Evaporators and condensers in a new dimension

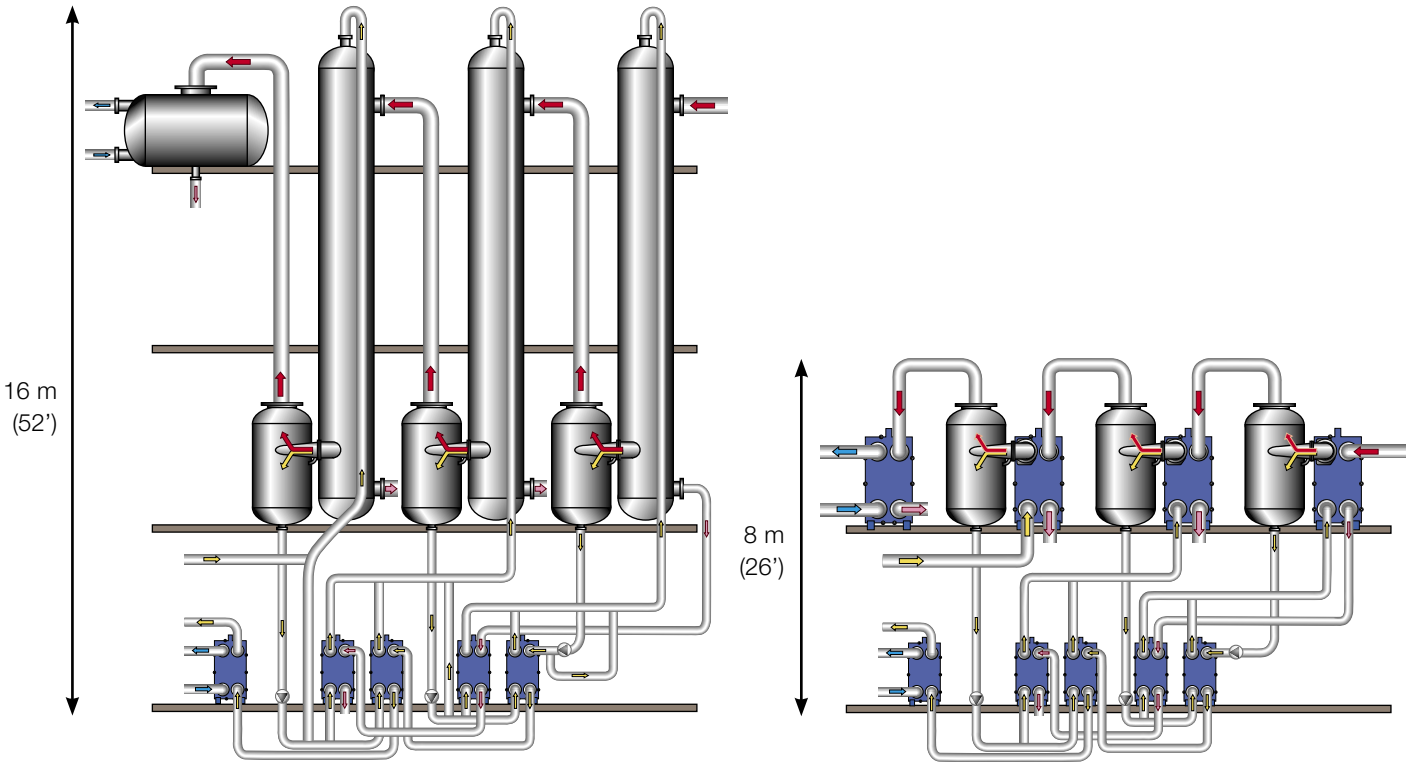
The complete range

Optimize your performance

Drawing on a complete portfolio of Alfa Laval evaporation and condensation solutions enables you to optimize the performance of your process better than ever before.

From space-saving AlfaVap and AlfaCond units to the renowned FilmVap falling-film evaporators and from fouling-resistant AlfaFlash evaporators to ConVap scraped-surface evaporators, Alfa Laval provides you with the most effective way to achieve the best performance.

Why use AlfaVap and AlfaCond?



Comparison between shell-and-tube and AlfaVap for a three-effect system that evaporates NaOH from 32 to 50%. The savings in installation costs and space are clearly apparent from the layouts shown above.

Save money

The unique designs of AlfaVap and AlfaCond provide substantially higher thermal efficiency than conventional shell-and-tube units, which means much less heat transfer area is needed. This makes AlfaVap and AlfaCond extremely economical, especially when exotic materials such as SMO, titanium, nickel and Hastelloy are required.

Save space

The compact, versatile design of AlfaVap and AlfaCond means that transportation, erection and installation costs are all drastically reduced compared to conventional shell-and-tube units.

Easy maintenance

The plate construction of AlfaVap and AlfaCond means that the heat transfer surfaces are easily accessible for inspection or mechanical cleaning, simply by removing the tightening bolts and rolling back the pressure plate. The special corrugated patterns ensure a high degree of turbulence over the whole plate. This turbulence not only reduces fouling but also makes chemical cleaning very effective. In addition, due to the low hold-up volume of both AlfaVap and AlfaCond, only very small amounts of cleaning chemicals are needed compared to shell-and-tube installations.

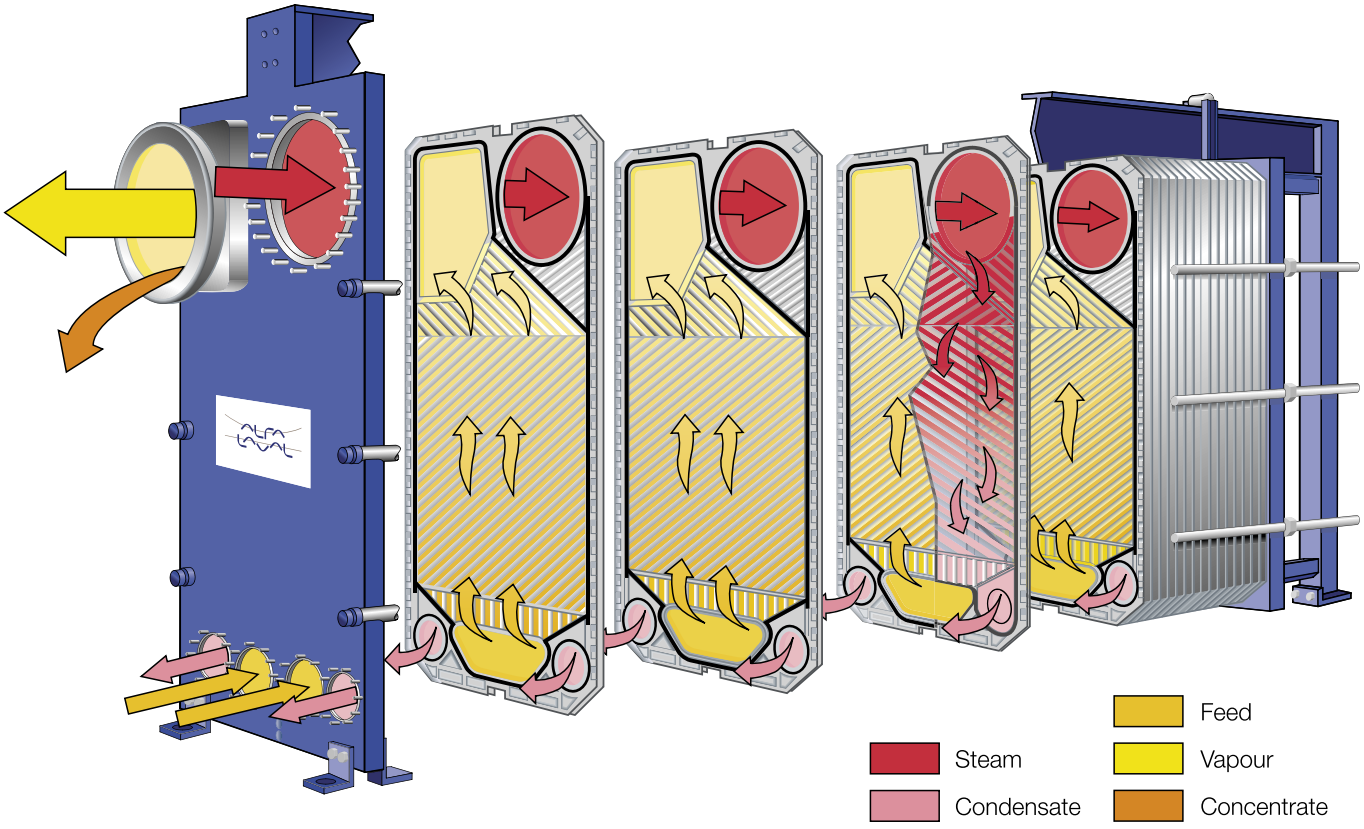
Easy to increase capacity

AlfaVap and AlfaCond make it easy to adjust capacity to meet changing needs, simply by adding or removing plates, while retaining the existing frame. This is a major advantage in relation to shell-and-tube units, where capacity is fixed at the level decided on at the time of installation.

AlfaVap

The AlfaVap plate evaporator is the result of development work done in collabor-ation with beet sugar manufacturers in the late 1980s. This new type of cost-effective rising film evaporator rapidly became a success in the beet sugar industry and has subsequently spread to many other applications.

There are currently more than 3000 AlfaVap evaporators installed in different applications all over the world, and Alfa Laval provides a complete range of AlfaVap evaporators for a wide selection of applications and capacities.



How it works

AlfaVap is tailor-made for evaporation, with two small inlet feed connections and a large outlet for the vapour and concentrate. There is one large inlet connection for the heating steam, and two small outlets for the condensate.

AlfaVap uses the cassette concept with the plates welded in pairs. The heating steam is condensed in the welded channels while the evaporated product passes through the gasketed channels.

Why use AlfaVap?

High heat transfer efficiency

The special corrugated plate pattern induces a high degree of turbulence, providing substantially better heat transfer coefficients than conventional shell-and-tube evaporators. AlfaVap is especially efficient at high concentration and high viscosities, and can work with temperature differences down to 3–4°C. This is a big advantage when AlfaVap is used in TVR and MVR systems.

Cost saving

High heat transfer efficiency means that much less heat transfer area is needed compared to shell-and-tube evaporators. This makes AlfaVap extremely economical, especially when exotic materials such as SMO, titanium, nickel and Hastelloy are required. In addition, the compact and flexible design of AlfaVap drastically reduces transport, erection and installation costs compared to shell-and-tube units.

Less fouling and easy maintenance

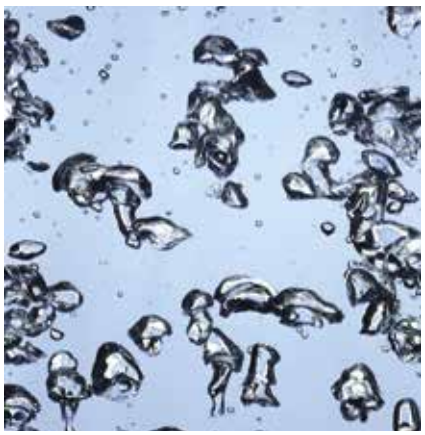
The high turbulence over the whole plate does not just reduce fouling but also makes chemical cleaning very effective. Due to the low hold-up volume, only very small quantities of cleaning chemicals are needed compared to shell-and-tubes. The flexible design of the AlfaVap means the heat transfer surfaces are easily accessible for inspection or mechanical cleaning by simply removing the tightening bolts and rolling back the pressure plate.

Easy to increase capacity

A popular feature of AlfaVap is that the capacity can be increased or reduced by just adding or removing cassettes in the existing frame. This is a major advantage in relation to shell-and-tube evaporators, where capacity is fixed at the level decided on at the time of installation.

Improved product quality

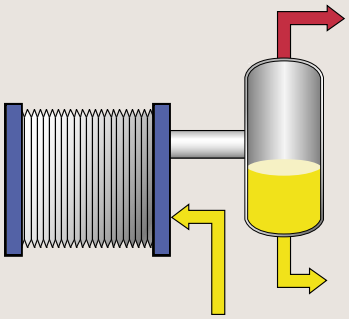
The extremely low hold-up volume means that very little product is actually in the AlfaVap at any given time. The short time the product spends in the evaporator is a big advantage for heat sensitive products. It also permits rapid start-up and shut down, with only minimal waste.



AlfaVap working modes

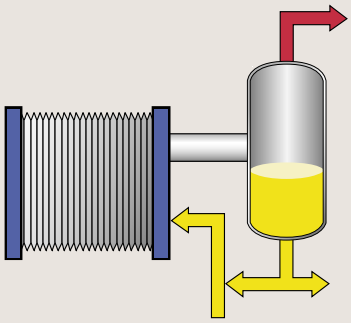
Once through

Due to the rising film concept and the high turbulence, AlfaVap provides excellent wetting ability, which means that a once-through evaporation process can often be used. In a co-current system, this means no pumps are needed between the effects. In a counter-current system, it means that recirculation pumps are not necessary – only transportation pumps are needed. The once-through mode also gives extremely low residence time.



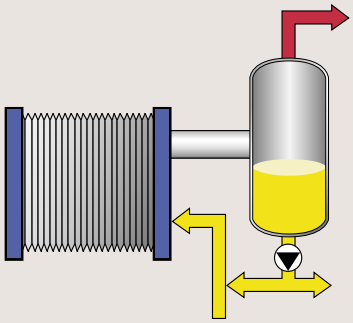
Thermosiphon

In the thermosiphon mode, natural circulation is used, rendering recirculation pumps unnecessary. This mode is used when the outlet vapour fraction is too high for a once-through evaporation process. The thermosiphon mode is also used for AlfaVap when used as a reboiler in distillation systems.



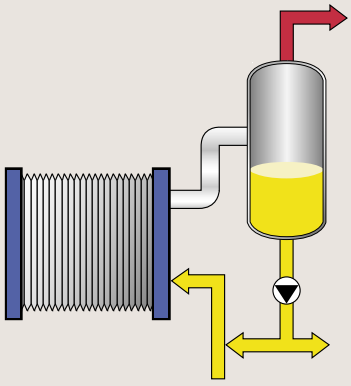
Forced circulation with boiling

This mode is used when the evaporated product has a tendency to foul. The forced circulation increases the wetting and turbulence and thus minimizes any fouling tendency.



Forced circulation with flashing

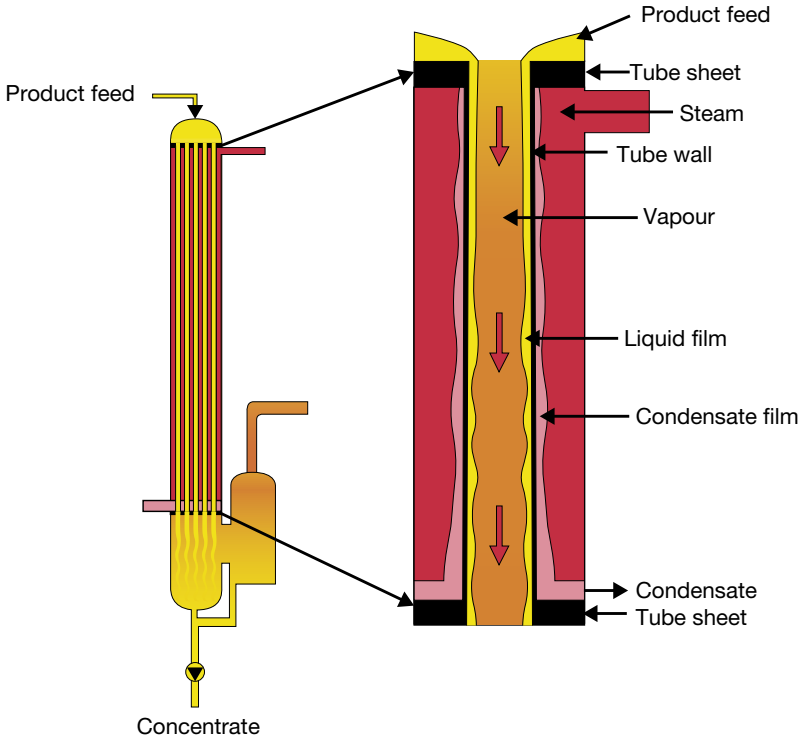
This mode is used when the evaporated product could cause considerable fouling or when crystallization takes place during the evaporation process. The evaporated liquid is recirculated so rapidly that boiling cannot take place in the evaporator, and the liquid is thus just heated. The actual evaporation then takes place when the liquid flashes into the separator vessel. A special type of AlfaVap with a wider gap is used for this mode, to minimize the fouling.



FilmVap evaporators

Alfa Laval FilmVap tubular falling-film evaporators are well proven and mechanically reliable. An innovative arrangement featuring more efficient vapour separators ensures a smaller footprint than with other falling-film designs.

These evaporators can process clear, non-fouling liquids as well as moderately fouling liquids, as a result of optimally configured FilmVap liquid distributors.



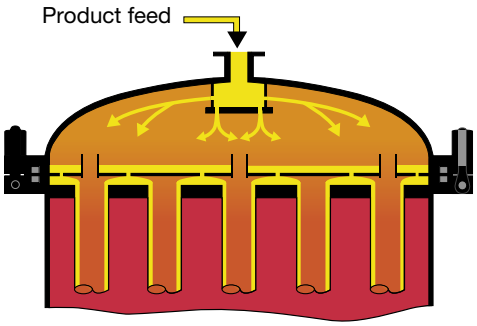
The right configuration and the ideal combination of Alfa Laval FilmVap evaporators and forced-circulation evaporator provide reliability as well as savings on both energy and cleaning in certain applications that include vinasse.

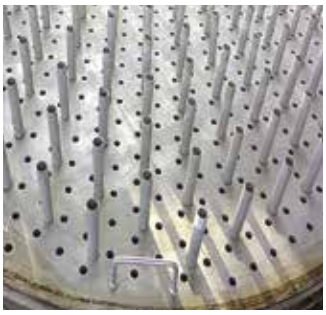
Liquid distribution – key element in falling-film evaporators

The liquid distributor is the most critical component in any falling-film evaporator. The optimized design of the liquid distributor helps prolong uptime and reduce CIP costs. It also reduces any additional effluent generation stemming from CIP, as well as the treatment costs involved.

Platter distributor

The combination of uniform distribution of liquid in a platter distributor and adequate wetting helps to avoid inefficient distribution and significantly reduces fouling in the tubes.
The vent tubes maintain pressure equilibrium above and below the distributor plate as well as maintaining a consistent static weight of liquid on the distribution plate.





Jet distributor

Another type of liquid distributor available in Alfa Laval FilmVap evaporators is the jet distributor, fitted with solid cone spray nozzles.

The size and quantity of these nozzles depend on the liquid flow and the tube sheet diameter in the heat exchanger.

The larger hole size compared with a platter distributor reduces the risk of blocking the nozzle and ensures even distribution to the tubes.

Alfa Laval expertise

- Practical experience with a wide range of applications
- More than four decades in the evaporation business with more than 900 installations worldwide
- Approved by a wide range of national and international consultants
- Experience in the use of exotic materials in evaporators and condensers

The right configuration makes it possible to concentrate corn steep liquor to 50% dry solids in this three-effect FilmVap evaporator, heated by waste vapour.

AlfaFlash

The AlfaFlash is a plate evaporator, working as a forced circulation flash evaporator, often used in the final concentration step as a finisher. It is designed with a high wall shear to minimize viscosity (in case of a shear thinning product), fouling and to maximize time intervals between cleaning. The considerably higher shear rate (already at quite moderate flows) leads to substantially higher heat transfer efficiency, much smaller pumps and significantly lower pump costs.

ViscoVap

Designed for evaporation duties with fibres and larger particles, the ViscoVap is the perfect evaporator for purées such as tomato and mango, as well as being a suitable finisher in systems such as effluent evaporation.

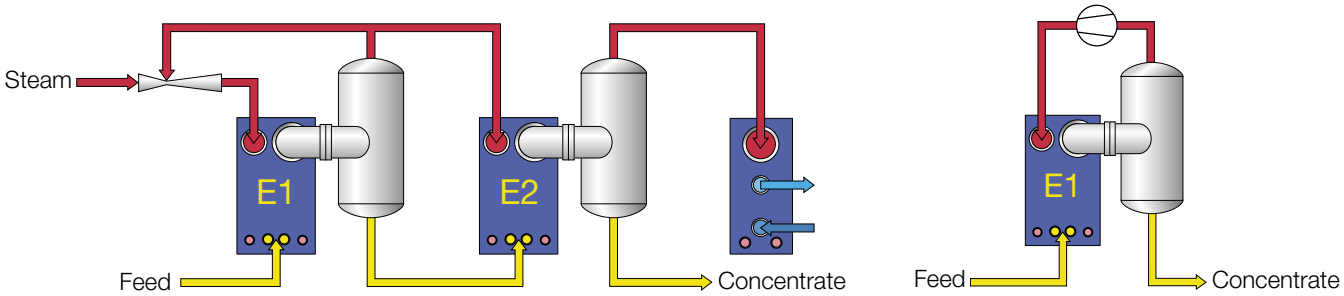
ConVap

Convap® is a specially modified Contherm® unit designed as a continuous scraped-surface evaporator. This makes it particularly suitable for concentrating viscous, sticky and/or heat-sensitive products that tend to cause fouling.

Convap can effectively concentrate products to extremely high solids levels – in some cases up to 99%. And it is often used to process products that rapidly become viscous as they undergo concentration.

Convap can also serve as a pre-evaporator for any type of drier, because it makes the overall process from concentration to drying more efficient.

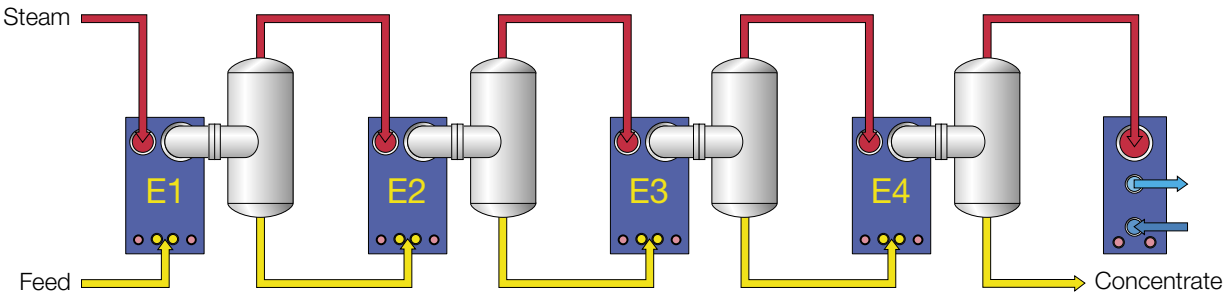
Thermal and mechanical vapour recompression systems



AlfaVaps used in a two-effect TVR system in a sugar refinery in Malaysia. An existing parallel falling film shell-and-tube system can only deliver fine syrup to a concentration of 71 Brix. The AlfaVap system concentrates all the way to 75 Brix without recirculation, achieving a very short processing time. This results in a better product quality, and provides simpler and faster start-up and shut-down procedures.

Mechanical vapour recompression system to concentrate effluent. Steam consumption reduced to zero.

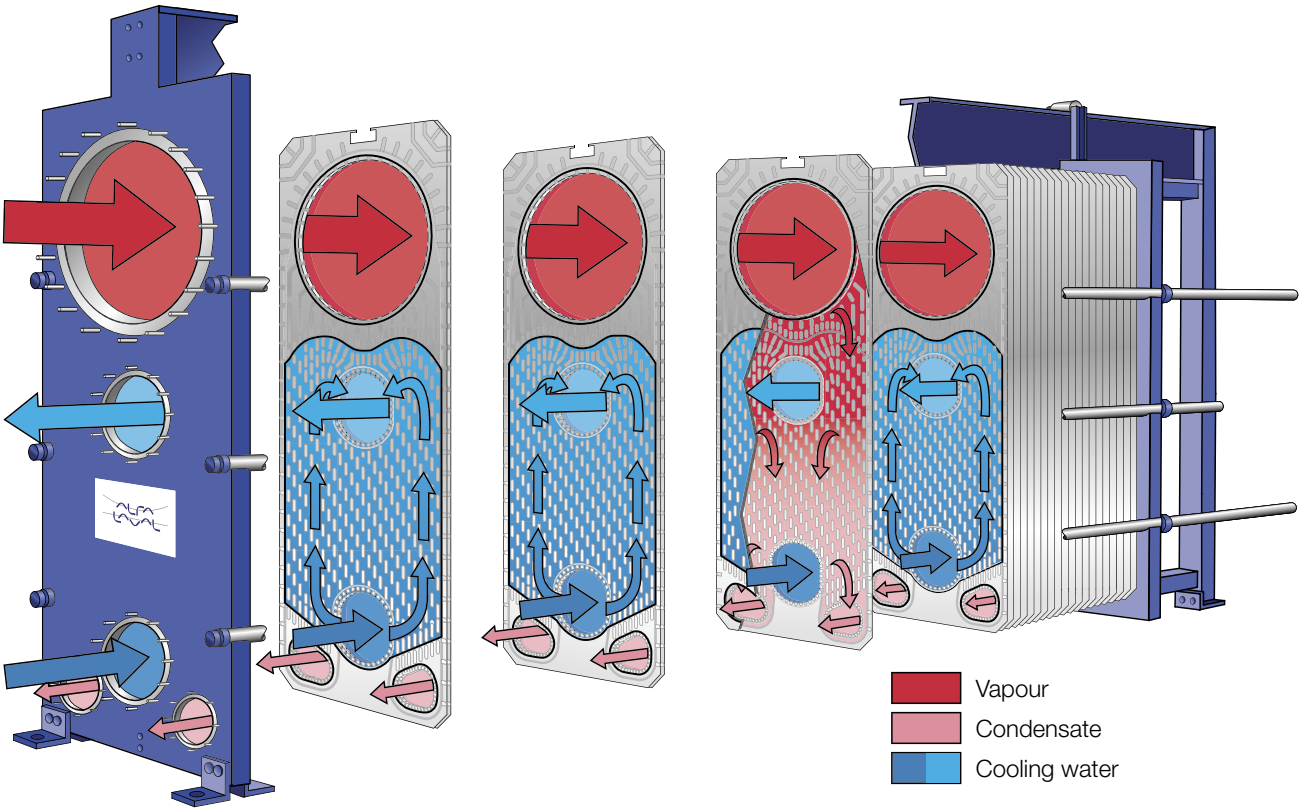
Multi-effect evaporation systems



A three-effect system that evaporates NaOH from 32 to 50% at Akzo Nobel in Sweden. The system was built by the contractor Chematur Ecoplanning, using AlfaVap and AlfaCond. The need for exotic materials such as nickel makes the AlfaVap exceptionally economical in this application.

AlfaCond

AlfaCond is the world's first tailor-made plate condenser. It was developed specifically for condensing vapours under low pressure/vacuum conditions in evaporation and distillation systems. A whole range of AlfaCond condensers is available to suit specific applications and capacity requirements.



How it works

AlfaCond is tailored for vacuum condensation. The vapour inlet connection is very large whereas the two condensate outlets are small. The cooling water connections are medium-sized and located in the centre of the plate.

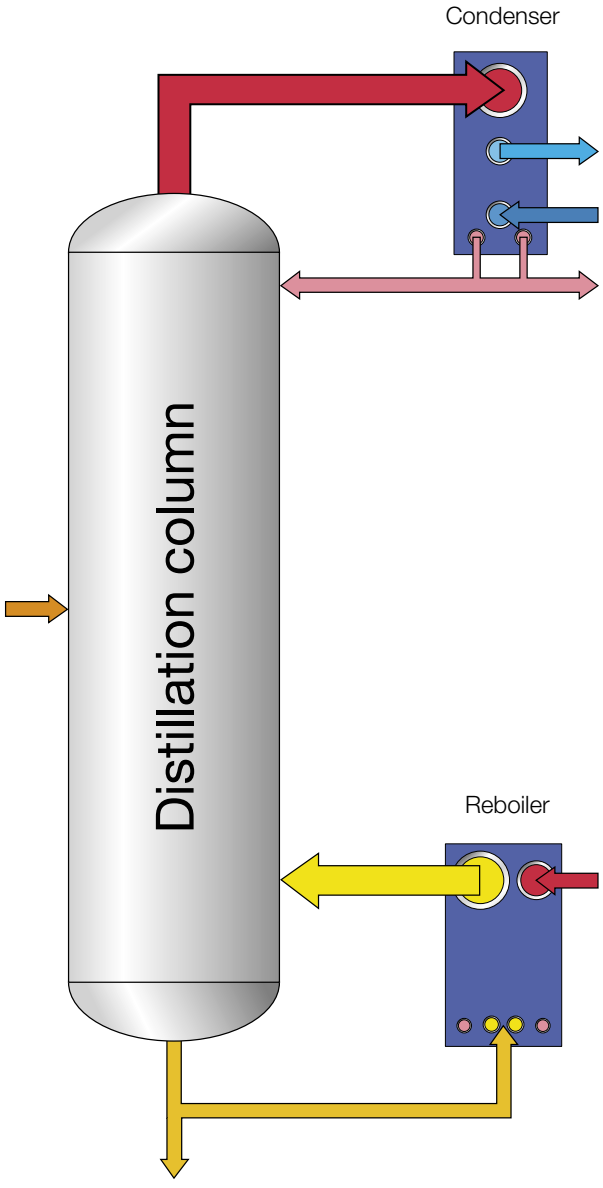
AlfaCond consists of a plate pack with plates welded together in pairs forming so-called cassettes. The cassette concept gives rise to two different type of channels – welded channels used for the condensing vapour and gasketed channels used for the cooling water.

The plate pattern is specifically designed for optimal condensation, with an asymmetric configuration that features a large gap on the vapour side and a small gap on the cooling water side. This makes it possible to maintain a very low pressure drop on the vapour side while keeping up the velocity and turbulence on the water side. This maximizes the heat transfer efficiency and minimizes fouling.

Why use AlfaCond?

- **Lower costs** because the high heat transfer efficiency means that much less heat transfer area is needed compared to a conventional shell-and-tube. This makes AlfaCond more cost effective, especially if stainless steel or titanium is required. The compactness of the design also saves space, which reduces transport, erection and installation costs.
- **Less fouling** on the cooling water side compared to shell-and-tube condensers, due to the high turbulence created by the special design of the corrugated plates.
- **Easy cleaning** of the cooling water side using either mechanical or chemical means.
- **Easy to increase capacity** by just adding extra cassettes in the existing frame.
- **Fully counter-current flow**, which makes it possible to sub-cool the non-condensable gases better than in a comparable shell-and-tube installation. This reduces the load on the vacuum pump.

AlfaVap and AlfaCond as reboiler and condenser in distillation systems



Ethanol condenser at The Absolut Company in Sweden. All the columns at The Absolut Company's Åhus distillery use Alfa Laval reboilers and condensers. The Alfa Laval units were chosen because of their compactness compared to corresponding shell-and-tube solutions.

AlfaVap thermosiphon reboiler at Carboneco in Spain. The AlfaVap is used to boil 30% MEA at the bottom of the stripping column. The absorption-stripping system at Carboneco is used to recover carbon dioxide from a cogeneration plant. The system was built by the Danish contractor Union Engineering.

Examples of installed applications

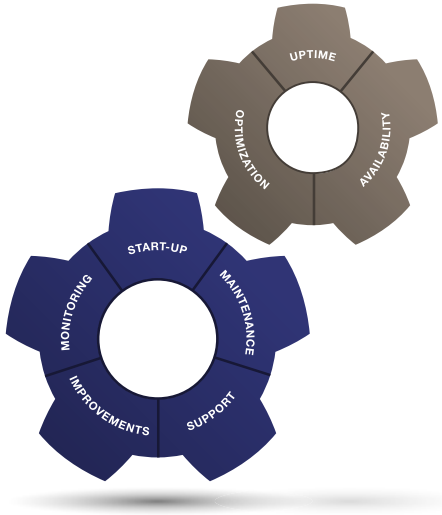
There are more than 3000 AlfaVap and/or AlfaCond installations in different applications all over the world. Alfa Laval can provide a complete range of AlfaVap and AlfaCond units for a large range of applications and capacities. Some of the applications where AlfaVap and/or AlfaCond units are installed include:

Alumina liquor	Ferric chloride	Lysine
Ammonium lactate	Fish and meat extract	Maltodextrine
Ammonium nitrate	Fish and meat stick water	Maltose
Beet sugar	Fish silage	MEA reboilers
Calcium chloride	Fructose	Polyols
Cane sugar	Fruit juice	Soap
Copper electrolyte	Gelatine	Sodium chloride
Corn steep liquor	Gluconic acid	Sodium hydroxide
Dextrose	Glucose	Sodium sulphate
Effluent streams	Glycerine	Sorbitol
Electrolytes	Hydrolysate	Stillage
Ethanol reboilers	Kaolin	Waste waters
Ethylene glycol	Lactic acid	Vinasses

AlfaVap and AlfaCond used in a two-effect evaporation system installed in the fishmeal plant Conresa in Spain. The AlfaVap system concentrates stick water from 12% up to 40%. “We needed an evaporation system that fitted into our existing building,” says Mr Cobas, Managing Director. ”With the unique compactness of the AlfaVap system, this became a natural choice. A conventional falling film shell-and-tube system would have required a whole new building.”

Extending performance

with Alfa Laval 360° Service Portfolio



Our team is committed to supporting you with our knowledge and skills, to keep you confident in your Alfa Laval equipment over time. Working with us and our partners secures equipment uptime and optimization, plus the availability of parts and expertise for a maximum return on investment.

Alfa Laval's vast process and application knowledge, the result of over 130 years in business, is put to your benefit through our extensive 360° Service Portfolio.

The 360° Service Portfolio helps you maximize return on investment throughout your equipment's life cycle. With its services, you can count on optimal equipment performance, time and time again.

START-UP
- Installation
- Installation Supervision
- Commissioning
- Commissioning Supervision

MAINTENANCE
- Cleaning Services
- Preventive Maintenance
- Reconditioning
- Repair
- Service Kits
- Service Tools
- Spare Parts

SUPPORT
- Exclusive Stock
- Technical Documentation
- Training
- Troubleshooting

IMPROVEMENT
- Equipment Upgrades
- Redesign
- Replacement & Retrofit

MONITORING
- Condition Audit
- Performance Audit

Top performance - now and in the future

Alfa Laval Performance Agreements are individually tailored service agreements that can include any of the services in the extensive Alfa Laval 360° Service Portfolio. Performance Agreement maximizes return on investment and is based on a fixed yearly service cost, which makes budgeting simpler.

PERFORMANCE
AGREEMENTS

Alfa Laval in brief
Alfa Laval is a leading global provider of specialized products and engineering solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuffs, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

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