

Kalrez® can help you

# optimize total system cost

in pumps and process equipment



**Kalrez®**

From DuPont Performance Elastomers

# Kalrez® is a proven way to cut costs in pumps and process equipment

The drive to reduce costs and environmental concerns have caused many design and processing engineers to turn to perfluoroelastomer sealing parts as the most cost-effective sealing solution. The value-in-use of perfluoroelastomers can be proven in operating conditions where conventional elastomers fail. Even under less arduous conditions, Kalrez® perfluoroelastomer seals can be the best solution, as they can last significantly longer than conventional sealing solutions.

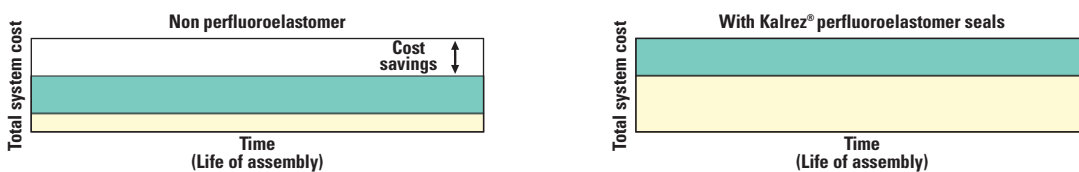
### Economics depend on the total system cost

When considering the economics of elastomeric seals, it is vital to look beyond the cost of the seal itself and compare the total cost related to the sealing solution. The total system cost in use is the sum of the cost of O-ring seal + installation cost + downtime cost (including loss of productivity through leakage + clean-up costs).

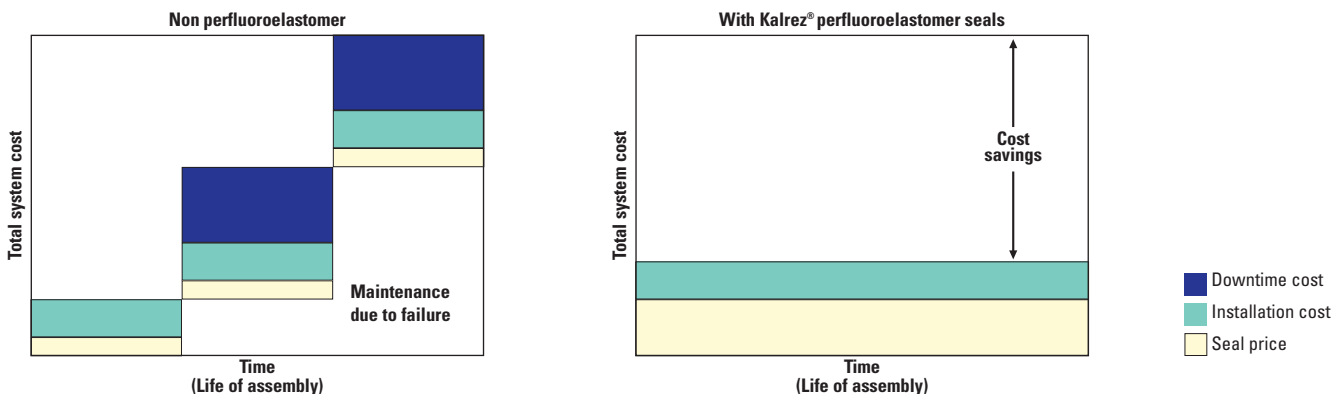
### Case studies show the value of high quality seals

The following case studies highlight the total system cost comparison. They take into consideration the frequency and cost of seal replacement as well as the attendant downtime cost.

#### CASE A: SEALS THAT LAST FOR THE LIFE OF PROCESS EQUIPMENT



#### CASE B: SEALS THAT NEED TO BE REPLACED ONCE OR TWICE DUE TO FAILURE





**Two field application examples**

**Company:** Dow AgroSciences S.A.S., Drusenheim, France, global leader in pest management and biotechnology products.

**Application 1:** O-ring seals fitted to product filling line, processing solvents, surfactants and concentrated herbicides at temperatures ranging from 10°C to 45°C, and pressures from 1.5 to 3.5 bars Eff.

**Previous material used:** Dynamic O-rings of PTFE (Polytetrafluorethylene)

**Average lifetime:** One day

**With Kalrez®:** Kalrez® Spectrum™ 6375 perfluoroelastomer O-rings extended the lifetime to an average of two months.

**Application 2:** Seals of fluoroelastomer (FEP/FKM), fitted to the piston rod of a type SRC Alfa Laval valve.

**Problem/previous material used:** Regular failure after only eight hours operation, lifetime of about eight hours.

**With Kalrez® perfluoroelastomer parts:** Increase in operating lifetime from 8-12 months.

**Overall advantages choosing Kalrez®:**

- Dramatic cost savings due to elimination of downtime.
- Increased operating uptime.
- Improved overall reliability of packing line.
- Reduced maintenance.

**CASE A: Seals that last for the life of process equipment**

In this situation the seals are not being replaced, as they last for the life of the pump or of the equipment. Strictly on a cost basis, perfluoroelastomers cannot be justified.

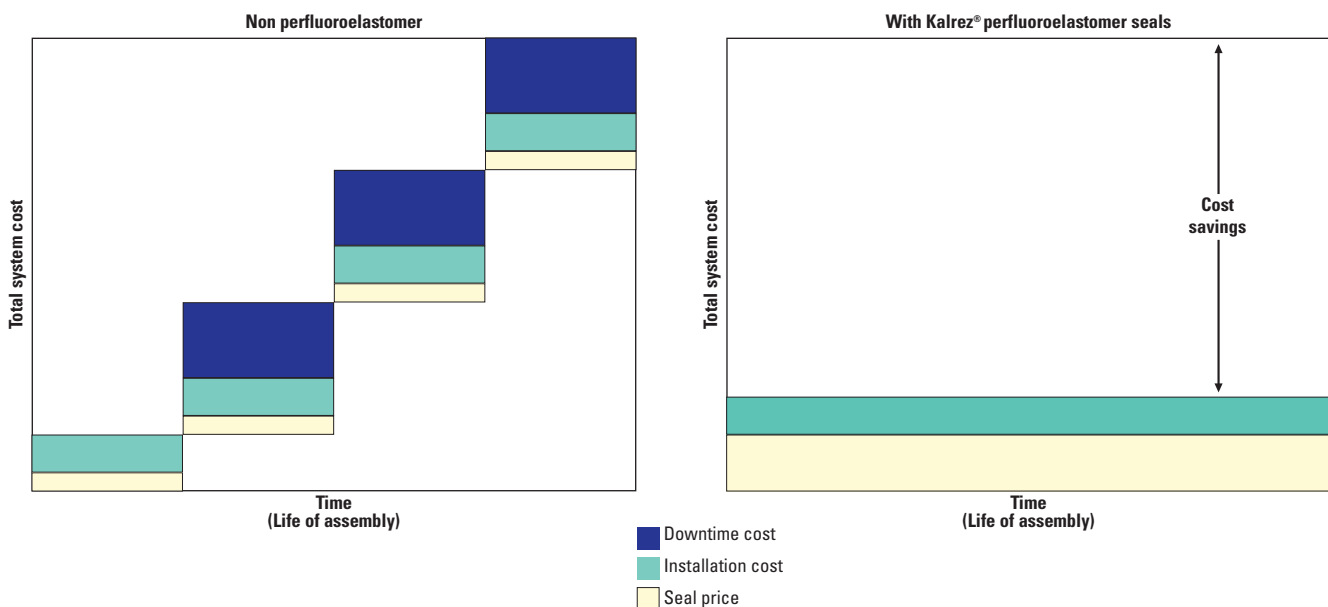
**CASE B: Seals that need to be replaced once or twice due to failure**

This is the situation in which seals need to be replaced for failure or maintenance reasons once or twice during the life of the equipment, introducing the added factor of downtime cost each time the seal is changed. Using Kalrez® perfluoroelastomer seals could be the most cost-efficient solution.

**CASE C: Seals that need to be replaced repeatedly**

In this situation, seals need to be replaced several times. Using a conservative estimate of service life of perfluoroelastomer seals being four times that of conventional sealing material, the replacement and downtime costs associated with repeated, multiple replacements of existing seals far outweigh the initial higher costs of perfluoroelastomers. In addition, the unplanned replacement of existing seals would further increase downtime costs, as well as having other, possibly serious, effects.

**CASE C: SEALS THAT NEED TO BE REPLACED REPEATEDLY**



# Analyzing service-life cost to choose the right seals makes real business sense

## CASE D: Seals that are replaced on a schedule

When seal replacement is regularly scheduled instead of wait-to-fail, for reasons of safety, service, quality or economy, the downtime costs incurred in replacing existing seals is usually constant. The added expense of switching to Kalrez® perfluoroelastomer seals should be offset by doubling periods between overhauls. In certain cases, this period could typically be tripled or quadrupled.

### Field application example

**Company:** CDR Pompe S.p.A, Senago, Milan, Italy, specialist high-tech pump manufacturer. CDR pumps are used mainly in pharmaceutical, chemical and petrochemical processing.

**Application:** CDR FC 35 and FC 50 mechanical seals used in ETN Lined Series magnetic drive pumps operating in concentrated sulphuric acid.

**Previous material used:** O-rings made of fluoroelastomer (FKM).

**Previous lifetime:** Regular failure after a maximum service life of only two months.

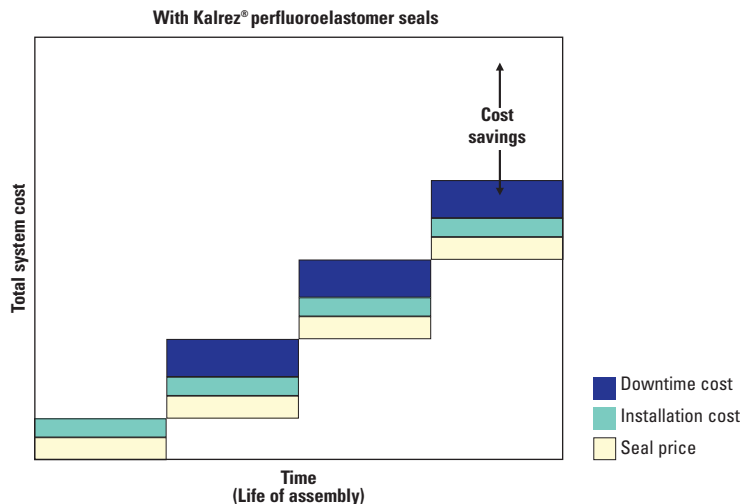
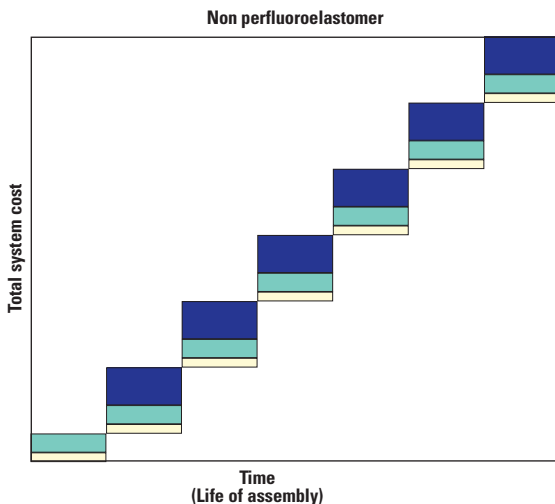
**With Kalrez®:** By comparison, the O-rings of Kalrez® Spectrum™ 6375 are still operating after 20 months.\*

**Advantages:**

- Higher resistance to chemicals (such as sulphuric acid).
- Increased operating uptime.
- Cost savings through reduction of costly downtimes.

\* at time of printing

## CASE D: SEALS THAT ARE REPLACED ON A SCHEDULE







### Examples of total system cost comparison

Manufacturing facilities continually strive to extend time between maintenance to reduce costly downtime. The example below (left) shows costs related to a standard, cartridge, dual mechanical seal for the chemical process industry. Even with a relatively low 20% seal replacement rate over the lifetime of its assembly, savings could be realized from using Kalrez® parts.

The second example below, on O-rings installed in couplings, shows that the lifetime of the O-ring has an even more dramatic impact on cost savings. Of course, each plant has its unique replacement rate and downtime cost. The chemical environment influencing the choice of the sealing material used must be considered when evaluating the potential savings from using Kalrez® seals in an assembly.

<b>Example: Pumps with mechanical seals</b> (amount in US\$ can also stand for Euros)		
	Non FFKM	Kalrez®
Cost of O-rings (7 seals)	28	700
Cost of mechanical seal (repaired)	750	750
Installation cost	100	100
Total installed cost	878	1 550
# of pumps	100	100
Total installed cost	87 800	155 000
Downtime costs (average 2 hours)* 6 000		6 000
<b>Total system cost – example 1</b>		
Replacements per year	20	8
Replacement rate***	20%	8%
Initial cost (seals and installation)	87 800	155 000
Replacement seal cost	17 560	12 400
Downtime cost	120 000	48 000
Total system cost	225 360	215 400
Net cost savings		9 960
Cost savings		4%
<b>Total system cost – example 2</b>		
Replacements per year	30	8
Replacement rate***	30%	8%
Initial cost (seals and installation)	87 800	155 000
Replacement seal cost	26 340	12 400
Downtime cost	180 000	48 000
Total system cost	294 140	215 400
Net cost savings		78 740
Cost savings		27%

<b>Example: O-rings in couplings</b> (amount in US\$ can also stand for Euros)		
	Non FFKM	Kalrez®
Cost of O-ring	1	30
Installation cost	100	100
Total installed cost	101	130
# of units used	1	1
Total installed cost	101	130
Downtime costs (average)**	1 000	1 000
<b>Total system cost – example 1</b>		
Requested lifetime	3 years	3 years
Actual seal lifetime in example	1.5 years	3 years
Replacements during lifetime	1	0
Initial cost (seals and installation)	101	130
Replacement seal cost	101	0
Downtime cost	1 000	0
Total system cost	1 202	130
Cost savings		1 072
Cost savings		89%
<b>Total system cost – example 2</b>		
Requested lifetime	3 years	3 years
Actual seal lifetime in example	6 months	3 years
Replacements during lifetime	5	0
Initial cost (seals and installation)	101	130
Replacement seal cost	505	0
Downtime cost	5 000	0
Total system cost	5 606	130
Cost savings		5 476
Cost savings		98%

\*Downtime costs: without an in-line spare pump = \$3000/hr, no downtime cost with an in-line pump. Cost takes into account a pump going down, process shutting down, two hours to replace a seal, getting the process lined out and running again.

\*\*Downtime cost of \$1000, 15-30 minutes to replace O-ring and rebuild coupling, or to install a spare coupling.

\*\*\*Average replacement rate based on case histories and real-life experience due to seal face, O-ring, maintenance and/or failure.

# Kalrez® perfluoroelastomer parts have proven value-in-use performance in pumps, seals and process equipment

When comparing the total cost related to sealing solutions, Kalrez® parts are often the more efficient choice, as they last longer, reduce downtime and increase MTBR. They also add to increased safety on production sites, helping to avoid unplanned leakages and to reduce environmental risks. These properties make Kalrez® perfluoroelastomer parts a preferred choice for critical sealing applications.

### Fluid and chemical resistance

Kalrez® perfluoroelastomer parts withstand more than 1,800 chemicals, solvents and plasmas. Standardizing with Kalrez® products for broad chemical resistance reduces your need to keep multiple materials in stock and therefore lowers cost of inventory.

### Sealing force retention

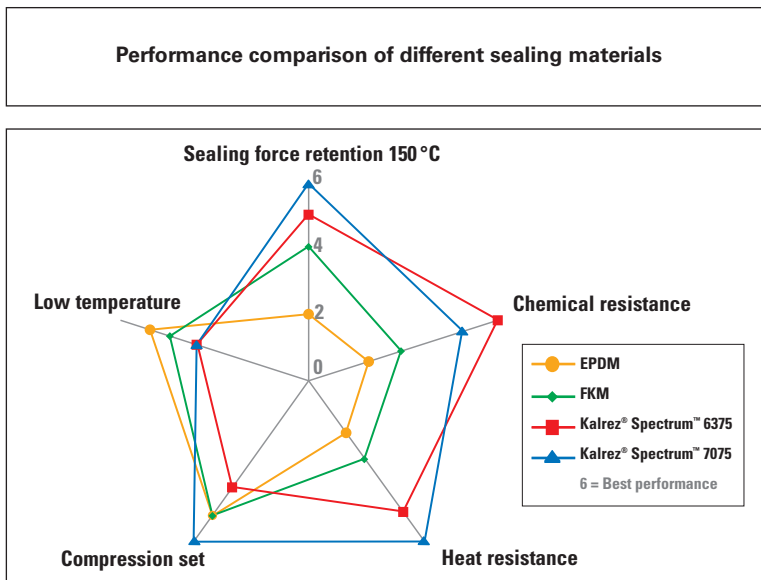
We have established in ISO 3384 tests that even under harsh and aggressive conditions, Kalrez® will retain its sealing force longer than other solutions.

### Compression set

Kalrez® parts exhibit low compression set, maintaining their elastic recovery to maintain tight seals longer. Because Kalrez® Spectrum™ 7075 parts recover better under compression than many other perfluoroelastomers, they tend to maintain their shape better under prolonged stress.

### Temperature resistance

In our experience, Kalrez® retains its elasticity and recovery properties better than other high temperature elastomers, and Kalrez® Spectrum™ 7075 retains it even after long-term exposure to temperatures up to 327°C.





## From technical assistance to fast, reliable supply you get more than just a product

### Global technical support and testing

We help you with the technical assistance and support you might need to achieve optimum results in the shortest possible time. Our worldwide R&D expertise can help you with compound selection and seal design, application testing and development, failure analysis and on-site training.

### Customer-tailored solutions

Advanced Finite Element Analysis (FEA) offers single-source analysis capability. From designing new seal shapes with concurrent analysis to groove geometry optimization, FEA gives unequalled flexibility. It shortens your product development lead times and brings innovative solutions to the market.

### In any shape you want

- Standard O-rings in AS-568, metric and JIS sizes
- Customized O-rings in various cross-sections and diameters
- Valve seats, diaphragms, gaskets, packer seals, T-seals, column fittings, custom shapes
- Kalrez® KVSP™ Valve Stem Packing System

### Fast delivery

Upon agreement and request, standard O-rings and make-to-stock parts can be delivered within 48 hours to most European and North American destinations.

### A worldwide presence network

Kalrez® parts are readily available through an extensive network of worldwide-authorized distributors. Our authorized distributors can give you the technical assistance needed to help solve your sealing problems.

#### Latest updates

We provide our customers with the latest information about sealing performance.

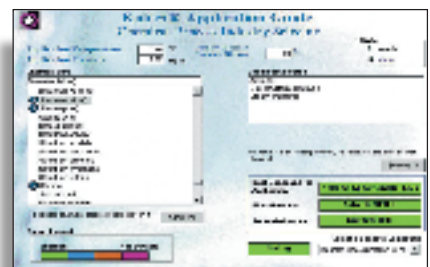
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[www.dupontelastomers.com](http://www.dupontelastomers.com)

and read or download the latest product information. Check out the DuPont Performance Elastomers Chemical Resistance Guide – an online tool that rates the chemical resistance of all elastomers, including Kalrez® and Viton®, in a variety of chemicals.

For more specific information on Kalrez® including seal design, contact us about the Kalrez® Application Guide, a unique interactive software program.

Visit the Chemical Resistance Guide on:  
[www.dupontelastomers.com](http://www.dupontelastomers.com)





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*(06/05) Printed in Switzerland  
Reorder no: KZS-D10651-00-A0804*

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