use – from setup through sanitation.

Zeroing in on the dairy industry

Dairy products vary widely. They include:

- cheese
- milk and related fresh dairy items
- yogurt
- ice cream
- novelties
- milk powder/whey protein concentrates
- sauces



Common packaging types/materials include:

- plastic or glass bottles
- plastic or paperboard tubs
- transparent, metalized film or aluminum foil lids
- metalized film overwraps
- various material combinations

Selecting the right inspection, detection and checkweighing technology depends on product attributes and materials, as well as the production environment.

Historically, detecting foreign objects in dairy products has been challenging. Metal detectors are often fooled by what is called a “product effect” in cheese and other high-moisture, high-salt dairy products. These products have conductive properties that affect the magnetic field and trick the detector into generating a signal indicating metal is present when it is not. Modern Multiscan metal detectors, where the product is inspected using multiple detection frequencies, alleviate the challenges of product effect and increase the probability of contaminant detection. Metal detectors are also found in gravity applications for dry powders, but a lack of product consistency can cause problems.

X-ray inspection technology offers increased value to processors, not only finding foreign materials but checking for quality defects such as missing or broken components. X-ray systems now are also easier to use, more reliable and more affordable.

Consistency in product weight is also critical. To meet labelling requirements and ensure that consumers get what they pay for, checkweighers play a key role. They also help control overfills so manufacturers do not give away extra product. Checkweighers can quickly detect package weight deviations, allowing fast adjustments that otherwise would lead to shutting down a production line, costing time, materials and ingredients.

Durability and placement

Any inspection technology used in a dairy plant must be able to withstand thorough sanitation procedures. This includes harsh washdown and extreme temperature variations. The equipment must also be designed to minimize the potential for bacteria to grow and be easy to disassemble for complete cleaning.

While there are several technologies used to inspect dairy products, the location of inspection equipment is consistent. X-ray systems or metal detectors typically are positioned after the filling/sealing operation. Checkweighing follows. The exception is for products using pipeline metal detectors, which generally are placed before filling.

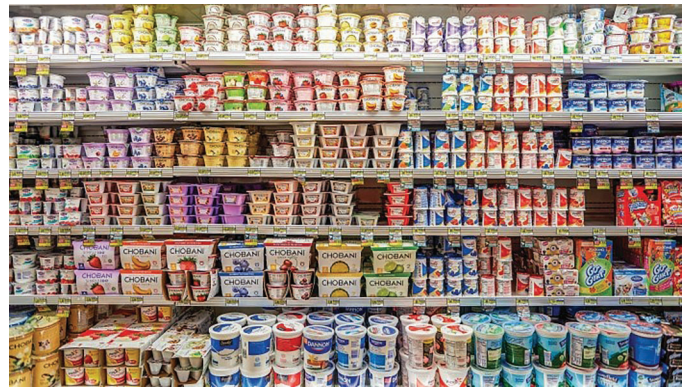
Applications for dairy products

Cheese

Cheese comes in many shapes, sizes and textures and is expensive to process: It takes about 10 pounds of milk to make 1 pound of cheese. Production priorities are in ensuring the final product is free of foreign objects and weighs the correct amount.

After the cheese product is prepared and formed, it is sized for the package and application, then weighed and inspected. (Because cheese is cut with metal blades, inspecting it after slicing is important to be certain that a metal fragment hasn't been left in the package.)

As the trend toward pre-weighed packaged cheese increases with the rise of single-serve, sliced and shredded options, X-ray equipment can be a surprising asset. In addition to detecting foreign objects, X-ray systems can, for example, measure slice thickness and count the number of individually wrapped cheese sticks. X-ray inspection is also effective for Swiss cheese and other non-uniform products.



Yogurt

This market category is booming with the growth of Greek yogurt, a proliferation of flavors and package sizes and options for breakfast, snacks or dessert. Yogurt is made in a variety of ways and packaged in cups or tubs. All must be verified for weight and fill.

Many yogurt products use an aluminum foil or metalized lid to aid freshness and prevent tampering, making them better suited to X-ray inspection.

Fresh dairy products

A variety of products are in the “fresh dairy” category, including cottage cheese, sour cream, dips and others. Most are found in tubs.



Many of these products—particularly cottage cheese—are conductive, generating the “product effect” mentioned earlier. Because of this, X-ray inspection or Multiscan metal detection systems are the best options for these applications. Also, checkweighers are effective for these product lines in ensuring that profits are not given away by exceeding the label weight.

Ice cream

This category includes a broad variety of products, including ice creams, ice milks, sherbets, and frozen dairy desserts. As such, there are also many package types: plastic tubs, paperboard cartons, metalized overwraps and more. Metal detectors or X-ray systems can be implemented after filling for foreign material detection, though X-ray systems are preferred for metalized overwrap containers. A checkweigher will be used downstream of the filler to verify weight, providing data for process control.

Novelties

Most novelty products contain a stick to make them easier to eat. To verify that the stick is in the right position, or is even in the package, an X-ray system is ideally suited for the task. Because these products are small and are produced at high speed in a flow wrapper, multi-lane X-ray may be the most cost-effective way of inspecting them. Detection of an individual product will be more sensitive than that of a fully loaded carton.



Milk powders/whey protein concentrates

Because many of the products in this category target infant feeding, the stakes are high for contaminant detection. X-ray inspection is used to look for contaminants, but also to ensure that components such as measuring scoops are present. Drop-through metal detectors, which have excellent sensitivity, are also used for this application.

Sauces

Some dairies produce sauces, dressings and gravies containing a dairy ingredient. Formulations for these products can be complex and frequently modified. This can negatively affect metal detector performance due to changing product effect, making pipeline X-ray inspection a better methodology.

Points of inspection

There are several points in the dairy production process that benefit from inspection (metal detectors, X-ray equipment) and checkweighing technology. Here are some examples.

1. Incoming ingredients. Dairies that use bulk incoming ingredients such as powders, fruits or nuts as part of their formulation may inspect products before incorporating them into the formulation. Drop-through and bulk-flow metal detectors are ideal choices.
2. Liquid flow. Metal detectors work in pipeline applications for novelties and other liquid-fill products.
3. After filling/packaging. The inspection equipment type will depend on the product type and its potential for product effect. Since many dairy products have high moisture content, they are more suited for X-ray inspection at this stage. Checkweighers can be located here to make sure that the product weight is within minimum/maximum specifications. One option is to use electronic real-time feedback to the filler to adjust production on the fly.
4. After case packing. Some dairies can benefit from inspecting after final packaging—in case packing. This is typically done via X-ray inspection if the machine’s aperture is large enough to accommodate a case. The X-ray system can be used to confirm that the specified count is loaded into the case. In certain situations checkweighers can perform this latter function.

Popular inspection and detection solutions

Thermo Scientific™ metal detectors are ideal for dairy applications, with both conveyor models and drop through options. These systems are highly suited for use in dairy processing plants, with sanitary, easy to clean designs and robust materials of construction. The Multiscan technology used in the Thermo Scientific™ Sentinel™ 5000 and 3000 Metal Detectors simultaneously scans products using five detection frequencies, minimizing the challenge of high product effect and increasing probability of contaminant detection. The Selectscan technology used in the Thermo Scientific™ Sentinel™ 1000 Metal Detector enables users to rapidly establish the optimal detection frequency for a given application, minimizing set-up time while offering strong detection performance.

The harsh washdown option, available for the Thermo Scientific™ Sentinel™ 5000 Multiscan Metal Detector, was independently tested for over 10,000 thermal cycles without allowing water ingress, misbalance or fault. It was built to thrive in tough environments such as dairy plants.

Dairy processors interested in X-ray inspection will find a compact Thermo Scientific™ NextGuard™ C330 X-ray Inspection System ideally suited to handle dairy environments. The larger-aperture Thermo Scientific™ NextGuard™ C500 X-ray Inspection System was designed for club-size packages. Easy to use and own, all NextGuard systems feature a unique, non-linear detector to eliminate inspection blind spots. Built-in remote monitoring provides quick problem determination.

The Thermo Scientific Xpert™ X-ray detection family of high performance X-ray systems quickly finds contaminants and quality defects that other systems miss. Xpert systems are flexible enough to accommodate nearly any size or shape package and powerful enough to eliminate false rejects. They also meet HACCP and retailer food safety and quality requirements.

Popular weighing solutions

The Thermo Scientific™ Global VersaWeigh™ checkweigher for dairy and other food applications is an easy-to-use, easy-to-maintain, sanitary and scalable system. Built on 50 years of experience, it offers accuracy equal to or better than market-requirement standards.

For dairy products in cartons, cans, bottles or pouches, the Thermo Scientific™ VersaWeigh™ 8120 Chain Checkweigher offers line speeds up to 700 packages per minute. It is appropriate for both dry and wet environments.

Consumer satisfaction

All food companies want a high level of consumer satisfaction. Consumers have learned that their concerns are more likely to be addressed quickly if they are made public. When a consumer found a contaminant in the past, the matter was addressed by a phone call or letter to the manufacturer. Now, the unwanted item can easily be photographed and shared via social media. This can encourage others to chime in with their negative experiences.

A robust product inspection program at the appropriate stages can help guard against such instances. With such equipment in place, deviations in product quality and safety are identified and resolved before products find their way to market.

Key takeaways

Dairy product safety and quality can benefit from the use of inspection/detection and checkweighing equipment. There are multiple places on the processing and packaging line where installing these systems can positively impact the quality, accuracy and safety of the food item being marketed. The specific inspection solution is dependent on the product characteristics, placement in the line (before or after packaging) and inspection/detection objectives.

Find out more at thermofisher.com/productinspection

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