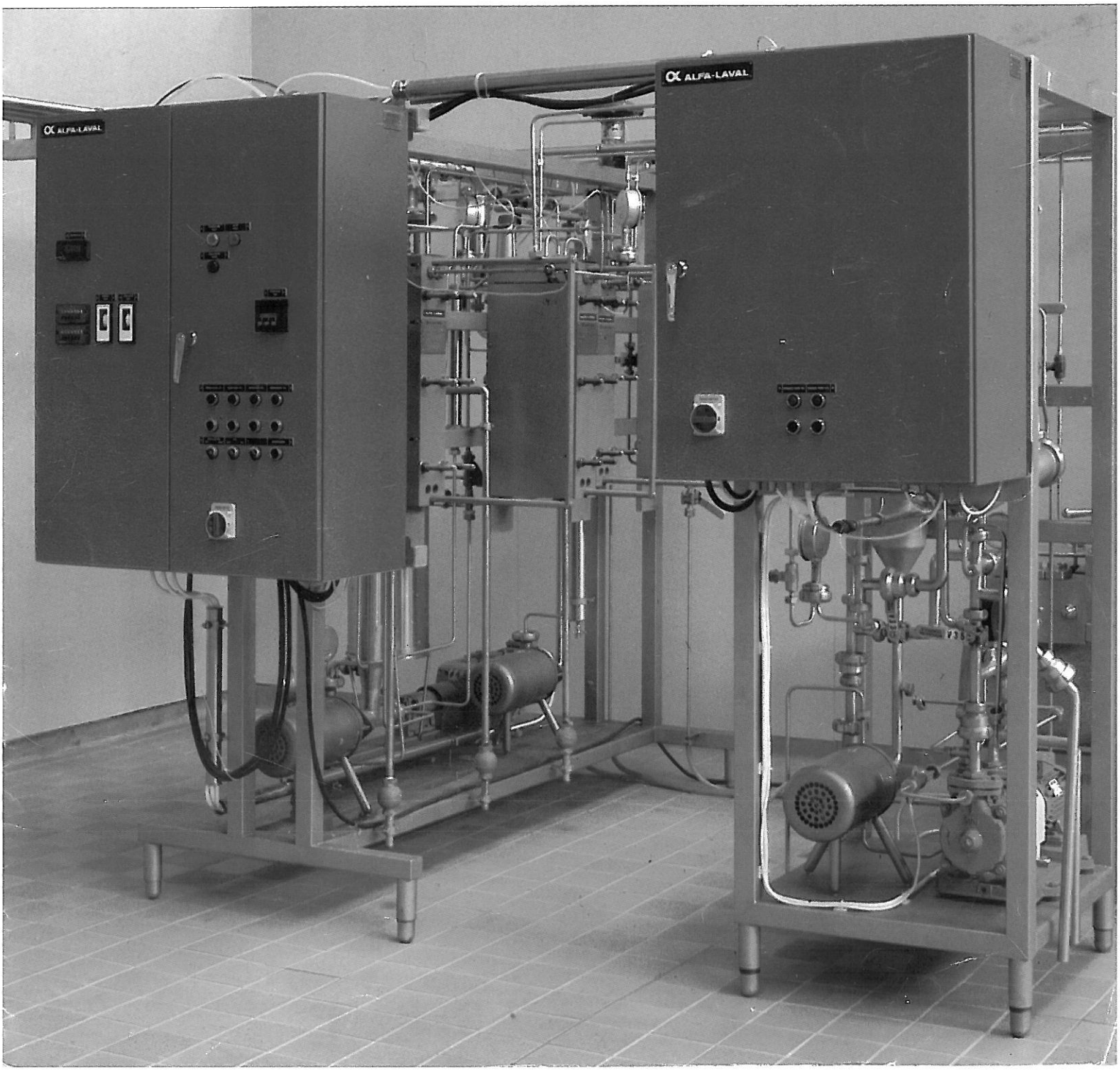
ALFA-LAVAL

STERILAB™

the UHT pilot plant



Products with a promis

Long-life liquid foods – products that keep their freshness and taste over long periods of time. In some cases, wishful thinking; in others an absolute necessity for successful marketing. In most cases, aseptic technology offers the only viable solution.

All over the world the food industry, and not least the dairy sector, is introducing new product lines that are directly dependent on a long shelf life for their profitability. No wonder that aseptic processing techniques are fast gaining ground.

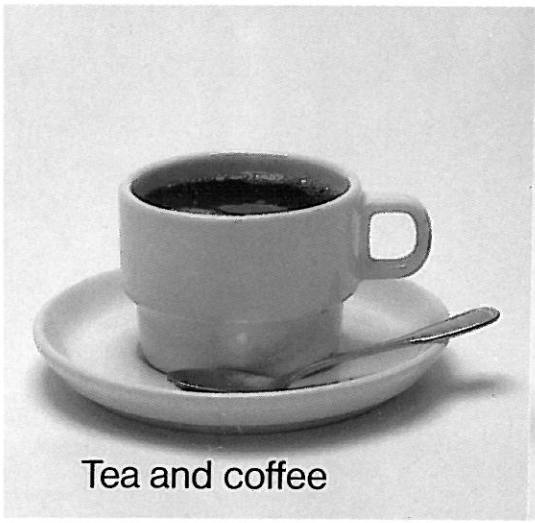
STERILAB can help you test and evaluate a whole range of new interesting products. Products that can be produced commercially in Alfa-Laval's UHT process plants, STERITHERM and VTIS, and that can carve out new profitable shares of the market.

The list of liquid food products that are UHT-treated around the world today is a long one. Some examples of the present applications are shown on these pages. The future and your R&D work at the STERILAB unit will surely add many new products to the list.

STERILAB puts you ahead in product development

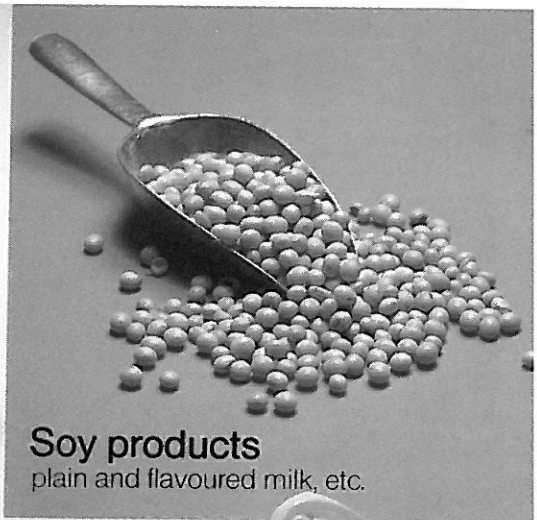
- Speeds development of liquid food products. No waiting to conduct process trials.
- Cuts the cost of product development. Capacity 100 l/h means lower product cost than full-scale production plant.
- Fast testing of process parameters, rapid product optimization.
- Indirect (STERITHERM), direct (VTIS) heating.
- Handles also pasteurization besides UHT.
- An essential development tool for every modern food and dairy processor and food technology institute.

STERILAB – the vital step between laboratory and fullscale production.



Tea and coffee

Dressings



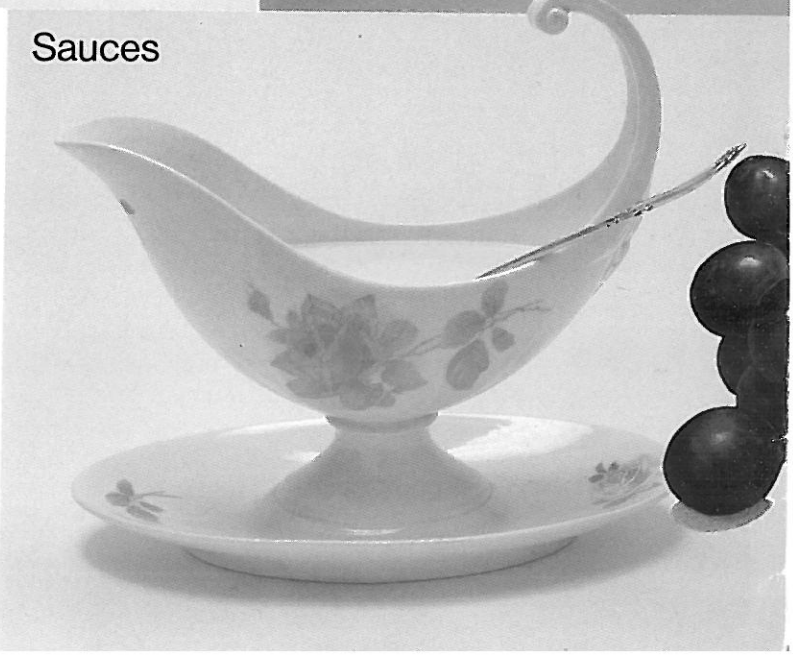
Soy products
plain and flavoured milk, etc.

What is UHT?

UHT stands for Ultra High Temperature, and a UHT product is a liquid that has been subjected to a continuous flow heating process at a high temperature for a short time, normally 135–140 °C (275–285 °F) for a few seconds.

The heating and subsequent cooling may be indirect through a heat exchanger or direct by steam injection and vacuum cooling, for example.

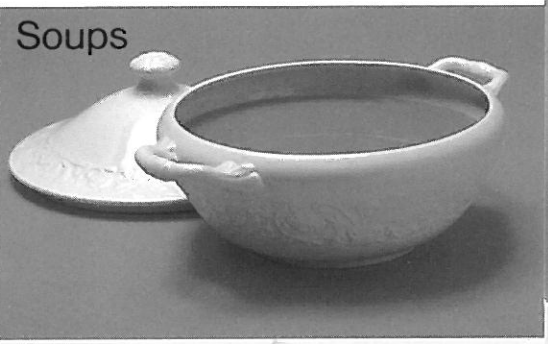
A UHT product is aseptically packaged to prevent reinfection. It can then generally be stored at room temperature for months or longer.



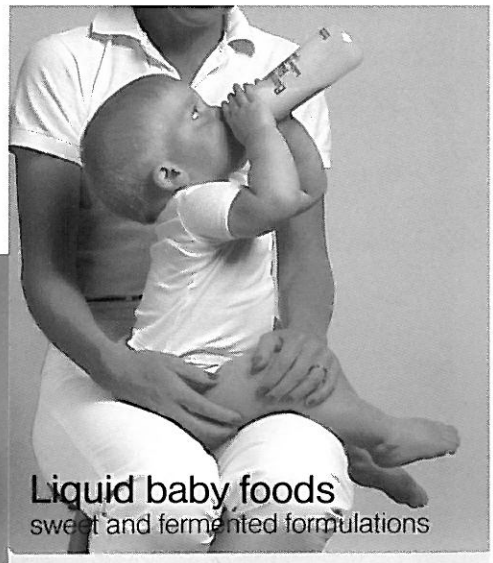
Sauces

ng future

Purées



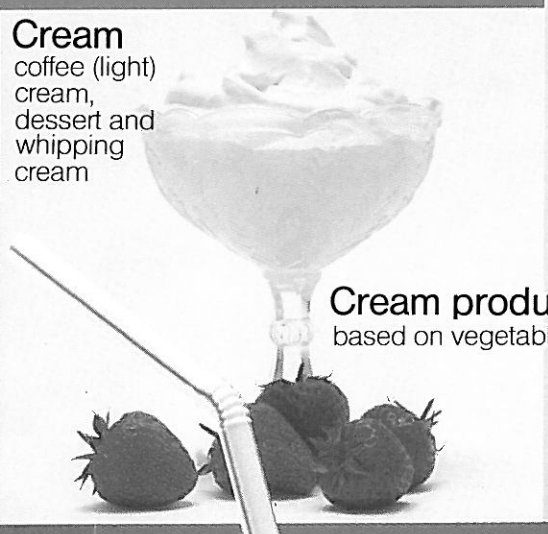
Soups



Liquid baby foods
sweet and fermented formulations

Concentrated milk products
evaporated milk, concentrated recombined milk

Cream
coffee (light) cream, dessert and whipping cream

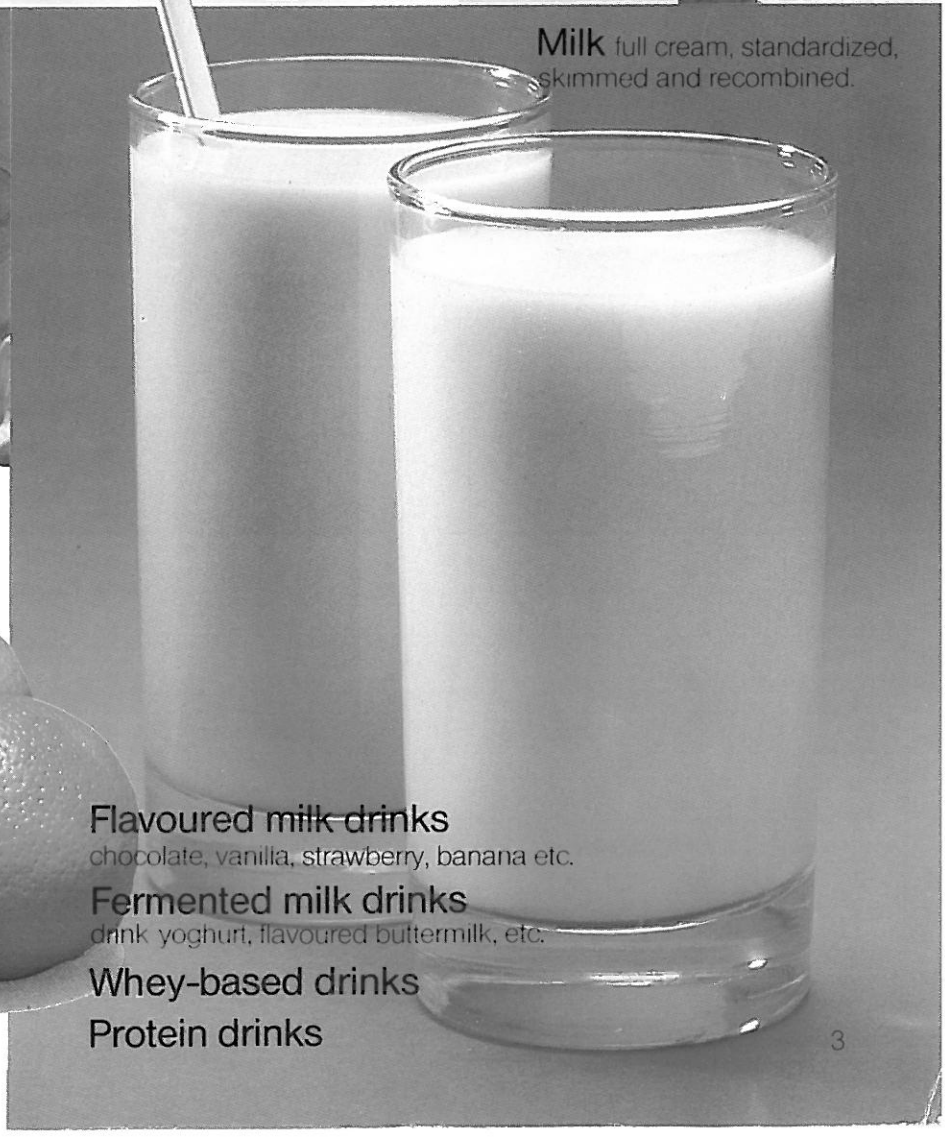


Cream products
based on vegetable fat

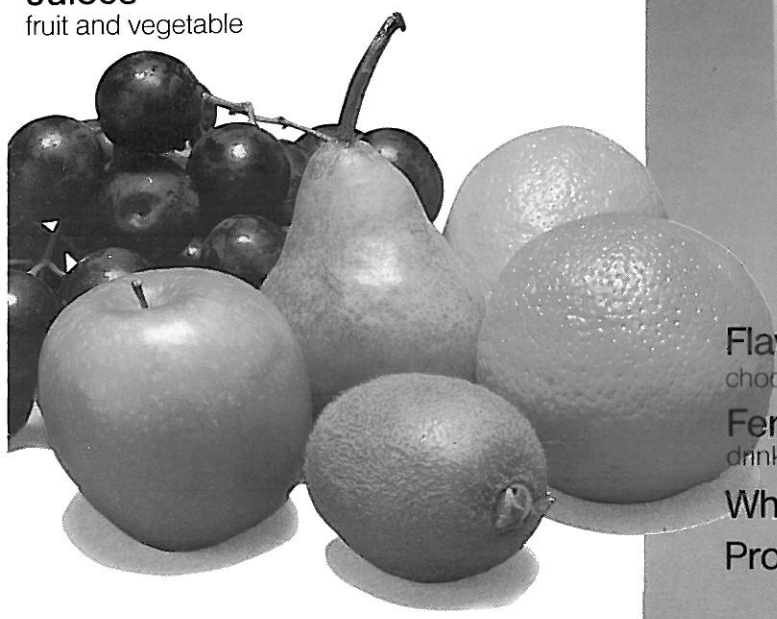
Ice cream mixes
soft ice mix, milk shake mix

Dessert
puddings (gelified desserts), custards (creamy desserts) etc.

Milk full cream, standardized, skimmed and recombined.



Juices
fruit and vegetable



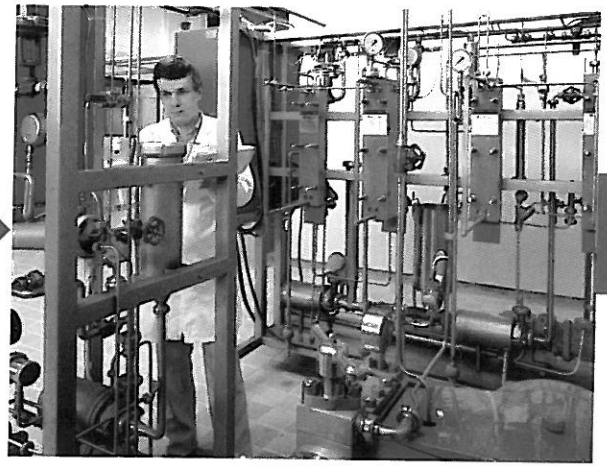
Flavoured milk drinks
chocolate, vanilla, strawberry, banana etc.

Fermented milk drinks
drink yoghurt, flavoured buttermilk, etc.

Whey-based drinks

Protein drinks

STERILAB – R&D tool for



The most important R & D resource is the human brain. But an idea has to be tested and evaluated in a thousand-and-one practical ways before the idea becomes an established product.

This is where STERILAB comes in. It provides an inexpensive way of establishing and checking parameters for UHT treatment prior to full-scale production.

Transforming an idea into a commercial product

There are a number of distinct stages in the development of a UHT product. The first includes the formulation of recipes, development of selected recipes to finished products, and preliminary comparative evaluation. Here STERILAB can process the necessary small product samples of only a few litres; even without packing them aseptically.

The next stage involves a more detailed evaluation of preferred recipes. STERILAB can be used to determine the effect of the various ingredients and the different recipes on product quality. It is also essential to evaluate the organoleptic and physicochemical properties as well as the effect of age and storage temperature on the keeping quality.

Although most work now is concentrated on product formulation, it is important to make a start on the optimization of process parameters as well. Two sets of parameters are of interest: Those applying to pretreatment and those of the UHT process itself.

Pretreatment covers the whole process of preparation – mixing, blending, heat treatment, etc. – that the product undergoes before it enters the UHT line.

Optimization of this procedure – the conditions and the equipment used – is essential for a consistently high quality end product.

Certain parameters in the UHT process itself can be varied. This possibility, of course, will depend on the individual product. For most dairy products, optimum UHT parameters usually prove to be the same as the normal operating conditions for full scale STERITHERM and VTIS plants on normal white milk. The advantage of this is that the same operating conditions can be used for a wide variety of products.

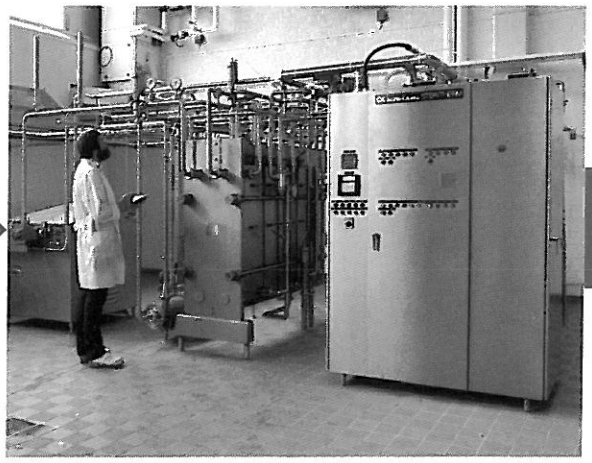
For certain other products, the STERILAB offers the possibility of studying the effects of varying technological parameters such as:

- Temperature program
- Holding time
- Heating method, indirect or direct (optional)
- Deaeration or not (optional)
- Aseptic or non-aseptic homogenization
- Homogenizing pressures and temperatures

At the same time, STERILAB can be used to study heat related properties of the product like stability, sensitivity, and heat resistance of spores.

If the results of the STERILAB trials are favourable, the last stage of the development work consists in scaling up the whole process to commercial proportions. The results from STERILAB tests give valuable information of how to convert the production to STERITHERM and VTIS plants.

UHT products



STERILAB-ranging from pasteurization to UHT treatment

The STERILAB plant has built-in flexibility. It can be used for a wide variety of test programs, covering all kinds of heat treatment from low-temperature pasteurization to UHT-treatment. This flexibility enables the STERILAB to be used for pilot-scale evaluation of products and processes outside the UHT range.

STERILAB - for laboratories in industry and institutions

The STERILAB is primarily intended for new product development work in the laboratories of the food and dairy industry. Its simple construction and ease of operation also make it suitable for schools, universities and other scientific institutions with an interest in food technology. Here the STERILAB gives an insight into the UHT technique as such and stimulates study of the properties of liquid UHT products.

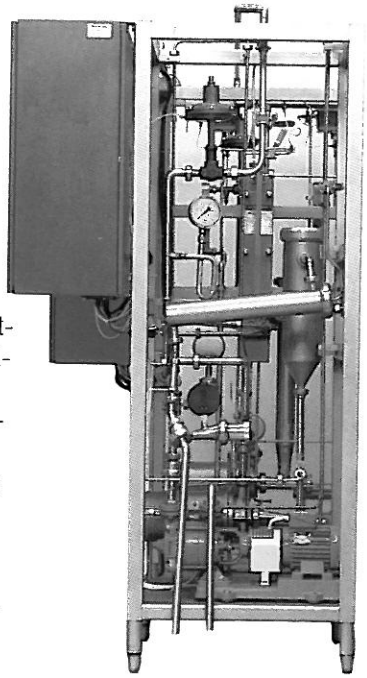
The need for a UHT laboratory plant has existed ever since the UHT sterilization method was introduced in the fifties. Alfa-Laval has already supplied more than 50 UHT pilot plants to the food industry and institutions around the world.

But nothing stands still. The design of the laboratory plant has to keep pace with developments in full-scale equipment. Today's STERILAB is the 3rd generation of Alfa-Laval UHT pilot plants, and incorporates all the advances made over the years in the design of UHT equipment. It is a complete, pre-assembled and tested unit, supplied ready for installation.

The compact STERILAB

The STERILAB is built up on a robust framework. The basic unit is fitted with four plate heat exchangers for indirect heating, as well as all necessary pumps, valves, pipes, fittings, temperature control equipment, etc.

All controls, instruments and guards are mounted on a panel, which also contains contactors and electrical connections.



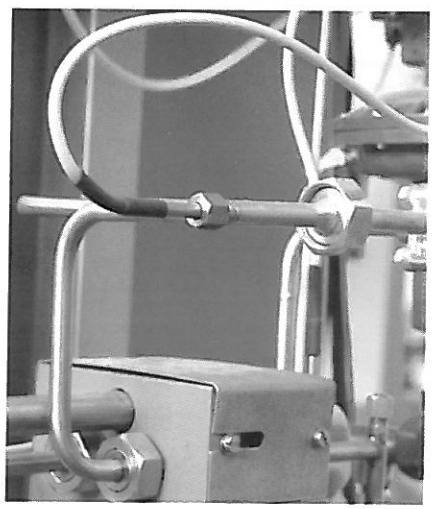
Equipment for direct heating of the product is available as a separate, optional module. Final heating is by steam injection and the following cooling operation by expansion in a vacuum chamber. When indirect heating is used, the vacuum chamber can be utilized for deaeration.

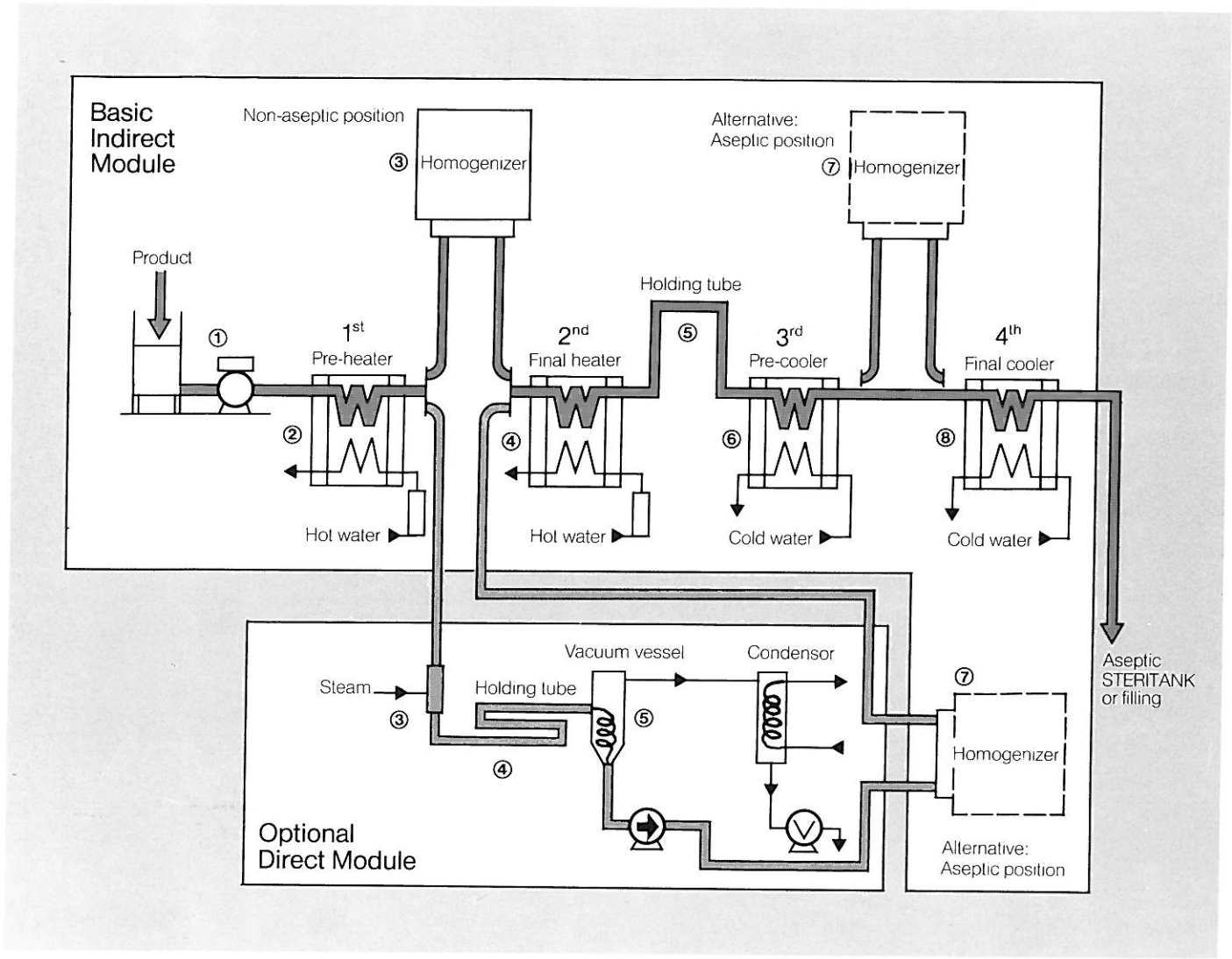
A homogenizer with a capacity of 100 litres/hour (26 US gal./h) is supplied with the pilot plant. As it is an aseptic homogenizer, it can be fitted either before or after sterilization for comparative studies.

Purpose designed

Laboratory equipment must be easy to operate. Therefore in the design of STERILAB extra special attention has been paid to making it easy for the non-specialist to conduct practical trials.

Temperatures are important in STERILAB tests. Consequently eleven temperature transmitters are fitted at strategic points in the process, and the crucial temperatures can easily be read off from a digital display on the control panel. A multi temperature recorder can be fitted as an alternative to the digital display.





The STERILAB **indirect** heating process

The successive stages of the continuous indirect process are:

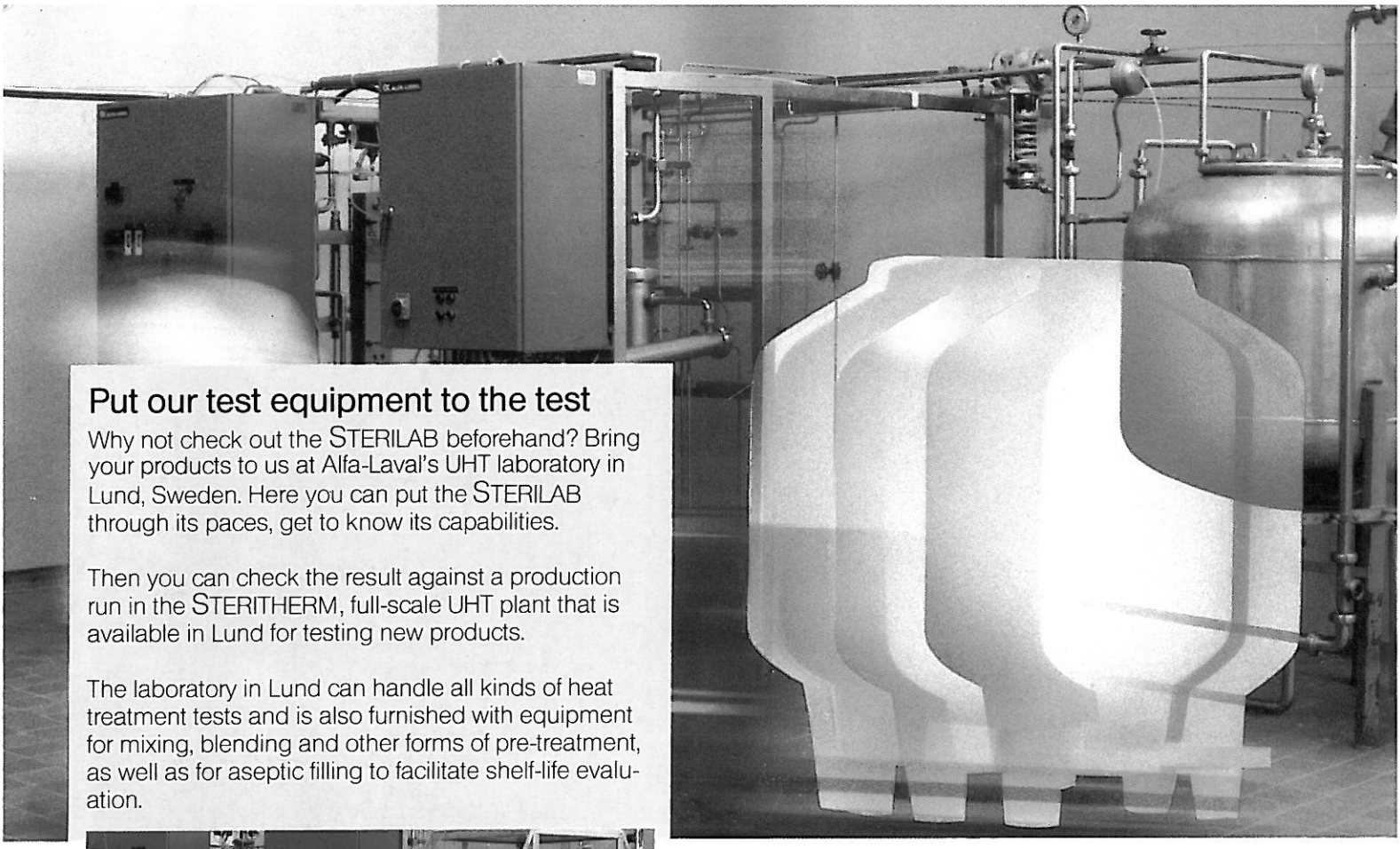
Pos. 1. Product supply from balance tank and feed pump.
2. Preheating in the first plate heat exchanger to approx. 75 °C (167 °F) with hot water.
3. Homogenization (if non-aseptic position is being tested).
4. Final heating to sterilization temperature in second plate heat exchanger to approx. 137 °C (279 °F) with hot water.
5. Holding at sterilization temperature for about 4 seconds in a holding tube.
6. Cooling in the third plate heat exchanger with water.
7. Homogenization (if aseptic position is being tested).
8. Final cooling in the fourth plate heat exchanger with water down to filling temperature.

Note:
The above temperature programs are used for the most common dairy products and correspond to those for full-scale production in STERITHERM and VTIS plants. Variations are, of course, possible for both small scale and full scale plants within certain limits.

The STERILAB **direct** heating process

With the optional direct module connected to the basic module, a direct heating program can be run. The successive stages are:

Pos. 1. Product supply from balance tank and feed pump (same equipment as in the indirect process. This applies also to positions 2, 6, 7 and 8).
2. Preheating in the first plate heat exchanger to approx. 80 °C (176 °F) with hot water.
3. Direct heating by steam injection to sterilization temperature of approx. 140 °C (285 °F).
4. Holding at sterilization temperature for about 4 seconds in a holding tube.
5. Flash cooling to approx. 81 °C (178 °F) in a vacuum vessel. This temperature is precisely controlled to keep the amount of water evaporated exactly equal to the amount of steam injected so that the original solid content is not altered.
7. Homogenization with aseptic homogenizer.
6. Cooling in the third plate heat exchanger with water.
8. Final cooling in the fourth plate heat exchanger with water down to filling temperature.

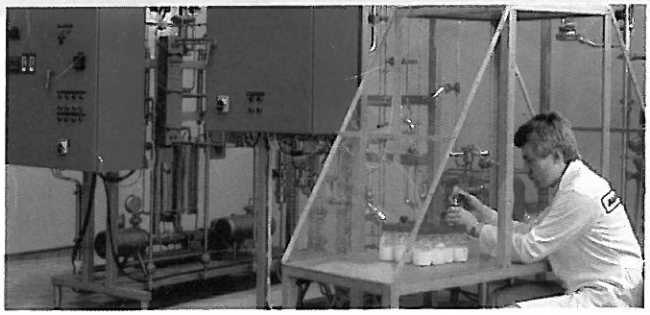


Put our test equipment to the test

Why not check out the STERILAB beforehand? Bring your products to us at Alfa-Laval's UHT laboratory in Lund, Sweden. Here you can put the STERILAB through its paces, get to know its capabilities.

Then you can check the result against a production run in the STERITHERM, full-scale UHT plant that is available in Lund for testing new products.

The laboratory in Lund can handle all kinds of heat treatment tests and is also furnished with equipment for mixing, blending and other forms of pre-treatment, as well as for aseptic filling to facilitate shelf-life evaluation.



Product and shelf-life testing

The ultimate test of UHT-treatment is the time the product can be stored with retained quality – its shelf-life. After processing in STERILAB, the product can be packaged and stored in a manner suitable for the test concerned.
Alfa-Laval can offer the following alternatives:

Test cabinet

Aseptic conditions can be obtained if pre-sterilized bottles are filled directly from STERILAB in a cabinet where an overpressure is maintained by filtered sterilized air. This preliminary method is adequate for many tests at an early development stage before the type of packing is decided.

STERITANK

If there is access to an aseptic filling machine in the laboratory, it is convenient to combine the STERILAB with a STERITANK for laboratory duty. This is a manually operated aseptic buffer tank with a volume of 600 litres (158 US gal.).

Transportable STERITANK

In many cases there is no direct access to aseptic filling machines in the laboratory. Then the transportable STERITANK offers a practical solution. The product can be transported in this tank under aseptic conditions to the filling hall within the plant or to the nearest factory with aseptic filling equipment. This saves the extra investment of an aseptic filler in the laboratory.

The Alfa-Laval UHT range

Alfa-Laval can supply a complete range of aseptic processing equipment including the UHT plants necessary for rational production of long-life liquid foods.

STERITHERM®	UHT plant with indirect heating in plate heat exchanger. Capacities from 1,000 to 30,000 litres/hour (265 – 7,950 US gal./h).
VTIS™	UHT plant with direct heating by steam injection. Capacities from 1,000 to 20,000 litres/hour (265 – 5,300 US gal./h).
STERITANK™	Aseptic storage tank. Size range 600 – 30,000 litres (158 – 7,950 US gal.)
STERILAB™	Pilot plant for UHT and other heat treatment tests. Indirect heating with optional direct heating facility. Capacity 100 litres/hour (26 US gal./h).

ALFA-LAVAL
FOOD & DAIRY ENGINEERING

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