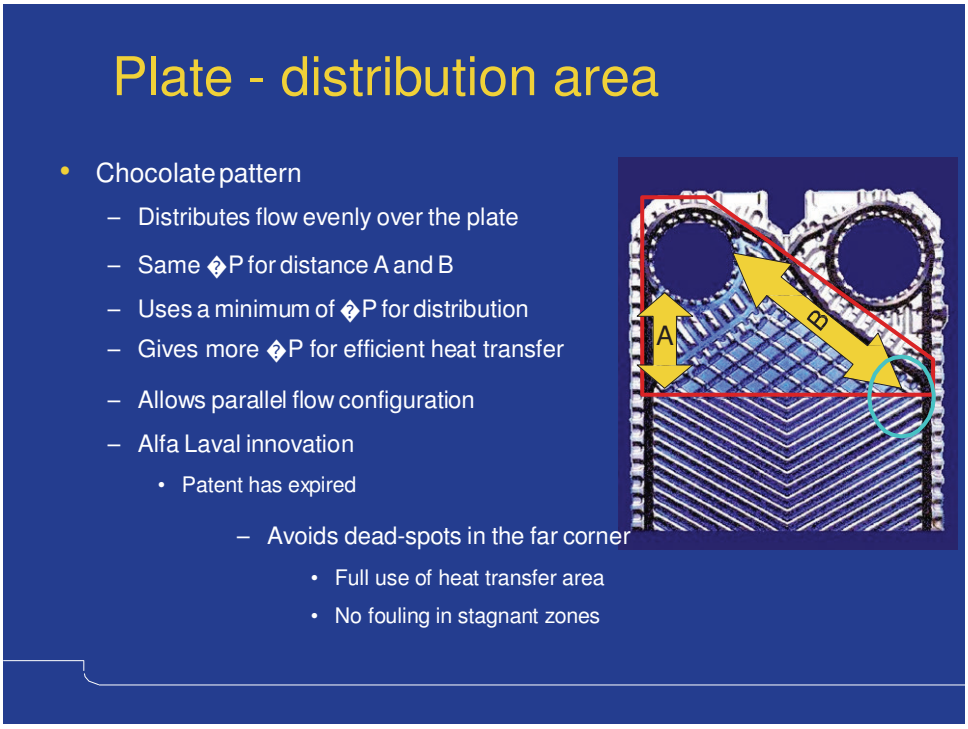
Salient Features of Alfa Laval Plate Heat Exchangers

1. **Single step pressing**. This gives good dimensional tolerances and good performance of Plate Heat Exchanger. This will also allow no “Bypass channels”.

2. **Chocolate pattern for flow distribution**. This is patented by Alfa Laval. This allows good distribution of fluid flow in the channels which increases the performance of Plate Heat Exchanger fully utilizing the heat transfer area.



3. **Five point steering and locking system**. We employ 5 point steering and locking system in our Plate Heat Exchangers so as to avoid vertical misalignment & horizontal misalignment.

4. **Superior bolt closing system**. We employ bearing boxes, long nuts and rolled threads. Bearing boxes facilitate easy opening of bolts during dismantling / tightening of PHEs. The above facilitates longer life, easy and quick service.

5. **Frame is bolted together**. No welds & no welded reinforcement.

6. **Roof top gasket**. We employ roof gasket instead of flat gaskets which increases the life of gasket and increases the performance. Please note that Flat gasket is inferior and the life of gasket is shorter compared to Roof Top gasket.

7. **Good gasket groove design**. The gasket groove in Alfa Laval Plate Heat Exchanger is designed so that the gasket receives even support along both its inner and outer edges. This construction prevents displacement of the gaskets in any direction and helps ensure a longer gasket life.

8. **Gasket expansion space**. The gasket in a Plate Heat Exchanger is subject to thermal expansion owing to temperature differences. Gaskets in Alfa Laval Plate Heat Exchangers are designed with ample space for enlargement without the danger of them being crushed or deformed.

9. **Good sealing system**. We never mix sealing and fastening.

10. Good references & experience for the similar service conditions.

11. We have full-fledged Service Centre at Thane in Maharashtra, Kundli (near New Delhi and Vazag in A.P., to cater to the After-Sales requirement of our valued customers.

12. Full back up from our Principals M/s. Alfa Laval Thermal AB, Sweden.

13. State-of-the-art plate pattern optimized for strength & flow.

14. Availability of spare parts from us.

15. Belief in continuous upgrading of Technology and production techniques by continuous Research and Development.

16. First to introduce innovative products like Semi Welded Plate Heat Exchangers, Wide Gap Plate Heat Exchanger, Graphite Plate Heat Exchanger and completely Welded Plate Heat Exchangers known as "**AlfaRex**".

17. We have adequate design, plant and manufacturing capability and capacity available to perform the works properly and expeditiously within the time period specified.

    In this connection we would like to mention that we have put up a factory at Satara (in Maharashtra) exclusively for the manufacture of Plate Heat Exchangers of the large, medium and smaller size capacity including facilities for pressing plates of small and medium size. The facilities in Satara also include sophisticated cleaning/testing facilities for the plates and assembly, test rigs for hydrostatic testing of the heat exchangers.

    We have full-fledged manufacturing facilities also at our Pune factory which include Computerised Numerical Control (CNC) machinery.

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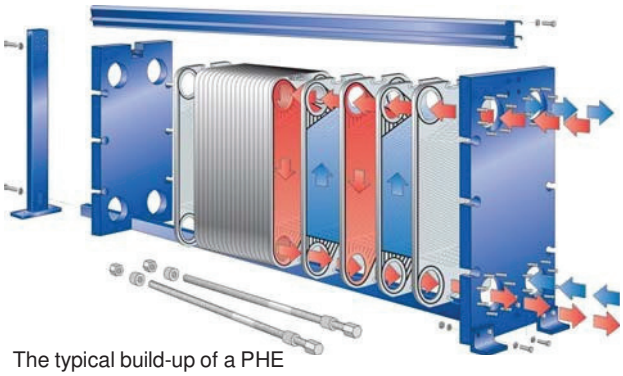
Benefits of Using Alfa Laval Plate Heat Exchangers

Benefits of Using Alfa Laval Plate Heat Exchangers
Plate Heat Exchangers (PHE) have numerous applications. They can be efficiently used for creating a comfortable indoor climate, for cooling in summertime or in tropical zones and for heating in wintertime. They can be used for heating tap water and for heating or cooling pools. They can also be used for taking advantage of surplus heat created in industries and for more environmentally friendly climate control.

A Plate Heat Exchanger is made up of three main components: plates, gaskets and a frame, and can also be completed by various accessories such as insulation, a drip tray and a protection sheet. PHEs are characterized by a flexible and compact design that allows multiple applications, by efficient heat transfer and by good serviceability.

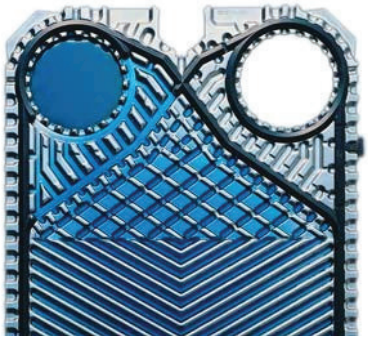


The typical build-up of a PHE

The flexible design has the advantage of allowing the customer to choose from a very wide range of products to meet their specific requests. The size of the PHE as well as the number of plates can be customized. A PHE can thus be used in almost any environment and for a number of purposes. The compact design allows usage even in cramped spaces, such as in one-family homes. The plates in a PHE used for heating and cooling are generally made of stainless steel but can be made in any pressable material allowing even aggressive media such as geothermal water to be used as a heat transfer media. Another benefit of using PHEs is that they are adjustable, making it possible to meet changes in demand over time. The number of plates in a PHE can relatively easily be increased or decreased.

Plates
Generally, a thinner plate means better heat transfer, but a turbulent flow is equally important. At Alfa Laval all plates are pressed in a single step which makes them totally uniform. This results in both a good fit, decreasing the risk for leakage and fatigue, and a strong plate that can withstand pressure shocks, vibrations, high operating and high differential pressures. This production method also has the result that all contact points are metal to metal.

Plate Patterns
Alfa Laval PHEs have a chocolate patterned distribution area that distributes the fluid evenly. The advantage of this is that there are no dead spots and thus no fouling in stagnant zones. This also allows for full use of the heat transfer area. In the main heat transfer area the Alfa Laval PHEs have a herring bone structure which, through its mechanical structure, allows for thinner plates, increasing the heat transfer capacity and saving material, and provides the plate with support points. This mechanical structure makes the PHE less sensitive to vibrations. The herring bone structure also has the advantage of creating high turbulence. High turbulence benefits the customer with more efficient heat transfer and minimized fouling and corrosion allowing energy to be saved and increasing the life expectancy of the product. The compact design and the efficient heat transfer of a PHE provides the advantage of a small hold-up volume, making rapid regulations possible and giving instant access to hot/cold water.



Distinctive chocolate and herring bone patterns distribute the media over the whole heat transfer area

Gaskets

The gaskets of Alfa Laval PHEs are an advanced sealing system constructed to perform outstandingly and to have a long life expectancy. The gaskets are of homogenous rubber and constructed in one piece. Only material from certified suppliers is used. The plates are pressed in such a way that a groove that protects and supports the gasket is created. This prevents gasket blow-out, giving it a life expectancy of more than ten years under certain conditions. The gasket itself has a roof-top profile which creates higher sealing pressure and prevents leakage.

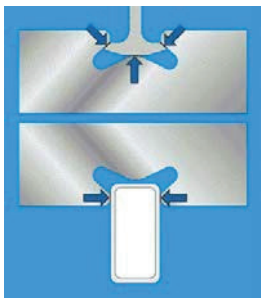
The groove in the p late prevents gasket blow-out and the roof top profile of the gasket increases sealing pressure and prevents

Fastening Methods

The gaskets can be either glued or clipped onto the plates. When gaskets are clipped on, the functions of fastening and sealing are kept separate—the gasket stays sealed, even if a fastener breaks. The clip-on fastening method has the advantages of easy gasket replacement and disassembly of the PHE resulting in benefits to the customer in the form of quick replacements and short downtimes. A two-component oven-cured epoxy glue is used for the gluing method. A gasket bonded with this glue sticks to the plate unless it is torn.

Frame

The frames of large Alfa Laval PHEs support a five-point alignment system, achieved by fitting the plates to a carrying bar at the top and a guiding bar at the bottom. Exact vertical and horizontal positioning is obtained by this alignment system which insures excellent sealing. In smaller PHEs the plates are positioned first by the carrying and guiding bars and then fine-tuned via corner guidance. This is a cost-saving and effective solution. The frame is also constructed in such a way that it is easy to open and close the unit, making service and maintenance uncomplicated.



The fitting to the carrying bar at the top and the guiding bar at the bottom allows a five-point alignment of the plates

Accessories

Several types of insulation are among the list of accessories for the Alfa Laval PHEs. Normally, heating insulation consists of mineral wool while cooling insulation consists of polyurethane. The reason behind the different materials is that when the temperature of the heat exchanger is lower than the temperature of its surroundings condensation is formed which would wet the mineral wool. Polyurethane could technically be used for both purposes but, due to its cost, it is only used for cooling purposes. A drip tray forms the insulation between the PHE and floor. The drip tray also collects any condensation that is formed as well as water that is left after drainage when the unit is opened. In order to prevent injuries due to a possible leakage of hot or toxic liquid or steam, all sides of a PHE's plate pack can be covered by a protective sheet made of stainless steel or aluminium.

A PHE covered with protective sheets

Service and Maintenance

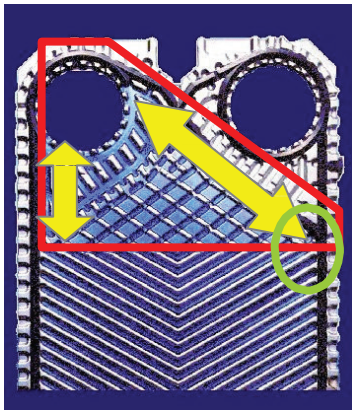
From the beginning of the development process Alfa Laval Plate Heat Exchangers are designed with service in mind. The innovative construction makes it possible for one person to service even the largest of the PHEs using only standard tools. This makes downtimes short and leads to a longer lifespan of the PHE. The easy-to-service construction also improves safety for all people involved in using the unit. Alfa Laval is a global company with representatives all over the world who are ready to support customers, provide prospects, calculations and spare parts.

Alfa Laval's well thought-out design makes one-man servicing with standard tools easy

Every detail of an Alfa Laval Plate Heat Exchanger is designed with quality and functionality in mind. This makes them suitable for numerous different applications when it comes to heating and cooling. The wide product range assures that the customer can always find an Alfa Laval PHE well-suited for a specific task and that it will be dimensioned in a way that fulfills the need for power without using unnecessary amounts of energy.

Plates
Plates can be made in all pressable materials but the most common are stainless steel AISI 304, AISI 316, and titanium.

Distribution Area
The distribution area, circled in red in the figure below, of the plates is pressed in a so-called chocolate pattern that is an Alfa Laval innovation. Pressing this way has multiple advantages. It distributes the flow evenly over the plates and prevents dead spots in the far corner, circled in green.



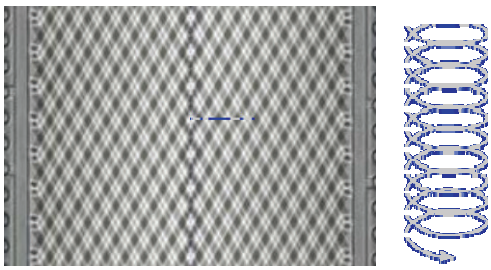
The change in pressure is the same along both the yellow arrows and only a minimal pressure change is used for distribution, leaving more pressure for efficient heat transmission.

This design of the distribution area also allows for parallel flow configuration.

Heat Transfer Area
At Alfa Laval PHE plates are pressed in a herring bone pattern creating a corkscrew flow that creates good turbulence, preventing fouling in stagnant zones. Creating a turbulent flow is also important for the heat transferring properties of PHEs. By changing the pattern of a plate, different types of flows suited for different processes can be created.

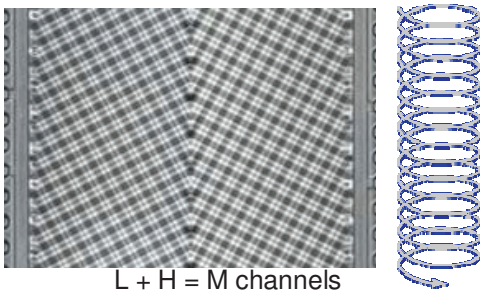
The following are figures describing different kinds of flows:

Low turbulence
& pressure drop



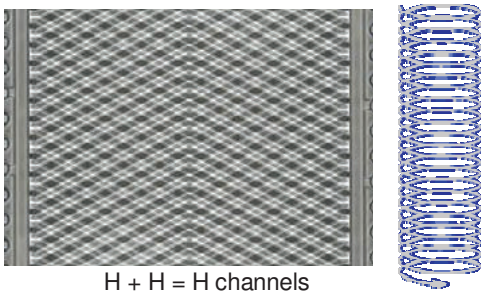
L + L = L channels

Medium turbulence
& pressure drop



L + H = M channels

High turbulence
& pressure drop

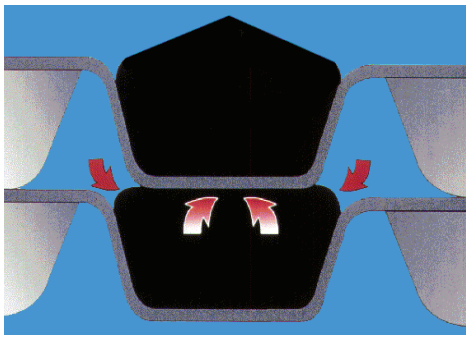


H + H = H channels

This benefits the customer whose requirements are always met in the most cost and energy efficient way.

Gaskets
Gaskets from Alfa Laval are available in various elastomer materials. The most common materials are EPDM and Nitrile. Only material from certified producers is used. The gaskets are made in one piece of homogenous material with a rooftop profile. This profile increases sealing pressure and

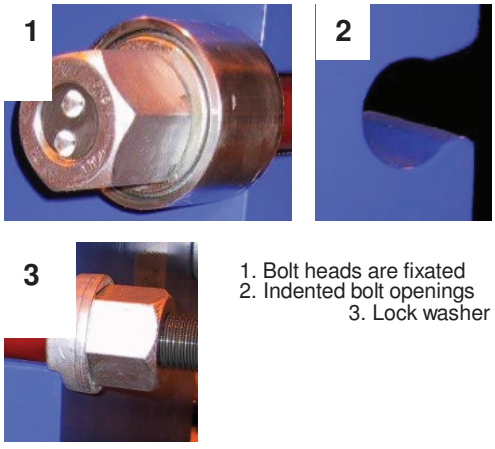
prevents leakage even better than an ordinary gasket. Sealing is improved further by the groove in the plate that supports the gasket from all directions.



Gaskets can be either of a clip-on type or glued to the plates. The clip-on gaskets are developed to facilitate and hasten gasket maintenance. It also makes inspection of the gaskets easier. When gaskets are glued to the plates Alfa Laval has found that there are four parameters critical for a good bond to form: clean plate groove, clean gasket, compression and that the glue is cured. By taking these parameters into consideration and using a 2-component epoxy glue, Alfa Laval has developed a method of gluing that is so strong that the bond will only break if the gasket is torn.

Frame
Even the large PHEs from Alfa Laval are easy to open thanks to the innovative design. The frame plate, plate package and pressure plate are kept together by tightening bolts to allow easy opening of PHEs. There is also a roller on the pressure plate to further facilitate opening and closing.

Error!



1. Bolt heads are fixated
2. Indented bolt openings
3. Lock washer

The bolt heads are fixated (1) so as not to loosen when opening. The bolt openings of the frame are indented (2) in such a way that the bolts cannot fall out when loose and there are lock washers (3) to prevent the bolts from falling out during tightening and opening. All these safety measures make servicing an Alfa Laval PHE safe, quick and easy.

Customer Benefits

Investment Benefits
When buying a plate heat exchanger from Alfa Laval the customer can benefit from a lower investment cost due to the low material consumption. This low material consumption is based on the good heat transfer properties of a PHE that requires only a small heat transfer area. The material savings get higher the more exotic material that is used. The flexible construction with bolted frames makes it easy to add or remove heat transfer areas, taking possible future expansion into account.

Design Benefits
The PHE has a compact design and requires less space than competing products making an overall compact process possible and reducing costs associated with installation of piping and foundations. The PHE is also a lightweight device (up to 125m^2/ton).

Long operating periods and speedy cleaning keep costs of maintaining PHEs down. Quality plates, gaskets, gasket grooves and fastening provide long life expectancy and high turbulence which prevents fouling. This results in long operating periods between service occasions. Cleaning, when needed, is speedy thanks to easy dismantling and good heat transfer, making for a small area to be cleaned. The hold-up volume of a PHE is small, making chemical cleaning effective. Gaskets that are glued to the plates stay fixed and clip-on gaskets are easy to replace which further shortens down-time.

Energy Savings and Environmental Benefits
A great deal of energy can be saved by using PHEs. A close-temperature approach allows a reduced cooling water flow rate, consequently reducing the cost of water and pumping of water. It also leads to a reduced cost in pipe work, pumps and valves. There are also environmental benefits from using PHEs. Material consumption is low and since all the materials used are pure it is easy to recycle. Heat efficiency is good enabling a high degree of heat recovery.

Reliability
Quality materials and quality production methods make PHEs reliable. There is little risk of unplanned stops and it is easy to regulate thanks to the small hold-up volume.