

NO SURPRISES

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The package can't make the product

Although different types of aseptic packaging methods allow manufacturers to supply convenient, healthy and nutritious products with a considerably longer shelf-life, aseptic packaging alone cannot improve upon the initial quality of the product that goes into it.

In fact, it is the aseptic process itself that was identified by the Institute of Food Technologists as “the most significant food science innovation of the last 50 years.” In general terms, aseptic processing involves thermal processing of a high- or low-acid fluid food product at temperatures that are considerably higher than typical pasteurisation temperatures, while the holding times are usually within the range of few seconds. Following thermal processing, finished products are usually stored in sterile surge vessels and finally packaged using aseptic packaging systems.

Design of a typical aseptic processing system must start with an exploration of the characteristics of the range of products the producer plans to process through the system. Once the product formulations have been analysed, a team of engineers and technical staff develop the concept for the processor, following a very detailed set of criteria so that the final design can provide the client with the most flexible process capabilities. Various factors are considered during the selection phase:

Table 1 - Aseptic Processor Selection based on Product Family

Product Family	Aseptic Processor Type				
	Indirect Tubular	Indirect Plate	Direct Steam Injection with Flash Cooling	Scrape-surface Heat Exchangers	Raw-side Deaeration
Clear Juices		X			X
Fruit Juices With Limited Pulp	X	X			X
Fruit Juices With Long Fibbers	X			X	X
Fruit Puree without Particulates	X			X	
Fruit Puree with Large Particulates				X	
Milk and Milk-based Beverages			X		
Tea		X			
Ice Cream Mix			X		
Shake Mix			X		
Custards and Puddings				X	
Soups and Stews with No Particulates	X				
Soups and Stews with Large Particulates				X	

pH

Food products can be categorised as high-acid (pH < 4.5) or low-acid (pH > 4.5). In general, indirect UHT processors that utilise tubular heat exchangers are better suited for processing high-acid products, whereas low-acid products can be processed through indirect systems using tubular or plate heat exchangers, or through direct steam injection or infusion systems. Clear high-acid products such as apple juice can be processed through either plate or tubular aseptic processors, whereas presence of either short or long fibres in the juice may direct the design team to select a tubular unit or an aseptic processor that includes a wide-gap plate heat exchanger.

Viscosity

Products that possess low viscosity such as fluid milk, soymilk, etc. can be easily processed using UHT processors that employ plate heat exchangers or through aseptic processors that use direct steam injection. As the viscosity of the product increases to heavier creamy products, certain high-viscosity mixes, custards, etc. the choice of processor also switches to indirect aseptic processors. Usually, tubular UHT processors are better suited for products that have higher viscosity, or for products that have added fibres or suspended particulates. In the extreme case of high viscosity low-acid products that contain large suspended particulates, one may consider using aseptic scraped surface heat exchanger units to ensure adequate heat transfer.

Sensitivity to heat damage

Products such as fluid milk, ice cream mix or shake mix, can react differently during thermal processing. For example, different proteins denature at different temperature-time combinations. In addition, during UHT processing a number of chemical reactions, such as browning reactions or caramelisation of sugars, may take place. Generally, the thermal damage and/or the extent of undesirable chemical reactions are

least significant in the case of direct steam injection systems when compared to indirect aseptic processors. Furthermore, some of the undesirable flavour compounds that may form during processing are commonly removed as the finished product goes through the flash chamber, leaving a cleaner flavour profile. On the other hand, if some of the desired finished product attributes are

8. Complete separation of cleaning chemicals from products.

As shown in Table 1, no single aseptic processor is flexible enough to accommodate every possible product on a single system. However, there are number of methods to design hybrid systems that will enable a single aseptic processor to be flex-

“the most significant food science innovation of the last 50 years”

to be formed during thermal processing, such as caramelised flavour or texture development due to certain chemical interactions that are initiated by greater heat damage, then using a direct UHT processor with a flash chamber may be detrimental to finished product quality.

Regardless of the mode of heat transfer (direct or indirect) or the type of heat transfer equipment used (plate or tubular heat exchangers or direct steam injection/infusion), an aseptic processor must meet the following criteria:

1. A very well energy balanced and efficient process configuration.
2. A pressurised energy efficient sterilisation.
3. Steam sterilisation and steam sealing of the processor.
4. A very high degree of isolation through isolation barriers, and flexible sterile valving to provide such features as sterile water rinse of downstream sterile surge tanks, if available.
5. An effective methodology of controlling and balancing temperatures, levels and flow rates of process and utility streams.
6. Ability to run intermediate cleaning cycles without losing system sterility.
7. Ability to rinse sterile surge tanks, if available, using sterile water.

ible enough to accommodate a wider range of product mix than a standard aseptic processor can. JCS Inc. has a design where the flash cooler and injector are used for Lo Acid product and then become a deaerator in the raw side of the process for Hi Acid production. This hybrid design is capable of producing all particulate free products.

Although processors shopping for new aseptic systems have a number of options whereby they can purchase off-the-shelf systems by a single manufacturer, such an approach would severely limit the ability of these producers to have best-of-breed components in every area of the processor. Such companies, on the other hand, would greatly benefit from engineering firms that do not represent any particular equipment manufacturer, and as such are free to choose the most suitable component for each task. In addition, these companies can expect firms, such as JCS, Inc. to be dedicated to continuously improving their system design and have a focused approach to customising each system to meet the specific needs of individual beverage, dairy and food processors.

For more information please contact JCS Process and Control Systems Engineering at: 1-585-227-5910 or info@jcs.com



Process & Control Systems Engineering

A Message from Philip R. Frechette, President of JCS



At JCS, the focus is on: integrity, family values, professionalism, employee development, (both professional and personal) and customer partnerships, with significant contributions in food processing and food safety. We strive for only win-win results with each of our partners.

At JCS, we employ a diverse staff of highly competent personnel, and invest heavily in their training and development. We endeavor to be a contributor to the Food and Dairy Industry's growth. We are also a dedicated engineering firm involved in R&D, Education and Training, and an avid participant of cooperative development programs of several Universities and Colleges. We closely collaborate with Regulatory Agencies, Laboratories, and the Food & Drug Administration.

We do not intend to be everything to everyone, but rather, to be considered for the areas of our expertise, by those customers with whom we develop partnering relationships. We expect to earn your partnership through our design-build and turn-key capabilities and superior engineering knowledge, delivered to you with the highest degree of integrity and professionalism, and executed in a methodology that is proven. At JCS, we strive to be the best, and will focus on the continued growth of our customers through partnering. You have my promise to continually focus on your business so that we may both be successful and grow.

We sincerely invite you to let us prove our value to your company. There are few companies with the degree of plant and process knowledge and technology expertise that JCS possesses. Together, we'll continue to build this business, and the Food and Dairy Industry in general, to greater heights.

Sincerely,
JCS
Philip R. Frechette, *President*

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