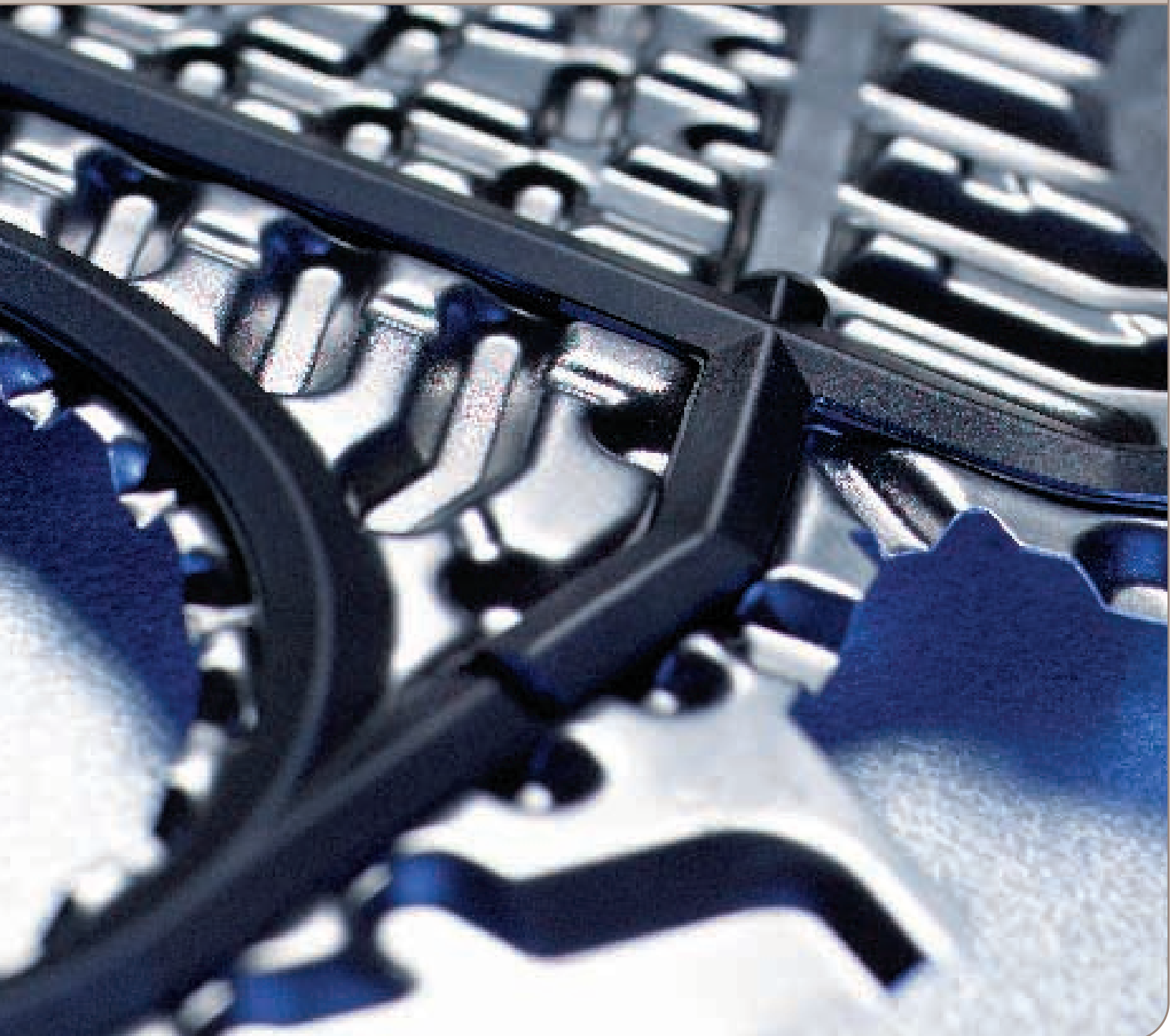




Wise investments deliver uptime

**Plate heat exchanger gaskets from the sealing technology experts**



# Longer lifetime, more uptime

Using genuine rubber gaskets ensures tighter seals, longer life and more uptime for your plate heat exchanger. Alfa Laval helps you make the right decisions by putting our expertise in sealing technology to work for you.

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### Quality proves far less costly

Conventional wisdom says, “Use the best-quality gasket, because anything less is only going to end up costing you more in the long run”. Quality gaskets from Alfa Laval have staying power. They are made to endure the wear and tear of specific plate heat exchanger applications. Years of experience prove that genuine parts always deliver more uptime, outlasting their less-expensive counterparts.

To achieve the best sealing performance from a gasket, you must ensure that its material properties and its construction suit its intended application. Although a gasket may look like the original supplied by the plate heat exchanger manufacturer, it probably does not perform like the original since the composition of its rubber compounds most likely differs from that of the original.

These differences, however small, have great consequences on the local sealing force. If the local sealing force is too low, you reduce both the performance and life of the plate heat exchanger. If it is too high, you increase the risk of mechanical damage, such as crushing the gasket, due to stress and elevated temperatures.

Designing a gasket for a particular duty requires detailed analysis of both the plate and gasket. Just as a chain is only as strong as its weakest link, the

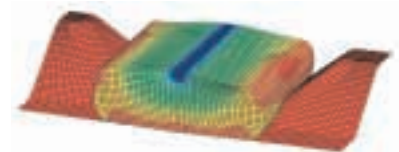
reliability of a plate heat exchanger is only as good as the seals or gaskets between its components. That is why it is so important to simulate performance of the gasket under the same conditions as if the gaskets were incorporated in the actual plate heat exchanger during operation.

To ensure optimal performance of the sealing system, the ABAQUS finite element method (FEM) stress analysis program is used to simulate new construction and to correct all possible design weaknesses. FEM considers detailed plate and gasket geometry including expected plate deformations, elastic as well as plastic.

Design parameters, such as thickness, width and profile, are carefully adjusted to ensure optimal and consistent function of different gasket sections. Changing gasket thickness by as little as 0.5 mm, for instance, may be critical to success. Because rubber is subject to significant thermal expansion, the geometry of the gasket-molding tool must be adjusted accordingly. This reduces the need for later modifications. Making an exact copy of the gasket mold that provides optimal performance simply by measuring the size of an elastic gasket is extremely difficult.

Next, the new plate construction and prototype gasket undergo conventional life and leak-pressure tests under laboratory conditions. If performance

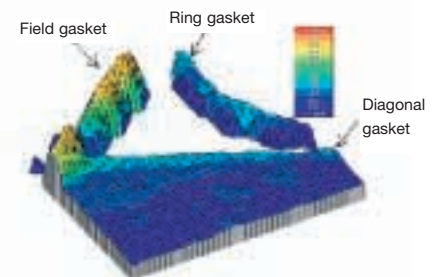
does not meet expectations, the gasket section in question is then re-tested using advanced pressure-sensing technology, measuring the actual local stress applied by the gasket or by the fluid to the plate’s surface. Final adjustment to the geometry of the gasket tool is then made based upon further laboratory testing. This is critical to ensure the life of the gasket.



Simulation of a plate heat exchanger gasket using ABAQUS FEM stress analysis program.



Design parameters are carefully adjusted to ensure optimal function of the gasket.



Analysis of the forces and behaviour of the gasket during operation, when one side is pressurized and the other is not.



## Reliable rubber seals

Rubber consists of several different components:

- Polymers: More than 100 grades of EPDM (ethylene propylene terpolymer) and more than 100 grades of NBR (nitrile rubber)
- Curing agents: More than 100 grades
- Fillers: More than 200 grades
- Processing aids: More than 300 grades
- Anti-degradants: More than 300 grades

Rubber is available in unlimited variants. Each variant differs in quality and lifetime.

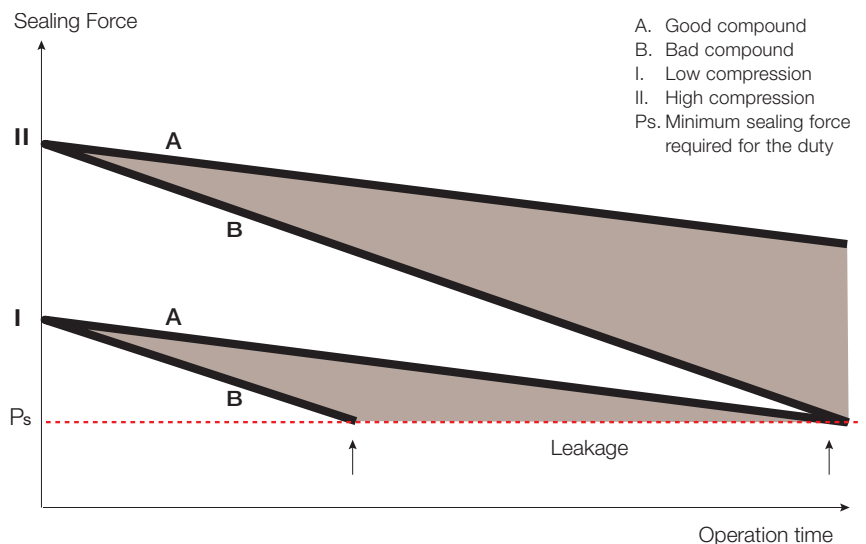
### All gaskets are not created equal

To develop new or improved rubber compounds for plate heat exchangers, you must find the right combination of between five and 15 different substances from more than 1700, including hundreds of different types and grades of polymers, vulcanization chemicals, processing aids and anti-degradants. The proportions of the raw materials used to manufacture the rubber compound determine the quality of a gasket.

It is important to remember that, although gaskets may have the same designation, a gasket from one supplier does not necessarily have the same properties as that from another. Specifying gaskets based solely upon polymer type and hardness, for instance, will prove grossly inadequate for sealing technology requirements.

Quality gaskets usually contain approximately 50 percent polymer. Lower-priced imitations contain less than 20 percent polymer and more fillers and softeners, such as carbon black or oils. The lesson? The less expensive the rubber, the faster it ages, and the less effective it is as a sealant.

Theoretical and/or empirical models that can predict properties of the vulcanized compound are not yet available. That's why developing a specific gasket material to meet the precise requirements of various media



**Comparison of two gaskets of the same designation, but with different properties. A high-quality compound ensures longer gasket lifetime.**

and applications calls for a worthwhile investment in time and money. This ultimately pays off in terms of more reliable operations and longer life.

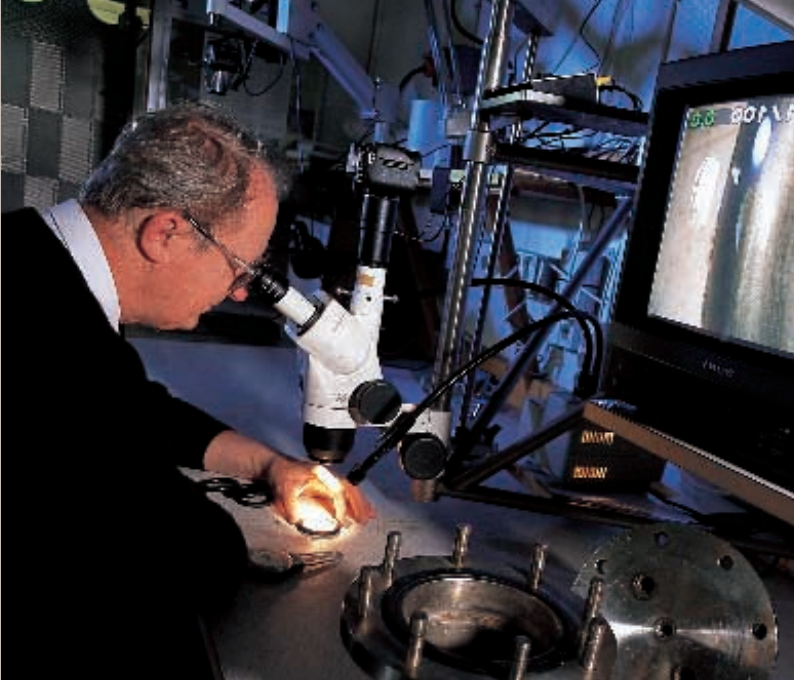
Developing new or improved compounds is a time-consuming, labour-intensive process. Alfa Laval conducts ongoing research and development for sealing technology to improve the rubber for its plate heat exchanger gaskets and, thus, to improve overall performance.

New or improved compounds require anywhere from 18 months to six years to research, develop and approve. We put our expertise – including a thorough understanding of rubber and

its properties as well as the intricacies of sealing technology and its different applications – to work for you.

### Proper care limits wear

It is important to know the capabilities of the rubber compound used in gaskets as well as its limitations. New gaskets are highly resilient, expanding and filling the grooves to seal in the exchanger media and to direct flow. Maintaining this condition helps ensure optimum performance. To maximize gasket lifetime: (1) invest in the right type of gasket – one capable of compression in order to resist the stresses and forces generated by the flow of media, and (2) select the right gasket materials.



“Quality means reliability. That’s why it’s so important to use genuine gaskets for a plate heat exchanger. Choosing a quality gasket means more uptime.”

Dr. Ladislav Novak, Materials Specialist  
Alfa Laval

Over time, all gaskets – even those of the highest quality – slowly succumb to natural aging because the ambient temperature affects rubber, just as it does any other organic material. Proper storage is critical to ensuring the resilience of spare gaskets. Each original Alfa Laval gasket is stamped with the year and quarter in which it was manufactured to help you determine the age and handling of spare gaskets onsite.

Gaskets also wear depending on operating conditions, losing elasticity and sealant capabilities. For instance, gaskets in plate heat exchangers for applications involving water, especially at low temperatures, can be in service for decades without leaking. On the other hand, gaskets used in the process industry, where plate heat exchangers handle corrosive materials, such as lye and acids, at high temperatures are subject to high stress and wear more quickly.

These examples illustrate the environmental effects, either chemical or physical in nature, on any organic material, such as rubber. Chemical effects or attacks are, as a rule, due to oxidative action, such as occurs in high-temperature air, strong sulfuric acid, nitric acid and chlorate solution. These have disastrous results on rubber, including hardening, embrittlement, reverse plastication, loss of sealing force, dissolution and, in

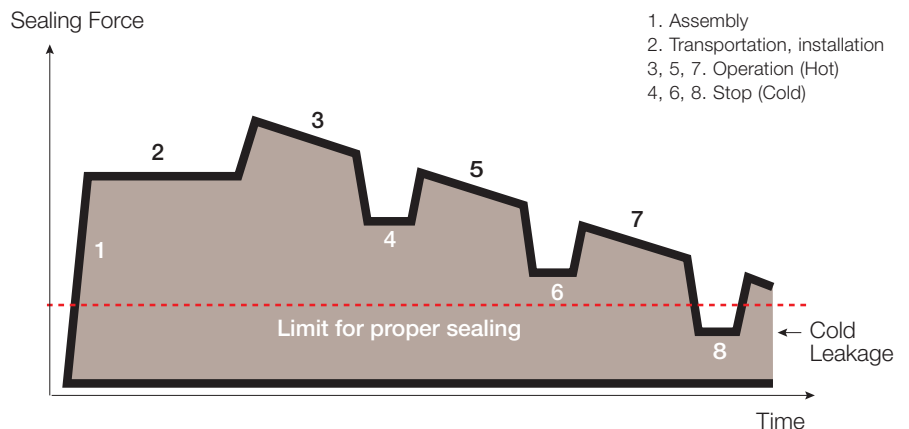
extreme cases, conversion to carbon dioxide.

The physical effects are, as a rule, due to absorption phenomena. Rubber, like plastic, is not diffusion-resistant and allows gases and liquids to seep into its molecular structure. The degree of absorption is dependent upon the attractive or cohesive forces between the fluid and the rubber molecules. For instance, pure hydrocarbon rubbers, such as EPDM, will absorb pure hydrocarbons (fuels, lubricating oils, etc.) but will not absorb substituted hydrocarbons, such as organic acids, ketones and alcohol. Absorbing liquids increases the volume of a gasket’s mass and decreases its physical properties, such as hardness and tensile strength. This results in cracking, blow out, blistering and loss of sealing force.

Specific environments attack different types of rubber in different ways. The type of rubber polymer is the most important factor in determining the environmental resistance of the gasket. However, the compatibility behaviour of a specific rubber compound is dependent upon all constituents of the rubber formulation. One formulation may be completely destroyed by a specific environment, while another of the same elastomer type may remain essentially unaffected. Therefore, compatibility predictions must be based on experience with actual plate heat exchanger formulations.

#### Unique solutions require application expertise

Every gasket material compound is unique. Each is developed with reference to the type of media in the plate heat exchanger and to the



The lifecycle of a plate heat exchanger gasket.



“When you face tough challenges, you can rely on genuine gaskets for comprehensive support from sealing technology specialists.”

ambient environment. Quality gasket materials maintain tight seals for a longer duration of time, while providing maximum resistance to degradation from exposure to oxygen, high temperatures and other factors.

There aren't any standard solutions to match the right rubber compound to a particular application. Take, for example, the expression "Like dissolves like." This means that polar molecules react with other polar molecules, while non-polar molecules react with other non-polar molecules. This makes non-polar EPDM a poor gasket choice for fluids containing oil. The non-polar oil will dissolve the EPDM and cause swelling and cracking of the gasket. A highly oil-resistant rubber polymer, such as NBR, would appear to be a more appropriate candidate if not for the exposure to extreme temperatures. However, thanks to a specially developed variant of hydrogenated nitrile rubber (HNBR), nitrile gaskets are nevertheless used.

Alfa Laval can help you determine the right solution for your unique applications. We share our technology and expertise with customers worldwide. We have service engineers who can work for you in more than 80 countries. Your uptime is our main concern.

#### **Professional advice from sealing technology experts**

Alfa Laval has global reach with local expertise. We work closely with cus-

tomers to address your every need. No matter where you are in the world, you're never far from our most valuable resources – the knowledgeable people who make Alfa Laval specialists in sealing technology.

A wide range of Alfa Laval services – from analyzing gasket selection and predicting gasket compatibility to reconditioning plate heat exchangers – is always close at hand. Here's a brief look at some of the professional and support services that Alfa Laval provides its customers:

*Gasket-selection analysis.* Upon request, Alfa Laval provides customers with complementary professional services to determine which rubber compound best suits real-world requirements.

Let's say, for example, that you are introducing a new chemical into your plate heat exchanger media and that there is no available data on how it will affect the sealing performance. Alfa Laval works closely with you to test the actual operating conditions of your plate heat exchanger, by providing a test pile, including a range of appropriate test seals, for insertion in your process. Our experts then analyze the gasket material for changes in properties and sealing force, and recommend the best gasket compound to use with your new media.

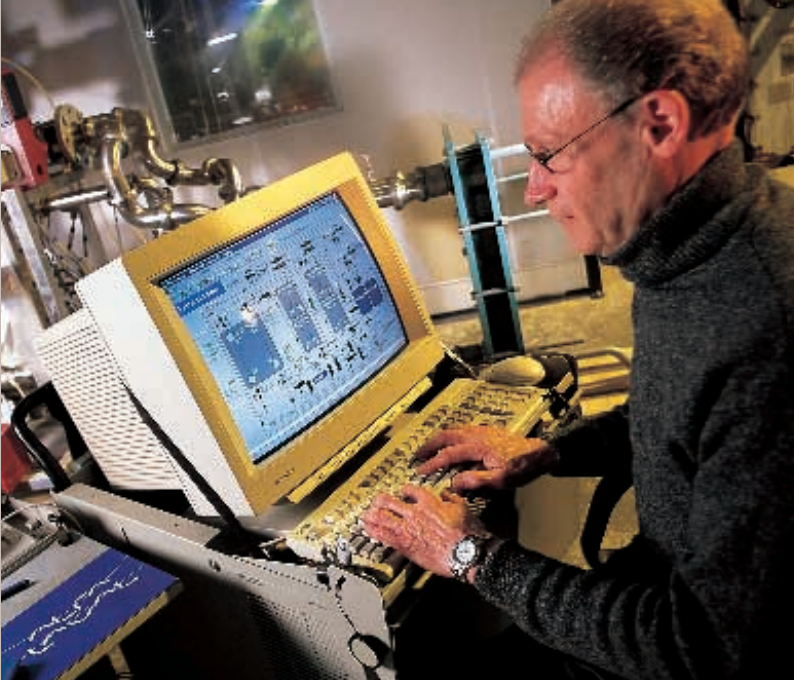


**Alfa Laval helps you determine exactly the right gasket for your plate heat exchanger, based on operating conditions.**

*Gasket database.* Alfa Laval's comprehensive computerized database, available to our staff around the world, helps determine exactly the right gasket for your plate heat exchanger, based on operating conditions.

*Reconditioning.* When it's time to replace your gaskets, Alfa Laval's service centres are there to assist you – no matter what kind of gaskets are in place. And while we'll work with you to make the best gasket-replacement decisions for your needs, we firmly believe that genuine gaskets keep on going stronger and last longer than look-alike imitations. Our service centres also assess and test the plate to ensure sealing function of the entire plate heat exchanger.

Simply put, look-alike gaskets do not perform alike. Invest wisely. Choose genuine gaskets.



## Invest wisely

Don't make a costly mistake. For peak performance, use genuine parts from Alfa Laval.

- Quality gaskets from Alfa Laval save you money by increasing uptime and decreasing operating costs.
- They come with built-in sealing technology expertise.
- They outperform look-alike imitations.
- They last longer.

Can you find a better guarantee for performance?

Alfa Laval is committed to providing application expertise to develop unique solutions for every type of plate heat exchanger duty. If you find a rubber compound isn't performing up to par, our experts will help find ways to increase uptime and to improve **Nonstop Performance**.

## **Alfa Laval in brief**

Alfa Laval is a leading global provider of specialized products and engineering solutions.

Our equipment, systems and services are dedicated to assisting customers in optimizing the performance of their processes. Time and time again.

We help our customers heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuff, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

## **How to contact Alfa Laval**

Contact details for all countries are continually updated on our website. Please visit [www.alfalaval.com](http://www.alfalaval.com) to access the information.

