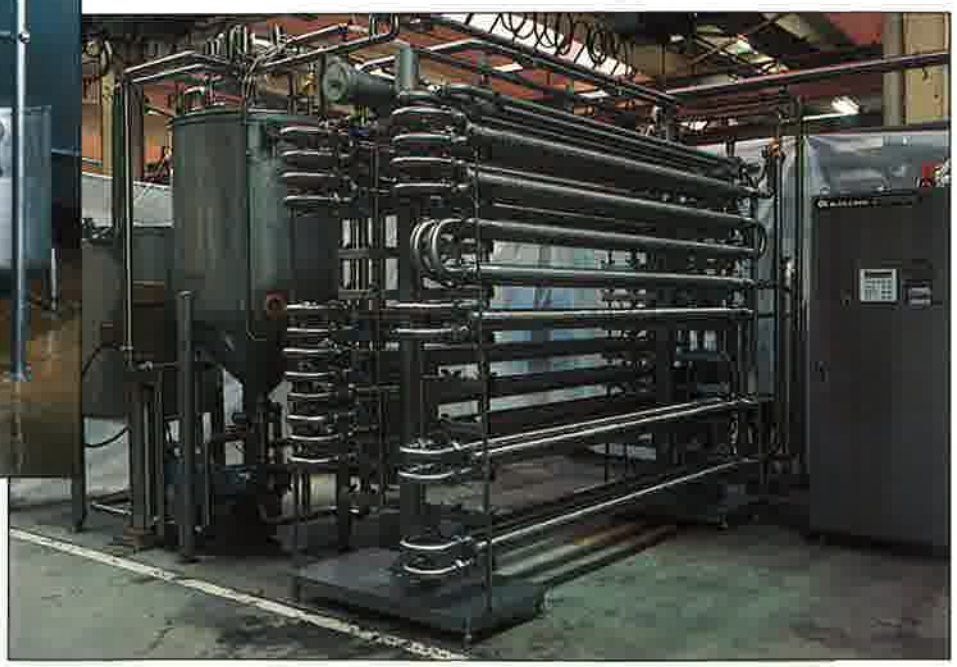
ALFA-LAVAL

STERITUBE™

The aseptic processing system for liquid food products

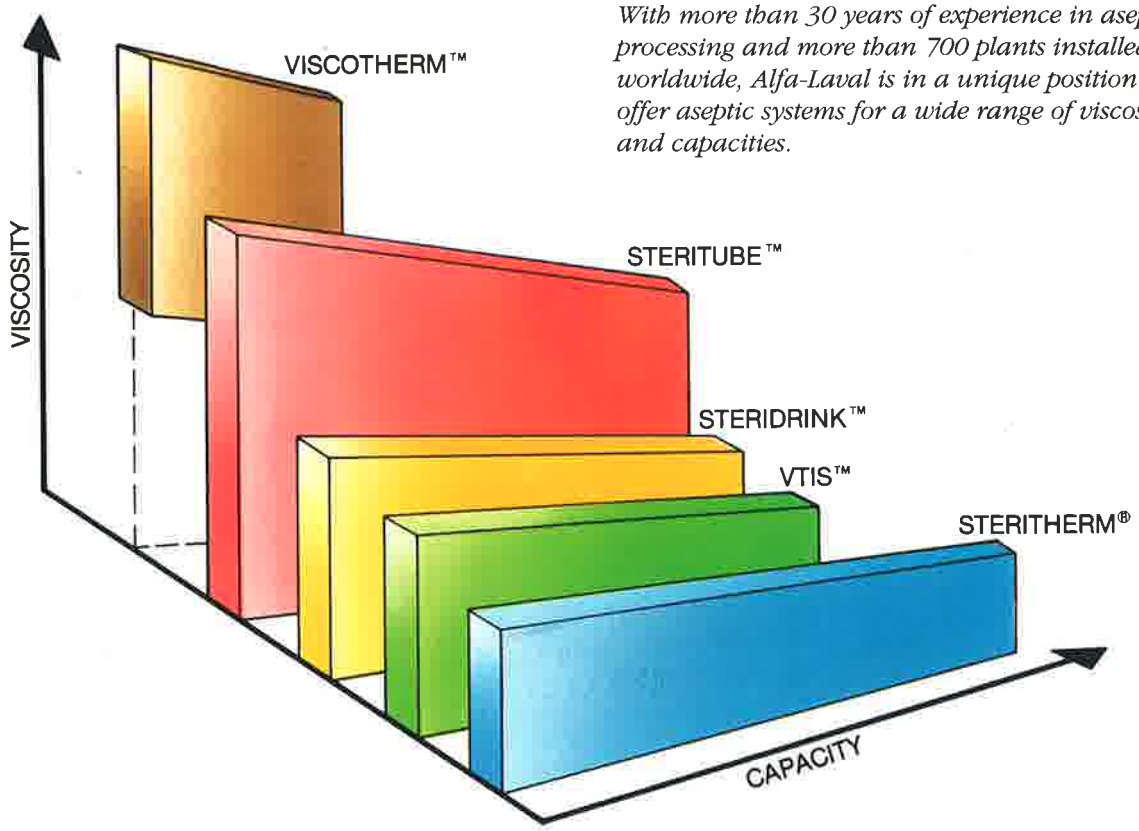


What is aseptic processing?

In aseptic processing the product is exposed to brief, intense heating and cooling. This continuous process ensures the destruction of all undesirable micro-organisms. Since the process takes place in a completely closed system, it also effectively prevents reinfection of the product.

Aseptic processing has little or no effect on the flavour or nutritive properties of the product, and therefore the quality is far superior to that of canned or in-bottle sterilized products.

Aseptic processing is one way of improving both production profitability and distribution profitability. Once the product has been aseptically processed and packaged, its shelf-life is considerably extended, and it no longer requires refrigeration during storage and handling. This means simpler and less expensive distribution.



With more than 30 years of experience in aseptic processing and more than 700 plants installed worldwide, Alfa-Laval is in a unique position to offer aseptic systems for a wide range of viscosities and capacities.

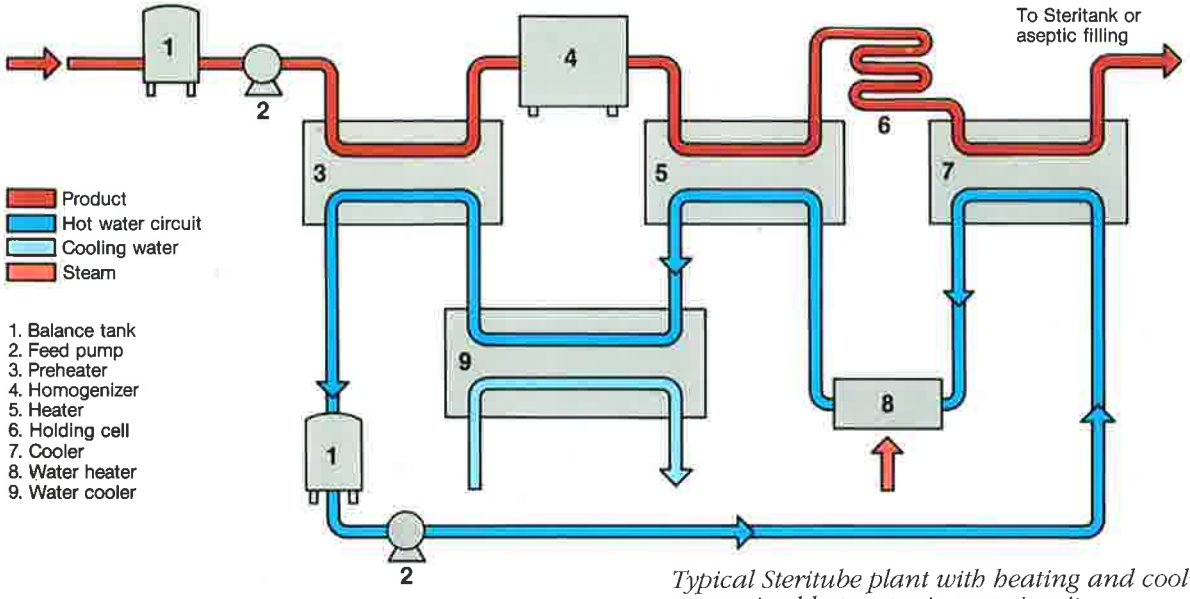
STERITUBE - a system developed by specialists

The experience gained by Alfa-Laval in this field has been channelled into the development of the *Steritube*. This means that each component has been carefully designed to match product characteristics and to fulfill all process requirements.

Steritube is an aseptic processing system designed for liquid food products, with or without particles. Depending on the product treated, the system can be based on different types of tubular heat exchangers. Steritube offers the user a number of distinct benefits:

- Flexibility for optimum product quality
- Thermal efficiency and gentle UHT treatment
- Reliability for high productivity
- Total operating economy
- Compact, pre-assembled and pre-tested unit
- Components and process know-how from a single experienced supplier
- Easy inspection and maintenance

The STERITUBE process



Typical Steritube plant with heating and cooling by pressurized hot water in one circuit

The Steritube process is characterized by its simplicity. The product is pumped from a balance tank through a tubular heat exchanger in which it is indirectly heated to the desired sterilization temperature using pressurized hot water or steam.

The product is kept in the holding tube for the required time and then cooled. Temperature sensors check that the product has reached the preset values to guarantee that no unsterilized product is released to the filling machine.

In order to achieve optimum thermal efficiency, one single pressurized hot water circuit performs both heating and cooling.

Independent heating and cooling circuits can be incorporated for certain applications.

If required, a homogenizer can be connected before or after the heating section. An aseptic homogenizer must be used if it is to be installed after the heating section.

The Steritube system is designed for automatic cleaning-in-place (CIP). Aseptic intermediate cleaning (AIC) can be used for longer periods of operation. Sterilization is not necessary with AIC, which in practice means extended operating times with maintained product quality.

Advantages of aseptic processing

- keeps fresh food fresh for months
- conserves taste, colour and texture
- eliminates preservatives
- offers continuous production
- consumes minimal amounts of energy
- uses versatile low-cost packaging
- permits storage and handling without refrigeration.

The STERITUBE heat exchanger

A Steritube heat exchanger comprises a number of tubes assembled into modules which can be connected in series and/or in parallel to offer a complete optimized system for any heating or cooling duty. The type, length and diameter of the tubes can be varied.

This flexibility enables a virtually unlimited amount of configurations. The ingeniously simple tubular design can handle low temperature differences which means very gentle treatment and excellent product quality. Service is reduced to a minimum: replacement of the O-ring seals.

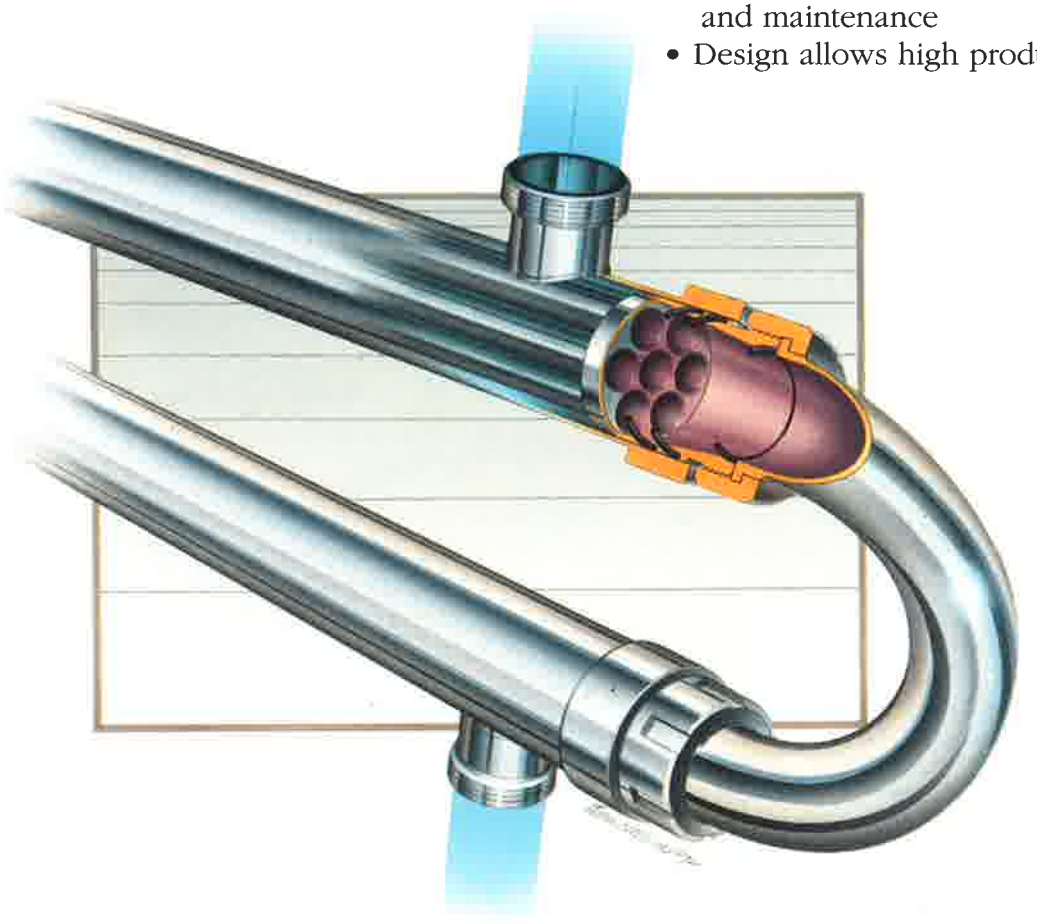
The Steritube system incorporates different tube types which can be combined to optimize product treatment. It also allows multipurpose operation with products of different viscosities, with or without particles. The most common tube types are described here:

Multitube

The Multitube consists of a shell containing a number of tubes for the product. The tubes are assembled in bundles with the ends welded onto headers. The number and diameters of the tubes in each bundle can be varied to match flow characteristics or thermal requirements.

To avoid thermal stress, the tube bundles "float" independently of the outer shell. This unique *Floating Head Design* offers several user benefits:

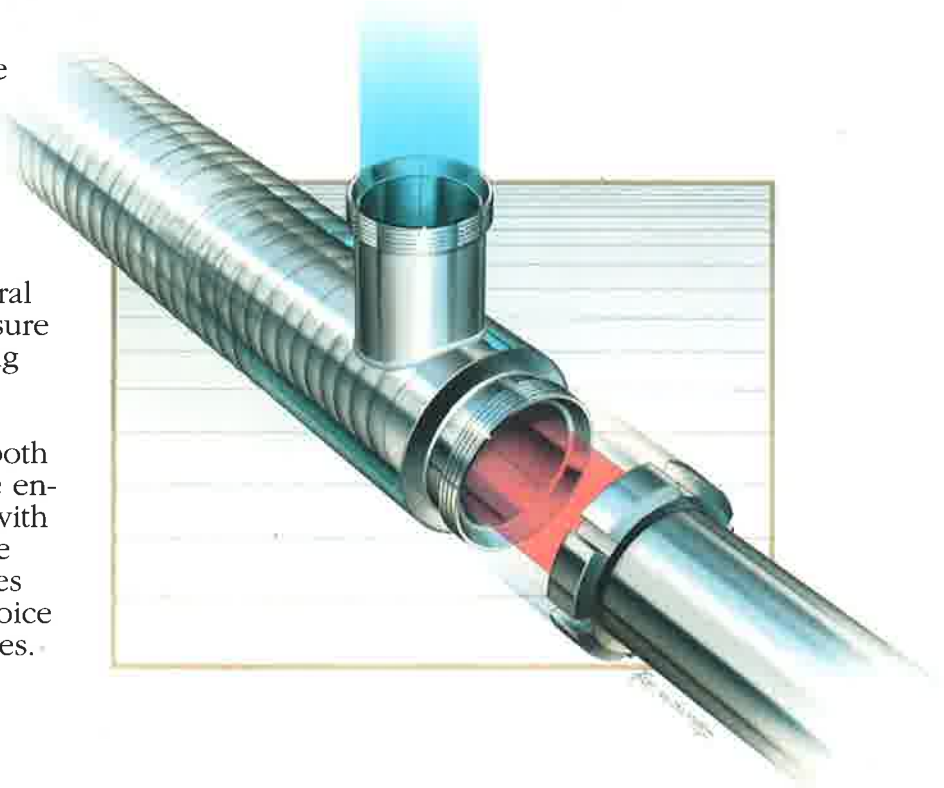
- No stress caused by thermal expansion
- Double seal eliminates risk of contamination
- Tubes are easily opened for inspection and maintenance
- Design allows high product pressure



Monotube

The Monotube consists of one internal tube surrounded by a heating/cooling jacket. This simple, completely welded construction requires no service and contains no O-ring seals. It is available in different sizes and offers several advantages such as high pressure tolerance and a wide operating temperature range.

Identical inner diameters on both the inlet and the product tube ensure a uniform product path with easy flow and an even particle distribution. This feature makes the Monotube the obvious choice for products with large particles.

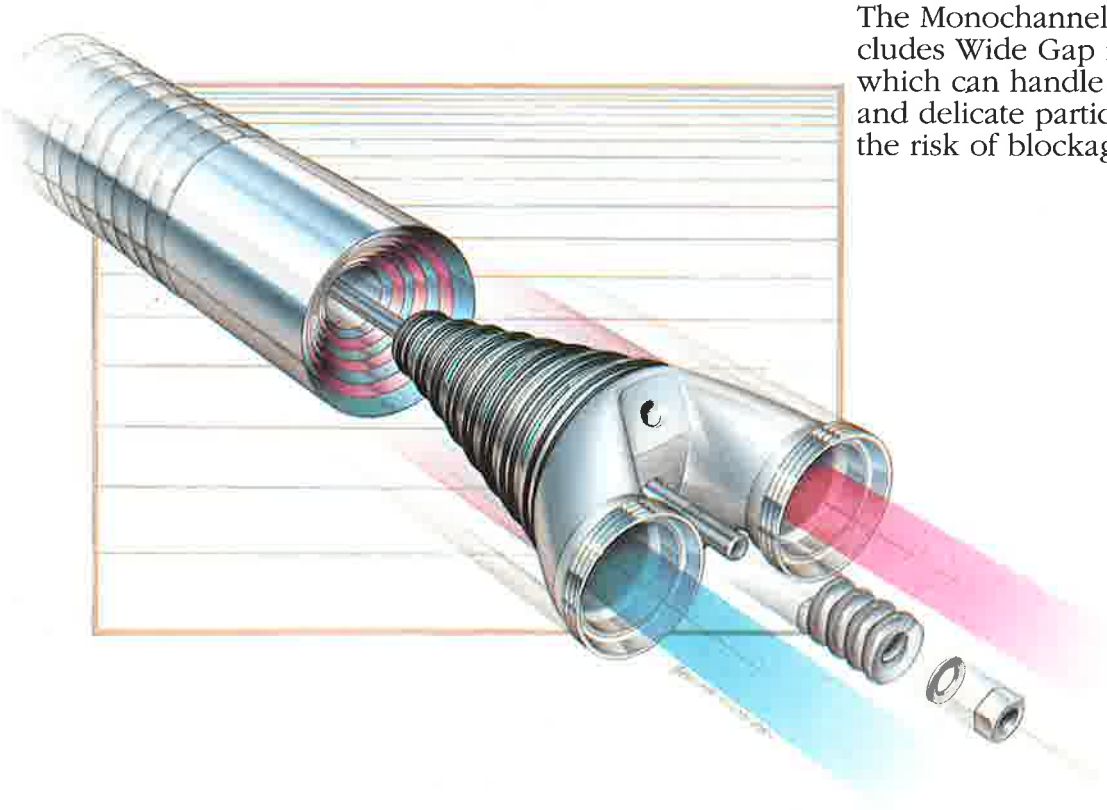


Multichannel

The Multichannel comprises between five and nine concentric tubes with varying diameters which form four to eight channels. The product is completely surrounded by the heating or cooling medium in a compact design with high thermal efficiency.

An alternative version, the *Monochannel,* combines uniform thermal treatment and the ability to handle viscous, particulate products requiring high pressures. It has four tubes with one single product channel with a variable diameter.

The Monochannel range includes Wide Gap models which can handle irregular and delicate particles without the risk of blockage.



The STERITUBE applications

The choice of heat exchanger depends on product characteristics and a number of process factors such as heat recovery, flexibility, pressure drop, cleaning, inspection, and maintenance. This table gives guidelines for the selection of the most suitable tube type for final heating of each product. A combination of tube types is often used.

	Multitube	*Monotube*	*Multichannel*	*Monochannel*
Cream	●	○	○	○
Diced fruit		●		●
Dressing	●	●	○	○
Evaporated milk	●	○	○	○
Fruit juice	●	○	●	○
Ice-cream mix	●	○	○	○
Infant formula	●	○	○	○
Jam	○	●	○	●
Milk	●	○	○	○
Paste		○	○	●
Pudding	●	○	●	○
Purée	○	●	●	●
Sauce & soup	●	○	●	○
Ditto, with particles	○	●		●
Yoghurt drink	●	○	○	○
Yoghurt fruit	○	●		○

● =first choice
○ =possible

The STERITUBE Pilot Plant

A pilot version of the Steritube system is available for testing and evaluating new recipes. This unit which duplicates full-scale production conditions, helps determine the influence of various process parameters on product quality.

Another alternative, the well-established *Sterilab* UHT pilot plant can be supplemented with a tubular module. This option is also available for existing Sterilab installations.

The Steritube Pilot Plant is available for purchase by processors or use at one of Alfa-Laval's Food Laboratories. In the latter case, the processor will also have access to Alfa-Laval's experienced staff who can make valuable suggestions on process technology and alternative production methods.

Steritube Pilot Plant installed at the premises of the Leatherhead Food Research Association, UK.

The STERITUBE control system

There is more to Steritube than tubular heat exchangers. Steritube is a complete aseptic processing system which accurately controls and monitors components and process parameters to ensure smooth operation.

The control system is installed in a stainless cabinet and contains all components necessary for triggering sequences automatically. The operator only has to start sequences such as start-up, production or CIP. The automatic control system then takes over and ensures that preset values and functions are activated.

The preset program includes alarm signals and initiates emergency measures necessary if a malfunction should occur. All principal actuators and instruments are located on the control panel front.

Control panel with an OP45 microprocessor.

The STERITUBE options

Split heater

Upon request, the heating section of the tubular heat exchanger can be divided into subsections. This design is used in two-speed or variable-speed plants in order to reduce the heat load on the product when operating at lower capacities.

Non-aseptic/aseptic homogenizer

The plant can be equipped with a non-aseptic upstream homogenizer or, to improve the texture and physical stability of certain products, an aseptic downstream homogenizer.

Deaeration

Occasionally, air becomes mixed with products during pretreatment. A deaerator removes unwanted air and thereby decreases fouling in the final heating section.

Extra cooling sections

Additional sections can be built into the tubular heat exchanger for extra cooling duties.

Automation

Varying levels of automation are available for the Steritube plant. The control system can use various types of programmable controllers.

Recipe handling

Temperature programs and holding times can be preset to suit special products or to produce certain product characteristics.

Variable-speed plant

This option is available for plants in which the capacity must be regulated to meet filling requirements.

Alfa-Laval has the complete range of aseptic processing systems

STERITHERM®
An extremely economical UHT system featuring indirect heating in plate heat exchangers for low-acid and high-acid liquid food products.
Capacities: 1,000 - 30,000 l/h.

STERILAB®
Pilot plant for UHT and other heat treatment tests. Indirect heating with optional direct heating.
Capacities: up to 300 l/h.

VISCOTHERM™
System intended mainly for viscous or sticky, low-acid and high-acid products with or without particles. Heating and cooling in scraped-surface heat exchangers.

VISCOLAB™
Pilot plant for viscous products based on scraped-surface heat exchangers.

TWINTHERM™
System for separate processing of the liquid and solid phases in high-quality products, incorporating the Particle Processor as a key component.

VTIS™
UHT system with direct heating by steam injection for low-acid and high-acid liquid food products.
Capacities: 1,000 - 22,000 l/h.

STERIDRINK™
System for aseptic processing of high-acid products.
Capacities: up to 20,000 l/h.

STERITANK™
Aseptic storage tank.
Sizes: vertical type 600 - 30,000 l
horizontal type 600 - 15,000 l
High-Acid type 2,000 l.

ALFA-LAVAL
FOOD ENGINEERING

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