Leaking throughout the plate pack

The effects of poor reconditioning using non-Alfa Laval parts **Case story**

A non-Alfa Laval reconditioning company cleans Alfa Laval plates. Is this the best way to protect your investment?

Plate heat exchangers can be a major investment. It therefore makes good sense to safeguard your investment by taking proper care of your equipment throughout its service lifetime. Reconditioning using non-Alfa Laval parts and processes usually puts worker safety, the environment and your property and equipment at risk.These are the findings from an investigation into the use of non-Alfa Laval parts for reconditioning a large Alfa Laval plate heat exchanger.

Background

An Alfa Laval plate heat exchanger (PHE) is an important part of an offshore oil production platform installation for a global energy and petrochemical company. This particular installation features a PHE with a total of 243 corrosion-resistant titanium plates.

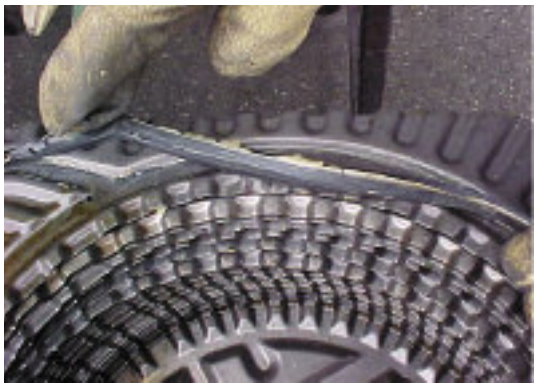
Plates for the entire unit were regasketed using non-Alfa Laval gaskets from a supplier of aftermarket gaskets. Soon after the plates were re-installed, leakage was detected. In response to this situation, the heat exchanger plates were sent to the Alfa Laval Camberley service centre in the U.K. for examination.

Examination

The investigation of the plates consisted of a visual examination, stereo microscope evaluation, and photographic documentation. Variances in the thickness of the plates, poor quality regasketing and subsequent deformation of the gasket grooves were identified as three major causes of leakage.

Discrepancies were identified in these areas:

- Plate thickness
- Gasket material
- Gasket glue
- Gaskets and gasket grooves
- Portholes



Glue has been pushed to one edge of the gasket during curing causing the gasket to sit proud with no adhesion within the gasket groove. The gasket could be lifted by finger. Sealing at this location is unlikely.

Old glue has not been removed from the gasket groove prior to regasketing.

This regasketed plate suffered mechanical damage to the inner port flute due to the use of non-Alfa Laval gaskets. Therefore the plate pack will not seal properly.

The diagonal gasket has moved from its groove at the junction where it meets the side gasket groove, shown here within the ring.

Plate thickness

A plate heat exchanger from Alfa Laval has plates with the same plate thickness. To ensure proper sealing and eliminate the risk of leakage, the plate pack is tightened to proper tightening dimensions.

Faults: Plates of different thicknesses were found in the unit. Of the 243 plates and one end plate examined, 233 were 0.6 mm thick, 8 were 0.9 mm thick and 3 were 0.75 mm thick. Only the 0.9 mm plates were in good condition.

Risks: Inaccurate tightening calculations. Plates of different thicknesses in the same plate pack can cause plate deformities, irreparable plate damage and leakage due to improper tightening of the plate pack.

Gasket material

Alfa Laval gaskets are specially manufactured and extensively tested to withstand variations in temperature, pressures and different media.

Although non-Alfa Laval gaskets may use the same nominal designations as Alfa Laval gaskets, they do not have the same properties.

Alfa Laval gaskets may contain up to 30% more polymer than other gaskets, which contributes to optimal sealing function.

Faults: Replacement of Alfa Laval nitrile gaskets with non-Alfa Laval gaskets.

Risks: Inaccurate tightening calculations. High risk of leakage and/or deformation and destruction of the complete plate pack.

Gasket glue

Alfa Laval glues and adhesives are specially formulated for high performance while handling tough heat exchanger duties.

For optimal sealing function, the proper amount of glue must be applied to a clean gasket groove and a clean gasket at the exact compression to hold the gasket securely in place.

Fault: No adhesion of gasket in the groove; one-third of all diagonal gaskets could be lifted by hand. Application of excessive amounts of non-Alfa Laval glue. Presence of glue remnants in the groove.

Risks: High risk of leakage. No adhesion can result in a complete gasket blowout.

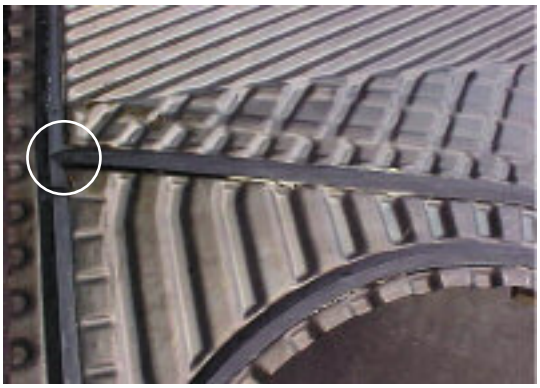
Gaskets and gasket grooves

Alfa Laval gaskets and gasket grooves are specially designed with exact dimensions and tolerances. Gaskets must be properly glued in the centre of the groove for optimal sealing.

Fault: Improper fit of poorly dimensioned gaskets into the gasket grooves. Improper alignment of the gasket causing mechanical damage to the inner port flute and elsewhere on the plate.

Extensive diagonal, port and side gasket groove deformation is clearly evident.

Risks: High risk of leakage. Deformation in grooves can lead to a distortion of the plates which result in mechanical failure and insufficient gasket compression.



The use of excess glue contributed to diagonal gasket movement shown here within the ringed area.

Portholes

For reliable erosion prevention, Alfa Laval portholes and entrance necks are designed for low pressure drop and low velocities.

Working in conjunction with the plate pattern and gaskets, the portholes help direct the flow of media through the plate and prevent the mixing of media.

Faults: Porthole gasket glued off-centre in relationship to the gasket groove.

Risks: Leakage, extensive deformation of the gasket groove and mechanical failure.

Port gasket is glued off-centre of the groove.

Economic effects

Poor reconditioning and the use of non-Alfa Laval gaskets, gasket glue and plates for Alfa Laval plate heat exchangers undoubtedly have economic effects on the operation of the PHE as well as the entire plant.

In addition, poor reconditioning and the use of non-Alfa Laval spare parts can affect the profitability of operations in several ways such as:

- More frequent replacement of plates.
  Due to extensive deformation and the use of non-Alfa Laval gaskets, only five to 10% of the 233 0.6-mm plates were serviceable. All other plates had to be replaced.

  It is of utmost importance that the plates are put back in the proper position according to the specified plate arrangement.

  Plate replacement can cost hundreds of thousands of euros depending on the size and material of the PHE.

- More frequent replacement of gaskets.
  Due to the increased wear and fouling caused by inferior quality spare parts, non-Alfa Laval gaskets generally require more frequent replacement.

  By replacing Alfa Laval gaskets with non-Alfa Laval gaskets, you run the risk of compromising the performance of the remaining Alfa Laval parts as well as the entire unit. Each time an entire set of gaskets must be replaced, it can cost tens of thousands of euros for the gaskets alone, excluding the cost of labour and glue.

Extensive deformation of a port gasket groove.

Deformation of the diagonal gasket groove.

- Equipment failure.
  Should the PHE breakdown completely due to the use of non-Alfa Laval parts, equipment replacement can cost several hundreds of thousands of euros depending on the size and the material of the PHE.

- Lost production time.
  Productivity losses are probably the most expensive consequence of using non-Alfa Laval spare parts. Downtime can vary from a few hours to several weeks. An hour of lost production time on an offshore oil production platform, for example, can cost hundreds of thousands of euros.

- Reduced heat transfer efficiency.
  Incorrect plate arrangement and/or the use of non-Alfa Laval spare parts can lower the k-value or the heat transfer coefficient. This contributes to a high resistance to the transfer of heat, which can drastically increase operating costs and even exceed the total value of the initial investment.

Conclusions

Manufactured to precisely the correct tolerances and material specifications, Alfa Laval spare parts are subject to stringent quality control procedures. It definitely pays to invest in Alfa Laval spare parts.

Using non-Alfa Laval spare parts that do not match the original specifications can contribute to less reliable PHE performance and put worker safety as well as the safety of your plant and the environment at risk.

In addition, the cost of using non-Alfa Laval spare parts can have a significant – and unexpected – impact your operating and maintenance budget.

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How to contact Alfa Laval
Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com