



Haarslev Industries Evaporators

Combines many years of experience from the companies *Atlas-Stord* and *Hetland*.

Haarslev evaporators maximize the use of raw materials, increase plant yields and reduce energy consumption while minimizing the environmental impact. Applications range from the fish meal and rendering industries to the alcohol beverages and bioethanol industries.

Haarslev evaporators can be incorporated into many chemical and biochemical industries, satisfying the needs of recycling concentrated waste into useful products. The benefits are twofold: increased output and improved energy efficiency.

Optimal evaporator design

Haarslev Industries takes a number of factors into consideration when choosing the optimal evaporator design for a specific application. Capital investment and operating costs, raw material type, ease of operation, plant capacity, desired degree of concentration, flexibility and available space.

Waste heat is used whenever it is technically possible and cost effective. Waste heat evaporators can be installed in series with steam heated evaporators, the first effects provide for the initial

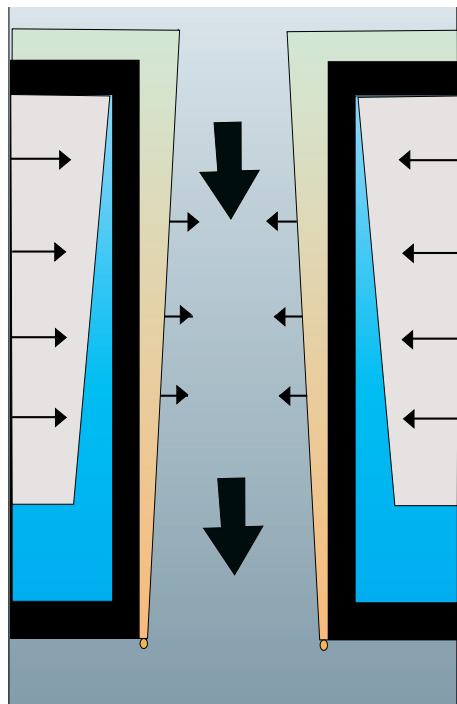
concentration and the last steam heated effects for the final concentration. This combination gives extra high concentrations, resulting in exceptionally good plant economy, flexible operation and larger production capacities.

The most commonly used evaporator systems utilize the falling film and flash evaporation technologies. These principles can be combined with different energy sources such as recompressed vapor, live steam and waste heat.



The falling film principle provides extra benefits

The process liquid is fed to the top of the evaporator stage, where it is distributed to the individual tubes. The liquid forms a thin film as it flows down the internal tube surface, driven by gravity and water evaporation.



Vapour
 Condensate
 Process liquid / concentrate

The falling film principle provides short retention time, combined with relatively low operating temperatures, which keep product degradation at a minimum.

The short retention time ensures quick start-up and shutdown of the operation adding to its flexibility. Quick start-up and shutdown combined with automatic control save manpower.

Automatic cleaning-in-place (CIP) is an optional feature for easy maintenance and maximum utilization of the heating surface.

Haarslev Industries WHE and SHE models are of the falling film principle.



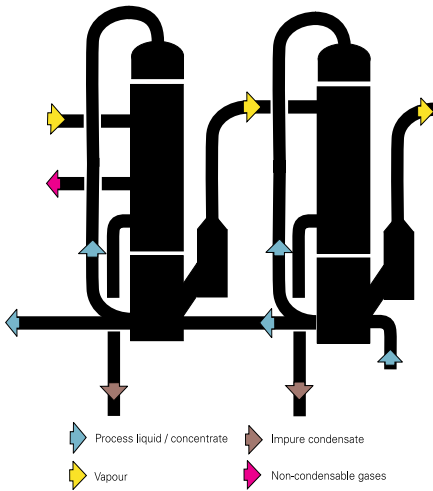
WHE for comprehensive heat recovery

The fact that air containing water vapor may give off moisture by condensation is well known from dew on windows or glasses.

Likewise, all gases containing vapors may be caused to form moisture when cooled to sufficiently low temperatures. Process gases in industrial operations contain large amounts of – primarily – water vapor which may be utilised by cooling the gas and thereby releasing the heat of condensation.

Drying operations, in particular, are often performed at atmospheric pressure, and the discharge from the drier is likely to consist of a mixture of air and water vapor. By cooling such gases in a WHE, a small or large part of the heat energy used in the drying process may be recovered in the waste heat evaporator.

In the case of process vapors with very small amounts of non-condensables – e.g. from traditional multistage evaporators – all heat energy may be recovered in the WHE.



The benefits of a WHE installation can be summarized as:

- Low investment and operating costs
- Comprehensive waste heat utilization
- No need of live steam supply
- Minimized impact on product
- Quick start-up and shutdown
- Flexible and easy operation



SHE for extra production capacity

The *Haarslev Industries* Steam Heated Evaporator – SHE operates with the falling film principle as the WHE, and thus it can be considered a WHE independent of waste heat. The SHE utilizes live steam as energy source, allowing for higher concentrations of the solution.

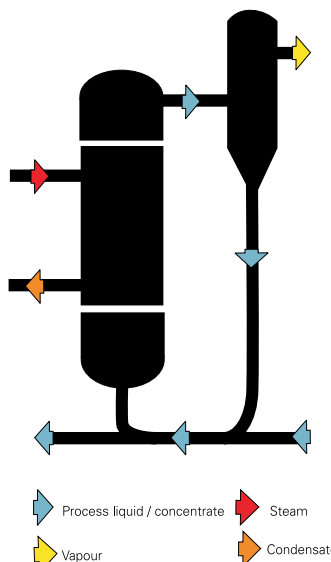
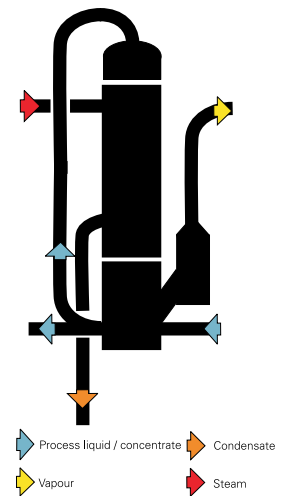
Several SHE effects can be installed. Additionally a SHE evaporator can be installed as a finisher connected to WHE effects for boosting the capacity.

The advantages of the SHE are similar to those of the WHE:

- Low investment costs
- Quick start-up and shutdown
- Flexible and easy operation

Additional benefits of the SHE installed together with WHE effects are:

- Minimized time and temperature exposure of products in a highly concentrated liquid
- Higher concentration at lower cost
- Possibility of higher production capacity



FLE provides flexibility and high concentration

The *Haarslev Industries* Flash Evaporator – FLE operates with a principle different from that of the WHE and SHE.

The liquid is heated in the tubes. The evaporation takes place in a flash separator after the pressure has been reduced over a valve. Because no evaporation actually takes place in the tubes, the FLE may be installed horizontally or vertically depending only on the available space. For increased concentration, the FLE can be used as a finisher connected to WHE and SHE effects.

The FLE operates at relatively

high temperatures with a considerable retention time, which can be an advantage with difficult raw materials.

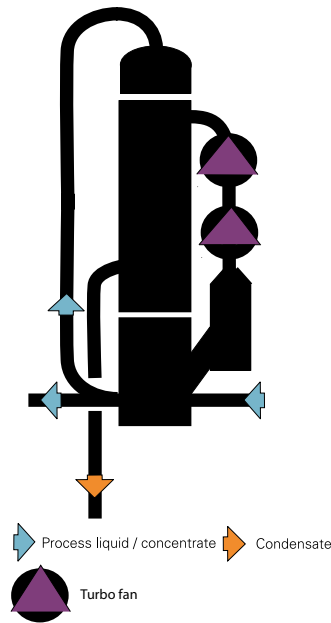
The FLE used as a finisher will normally be steam heated, but alternative layouts utilizing waste energy are also possible.

Contact Haarslev Industries for an optimal solution to your evaporation requirement.

The benefits of the FLE are:

- Flexibility in installation
- Steam or waste heat utilization
- Extra high concentration

CONTACTS



Mechanical Vapour Recompression Evaporator with Turbo Fans

The MVR evaporator is the most energy efficient evaporator.

In the MVR evaporator the vapor will be recompressed to a higher energy level and used as energy source for the evaporator of the stick water.

A single stage MVR evaporator operating with turbo fans may use from 29 to 34 HP per tonnes of evaporated water.

A two-stage MVR evaporator, with a CIP system, is cleaning in one stage while the other stage is operating. This system reduces the downtime considerably.

An MVR evaporator operating at atmospheric pressure doesn't require cooling water. An MVR evaporator operating under vacuum requires only a small amount of cooling water. The vapor from the fan is condensed indirectly by the stick water.

Considering normal differences in energy costs between steam and electricity, the operating costs of a single stage MVR evaporator will be approximately 50 per cent lower than for a 3-stage evaporator and approximately 40 per cent lower than a 4-stage evaporator. In a two-stage MVR evaporator the energy costs will be even lower.

DENMARK

Head office

Haarslev Industries

Bogensevej 85

DK-5471 Sønderso

Tel: +45 63 83 11 00

Fax: +45 63 83 11 20

E-mail: info@haarslev.com

Web: www.haarslev.com

USA

Haarslev Inc.

9700 NW Conant Avenue

Kansas City, MO 64153

USA

Tel: +1 816 799 0808

Fax: +1 816 799 0812

E-mail: info-usa@haarslev.com

Branch office

7011-F Albert Pick Road

Greensboro, NC 27409

USA

Tel: +1 336 668 7727

Fax: +1 336 669 0537

E-mail: info-usa@haarslev.com

