Gaskets

Alfa Laval puts substantial resources into developing gasket materials, production methods, fastening methods and other factors that improve sealing and increase gasket life expectancy. At Alfa Laval it is believed that quality products last longer and save money in the areas of maintenance, spare parts, and downtimes. Gaskets are required to maintain the highest internal pressure for the longest possible time. The success rate of this is determined by the shape and material of the gasket, the shape of the groove and type of duty.

Material

Raw Materials
More than 98 percent of all gaskets are made of some kind of rubber. Rubber materials are characterised by high tensile strength, oxidation and chemical resistance, and resistance to temperatures and temperature variations. The specific traits of a rubber material are determined by five different components that together form the material, rubber polymer, vulcanising substances, fillers, breakdown protectors, and additives that simplify handling and production.

Rubber polymers can be either non-polar hydrocarbons like EPDM and IIR, hydrocarbons where one atom of hydrogen is exchanged with one atom of chlorine or fluorine, such as Nitrile and FKM, or with a non–hydrocarbon, like silicon. Non-polar hydrocarbons are not oil-resistant but some of the hydrocarbons with chlorine or fluorine have excellent oil resistance.

Vulcanizing substances give the rubber its elastic properties by binding it into a three dimensional network during heating. Examples of commonly used vulcanizing substances are sulphur, organic resins and organic peroxides.

Fillers provide the rubber with hardness and tensile strength by filling and reinforcing the substance. Coal is often used as a filler and is what gives the rubber its black colour.

Breakdown protectors are added to protect the rubber from ageing and the chemical breakdown that takes place when the rubber is exposed to oxygen and ozone.

Substances are also added to simplify the mixing of the material and moulding of the gasket.

Manufacturing Methods
Both the choice of raw materials and the manufacturing process are of outmost significance for the result. Creating a rubber material with the desired properties is difficult since the result of changing ingredients cannot be calculated in advance and since it is impossible to copy a successfully created substance. There are, for example, more than 100 variants of EPDM rubber, 600 vulcanizing substances, 200 fillers, 300 breakdown protectors and 300 manufacturing additives to choose from. Hence, the number of materials that can be made are abundant and the quality varies between suppliers.

Developing Materials
Developing a new material takes years and requires extensive testing. Alfa Laval conducts a comprehensive development program including both laboratory and field tests, which secures top-quality products.

Material information is stored in a database.

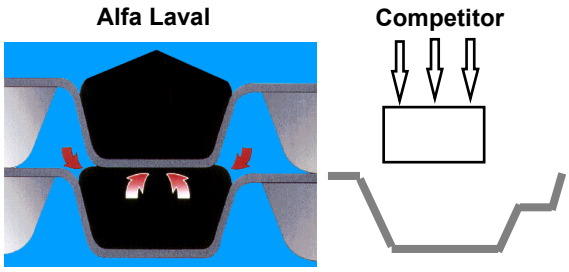
Knowledge about gasket materials is stored in a database so that information can be retrieved at any time. The production plant in Sweden is ISO 9001 certified and each batch of gasket material is tested before it is allowed to proceed into production.

How to Select Material
The rubber material chosen depends on what fluids it will be exposed to and on the temperatures and pressures in the system. Nitrile is an inexpensive standard material for use with temperatures up to 130°C. There are more expensive variations that

are developed that are suitable for duties where normal nitrile swells as well as for refrigeration duties where temperatures are low. EPDM is a standard material used for temperatures up to 160°C. EPDM is used for glued gaskets and for high temperature clip-on gaskets. FKM, or fluoro-carbon rubber, is used for aggressive chemical compounds such as acids or chlorinated compounds.

Advanced Design of the Sealing System

What Makes Gaskets from Alfa Laval Special?
Alfa Laval gaskets are made of homogenous rubber in one piece. Only materials from certified producers are used. The design of Alfa Laval's sealing system differs from those of its competitors not only in the conscious choice of quality materials but also in the shape of the gasket groove and the profile of the gaskets. Gaskets from Alfa Laval have a rooftop profile that prevents leakage extra-ordinarily well. When two plates with a gasket in between are pressed together, the sealing pressure is increased by the rooftop profile. The gasket grooves of Alfa Laval plates are designed to give full support to the gasket from both sides. This, unlike the sloping sides of the gasket grooves of most competitors, prevents gasket blow-out and increases the life span of the gaskets as well as the reliability.



Both the shape of the gasket groove and the profile of the gasket differ between Alfa Laval and its competitors

Dual Sealing System
Gaskets are expected to seal both from the atmo-sphere and between the two media. Should there be a leakage inside the PHE, it is important that it is detected so that it can be fixed and contamination can be avoided. Special venting ports are an essential part of the gasket design to prevent cross-contamination. The venting ports ensure that a leakage is detect-able on the outside of the PHE by dripping or squirting. It is then possible to follow guidelines to find the exact location of the leakage so that the PHE can be opened and repaired.

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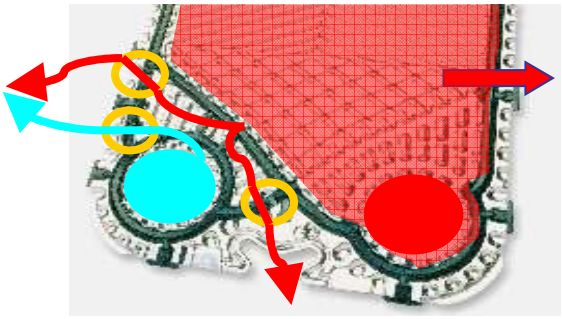

If the gasket fails, leakage is detected on the outside thanks to special venting ports

Fastening Methods
The gaskets can be either glued to or clipped onto the plates. Both methods are excellent at sealing. It is up to the customer to choose the method to be used. However, glued gaskets are preferable if the plates are large, if the PHE will be opened fre-quently, if it is used for high pressure duties, and when the gasket will be exposed to chemicals that cause swelling. For gluing gaskets, Alfa Laval uses a two-component, oven-cured epoxy glue. In com-parison with other types of glues, this one has proven to more than double the life span of a gasket found in a PHE that is opened once a year. Alfa Laval has also identified four parameters that are crucial for a lasting bond to form when gaskets are glued: a clean plate groove, a clean gasket, compression, and that the glue is oven-cured. Bonds created with two-component epoxy glue under these circumstances do not break unless the gasket is torn.

Using clip-on gaskets separates the functions of sealing and fastening—the gasket stays sealed, even if a fastener breaks. Clip-on gaskets make gasket maintenance easy.

Gasket Life Span
The life span of the gaskets often determines the degree of maintenance needed on a PHE. Extensive savings are obtained in the areas of service and maintenance costs as well as downtimes by using quality gaskets and a quality sealing system.

The sealing life span of gaskets is determined both by the design of the product and the conditions under which it operates. High temperatures and pressures shorten a gasket's life expectancy. In order to maximize the life span of a gasket, it is vital to choose a material that can handle the temperatures and pressures to which it will be exposed. Standard materials may not last very long, but, on the other hand, there is no reason to choose expensive materials unless necessary. You can save considerable amounts of money by considering the choice of materials early on.

Cold Leakage
Even the most well-developed gasket has a limited life span. The sealing force of a PHE gasket is obtained from its elasticity. The elasticity functions as a sort of "memory"—a gasket remembers its original shape. The sealing properties are, however, affected by age and temperature. When the temperature decreases at, for example, shutdown or between batches, the gasket shrinks and the sealing force is maintained only by the "memory". When ageing, all gaskets, due to compression, begin to deviate from their original shape—a change that is permanent. This deviation slowly erases the "memory" and leads to leakage. This is called cold leakage and appears when a unit is started up. When the temperature rises, the leakage stops, but it is nonetheless a signal that the gaskets are ageing and should probably be replaced during the next planned stop.