

[total care specific solution]



STOPAQ®

Self healing corrosion prevention & sealant technology
SEALFORLIFE

An aerial photograph of a lush green landscape. A winding river flows through the terrain, which is covered in dense vegetation. In the distance, a large dam structure is visible, spanning across a valley. The sky is a clear, bright blue, and the overall scene is bathed in natural light, creating a vibrant and scenic view.

Stopaq® is part of Seal For Life Industries, which is the name of a closely associated group of companies engaged in preventing and combating corrosion in the broadest possible sense. Seal For Life is the statement through which we demonstrate our thinking about the concept of ‘people, planet, profit’ – as well as about the quality and therefore the lifespan of our solutions. It shows what we think about markets, complete solutions, cost of ownership, the often sensitive infrastructures within which we work, and about our sustainable cost-effective solutions.

Welcome to Seal For Life Industries.

Why STOPAQ®?

STOPAQ® eliminates adhesion and fixation problems to any substrate. Due to its fluid-like nature and linear visco-elastic properties, STOPAQ® systems prevent corrosion for life. Thermal friction stress or disbondment related to CP are no longer issues. Surface preparation according to ST-2 or SSPC-3 is sufficient. Severe wet and hot aging tests combined with CP current tests underwrite the guarantee period and a service life level expectancy of greater than 60 years.

- Immediate & permanent adhesion to PE, PP, FBE, blasted steel and de-rusted steel
- Can be applied in cold temperatures
- Tested and proven from minus 45°C to 95°C operating temperatures



**STOPAQ**[®]
Self healing corrosion prevention & sealant technology
SEALFORLIFE



What is STOPAQ®?

STOPAQ® produces and supplies worldwide a broad range of innovative patent defended self-healing anti-corrosion solutions. The anti-corrosion and sealant systems actively protect structural objects against the daily risk of corrosion. The self-healing systems with unique linear visco-elastic properties prevent corrosion of your valuable assets for life. STOPAQ® systems are maintenance-free and seal completely and permanently any substrate against the ingress of water, oxygen, bacteria or AC/DC current. STOPAQ® offers by far the most environmentally-friendly protection systems in the coatings world. 100% stable, 100% self-healing and 100% adhesion guaranteed!

- non-polar
- non-toxic
- no stress generated
- non-crosslinkable
- non-crystalline
- non-hardening
- no cathodic disbondment
- totally inert
- fully amorphous
- no osmosis
- no M.I.C.
- pure linear visco-elastic technology

Seal for life is our contribution to a sustainable world. By offering unique non-crosslinkable anti-corrosion and sealant solutions that require only minimal surface preparation and perform for life, STOPAQ® ensures an environmentally-friendly, energy efficient and safe coating system application. STOPAQ® continuously develops new systems and applications by focussing its activity on the interaction between science, industry and the needs of the market. Our Research and Development is tasked to look for safer, healthier, risk-free, faster, easier and absolutely sustainable solutions from a total low cost of ownership perspective.

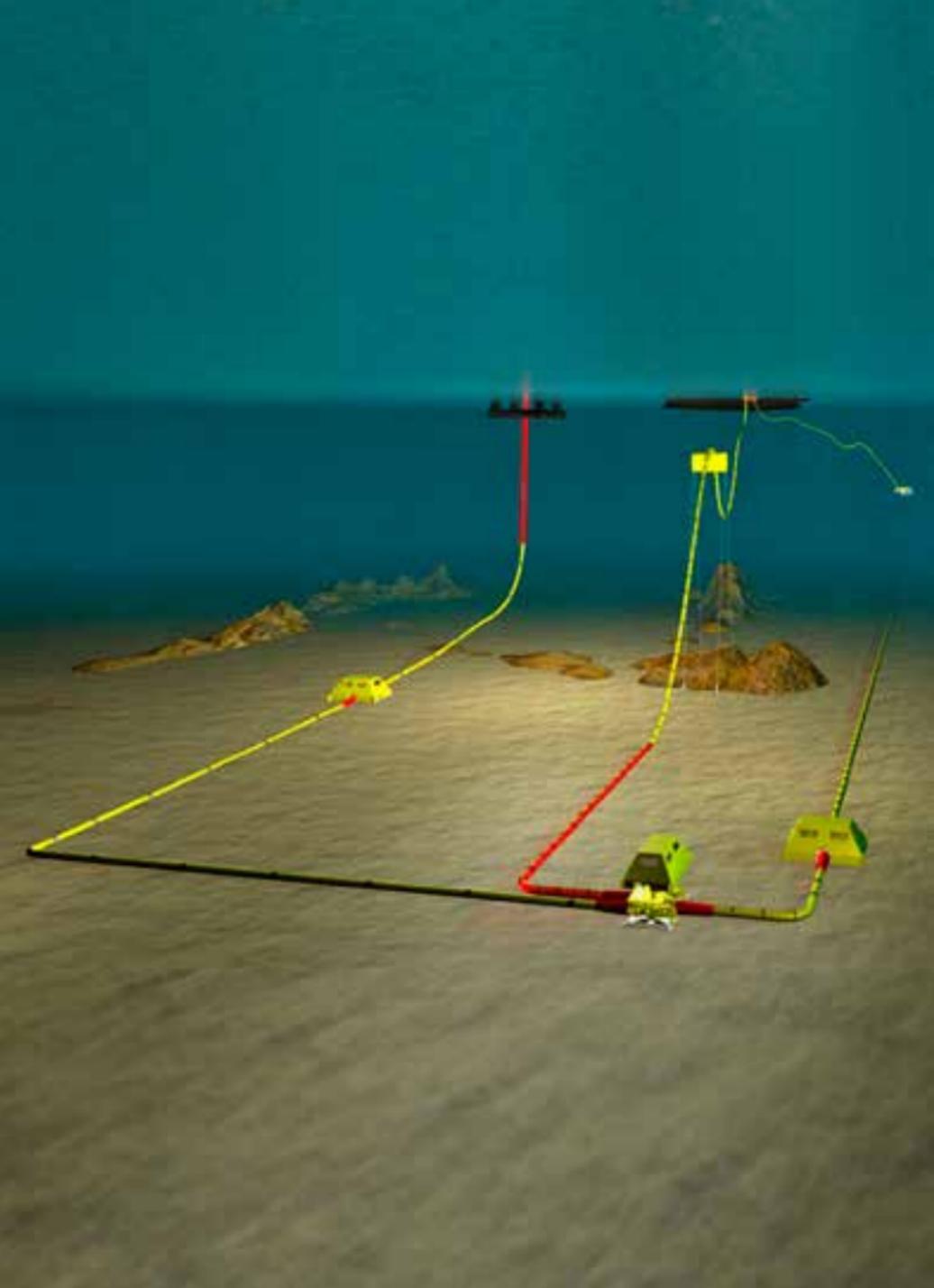
- Protects valuable assets
- Long-life stability
- Cost-effective
- Do it right, do it once



Innovative values

For more than 20 years, STOPAQ® has been the market leader in developing new applications for sealing and corrosion prevention meeting the most stringent safety and health requirements. Every day our people are developing and searching for new solutions using intelligent engineering from a total cost of ownership approach to ensure the end-user a safe and sound system. In many markets, from onshore pipelines, refineries to offshore platforms, subsea pipelines and civil structures, STOPAQ® solutions can be found making the impossible possible.

- Goes beyond where others fail
- Meets & exceeds international norms
- Pipelines, valves, casings, flanges, jetty piles, joints, cable inlets, tank roofs, city pylons, windmills, chimers, structural steel, LNG plants, sweating lines



STOPAQ® specialties

Subsea

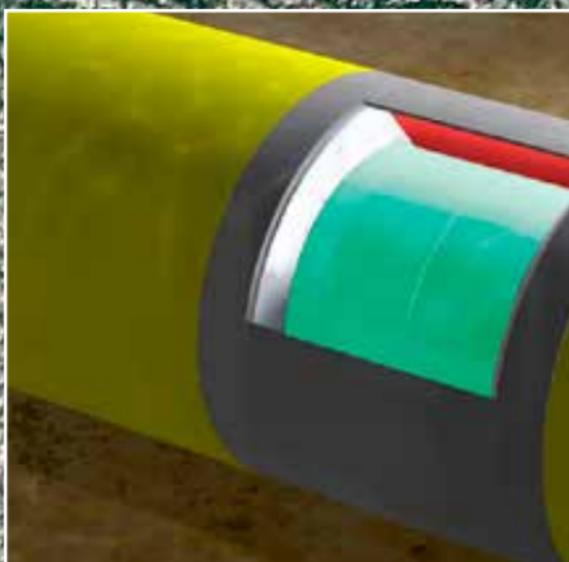
STOPAQ® Subsea systems protect (sub)merged objects against the influence of (salt) water and bacteria's and can easily be applied by divers or ROV's.

SFL Industries' Subsea division offers solutions for the offshore and inshore industry, based on Stopaq Visco Elastic Technology. It serves clients with the best possible preventative systems to protect their partly or fully submerged structures against the impact of corrosion. With STOPAQ® corrosion preventative solutions, we are able to seal spools, risers, piles, J-tubes, flanges, Christmas trees, subsea pipelines, power cables & connections.

Casing Filler

STOPAQ® Casing Filler is the most effective solution for preventing corrosion of steel pipelines in steel casings. Water and oxygen that normally is expected to be present in a non-filled casing pipe, will cause corrosion of the operational steel pipeline and also will cause internal corrosion of the casing pipe. By filling the annulus between the casing pipe and the operational pipe with STOPAQ® Casing Filler, water and oxygen will be displaced, thereby ruling out corrosion. STOPAQ® Casing Filler is delivered to the casing job site by truck in a heated tank and pumped down the casing vent as a hot liquid. As it cools down, it firms up to a pasty consistency. The product does not cure or become brittle, it stays flexible forever and maintains its optimum sealing properties.

Once applied, STOPAQ® Casing Filler will also prevent eventually present Cathodic Protection currents to cause internal corrosion of the casing pipe. The material has high specific electrical insulation resistance which prevents passing of electrical currents. Superior end-sealing solutions are applied in combination with STOPAQ® Casing Filler. This will prevent the ingress of water, oxygen and soil from the casing pipe ends. The solution is by far superior to other casing filling solutions on the market. It combines excellent corrosion preventing properties and linear visco-elastic behaviour of STOPAQ® materials.



STOPAQ® specialties

FAST

Factory Applied STOPAQ® technology (FAST) are mainly used for distribution lines & transmission pipelines in cities, at refineries and across the country for oil, gas and water pipelines.

- FAST PE
- FAST PP
- FAST GRE
- FAST GRU
- FAST Single Wrap
- Polyurea Spray
- Polyester UV-Cure

OFFSHORE

Pipelines and platforms need to be safe constructions, not only for the people, but also for the environment. STOPAQ® Offshore can seal risers, ballast tanks, J-tubes and flanges for life. STOPAQ® applications can be found at many big offshore objects worldwide and offshore pipeline joints. STOPAQ® offers total integral solutions including service preparation on board laybarge vessels.

The joint system offers simple safe and fast turnaround job guaranteeing 100% adhesion. Mechanical protection is ensured by implementation of tapes, shrinkable sleeves or PU infill.



The STOPAQ® range

4100 PUTTY: Mouldable Putty for underground corrosion prevention of manhole covers, flanges & fittings.

4200 FILLER: Injectable filler to protect permanent flange gaskets & tank chime areas.

WRAPPINGBAND CZ/CZH/CZHT: Non-crosslinkable linear visco-elastic compound of 2mm thickness in a tape form for pipe wrapping. CZ: <50°C CZH: <70°C CZHT: <95°C

2100 AQUASTOP: Sealing compound to prevent water ingress at cable/pipe wall penetrations in combinations with a mortar for inside and outside walls.

OUTERWRAP PVC/PE/HPP/HSPE/HTPE: Mechanical protection tape protecting the corrosion prevention layer. PVC: <70°C PE: <70°C HPP: <95°C HSPE: <50°C HSPEX: <50°C

EZ WRAPPINGBAND: Above ground, non-crosslinkable linear visco-elastic sealing compound in a tape form for structural objects and tankbottoms. EZR: roofs
EZ: tank bottoms Basecoat: steel constructions

WRAPPINGBAND SZ AND SSL: Non-crosslinkable linear visco-elastic compound in tape form for offshore use such as Splash Zone (SZ) and Subsea (SSL) application.

WRAPPINGBAND CL: Non-crosslinkable linear visco-elastic compound in tape form for condensating pipelines.

OUTERGLASS SHIELD XT: Glassfibre reinforced water activated polyurea for mechanical protection layers for subsea and above ground applications at piles, risers, above ground piping, soil-to-air transition areas.
XT: piping

HIGH IMPACT SHIELD (HT): A heat shrinkable sleeve for mechanical protection for field joints in various widths and tailor-made per joint size. HI Shield: <65°C HI Shield HT: <95°C (onshore) and <115°C (offshore)

VINYLESTER/POLYESTER: UV curing mechanical protection for rocky soils up to max. 100°C for underground and above ground piping such as risers.

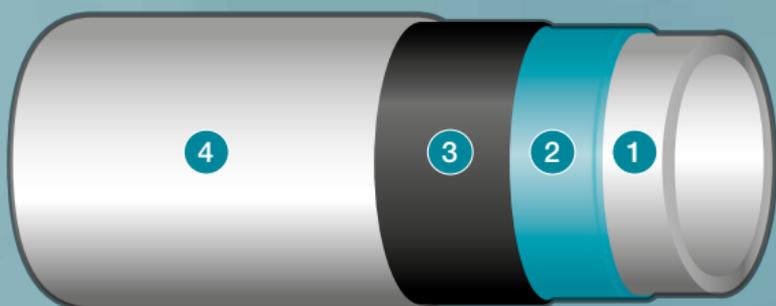
CASING FILLER: Hot-applied water displacing electrical insulator to prevent corrosion between the medium carrier and casing pipe. The application is turn-key applied by own trucks/mobile tanks, including metering and end-sealing service.

Product selection table

Property	Conditions	Requirement
Operating Temperatures	Cold	T_{max}
	Ambient	
	Hot	
		T_{min}
Glass Transition Temperature		-
Drip Resistance	$T_{max} + 50^{\circ}\text{C}$	No Dripping
Melting Point		No Melting Point
Specific Electrical Resistance	23°C	$> 10^8 \Omega \cdot \text{m}^2$
Thermal Conductivity	$0 - 100^{\circ}\text{C}$	
Adhesion - Steel surface - Plant coating - PE - PP - FBE	23°C and T_{max}	Cohesive Failure
Hot Water Immersion Test - Steel surface - Plant coating - PE - PP - FBE	23°C and T_{max}	Cohesive Failure
Thermal Ageing Resistance - Steel surface - Plant coating - PE - PP - FBE	23°C and T_{max}	Cohesive Failure
Cathodic Disbondment Test	T_{max}	0 mm

STOPAQ Mechanical Protection (Outerwrap Tapes, Shrinkable Sleeves)

Property	Conditions	Requirement
Impact Resistance	23°C	$> 15 \text{ J}$
Indentation Resistance	$T_{max} 10 \text{ N/mm}^2$	$\geq 0.6 \text{ mm}$
Soil Shear Resistance - Outerwrap - Tape - Outerwrap - Impact Shield - Outerwrap - Polyester - Outerwrap - Glass Reinforced		corrosion protective layer should stay intact
Epoxy - Outerwrap - Outerglass Shield		



	Value	Meets/Exceeds	Method
CZ	50 °C		-
CZH	70°C		-
CZHT	95°C		-
all	- 45°C		
	< - 65°C		ISO 21809-3
	No Dripping	exceeds	ISO 21809-3
	No Melting Point	meets	ISO 21809-3
	2.4 x 10 8 Ω.m ²	meets	ISO 21809-3
	0.25 W/m.K		ASTM 1114-98
	Cohesive Failure	meets	ISO 21809-3
	Cohesive Failure	meets	ISO 21809-3
	Cohesive Failure	meets	ISO 21809-3
	0 mm self healing!	meets exceeds	ISO 21809-3

s, and Outerglass Shields) Performance Tabel

	Value	Meets/Exceeds	Method
	> 40 J self healing!	exceeds	ISO 21809-3
	≥ 0.1 mm self healing!	meets	ISO 21809-3
	fair moderate good excellent	meets meets meets exceeds	Shear Test STOPAQ Shear Test STOPAQ Shear Test STOPAQ ISO 489 test PetroChina
	excellent	exceeds	ISO 489 FJC PetroChina

1 Clean steel surface

2 Wrappingband

CZ, CZH, CZHT 4100 Putty
EZ Wrappingband
Subsea Compound
4200 Filler
Paste CZ, CZH, CZHT in sheets

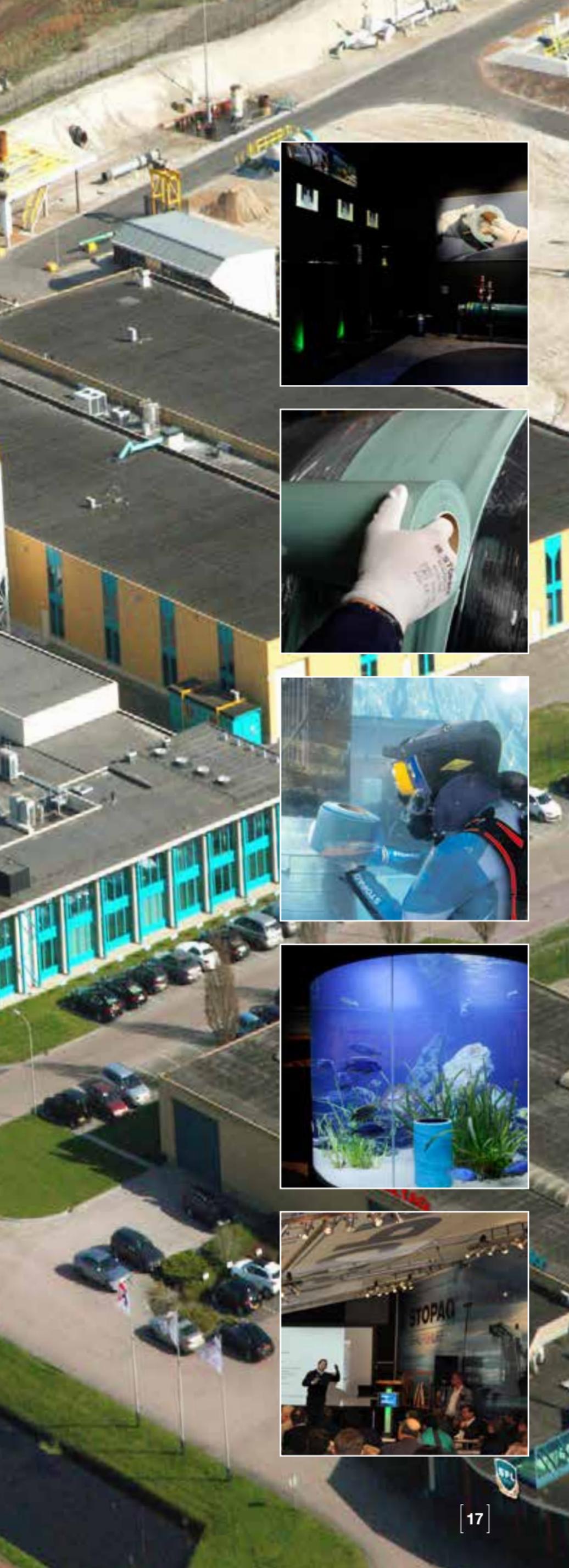
3 Mechanical protection layer

Outerwrap PVC, PE, HTPP, HSPEX,
HI Shield, Glass Reinforced Epoxy
Outerglass Shield XT, HT, XT24
Polyester

4 Additional mechanical protection

if needed Rockshields, PU Infill for
CWC coated pipelines etc.







Selection of endusers



TOTAL



شركة تنمية نفط عُمان
Petroleum Development Oman



gasunie



The Chemical Company



Saipem



أرامكو السعودية
Saudi Aramco



ConocoPhillips





Kiwa approval



ISO 9001



NSF approval



TUV Nord Baltic



Shell approval



Offshore non-toxicity

Certified & patented technology

STOPAQ® Corrosion Prevention & Sealant systems are certified according to the KIWA BRL k911/02, TUV Nord for the ISO 12068, class C50. The system are approved and tested from minus 45°C to 95°C according to ISO 21809-3. STOPAQ® is NSF/ANSI 61 approved with additional offshore approvals from the SouthWest Institute for smoke and toxicity.

STOPAQ®'s primary layers within a system consist of a fully amorphous, non-crosslinkable, non-polar polymer composition which is totally impermeable once applied. It is impenetrable to water, oxygen and bacteria, the elements that commonly cause corrosion. Unlike conventional coating types, the STOPAQ® compound features a liquid-like behaviour to flow across and ensure a full wetting of the entire surface of substrate. This behaviour does not change with time meaning that internal stresses do not arise in STOPAQ® ensuring that it retains its corrosion preventative properties (i.e., no ageing). STOPAQ® provides superior adhesive strength to any surface (steel pipe or existing coating) through a permanent molecular bonding with the substrate. With a glass transition temperature of -67°C, STOPAQ® will flow and adhere even in the coldest working environments, and it will self-heal in case of minor damages.



+



= Cathodic Protection Joint Sealing



+



= Factory Applied Pipeline Coating (FAST GRE)



+



= Above Ground Flange



+



= Fieldjoint Coating



+



= Linear visco-elastic Single Wrap



+



= Sealtaq Civil Solution

The synergy of Seal For Life Industries

Everyday brings us new opportunities to put the combined synergistic and innovative strengths of our companies into practice wherever required, throughout the world. It's a world that we face with an unequivocal mission which we consider so important that we've named our collective business after it: Seal For Life.

Above or under water, from salty swamps to complex polar operations, Seal For Life offers a number of specialist and proven products. The best approach for many projects is to combine these products, thus delivering a tailor made and optimized solution for each individual project.

Flexible 1 + 1 = 3 principle

We call this the 1 + 1 = 3 principle, which is made possible by the direct and open contacts between our products specialists. It means that Seal For Life can respond rapidly and effectively to any project, no matter what combination of products and specialisms is applied.

**1+1 = 3 principle is made a reality
by Seal For Life Industries.
Seal For Life is the constant factor!**

For more information regarding specifications, track records and other commercial/technical information, please consult us at:

Seal For Life Office:

Gasselterstraat 20, 9503 JB, Stadskanaal, the Netherlands
E-mail: info@sealforlife.com, website: www.sealforlife.com

Manufacturing sites:

Kentucky - USA, Tijuana - Mexico, Westerlo - Belgium,
Baroda - India, Stadskanaal - the Netherlands,
Dammam - Saudi Arabia



 **SEALFORLIFE**
Industries
PART OF THE BERRY PLASTICS ENGINEERED MATERIALS DIVISION

 **STOPAQ**[®]
Self healing corrosion prevention & sealant technology
SEALFORLIFE