As food processors, you know that nearly all food undergoes some form of processing. Whether it’s oranges being squeezed and packaged as juice, fish being cleaned, frozen and packaged, or peanut butter being mixed and placed into containers, all food and beverage processing is required to follow good manufacturing practices (GMP) as well as additional local, national and international food safety regulations.

To ensure consumers are informed and can make educated choices, processed food and beverages feature nutritional labels listing calorie and fat content, cholesterol, sodium, carbohydrates, fiber, sugars, protein, and vitamin and mineral content. Specific ingredients of the food, including allergen declarations, also are listed.

To determine all of these, best practices and regulation of processed food requires representative sampling and accurate analysis. Food is classified as “liquid”, “solid”, “wet” or “dry” depending on the amounts of water it contains. In the food and beverage manufacturing process, sampling and analysis can determine:

- Microbiologic pathogens such as e. coli, salmonella or listeria
- Moisture content
- Nutritional labeling content – described above
- Trace chemical contaminants such as pesticide residue, veterinary drugs or toxins
- Quality assurance: Appropriate mixture – such as for cereal or pet food that contains different types of flakes or other content – pH balance, acidity and more
- Ingredient authentication including the presence of various allergens
- DNA, genetically modified organisms (GMOs) or other biomatter

**GENERAL CLASSIFICATION OF FOOD & BEVERAGE SAMPLES**

<table>
<thead>
<tr>
<th>EXAMPLES</th>
<th>CHARACTERISTICS</th>
<th>TYPICAL ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>Aqueous, protein, lipids</td>
<td>Veterinary drugs, toxic elements, pesticides, industrial contaminants</td>
</tr>
<tr>
<td>Eggs</td>
<td>High lipids, albumin content</td>
<td>Veterinary drugs, industrial contaminants, pesticides</td>
</tr>
<tr>
<td>Other samples of animal origin</td>
<td>Various fat, proteins, water</td>
<td>Drugs, industrial contaminants, pesticides</td>
</tr>
<tr>
<td>Plant material</td>
<td>Various water, plant pigments, lipids, proteins, essential oils, waxes</td>
<td>Pesticides, toxic elements, industrial contaminants</td>
</tr>
<tr>
<td>Meat, fish, milk, cereals, wine, juices, plant oils, sugar</td>
<td>Various fat, oils, lipids, proteins, sugar, starch, water, or pigments</td>
<td>Pesticides, industrial contaminants, synthetic colorants, additives, synthetic sweeteners, antioxidants</td>
</tr>
</tbody>
</table>

Source: Curren, M.S.S. and King, J.W. Sampling and sample preparation for food analysis.
Nearly any food or beverage – including solid, powder, liquid and slurry food, beverages and pet food – can be sampled. Required sample sizes are defined in part by the nature of the food, and to what extent the material to be analyzed is present. For example, some materials, such as veterinary drugs in animal feed, are present at only trace levels, but a sample must capture them. This means that a sufficiently large amount of the product must be collected so minute quantities of the compound of interest can be analyzed. On the other hand, small samples may be collected for the macro analysis of larger food components such as crude fat, protein or fiber.

Sampling is required to ensure quality, safety, and specific attributes, and the data that sampling provides is essential to helping food and beverage plants control and optimize processes so they can run safely and efficiently.

A few examples of the types of solid and powder food that can be sampled are:

- cereals
- seeds
- grains or other raw ingredients
- coffee or loose teas
- sugars
- dry spices
- nutraceuticals
- pet food

Examples of liquids, beverages, pastes and slurries that can be sampled are:

- peanut butter
- gels
- juices, beer, wine, alcohol, soda, flavored water and all other beverages
- milk or cream products
- ice creams and other frozen desserts
- sauces and pastes
- soups
- canned goods
- food grade oils
- liquid and slurry raw ingredients
- and even plant wastewater or effluent

**Automatic sampling for efficiency**

To obtain a truly representative sample, food and beverages must be sampled automatically – continuously creating a composite sample representative of the entire batch or lot – while in their production environment. The chemical and physical properties of each food can vary, even between samples that originate from the same batch. However, representative sampling and analysis can identify this variability and allow for adjustments and corrections to the process.
Automated sampling – where a sampler is placed on or in a process pipeline, pneumatic convey line, gravity chute, hopper, bin, or a screw or belt conveyor – provides the inherent benefits of automation, with a composite sample easily and safely obtained with no need for direct human interface or interference. This ensures the integrity of the sample and increases efficiency over manual sampling. The product does not need to be sampled offline and production can continue.

Plus, for further automation efficiency, the sampler controller can be incorporated with existing equipment and systems so sampling can begin automatically without operator engagement. Overall, sample automation reduces risk and increases process efficiency.

**Top four ways sampling improves efficiencies**

Running an efficient operation requires controlled, real-time data obtained through representative sampling. The top four ways automated sampling solutions can help your plant include:

1. **Improving yield** One specific way a plant can improve its yield is by keeping ingredient moisture content in the proper band. If it is too low, a plant may be giving away product, and if it is too high, the product will deteriorate more quickly. Improper moisture content also is key in product shrinkage or expansion, which directly affects the volume a product takes up in packaging. Plus, by sampling after a dryer, a plant can not only identify if a product is being over-dried or under-dried, but also monitor and control the drier power consumption.

In addition, sampling can help monitor product breakage to identify potential disruptions or issues within the process. Poor performance of the sizing equipment can result in a direct increase in product needing to be discarded in landfills or sold at lower price points for non-target users.

2. **Ensuring quality** Sampling of food and beverages is needed to ensure quality, safety and specific attributes. Sampling within a production environment easily can show product contamination and help identify the point at which it's happening. Sampling and analysis also shows specific attributes, such as e. coli, salmonella or listeria pathogens; specific food ingredients and content such as calories, fat and vitamins; trace chemical contaminants; DNA and appropriate mixture.

Sampling often is needed to meet regulations. To ensure sample integrity, samplers must feature easy-to-clean, sanitary designs and FDA-approved seals. Some samplers are available with sanitary connections such as a tri-clamp, which makes them easy to install and remove. Other samplers are third-party certified to conform to 3-A Sanitary Standards for dairy. This ensures they are easy to clean and their design is without cracks or crevices where product can reside and create microbial growth. Other samplers are designed with these same standards in mind and meet USDA, Canadian Grain, FGIS and NOPA standards.

3. **Increasing efficiency and reducing risk through automation** Automated sampling allows a composite sample to be easily and safely obtained with no need for direct human interface or interference. This ensures the sample integrity and increases efficiency over manual sampling, as production continues during sampling with no downtime. For further automation efficiency, the sampler controller can be incorporated with existing equipment and systems so sampling begins automatically without operator engagement. Because no operator is exposed to pressure, temperature or the media being sampled, sample automation is safer for operators. And, because no operator can potentially contaminate the process, sample automation is safer for consumers as well.

4. **Avoiding recalls** $160 million in sales and several customer deaths. $12 million and one death. $101 million-plus in costs, lawsuits and factory upgrades. Hardly a month goes by when there isn’t a major food recall in the news listing the huge costs – in terms of money, brand equity and consumer trust – associated with it. Above all, you want to avoid a recall.

Food and beverage recalls can cost producers and processors reputation, customers, untold amounts of money, and plummeting stock prices that may not recover. Product quality and traceability is everything, and you need the data to assure and validate it.
Because a sample is representative of the entire process, it can alert plant management of contamination or upstream equipment failure such as mixing and blending. This means issues can be identified and fixed faster before they affect end product.

In terms of avoiding recalls, implementing a sampling solution appropriate to your application provides immediate ROI – meaning that if even one recall is prevented, the sampling solution has more than paid for itself.

**Sampling solutions**

Just a few of our Sentry® food and beverage sampling solutions include the following.

- **Sentry ISOLOK® MSA** automatic fixed volume sampler for sanitary products such as Grade A or industrial grade raw or processed milk. It can be used in a process line, on the wall of a vessel or reactor, or even on road tankers transporting liquid milk.

- **Sentry ISOLOK MSC** automatic fixed volume sampler for medium viscosity sanitary liquids, such as cream or orange juice, with FDA-approved seals – available in 3-A Sanitary Standards conformant models

- **Sentry ISOLOK M4KSA** automatic fixed volume sampler for free-flowing low viscosity sanitary liquids and slurries, such as raw or processed milk, juices or whey – conformant to 3-A Sanitary Standards

- **Sentry ISOLOK MSE** automatic high viscosity sampler for thick liquids and gels such as peanut butter, hummus and other dips, yogurt or tomato paste

- **Sentry B1** automatic point sampler for solid & powder food – available in 3A and ATEX conformant models

- **Sentry PR** automatic point sampler for solid & powder food – diluted and dense free-flowing materials such as granules, powders, flakes or pellets, as well as high viscosity or granulated liquids from gravity lines or positive or negative pressure systems

- **Sentry RX** automatic strip sampler for solid & powder food such as pellets, powders, granules, grain and seed – designed to eliminate product degradation

- **Sentry ISOLOK SAA** automatic fixed volume sampler for liquid and slurry flowing in a process stream, including plant wastewater

- **Sentry ISOLOK SAE** automatic point sampler – a large capacity sampler that captures a volume of approximately 100 cc per cycle and particle sizes of up to 3/4 in. (19 mm) without shearing or degrading of material

In summary, all food and beverages can and should be sampled automatically to ensure quality and safety. Trust the industry leader to be able to meet any of your food and beverage sampling applications, anywhere.

**Learn more about Sentry samplers for food and beverages at sentry-equip.com/food-beverage.**