**Unit III - Topic 8**

**What is the role of aseptic processing in the beverage industry?**

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One of the most significant advantages of going aseptic is the ability to produce high-quality food and beverage packaged goods that are shelf-stable for extended periods under normal storage conditions. Because the food and beverages do not need to be refrigerated in the supply chain or at the retail outlet, you can save on cold chain costs and expand your distribution to new markets while maintaining centralized production.
Your production schedule will become more predictable because of the long shelf life, allowing for correct planning for standard and seasonal items and cost savings because of longer run times and fewer product changeovers.

**Aseptic processing** may allow you to reduce or eliminate the use of preservatives in your product. It provides marketing opportunities for the growing number of consumers seeking clean-label packaged food and beverages produced sustainably. Doesn't that sound like a win-win situation? So, exactly what is **aseptic processing**?

***What is aseptic processing?***

**Aseptic processing** produces shelf-stable products that do not require refrigeration by packaging commercially thermally sterilized liquid products into previously sterilized containers under sterile conditions.
It has nearly replaced in-container sterilization of liquid foods such as milk, fruit juices, concentrates, cream, yogurt, salad dressing, liquid egg, and ice cream mix. Foods containing small discrete particles, such as cottage cheese, baby foods, tomato products, fruit and vegetables, soups, and rice desserts, have grown popular.
The aseptic processing gives food and beverage packages a stable shelf life over a long period of time under normal storage conditions

**Aseptic processing** comprises three primary steps: thermal sterilization, sterilization of the packaging material, and sterility preservation during packaging.

Any violation of a scheduled process for the processing or packaging system causes the destruction, reprocessing, or segregation and holding of the affected product for further evaluation.

The processing and packaging system must be cleaned and re-sterilized before processing and/or packaging operations can resume. Sterilization of packaging equipment and materials is accomplished using various media or combinations of media (i.e., saturated steam, superheated steam, hydrogen peroxide and heat, and other treatments).

***The role of aseptic processing and packaging***

***Aseptic processing and packaging*** is the ***aseptic filling*** of a commercially sterile product into sterilized containers, followed by hermetical dealing with a sterilized closure in a microorganism-free environment.

An **aseptic processing** facility has clean rooms where the air supply and equipment are regulated to control microbial contamination. The products are processed and packaged without further contamination. To achieve the required air quality levels, should appropriately filter the air in defined areas of an aseptic processing facility.

**Aseptic processing is important to your production process**

Should use positive pressure in clean and aseptic rooms to prevent contamination. In **aseptic processing** facilities, the equipment must be sterilizable using both heat and chemicals. Aseptic plant design and construction are highly specialized fields that experienced consultants should handle.

Aseptic processing and packaging is a sophisticated method of food preservation. Food is sterilized or commercially sterilized outside of the container before being placed in previously sterilized containers and sealed in an aseptic environment.

Ultrahigh-temperature (UHT) sterilization, a rapid heating treatment at temperatures higher than pasteurization, is used in aseptic systems. At the end of the processing line, paper and plastic packaging materials are sterilized, formed, filled, and sealed in a continuous operation.

Metal cans, large plastic or metal drums, or large flexible pouches are also used for aseptic packaging. Can use heat, chemicals, irradiation, or a combination of these methods to sterilize packages for **aseptic processing**.

***Packaging material and factors influence the choice of packaging material for aseptically processed***

**Packaging material**

Filling and sealing a sterilized packaging material with a sterilized product is what aseptic packaging is all about. Aseptic packaging material must not only ensure sterile conditions within the package and protect the product from physical damage, but it must also maintain the product's quality within the packaging. To accomplish this, laminate material is created by combining semi-rigid paper, aluminum, and plastic.

The package's stiffness, strength, and efficient brick shape are provided by paper (70%); it must address the potential for bacteria.

The innermost layer of low-density polyethylene (24%), the most common plastic used for aseptic packaging, forms the seals that keep the package liquid-tight.

Aluminum (6% ) is used on the inside of the aseptic package to form a barrier against light and oxygen, eliminating the need for refrigeration and preventing spoilage without the use of preservatives.

Food and beverage manufacturing businesses need facilities to carry out aseptic processing of products

Because of the lower cost of producing plastic material than metal and glass, most packaging material used in aseptic packaging is made from plastics rather than metal or glass containers. Because plastics are lighter than metal or glass, they are less expensive and easier to transport. Plastics also used far less energy to manufacture than metals and glass. Because of these factors, plastic has become the packaging material of choice for **aseptic processing**.

**The factors that influence the choice of packaging material**

Many factors can influence the type of aseptic container used for a product.

- plastic polymer functional properties (gas and water vapor barrier properties, chemical inertness, and flavor and odor absorption or scalping)
- interactions between plastic polymers and food products
- shelf life desired
- economical costs

Consider some fundamental factors before choosing packaging materials

- the mechanical properties of the packaging material (material handling characteristics, and compatibility with packaging and sterilization methods, molding properties)
- conditions of shipping and handling (toughness, compression),
- adherence to regulations
- consumer segmentation

***Difference between aseptic and sterile***

**The terms**

The words "aseptic" and "sterile" are frequently used interchangeably. They both refer to the same goal—eliminating or reducing potentially harmful microorganisms—but the distinctions are critical in cleanroom and pharmaceutical environments.

Aseptic vs. sterile are two different terms

While ***aseptic vs. sterile*** are commonly used contamination-control techniques, they are not the same thing. Any cleanroom employee must understand the key differences between the two. The following are the industry-accepted definitions of each:

**Aseptic**: A contaminated surface, object, product, or environment has been treated so that it is free of contamination. Bacteria, viruses, and other potentially harmful living organisms cannot survive or reproduce. Aseptic processing does not create a sterile environment; rather, it maintains sterility.

**Sterile**: A product that contains no microscopic organisms. While sterile means free of bacteria, viruses, fungi, and spores, it does not distinguish between specific pathogens. A sterilization technique seeks to eliminate all living microorganisms from an environment.

**The process**

Sterilization is a drastic procedure that can be accomplished in a variety of ways. It is frequently used in medical settings, such as to clean surgical instruments.

Isopropyl alcohol is a widely used local disinfectant. Can use hydrogen peroxide or peracetic acid droplet foggers to sterilize large areas. Autoclaves or gamma radiation are frequently used to sterilize devices.

In comparison to sterilization, aseptic processes are much more complex

Because humans are effective microbe transporters, asepsis is essential in cleanrooms where people work. It does not ensure complete sterility. It promotes a sterile environment through measures such as established cleanroom practices, training, and the use of gowns and other protective gear.

The key distinctions can be explored using related terminology. A sterilant, whether liquid or vapor, destroys all microbial life with which it comes into contact. An antiseptic kills or inhibits the activity of microbes on living tissue, whereas a disinfectant kills or inhibits the activity of microbes on inanimate objects, though spores may survive.

In a nutshell, sterilization eliminates potentially harmful microorganisms; asepsis is the primary goal of any ISO-certified cleanroom facility.

***9 considerations for aseptic processing in beverage***

**Compatibility of products**

The first step in **aseptic processing** planning is determining whether your product is compatible with aseptic processing. While this process can benefit many products, it is critical to understand the sensory changes that the process can cause and the cost and regulatory constraints. Any liquid product, with or without particulates, can be processed aseptically.

**Equipment and packaging costs**

When you have a firm grasp on your product and market, think about the cost of equipment and packaging materials, the new process, and the changes required in your facility.
Equipment and packaging costs are factors to consider when performing the aseptic process

**Hidden costs**

Consider "hidden" costs such as infrastructure requirements for product and packaging sterilization, additional instrumentation, personnel training, and regulatory compliance—estimates for the initial capital outlay range from two to three times the cost of fresh produce. Project stakeholders must consider the R&D effort for new packaging and closure design, including new secondary and tertiary packaging requirements. Can use the costs of such requirements and changes to calculate the return on investment.

**Commitment from management**

It is critical to get management commitment to devote the resources and time to address the additional requirements posed by **aseptic processing**. During installation and production, management must be prepared to assist the quality assurance department with training, validation, and documentation.
Validation of aseptic processes is a continuous process that begins with product and process development and ends when a product or piece of equipment is retired. Product development, equipment commissioning, plant startup, microbial validation, changes in process or product, change management, and product and equipment decommissioning must all be included in the approach.

**R&D and QA involvement**

Must involve research and development and quality assurance in converting formulas and generating new goods and formulations for **aseptic processing** once the equipment has been selected.

**Early alignment**

Align the marketing, R&D, and engineering departments early in the process to increase your speed to market. Make it a point to define each person working on the project clearly and layout the project's goals, which phases should benchmark.

**Food safety**

Food and beverage safety in production is very important

The safety of the food and beverages produced is critical. Aseptically packaged products are stored at room temperature because they are shelf-stable. These products can be tainted if proper processing and packaging are not followed, putting the consumer at risk. Every process step and piece of equipment used in **aseptic processing** must be designed and validated to produce consistently safe and high-quality products.

**Training**

All operations personnel, including plant management, quality control, maintenance, and engineering, must be adequately trained to produce high-quality and safe foods. This training should include Current Good Manufacturing Practices and Better Process Control School and ongoing professional development and refresher courses. To avoid complacency, training must be an ongoing process.

**Documentation**

Document and securely store electronic and/or hard copies of production records dating back three years in a secure location. QA should carefully examine batch/lot records and closure integrity and only release products that meet the required standards. If deviations are discovered, must conduct a root cause analysis, and corrective action must be implemented and documented.

***Conclusion***

**Aseptic processing** offers many benefits to food and beverage producers but must be carefully evaluated. Every process is distinct, and the Tan Do Beverage team is here to assist you in weighing your options. Contact us to discuss your processing objectives and create a plan.

Tan Do is a global beverage ODM/OEM manufacturer and supplier located in Vietnam. Since 1996, we have built trust and credibility not only throughout Vietnam but also in many parts of the world. Leveraging state-of-the-art technology, we have crafted thousands of products that align with ISO, HACCP, HALAL, FDA, and many other standards.