Preventive maintenance guidelines

Semi-welded plate heat exchangers in industrial refrigeration systems

Plan your maintenance budget and your downtime

Semi-Welded Plate Heat Exchanger – SWPHE

The Semi-Welded Plate Heat Exchanger transfers heat (energy) between two medias without intermixing. The medias can either be in liquid or gaseous form. The main applications in refrigeration systems are evaporators and condensers.

The heat exchanger consists of a pack of thin corrugated metal plates with portholes for the passage of the two fluids. The fluids travel through alternating channels and heat transfer occurs through the walls of the plates. A single, continuous laser weld joins two plates to form a cassette. Rubber gaskets seal the channels and direct the fluids. A specially designed area on the plate between the ring gasket and field gasket allow venting to the atmosphere – virtually eliminating the possibility of cross-contamination.

Gaskets

The gaskets are sealing off and controlling the flow direction of the medias in the SWPHE. Gaskets are made of rubber material such as Nitrile (NBR), EPDM and Chloroprene (CR). Separate ring gaskets and field gaskets for refrigerant and process fluid are used on each cassette to allow more flexibility in material selection based on fluids and temperatures. All rubber materials have a natural aging process and how long a gasket lasts depends on several factors including but not limited to: media exposure, temperature, pressure, on/off operation, and opening frequency. Over time the gasket will not be able to seal off the media due to low sealing force and an external leak will occur.

Preventive maintenance schedule

On a yearly basis, a check-up on performance, leakage, ammonia permeation etc. can be done on the SWPHE's. An 8- to 10-year rolling service schedule is shown below to secure maximum uptime and availability on your refrigeration system.

Year 2-3: Audit of SWPHE, clean if needed.

Year 4-5: Audit of SWPHE, clean if needed.

Year 6-7: Audit of SWPHE, clean if needed.

Year 8-10: Audit of SWPHE, clean if needed. Replace all field and ring gaskets.

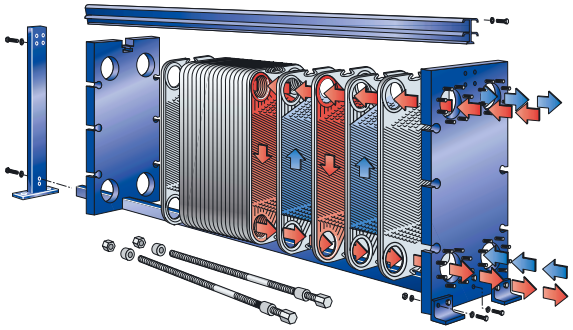


Plate heat exchanger construction

Clip-on glue free gaskets

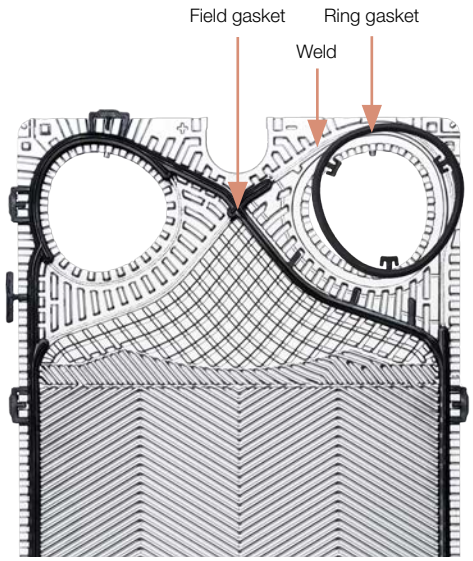
CIP unit

Monitor the status of your gaskets

The maintenance schedule provides a general guideline for servicing a SWPHE. Since gasket lifetime can vary under different operating conditions, monitoring the gaskets at these intervals is important. However, in many installations, SWPHE's operate for 10+ years without experiencing leaks. Due to constant innovation of gasket material and mechanical design of the plates, customers are discovering that they can extend their gasket replacement schedules compared to older plate heat exchangers.

Design innovations

Alfa Laval's RefTight™ plate innovation is a unique, reliable, robust sealing system promoting long-life expectancy for gaskets in refrigeration applications. The ring formed gasket groove offers full support of the ring gasket sealing at high pressures and temperatures. The groove is formed in the pressed plate and positioned separate from any laser weld, assuring optimal sealing of the ring gasket.



Fouling and cleaning

Depending on the nature of the transfer fluids and the application, the plate heat exchanger performance may decline over a period of time due to fouling. This deterioration in performance is typically due to the build up of scale, sediment and/or biological debris on the plates. In refrigerant applications, the main risk for fouling is on the coolant side, especially if it has open systems like cooling towers, river water, etc. Closed-loop coolant systems have less risk of fouling.

There are three general methods to removing fouling:

- Backflush the heat exchanger
- Cleaning in Place (CIP) by circulation of CIP fluid without dismantling the SWPHE
- Mechanical and/or chemical cleaning by dismantling the SWPHE

Fouling will deteriorate the thermal performance of the SWPHE. The evaporation temperature will decrease and the condensation temperature will increase from startup conditions.

2°F in higher temperature difference (ΔT) between evaporation/ condensation and coolant will increase the required energy input to the compressor by approximately 3%.

Example: By cleaning a fouled SWPHE and reducing the ΔT by 2°F, the energy savings will be 45,000 kWh/year with a 400 HP motor running 5,000 hours/year. With a cost per kWh of $0.10 the annual savings will be $4,500.

How to contact Alfa Laval

Contact details for all countries are continually updated on our website. Please visit www.alfalaval.com to access the information direct.

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