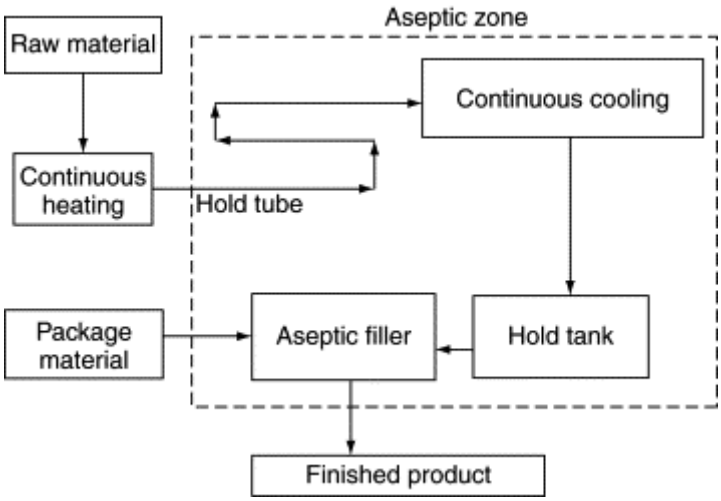
ASEPTIC FILLING

Aseptic processing is a high-temperature–short-time thermal process to commercially sterilize a product and fill the cooled sterile product into a presterilized package in a sterile environment. Purposes for aseptic processing include extending the storage life of food products, optimizing product quality, and reducing cost. A diagram of an aseptic processing system for consumer products is shown in Figure 1. In the aseptic process, the aseptic filler is designed to sterilize the package material, fill the sterile product into the package in a sterile environment, and then hermetically seal the package. Aseptic filling differs from other traditional methods of food packaging in that the food product and the package are continuously sterilized separately and then meet in the sterile environment provided by the aseptic filler. Important factors in the aseptic filling process are the type of product, type of package, obtaining and maintaining a sterile environment for filling, and the sealing process.



Aseptic packaging systems fill sterile product into sterile packages within the confines of the sterile zone of the filler. The aseptic zone/sterile zone extends from the point where sterilized packaging enters the sterile zone to where the sealed package is evacuated. Common attributes to all aseptic packaging systems include:

1. The sterile product, sterile package, and sterile zone prevent post-processing contamination.

2. The food contact surfaces of the package are sterile.

3. Product is filled aseptically into the package.

4. Packages are sealed hermetically.

5. Automation exists in monitoring and controlling the critical points.

Filler Types

The two primary aseptic packaging systems fill UHT product into preformed sterile packages or use a form-fill-seal system

Commercial manufacturers include Tetra-Pak, Scholle, and the Dole Aseptic Canning System. Aseptic packaging systems available for dairy foods include drum and bin systems, heat during blow molding, carton packaging machines, bag-in-box packaging systems, bulk tanks and containers, plastic cups/pots/cartons, and pouches/sachets.

Package Options Package options include metal and rigid containers, webfed paperboard containers, preformed paperboard containers, preformed rigid/plastic containers, thermoform-fill seal containers, flexible bags/pouches, and blowmolded plastic containers).The metal and rigid container category includes

metal cans, composite cans, plastic cups, glass containers, and drums (Anonymous 1995). Plastics used in aseptic packages can consist of acetal, nylon, polypropylene, polyester, polycarbonate, acrylic, ABS (acrylonitrile-butadienestyrene), PVC (polyvinyl chloride), polystyrene, high-density polyethelene, low-density polyethelene, EVAL (ethyl vinyl acetate), EVOH (ethyl vinyl alcohol), and PVDC (polyvinylidene chloride).

The primary objective of packaging is to preserve the product quality. Flavor scalping is a reduction in quality due to volatile flavors being transmitted between the product and package material.

Selection of aseptic packaging is based upon the following:

1. Product compatibility

2. Dispensing requirements

3. Storage conditions

4. Transportation costs

5. Waste minimization.

The selection of packages for fluid products to include convenience, appearance, safety, consumer preference, filling and handling, durability, and protection. Considerations for package material properties include geometry, mechanical properties, and barrier properties. The sealing strength must be adequate to maintain package integrity.

Packaging must provide a microbial barrier and prevent light, oxygen, and moisture transmission. Packaging must withstand environmental changes and sterilization temperatures/chemicals. The package must comply with legal requirements and meet environmental concerns. Environmental concerns include all steps from the package manufacturing through its disposal.

The polyethylene pouch consumed less energy to produce and resulted in less waste. Filler and Container Sterilization Aseptic fillers have sections containing sterile contact pipes and valves along with noncontact sections (sterile chambers). Both sections must be sterilized prior to production and must maintain sterility throughout production.

aseptic fillers and associated pipes are sterilized typically with heat in the form of steam. In-line gaskets must tolerate sterilization temperatures. Sterilization temperatures are monitored with thermocouples to verify sterilizing procedures. Wet heat sterilization using saturated steam is the 22 most dependable sterilant, as microorganisms are more resistant to dry heat, which necessitates higher temperatures .Sterilants are applied uniformly to the aseptic zone by misting equipment, whereas packaging typically is sterilized by misting or passing through a sterilant bath. Examples of sterilants include chlorine, iodine, oxonia, food acids, ozone, hydrogen peroxide, and ultraviolet light. Hydrogen peroxide is most effective at higher temperatures with an FDA minimum concentration of 30%. The residual level of hydrogen peroxide is regulated with a maximum level of 0.5 PPM. Infrared radiation and vaporized hydrogen peroxide have been studied as sterilants for packaging materials