

# Aseptic packaging of processed food and beverages

■ SREENATH PILLAI AND LEENA MURALIDHARAN

**SUMMARY :** Aseptic packaging can be defined as the filling of a commercially sterile product into a sterile container under aseptic conditions and hermetically sealing the containers so that re-infection is prevented, which is shelf-stable at ambient conditions. Aseptic packaging is the important development in the field of packaging. The first aseptic filling plant for milk was presented in Switzerland in 1961. Aseptic package does not only protect the product but also maintain the quality of the product. Packaging for aseptic was particularly in demand for long shelf-life, high seal integrity and consumer appeal and efficiency (a filled package weight is 97 per cent product and only 3 per cent packaging material); using a minimum quantity of materials necessary to achieve a given function. In 2007, Dr. Philip E. Nelson received the World Food Prize in recognition for his pioneering work in aseptic processing and bulk storage. Aseptic packaging process places less heat stress on foods than canning, therefore, product can contain more nutrients as well as taste, colour and texture. Glass bottles may lack the oxygen and light barriers needed to increase shelf life, heavier to transport, breaks more easily than aseptic packaging, stacking not as efficient, may require preservatives to be added to the product, can be recycled. The aseptic packaging is very well accepted in food product applications worldwide as a safe and high-quality packaging option. Aseptic sterilized food products by destroying the harmful bacteria and pathogenic micro-organisms through a tightly controlled thermal process and combines the sterile product with the sterile packaging material; the end result is a shelf-stable product requiring no refrigeration.

**Key Words :** Aseptic packaging, Processed food, Longer shelf life, Quality food.

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**A**septic packaging can be defined as the filling of a commercially sterile product into a sterile container under aseptic conditions and hermetically sealing the containers so that re-infection is prevented. This results in a product, which is shelf-stable at ambient conditions.

Aseptic packaging is the important development in the field of packaging. The first aseptic filling plant for milk was presented in Switzerland in 1961. Aseptic package should not

only protect the product but also maintain the quality of the product. Hence, the structure as well as composition of aseptic packaging are more complex and vary depending on product application, package size and package type.

## What are aseptic?:

- Packaging
- Processing
- Sterilization

Aseptic packaging applications are growing in popularity for in the medical devices, pharmaceutical, food and beverage industries.

## Aseptic comes to America:

Aseptically processed foods and beverages have been available to U.S. consumers for more than 25 years and in wider use overseas for even longer. Globally, aseptic packaging sales are approaching 150 billion annual units representing an

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astonishing 25 packages per person per year.

Still, the U.S. market has been slow to adopt aseptic packaging. While Americans have embraced juice boxes and grown accustomed to buying shelf-stable soy milk and cooking stocks, deeply ingrained consumer beliefs about refrigeration and safety and an infrastructure known for its resistance to change and innovation have, until recently, kept aseptic from making the same impact here as in the rest of the world. But now, after years of incremental growth, aseptic packaging in the U.S. is taking off. A wide variety of products, chief among them being dairy-based coffee drinks, iced teas and organic juices, etc., are sprouting on grocery shelves.

### Why aseptic?:

Aseptic represents a major advance over alternative forms of sterilization and shelf- stability. It allows perishable items to be shipped and stored without refrigeration, saving costs through every step of the supply chain. Aseptic also provides consumers a higher quality and better tasting product than conventional bottling and canning. In terms of health and wellness, aseptic generally retains a third more of the vitamins and nutrients than the “old” canning and bottling technologies. These attributes are attractive to any brand or storeowner and can be clearly explained to the consumer. But just how does it work? The proof is in the processing: filling a sterilized package with a sterile food product within the confines of a sterile environment. Not only can aseptic products be stored on the store or grocery shelf, in the home, or in restaurant kitchens at room temperature, but also can they afford superior product integrity and require no preservatives.

Retort canning typically requires products to be heated in the container for 20 to 50 minutes. Hot-fill bottling uses the heat of the product to sterilize the product and package, a process taking 1- 3 minutes for heating and another 7- 15 minutes for cooling. Both processes essentially “cook out” many of the original vitamins and nutrients present in the products. In contrast, aseptically processed products are sterilized prior to packaging, using an ultra-high temperature process that rapidly heats then cools the product before filling. The processing equipment allows time (generally 3- 15 seconds) and temperature (195°F- 285°F) to be tailored to put the least amount of thermal stress on the product, while generally to achieve all required properties, aseptic packages incorporate more than one material in the structure that is assembled by lamination or co-extrusion process.

In 1991, the Institute of Food Technologists rated the top 10 innovations in food technology where in aseptic processing and packaging ranked No. 1; ahead of juice concentrates, safe canning processes, freeze-drying and food fortification. In 2007, Dr. Philip E. Nelson received the World Food Prize in recognition for his pioneering work in aseptic processing and bulk storage.

### Application of aseptic packaging in milk and milk product:

There are two specific fields in the aseptic packaging of milk and milk products:

- Packaging of pre-sterilized and sterile products.

Ex: milk and dairy products, puddings, desserts, fruit and vegetable juices, soups, sauces, and products with particulates.

- Packaging of non-sterile product to avoid infection by microorganisms.

Ex: fermented dairy products like yoghurt



### Typical composition of aseptic cartons:

Aseptic cartons are made of three basic materials that together result in a very efficient, safe and light-weight package. Each material provides a specific function.

### Properties of aseptic packaging material:

- Higher degree of safety, hygiene and nutrient retention in food.
- Preserving taste and freshness.
- Can be kept for months with no need for refrigeration or preservatives.
- Efficient (a filled package weight is 97 per cent product and only 3 per cent packaging material), using a minimum quantity of materials necessary to achieve a given function.

Ex: Light weight resource (among the lightest packages available).

### Aseptic processing:

- **Methodology:**

- Sterilization of the products before filling.
- Sterilization of packaging materials or containers and closures before filling.
- Sterilization of aseptic installations before operation (UHT unit, lines for products, sterile air and gases, filler and relevant machine zones).
- Maintaining sterility in this total system during operation; sterilization of all media entering the system, like air, gases, sterile water, etc.
- Production of hermetic packages.

– **Sterilization agents**

- Heat
- Chemicals
- Radiation

Packaging for aseptic was particularly in demand for long shelf-life, high seal integrity and consumer appeal. However, because plastic material is so important to aseptic packaging, it is useful to discuss some special properties demanded of plastics by aseptic process itself.

**Typical packaging applications:**

- Fruit juices, concentrates, purees
- Tomato products
- Milk and cream
- Coconut products
- Jam



- No refrigeration required
- Saves energy both in transportation and in storage
- Requires less energy to heat and sterilize the product than some other packaging methods
- Nutrition benefits process places less heat stress on foods than canning therefore product can contain more nutrients as well as taste, colour and texture.
- Low packaging to product ratio of 96 per cent product and only 4 per cent packaging.

**Conclusion:**

The aseptic packaging is very well accepted in food product applications worldwide as a safe and high-quality packaging option. Aseptic processing sterilizes food products by destroying the harmful bacteria and pathogenic micro-organisms through a tightly controlled thermal process and combines the sterile product with the sterile packaging material in a sterile environment; the end result is a shelf-stable product requiring no refrigeration. Innova database analysis indicates that dairy and soft drinks are the top markets for aseptic packaging. Recently, wines, soups, baby foods and water are added to aseptic packaging line.

Packaging must address the following:

- Food safety
- Convenience

**Advantages of aseptic packaging technology:**

- Process
- Protection
- Logistics
- General advantages
- Environmental impact
- Advantages of bulk aseptic packaging
  - Safety
  - Reliability
- Extended shelf-life
- Product quality
- Convenience
  - Portable
  - Light weight
  - Shatter proof
- Food safety
  - Cooking and packaging process ensures that the liquid is free from harmful bacteria and contaminants.

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