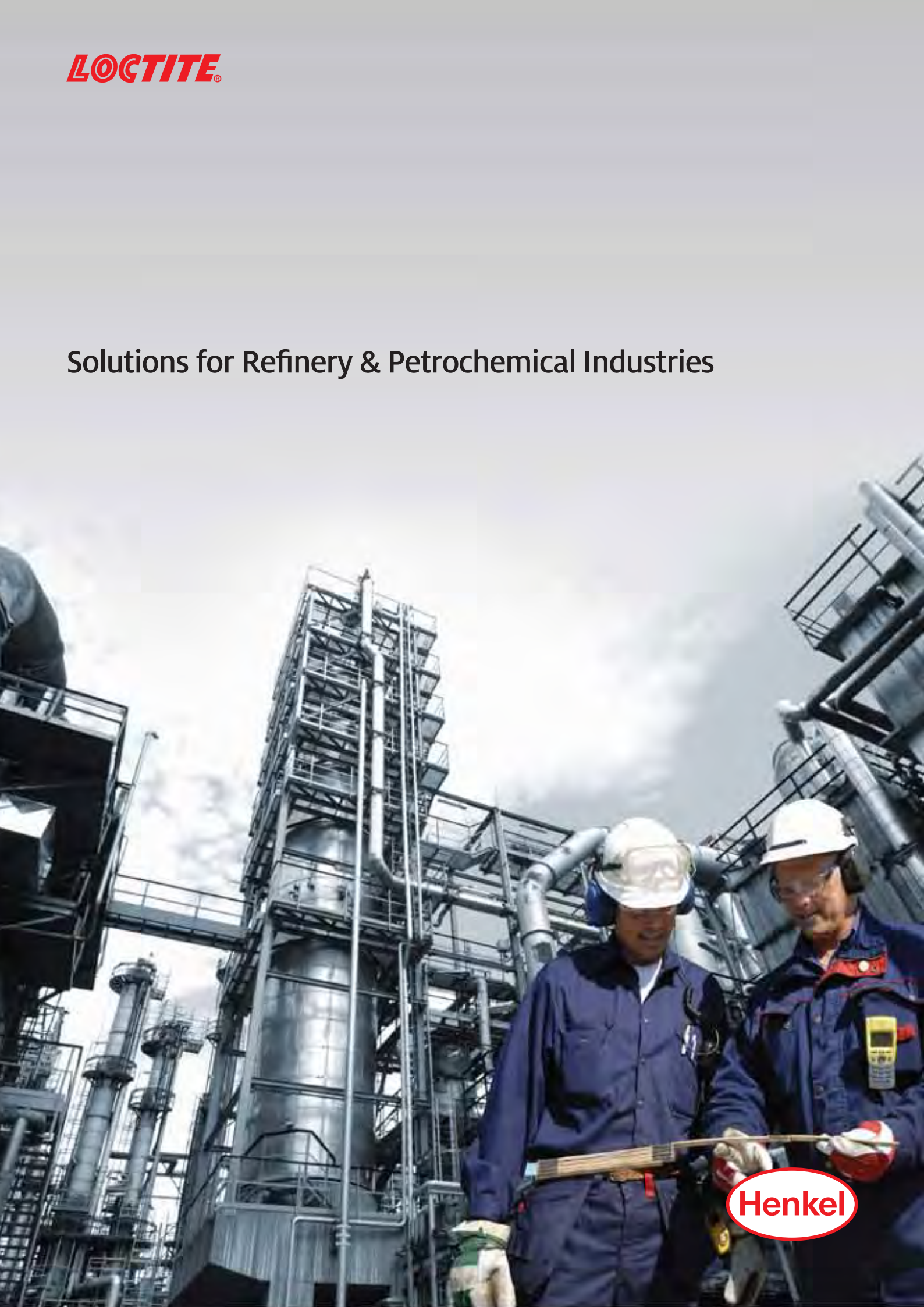
LOCTITE®

Solutions for Refinery & Petrochemical Industries



LOCTITE®

Optimizing Asset Performance

Table of Content

1. MAINTENANCE AND REPAIR SOLUTIONS FOR ALL MAJOR COMPONENTS

Taking a step beyond technology solutions we go even deeper to the specific maintenance and repair task of the industrial component. Whether it be static or rotating equipment, you will find the right product solution to maintain your devices time and cost efficiently and to noticeably increase the reliability of your industrial plant.

Static Equipment

Pipe Work and Valves

- Eliminating leakages during operations by using liquid thread sealing technologies.
- Reinforce corroded or leaking pipework with certified composite repair system (ISO/TS 24817 certified by DNV GL)
- Stop and prevent corrosion with high performance sprayable coating

Tanks, Drums and Pressure Vessels

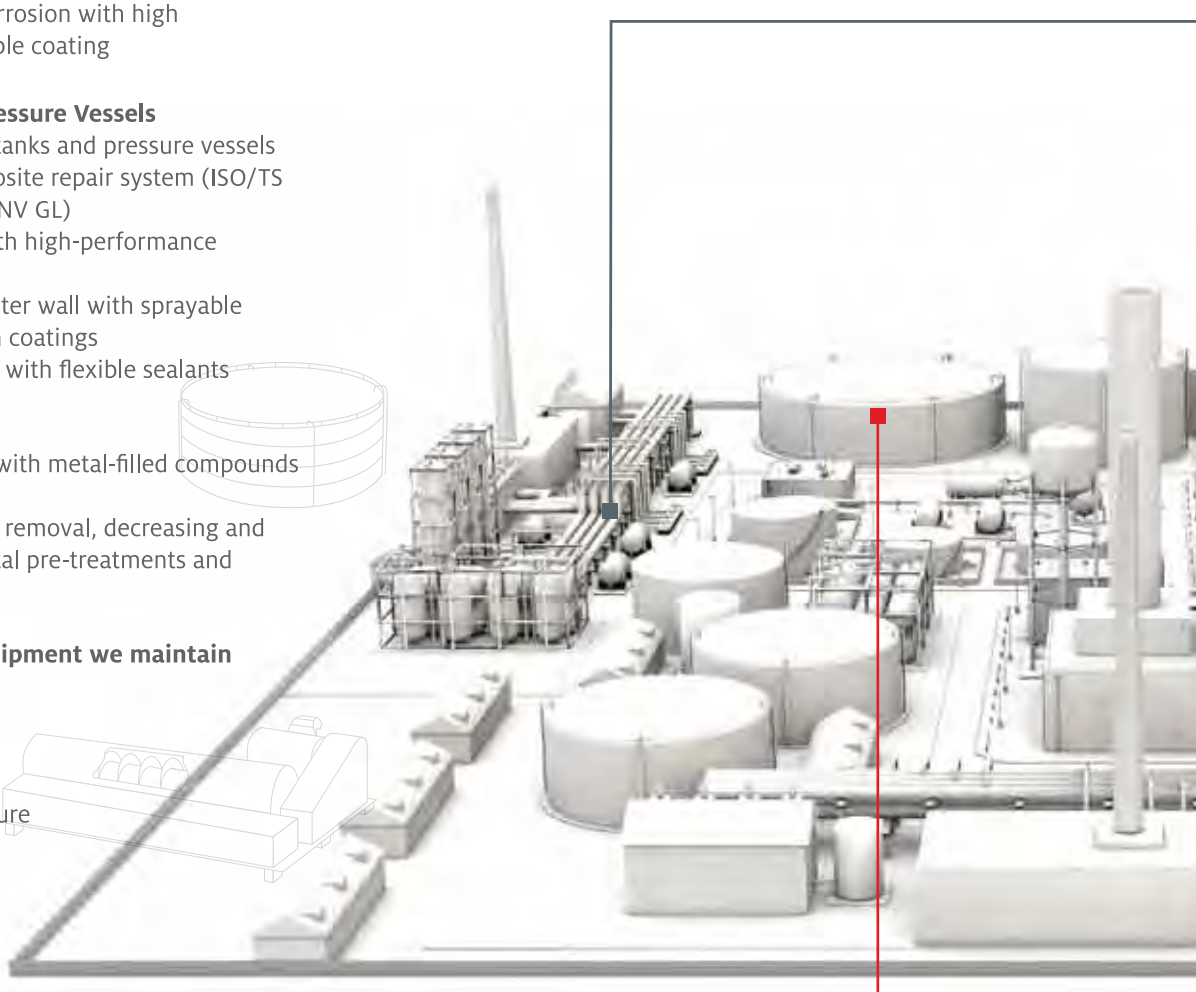
- Reinforce corroded tanks and pressure vessels with certified composite repair system (ISO/TS 24817 certified by DNV GL)
- Remove residues with high-performance cleaners
- Protect inner and outer wall with sprayable corrosion protection coatings
- Seal outer tank base with flexible sealants

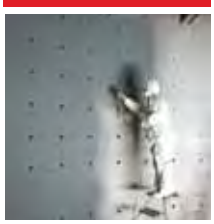
Heat Exchangers

- Protect front plates with metal-filled compounds and surface coatings
- Descaling, corrosion removal, decreasing and passivation with metal pre-treatments and cleaners

Additional Static Equipment we maintain

- Reactors
- Fired Heaters
- Screens & Fillers
- Metal Structures
- Concrete Infrastructure




Tanks, Drums & Pressure Vessels

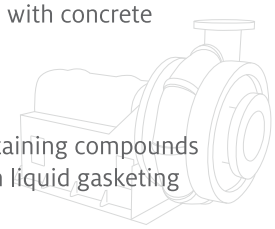

Heat Exchangers


Pipe Work and Valves

Rotating Equipment

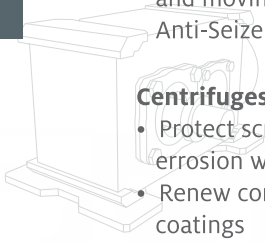
Pumps

- Increase efficiency by rebuilding and coating inner pump housings with ceramic-filled surface coatings and compounds
- Provide reliable sealing solutions for pumps, even against aggressive media, with liquid gasketing products
- Rebuild damaged shafts with high compressive strength metal-filled compounds
- Repair damaged foundations with concrete repair compounds



Gearboxes

- Prevent bearing spin with retaining compounds
- Seal against oil leakages with liquid gasketing products
- Clean housing with effective parts cleaners
- Prevent seizing and frettening of connections and moving parts with high-performance Anti-Seize products



Centrifuges

- Protect screw conveyors against abrasion and errosion with ceramic-filled surface coatings
- Renew corrosion protection with sprayable coatings
- Prevent loosening of threaded parts with threadlocking adhesive
- Bond wear bushings into bowls with structural epoxies

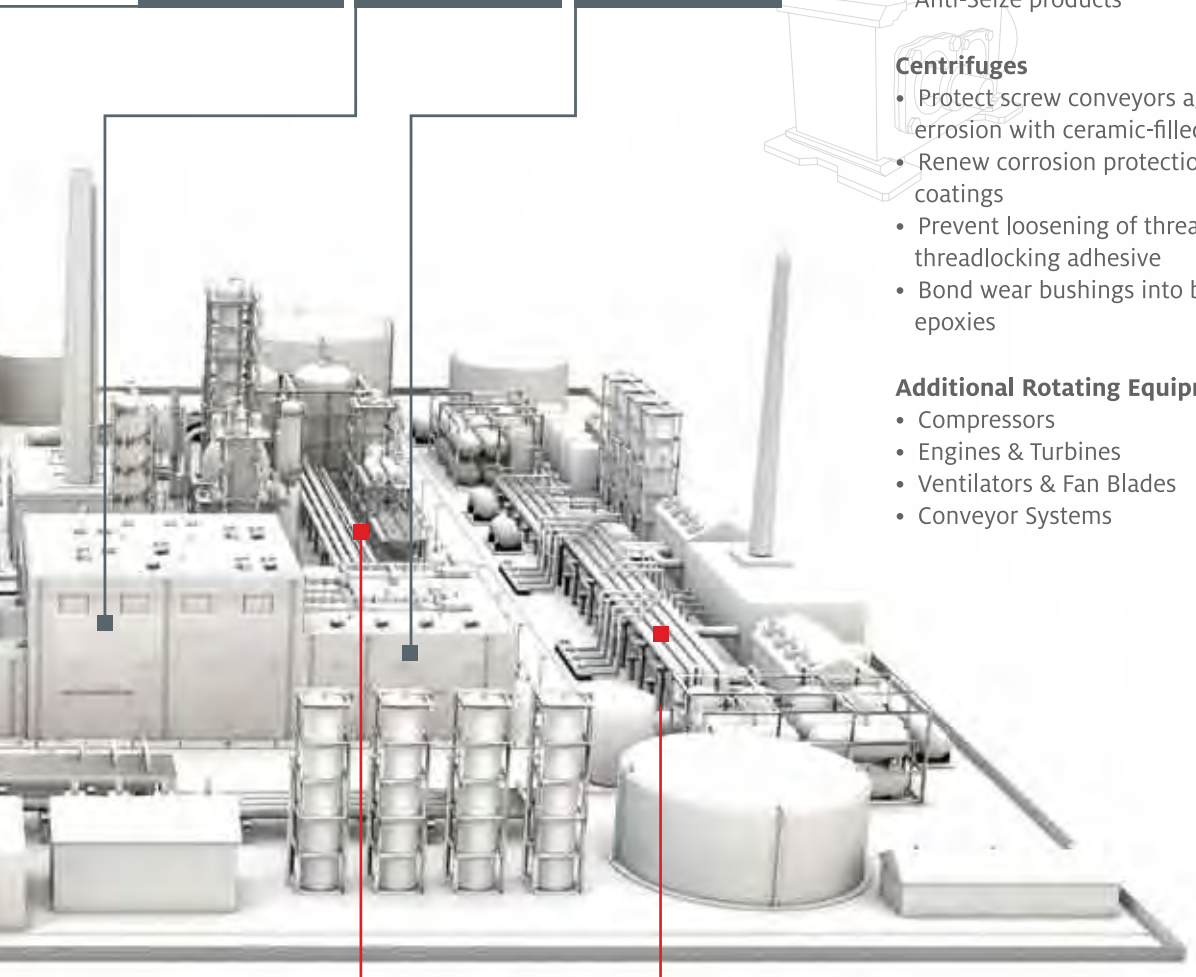
Additional Rotating Equipment we maintain

- Compressors
- Engines & Turbines
- Ventilators & Fan Blades
- Conveyor Systems

Pumps

Gearboxes

Centrifuges



Maintenance Solutions to Optimize Asset Performance

Today's refineries have to deal with various issues that pertain to the safety, reliability and environmental performance of critical process plants. Refineries are complex environments and require intensive maintenance to operate reliably.

Modern refineries are becoming larger and are able to allow higher refining capacities. Yet at the same time, these operations entail increased complexity, while demand for reduced down-time and field failures is more critical than ever.

The majority of industry maintenance applications mainly deal with equipment rebuilding and protective surface coating. Protection against wear and chemical attack is one of the most vital maintenance issues for teams in petrochemical facilities.
Increasing awareness is essential for the protection of assets from corrosion and improvement in service-life of the plant, while at the same time dealing with an increasing demand for reliability and safety.

The Maintenance Expert

With over 50 years expertise and know-how, Henkel brings numerous maintenance, repair, rebuild and protect solutions. Henkel utilizes proven as well as innovative solutions together with best management practices from our experience on refinery and petrochemical plants worldwide.
These proactive maintenance solutions are proposed to provide:

- Improved Efficiency, Reliability and Safety
- Reduced Downtime and Spare Parts Inventory
- Reduced Energy Costs
- Extended Equipment Life
- Minimized Maintenance Costs

NB: Application cases introduced in this catalogue only demonstrate a part of Henkel's capabilities.

Whatever You Rebuild, Repair and Protect...

Henkel's Solutions for all Surface Engineering Needs

Henkel offers you more than state-of-the-art adhesives, sealants and surface treatment products. We give you access to our unique expertise covering the entire value chain. So whatever you rebuild, repair or protect, with our technical consultancy and expert training we are able to offer you specific solutions for your industry and your maintenance needs.

Technical Consultancy

Our products have been designed to meet the specific challenges of your industry. With an extensive network of sales and technical engineers around the world we offer you professional consultancy to find the best solution for your specific surface engineering needs.

Cleaning & Pre-Treatment

surface preparation is the most important factor affecting the total success of any surface treatment. Without proper surface profile and surface cleanliness coating systems will quickly fail. To ensure high quality applications we offer superior cleaning and pre-treatment products like surface cleaners and corrosion inhibitors.

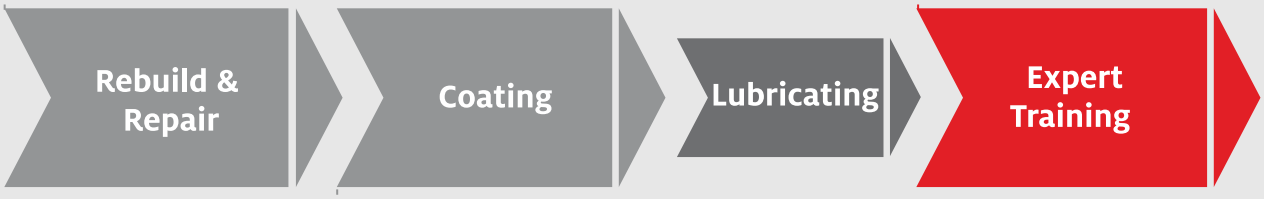
...Find the Right Solution!

Rebuild & Repair

To permanently repair, rebuild and restore damaged machinery, equipment, floors and walls specific products are required to put worn parts back to a serviceable condition. Our range includes putty or pourable formulations for aluminum, steel and concrete.

Expert Training

Maintenance Workshop Training from Henkel provides maintenance engineers with the necessary skills, knowledge and tools to reduce plant downtime and drive down maintenance costs.



Coating

The protection of machinery and equipment against external attack is a challenge in any industry. Protective coatings and compounds offer maintenance solutions to the problems caused by wear, abrasion, erosion, chemical attack, and corrosion. Our products are available in sprayable, brushable as well as trowelable formulations.

2. SURFACE ENGINEERING SOLUTIONS

Our highly experienced Henkel Technical Engineers are committed to provide the highest level of technical support and assistance in the industry. Working closely with local industrial suppliers and selected engineering service agents, our Application Engineers provide full process support – from maintenance assessment, performance and analytical testing to implementation of solutions – to find the right solution for your needs.

For your surface engineering needs we offer you technical consultancy for:

- Surface cleaning
- Surface preparation
- Surface pre-treatment
- Repair product selection
- Surface protection product selection
- Application process
- Control recommendation
- Application tips

2.1 Cleaning and Pre-Treatment

Correct surface preparation is crucial for the successful application of both, metal repair products and protective coatings and compounds. Good surface preparation will:

- Improve adhesion to parts
- Prevent corrosion between the surface and product used
- Extend maintenance intervals

The two main important factors for a successful application are surface profile and surface cleanliness.

Surface profile

Improve adhesion by increasing surface area and providing a keyed anchor pattern.

Surface profiles vary depending on the type and size of abrasive particles impacting the surface. A bad surface profile provides poor anchor pattern, resulting in adhesive failure.

Correct profile but insufficient coating causes surface peaks which may be exposed to rust and/or contamination.

It is critical to achieve the correct profile depth and product coating thickness. LOCTITE® product applications require a minimum 75µm surface profile. Only with this anchor pattern and a sufficient coating layer, maximized coating adhesion can be guaranteed.

Coating Surface

The best way to achieve the correct surface profile is abrasive blasting. It does not only remove visible surface rust and contaminates, but also creates a surface roughness ideal for bonding to. See following table for surface specification.

Surface preparation grades of blast

Rust grade	
A	Steel with mill scale layer intact and very minor, or no rusting
B	Steel with spreading surface rust and the mill scale commenced flaking
C	Rusty steel with mill scale layer flaked and loose or lost but only minor occurrence of pitting
D	Very rusty steel with mill scale layer all rusted and extensive occurrence of pitting

Blast class		
1	(SP-7/N4)	Very light over clean with removal of loose surface contaminants
2	(SP-6/N3)	Substantial blast clean with wide spread, visible contaminate removal and base metal colour appearing
2,5	(SP-10/N2)	Intensive blast clean leaving shading grey metal with only contaminates
3	(SP-5/N1)	Complete blast clean with consistent metal colour all over and no visible contaminates

Surface cleanliness

Chemical contaminants that are not readily visible, such as chlorides and sulphates, attract moisture through coating systems resulting in premature failure. For this reason it is fundamentally important to clean all substrates with an industrial strength cleaner and degreaser. Heating up the device before cleaning can facilitate the removal of contaminents.

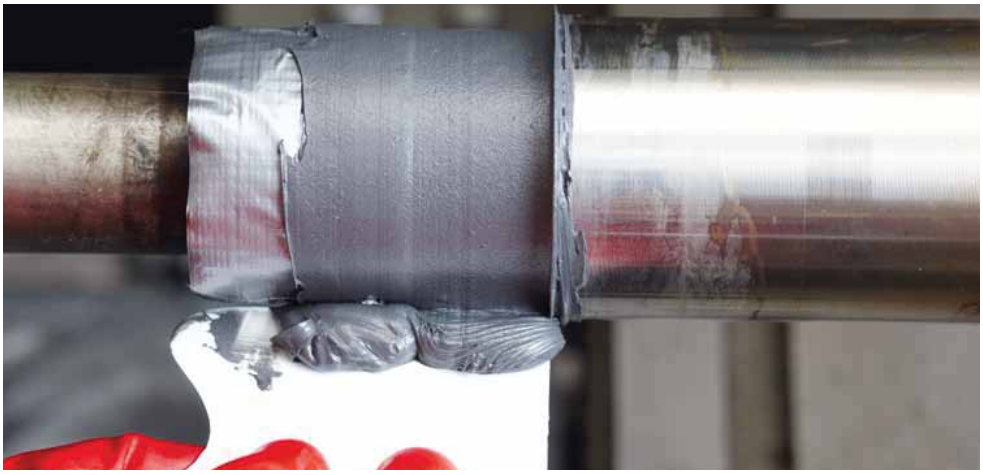
LOCTITE® SF 7840 – Cleaner and degreaser

- Before abrasive blasting
- Meets the requirements of a wide range of industrial cleaning applications
- Biodegradable, solvent free, non-toxic and non-flammable, diluted with water (Rated USFA-C1)

LOCTITE® SF 7063 – Cleaner and degreaser

- After abrasive blasting
- Compatible with metal, glass, rubber, most plastics and painted surfaces
- No residue, rapid flash off cleaner ideal for removing greases and contaminates prior to adhesive bonding, coating and sealing applications

2.2 Rebuild and Repair



LOCTITE®Metal Repair Compounds are designed to repair, rebuild and restore worn metal parts without the need of heat or welding. Typical applications include cracks in housings, worn keyways in shafts and collars, worn cylindrical shafts, etc.

LOCTITE® Concrete Repair products are designed to guarantee fast, reliable and long lasting repairs. They bond to concrete, wood, glass, steel and other construction materials. Typical applications include ramps and loading areas, support beam and footer repairs, bridge decking and supports, concrete bunds and walls etc.

Why choose LOCTITE® Metal Repair Solutions?

Traditional repair methods such as hard face welding are time consuming and expensive. Alternatively, LOCTITE® Metal-filled Compounds are easily applied and offer superior compressive strength and protection qualities.

Key benefits:

- Low-shrinking
- Can be drilled, tapped, or machined after cure
- Superior adhesion to metal, ceramic, wood, glass and some plastics
- Excellent resistance to aggressive chemicals
- Choice of mild steel, aluminium or non-metallic fillers
- Create durable repairs

LOCTITE® EA 3472 Steel Liquid pourable steel-filled, self-levelling 2K-epoxy

Why choose LOCTITE® Concrete Repair Solutions?

Traditional repair methods such as repairing beams, pillars, columns and workshop floors with conventional concrete need extensive time for curing. Alternatively, LOCTITE® Concrete Repair products are easily mixed, applied and cured after 45 minutes already.

Key benefits:

- Easy to mix and apply
- Can be applied at temperatures even below 0°C
- Can be applied on damp surfaces
- Does not shrink or crack
- Reduces repair time, labor costs and downtime
- Chemical resistant
- Impact resistant
- Can be coloured with standard cement colouring powders
- Bonds to old and new concrete, metal and woods etc.
- Very fast curing time

LOCTITE® PC 9410 Magna Crete : quicker and safer than conventional concrete.

2.3 Protective Coatings

Why choose LOCTITE® Protective Coating Solutions?

With a wide range of special coating solutions, we are able to meet the specific requirements for a huge range of applications that include: tank, structure, and vessel coatings. Additionally, LOCTITE® Protective Coating Solutions are easy to apply and offer excellent protection to the coated area.

Key benefits:

- Easy to mix and apply
- Chemical resistant
- Abrasion / Erosion resistant
- Flexible coating
- UV resistant for outdoor protection
- Able to withstand seawater environments
- Longer life and reduced coating frequency

LOCTITE® PC 7333 & LOCTITE® PC 7315 provides a high gloss low friction coating.

2.4 Application Tips

Preventing flash rusting

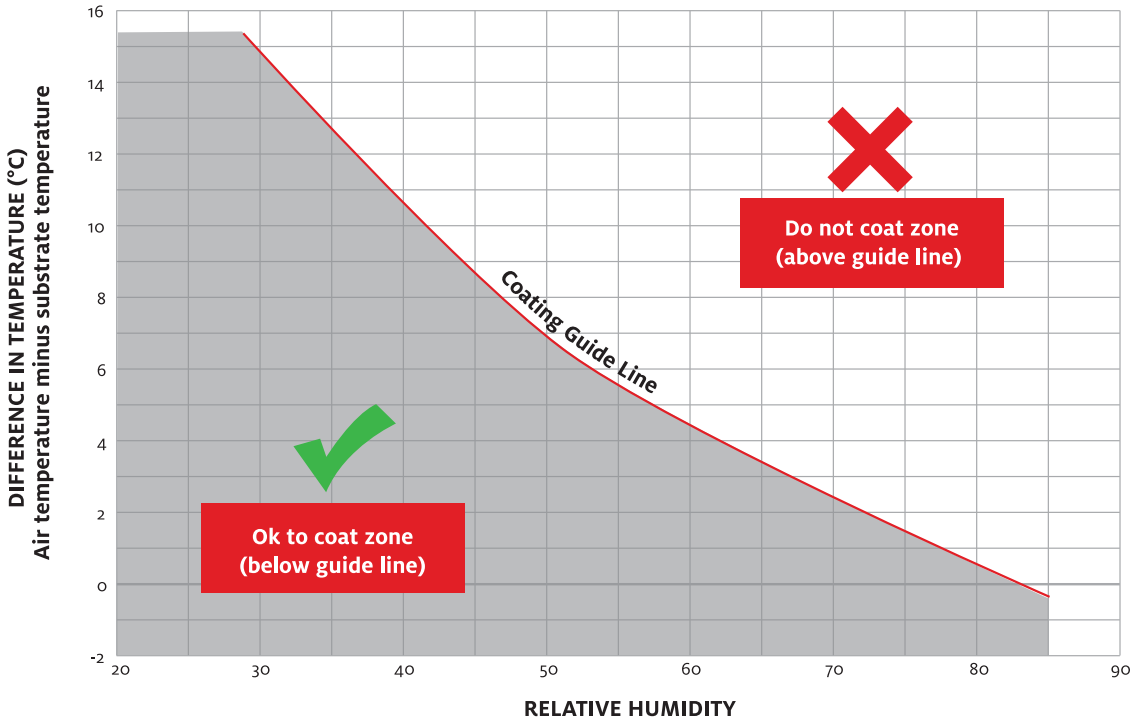
In high humidity conditions, flash rusting of a newly prepared metal surface can develop within minutes, causing contamination which will need to be removed again before a coating is applied. A thin coat of LOCTITE® SF 7515 applied as soon as possible after preparing a metal surface will prevent flash rusting.

Moisture free surface

It is critical to the success of most coating systems that the surface is completely free of moisture prior to and during product application and curing.

Dewpoint

Condensation of water (dew) from the atmosphere onto the surface can occur, given the right conditions. For a given set of conditions, the temperature at which condensation will occur is called the dewpoint. As long as the surface temperature is 3 °C (or more) above the dewpoint temperature, it is generally considered safe to coat as far as risk of condensation is concerned.



3. KEY PRODUCTS

3.1 Metal and Concrete Surface

Repair and Rebuild

Repair or rebuild damaged parts?

Steel

	Kneadable	High compressive strength	Putty
Solution	**LOCTITE®EA 3463** **Metal Magic Steel™ stick**	**LOCTITE®PC 3478** **Superior Metal**	**LOCTITE®EA 3471** **Steel Putty**
Description	2K-Epoxy	2K-Epoxy	2K-Epoxy
Mix ratio by volume/weight	N/A	4:1 / 7.25:1	1:1
Working life	3 min.	20 min.	45 min.
Fixture time	10 min.	360 min.	180 min.
Shear strength (GBMS)	≥ 3.45 N/mm²	17 N/mm²	20 N/mm²
Compressive strength	82.7 N/mm²	125 N/mm²	70 N/mm²
Service temperature range	-30 to + 120°C	-30 to + 120°C	-20 to + 120°C

- Emergency sealing of leaks in pipes and tanks
- Smoothes welds
- Repairs small cracks in castings

Sets in 10 minutes. Steel filled kneadable stick. Adheres to damp surfaces and cures under water. Chemical and corrosion resistant. Can be drilled, filed and painted.
ANSI/NSF Standard 61

- Rebuilding keyways and spline assemblies
- Rebuilding of bearings, clamp connections, tensioning elements, gear wheels or bearing seats

Ferro-silicon filled with outstanding compression strength. Ideal for renewing surfaces subjected to compression, thrust, impact and harsh environments.

- Seal cracks in tanks, castings, vessels and valves
- Patch non-structural defects in steel casings
- Resurface worn air seals
- Repair pitting caused by cavitation and/or corrosion

General-purpose steel-filled, non-sagging 2K-Epoxy. Used to rebuild worn metal parts.

What material are you filling / rebuilding?

	Aluminium	Concrete	
Pourable	Fast cure	High temperature resistance	Reliable and long lasting concrete repairs	
LOCTITE® EA 3472 **Steel Liquid**	**LOCTITE® EA 3473** **Fast Steel Putty**	**LOCTITE® EA 3479** **Metal Set HTA**	**LOCTITE® PC 9410** **Magna Crete**	**LOCTITE® PC 9416** **Floor Fill**
2K-Epoxy	2K-Epoxy	2K-Epoxy	2K Magnesium Phosphate	3K-Epoxy
1:1	1:1	1:1	Refer to TDS	Refer to TDS
45 min.	6 min.	40 min.	5 to 20 min.	40 min.
180 min.	15 min.	150 min.	60 to 120 min.	24h
25 N/mm²	20 N/mm²	20 N/mm²	–	–
70 N/mm²	60 N/mm²	90 N/mm²	8.96 N/mm²	103.35 N/mm²
-20 to + 120°C	-20 to + 120°C	-20 to + 190°C	-26 to + 1,090°C	-30 to + 110°C

- Form moulds, fixtures and prototypes
- Repair threaded parts, pipes and tanks

Pourable, steel-filled, self levelling. Recommended for casting into hard to reach areas, anchoring and levelling, forming moulds and parts.

- Repair holes in tanks, leaks in pipes and elbows
- Renew stripped threads
- Rebuild worn steel parts

Fast curing, steel filled, non-sagging. Ideal for emergency repair and repairing worn metal parts to prevent downtime.

- Rebuilding and repairing worn metal parts in high operating temperature applications.

A non-sagging, heavily reinforced, aluminium powder filled 2K-Epoxy. Easily mixed and moulded to form odd shapes if required. Cures to a non-rusting, aluminium-like finish.

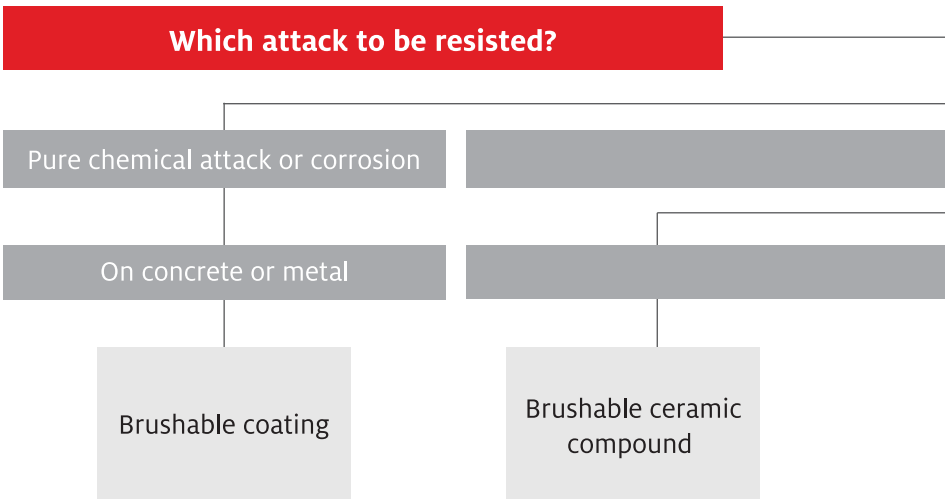
- Repair / rebuild of ramps and loading areas, support beam and footer repairs, bridge decking and supports, concrete bunds and walls etc.

Two-component, rapid setting concrete repair and grouting system designed for making reliable, long lasting repairs. Bonds to concrete, wood, glass, steel and construction materials. Can be mixed and applied from -25 °C to 45 °C.

- Three component chemically resistant product.
- Bonds to almost any clean substrate.
- Self-leveling
- Very high compressive strength.
- Can withstand impact load

A non-shrinking 100% solids epoxy based system for repairing holes in floors, spalled areas, ramps, stairs, cracks in floors and for use in grouting applications.

3.2 Protective Coatings and Compounds



Solution

	LOCTITE® PC 7319 Chemical Resistant Coating	LOCTITE® PC 7333 Brushable Ceramic
Colour	Grey	Dark grey
Service temperature range (dry)	-30 to + 65°C	-29 to + 95°C
Mix ratio by volume (A:B)	2.3:1	3.38:1
Mix ratio by weight (A:B)	3.4:1	100:16
Working time	20 min.	60 min.
Surface drying time	16 h	3.5 h
Recommended total layer thickness*	min. 0.5 mm	min. 0.5 mm

Brushable ceramic filled two-part chemical resistant epoxy to protect equipment against extreme corrosion caused by chemical exposure.

Brushable ceramic filled two-part epoxy for
- Impellers, butterfly valves
- Pump housings
- Cyclones
- Lining tanks

Abrasion or erosion on metal with or without chemical attack

Fine particle

Coarse particle

High temperature chemical resistant coating	Pneu-Wear ceramic compound	High temperature abrasion resistant coating
LOCTITE® PC 9340 **High Temperature Chemical Resistant Coating**	**LOCTITE® PC 7226** **Pneu Wear**	**LOCTITE® PC 7000** **High Temperature Abrasion Resistant Coating**
Grey	Grey	Grey
Dry +210°C | Wet+130°C	-30 to + 120°C	800°C - 1000°C
4.5:1	4:1	-
100:13	100:25	1:3
80 min.	30 min.	30 min.
24 h	6 h	24 h
min. 0.5 mm	min. 6 mm	min. 6 mm

Imperious ceramic composite designed to protect extreme corrision at high temperature:
- Tube sheer of heat exchanger/ condensor
- Scrubber lining
- Tank lining
- Vessel Lining
- Valves
- Boiler exhaust duct

Ceramic filled two-part epoxy for
- Dredge pump liners
- Flumes and troughs
- Pump impellers
- Vibrating feeders
- Chutes/hoppers

High temperature abrasion resistant coating for
- Coal burner nozzles
- Baffle plates for coat tip burner
- Refractory brick structure of chimneys

4. KEY APPLICATIONS

4.1 Crude Distillation Unit/ Vaccum Distillation Unit/ Fluid Catalyst Cracking Unit

Heat exchanger/condenser

Challenge:

- Corrosion to tubesheets, end plates and water boxes, for example, from sea water, steam and hydrocarbons
- In the long run it leads to a negative affect on process and a decrease in production output.

Solution:

High performance metal-filled putty LOCTITE® PC 3478 Superior Metal with Ferro silicon base ceramic compound LOCTITE® PC 7333 Brushable Ceramic.

Benefits:

Improves efficiency and helps in optimizing a plant's output.



Concrete foundation repair and protection

Challenge:

- Prolonged rotary equipment leakage of oil and/or chemicals absorbed by concrete that leads to foundation weakness
- Repairing of existing foundation or the casting of a new one, in situ while operation
- Underutilization of equipment capacity.

Solution:

Cleaning with water-based environmentally-friendly LOCTITE® SF 7840 Natural Blue and coating with LOCTITE® PC 7319 Chemical Resistant Coating.

Benefits:

Retains the strength of existing foundation and increases its life cycle. This allows a prolonged exploitation of equipment life at full capacity, which will improve plant's overall output.



External pipe surface repair and protection

Challenge:

External pipes and structure of cooling towers and effluent treatment plant corrodes due to condensation and salinity, especially in coastal areas.

Solution:

Rebuild with high strength metal filled putty LOCTITE® PC 3478 Superior Metal and top-coat with LOCTITE® PC 7319 Chemical Resistant Coating. LOCTITE® 5070 Pipe Repair for online leak repairs.

Benefits:

Increases pipe life and reduces frequency of painting.

Repair of beam, column & pillar from spalling

Challenge:

Corroded and chipped of concrete is difficult to adhere to a new mix and takes a long time to cure.

Solution:

LOCTITE® PC 9416 Floor Fill:
a three-component concrete repair system with very high compressive strength, chemical resistance and ability to bond with metal, old and new concrete, and cures within 24 hours.

Benefits:

- Quick and long lasting repair
- Reduces downtime
- Reliable and safe work environment

4.2 Jetty & Tank Farm

Jetty structure repair, repair of concrete road and expansion joints

Challenge:

- Breaking of edges and surface due to impact loading of a structure installed in coastal environments.
- Repair solutions need to be able to bond with existing surfaces that include old concrete and rusted reinforcement, as well as being able to withstand salinity and further impacts.

Solution:

LOCTITE® PC 9416 Floor Fill - three-component concrete repair system has high impact chemical resistance; the ideal choice for long-term repair of exposed and damaged reinforced concrete.

Benefits:

Increased reliability, safety and life of structures.

Floating Roof Repair

Challenge:

- Internal corrosion from petrochemical vapor and external corrosion from air salinity threatens the life-spans of floating roofs through multiple punctures.
- The repair solution must be sustainable and flexible to withstand stress in an area where limited scope for surface preparation is needed.

Solution:

TERESON® MS 930 is the ideal choice for demanding and complex applications

Benefits:

- Increased floating roof life-span
- Extends the tank's service life
- Creates a safer work environment

Restoration Of Tank Footing

Challenge:

- Storage tank and vessels concrete footing breaks up due to stress and corrosion. This requires in situ repairs that can withstand heavy loads and stresses. It needs to bond on rusted concrete and bars.

Benefits:

Increase service life and safety in the work environment.

Solution:

- LOCTITE® PC 9416 Floor Fill - Fast with its three-part concrete repair system that has ability to bond on old concrete and steel.
- High compressive strength and chemical resistance for long term repair and recasting.

4.3 Utility

CW Pump

Challenge:

Pump efficiency is lost due to corrosion and cavitation, causing energy loss, which may ultimately lead to pump replacement.

Benefits:

- Reduces flow resistance
- Saving on energy costs
- Extends pump life

Solution:

Repair of pitting and restoration of the surface with LOCTITE® PC 3478 Superior Metal, top coated with smooth abrasion-resistant LOCTITE® PC 7333 Brushable Ceramic.

Pipe support pad

Challenge:

Water accumulation and salinity leads to pad corrosion in interfaces, leading to difficulty with replacing them in situ while operating.

Solution:

LOCTITE® cold welding product helps to bond pads with pipes, and ceramic coating which protects from corrosion and erosion.

Benefits:

Increased life-span, safety and reliability.

Refurbishment and protection of valves

Challenge:

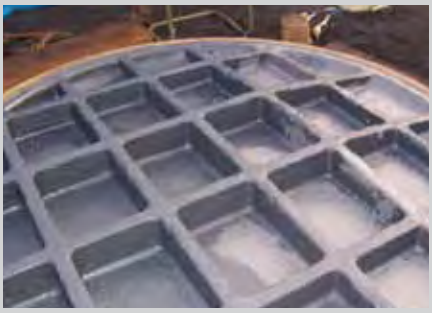
Refineries use of various valve types for utility liquids, sea water and petrochemical discharge lines etc. The valve gets corroded and starts leaking which ultimately affects processes.

Solution:

To rebuild and restore valves, LOCTITE® PC 3478 Superior Metal, top coated with LOCTITE® PC 7333 Brushable Ceramic prevents further corrosion and wear.

Benefits:

- Increased life-span
- Reduces leakage
- Ultimately improves plant output



Secondary containment area

Challenge:

Acid Resistant tiles perform well except in joints, from which hazardous chemical leaks into the soil, becomes an environmental issue in an era of strict standards.

Solution:

LOCTITE® PC 7319 Chemical Resistant Coating applied as a seamless coating sustains from exposure to aggressive corrosives.

Benefits:

- Environmental protection and increased life-span.
- Safe working environment.

Metallic joints repair, restoration and protection

Challenge:	Solution:	Benefits:
Pipe weld joints in lines and vessels are the weakest points. These usually corrode quickly, creating leakage and an unsafe working environment, especially where hot welding is either time-inefficient or may not even be allowed.	LOCTITE® complete cold repair, which contains LOCTITE® Chisel Paint Stripper; LOCTITE® PC 3478 Superior Metal for rebuilding pitted surfaces and LOCTITE® PC 7333 Brushable Ceramic for further corrosion protection.	A safer and more-reliable working environment.



4.4 Electrical Maintenance

Ht & lt motor body protection

Challenge:	Solution:	Benefits:
Prolonged body corrosion from salinity leads to perforation which allows water to penetrate, which is highly undesirable for any electrical equipment.	LOCTITE® PC 7319 Chemical Resistant Coating protects bodies from salinity and the harsh petrochemical environment.	Increased life-span and reliability of motor performance that has been installed in open and remote areas.



4.5 Sulphur Plant

Sulphur pit repair and protection

Challenge:

Sulphur pit concrete is constantly under attack from sulphur, breaking down and leaving steel corroded and open to further damage, and so application demands a solution that bonds to corroded concrete and steel and yet withstands the direct attack of sulphur.

Solution:

Benefits:

Fast and reliable repair of old concrete cuts downtime significantly.

Workshop floor repair

Challenge:

Workshop floors break under the impact of mechanical and electrical equipment, leaving damaged and uneven floors that threaten work safety.

Solution:

Benefits:

Long-term reliable repairs that improve work safety and cut downtime significantly.

Inside lining of the tank

Challenge:

Protection of metal and concrete tanks against the attacks of aggressive chemicals.

Solution:

Benefits:

Extends life-span and protects against chemical attack.

5. APPLICATIONS AT A GLANCE

	CRUDE DISTILLATION UNIT / VACCUM DISTILLATION UNIT	FLUID CATALYST CRACKING UNIT	UTILITY	JETTY	MARINE TANK FARM
Repair & reclaim cement lining of process water pipe - LOCTITE® PC 9416			✔		
Cooling water pipeline external surface restoration & protection -LOCTITE® PC 3478 & LOCTITE® PC 7333			✔	✔	
Cooling water pump protection & repair - Loctite WRP / LOCTITE® PC 7333			✔		
Repair, restoration & protection of condensor/heat exchanger - Loctite SM / LOCTITE® PC 7333	✔	✔	✔		
Beam & column / pillar restoration & protection from spalling - LOCTITE® PC 9416 & LOCTITE® PC 7319	✔	✔	✔	✔	✔
Concrete road & expansion joint repair at Jetty - LOCTITE® PC 9416			✔	✔	
Restore & protect pipe under support - LOCTITE® PC 3478 / LOCTITE® PC 7333		✔	✔	✔	✔
Protection of foundation against chemical attack and oil spillage - LOCTITE® PC 9416/ LOCTITE® PC 3478	✔	✔	✔		
Protection of concrete tank inside surface from chemical attack and sea water corrosion (N-pit & feed water reservoirs) - LOCTITE® PC 7319			✔		
Restoration of cooling tower concrete structure - LOCTITE® PC 9416			✔		
Restoration of damaged concrete containment of sulphur tank - LOCTITE® PC 9416					
Restoration of lost tank footings (recasting) - LOCTITE® PC 9416			✔		✔
Patch repair of floating roof of crude storage tank - TEROSON® MS 930 & LOCTITE® PC 3478			✔		✔
Protection of HT & LT motor canopy / body from corrosion - LOCTITE® PC 7319	✔	✔	✔		✔

RAIL & ROAD TANK FARM	AROMATICS	SULPHUR	POLY PROPYLENE	HYDROGEN	ALKALYNATION	MEROX
	✔		✔	✔	✔	✔
✔						
	✔	✔	✔	✔	✔	✔
		✔				
✔						
✔						
✔	✔	✔	✔	✔	✔	✔

6. EXPERT TRAINING

6.1 Maintenance Reliability Workshop

In the world of industry, maintenance typically contributes to over a quarter of the total cost of finished goods. LOCTITE® has identified the taproot causes of failures on most mechanical equipment, and teaches proactive approaches to combat downtime and optimize productivity and reliability.
After LOCTITE® Maintenance reliability workshop, your workforce will have the knowledge and the tools to do the following:

The majority of unplanned downtime is caused by mechanical subcomponent failure. Some taproots reasons are:
fastener loosening, key wallow, PTFE tape fouling control valves, fitting leakage and spun bearings. This workshop teaches how to prevent these from happening proactively.

SAVE TIME

- Reduce routine maintenance tasks
- Reduce standard repair time
- Reduce redundant repairs
- Reduce extended repair times

REDUCE ENERGY COSTS

- Air leak 1.6 mm @ 100 psi @ ₹3.2 per kWh = ₹41,360 lost per year
- Loose connector on 480 volt, 30 amp, 3 phase motor = 13% more energy needed to run

IMPROVED SAFETY

- Improve safety by eliminating personal injury hazards

REDUCE FLUID CONSUMPTION

- Hydraulic leak @ 1 drop/second @ ₹64.8/liter = ₹99,440 lost per year
- Reduce disposal costs
- Reduce clean up time and materials

IMPROVE RELIABILITY

- Quality production
- Extend Mean Time Between Failure
- Reduce minor stoppages for adjustment
- Fewer needless variables for Planned Maintenance
- Enlarged reliability culture

Air Leak Cost Calculator

Diameter of Opening	Cubic Meter of Air Loss per Year a 100 psit r	Cost per Year (Rupee)
0.8 mm	24,045	₹10,320
1.6 mm	96,328	₹41,360
3.2 mm	385,907	₹1,65,760
6.4 mm	1,543,626	₹6,62,880
9.5 mm	3,473,159	₹14,91,440
Cost per Kwh ₹3.2		

* Cubic Meter Air Loss may vary based on the shape of the opening and assumes facility maintains air pressure 8,760 hours per year.

Oil Leak Cost Calculator

Leakage Rate	Liter Lost per Year	Cost per Year (Rupee)
One drop in 10 seconds	153	₹9,920
One drop in 5 seconds	307	₹19,920
One drop per second	1,533	₹99,440
Three drops per second	5,110	₹3,31,440
Stream breaks into drops	32,706	₹21,21,440
Cost per Liter* ₹64.8		

* In addition to oil costs, the costs associated to leaks need to be considered, such as: clean-up labor, absorbents, transaction, shipping, storage, recycling, and disposal.

Threadlocking

- How a threaded fastener works
- Advantages and disadvantages of mechanical locking devices
- LOCTITE® Threadlockers
  - How they work
  - Benefits
  - Application cases and application techniques
  - Product selection
- Hands-on demonstrations & practice

Gasketing

- Why gaskets leak
  - Design and service factors
  - Gasket materials and dressings
  - Assembly problems
- Form-in-place gasketing basics
- LOCTITE® Anaerobic and Silicone (RTV) Gasketing
  - How they work & benefits
  - Application cases and application techniques
  - Product selection
- Hands-on demonstrations & practice

Thread Sealing

- Types of threads and fittings
- Causes of leaks
- LOCTITE® Thread Sealants
  - How they work
  - Benefits
  - Application cases and application techniques
  - Product selection
- Hands-on demonstrations & practice

Retaining

- Types, classes, and typical uses of cylindrical fittings
- Potential fit problems and possible solutions
- LOCTITE® Retaining Compounds
  - How they work
  - Benefits
  - Application cases and application techniques
  - Product selection
- Hands-on demonstrations & practice

6.2 Surface Engineering Workshop

Despite the right coating systems are selected for the correct applications, it is often the lack of correct surface preparation and proper application procedures that will cause delamination and reduction of the coating's performance. Surface preparation is critical to enable the composite to stay fixed in place onto the substrate in order to perform at its designed specifications.

Loctite® Surface Engineering Workshop offers methods that can create correct Surface Profile, and provide Reduction in Equipment Replacement, Reduction of Energy Consumption and Increase in Equipment Efficiency and Reliability. The workshop covers the following subjects. Please call Loctite® today to arrange a Surface Engineering Workshop for your plant!

Wear / Abrasion

- Wear / abrasion
- Traditional methods to prevent and repair wear /abrasion
- Wear resistant polymer composites – dissected
- How wear and abrasion affect metal surfaces and surface dynamics
- Advantages of wear resistant polymer composites versus traditional

Corrosion / Erosion

- Corrosion / erosion cycle
- Reasons for and types of coating delamination
- Traditional methods for corrosion erosion / chemical attack
- Polymer composites and their role in Surface Engineering

TRAINED, MOTIVATED & EQUIPPED PERSONNEL DRIVE COSTS DOWN

Loctite® Polymer Composites

REBUILD, REPAIR & PROTECT

Industrial equipment and surfaces, extend equipment life, improve efficiency, and minimize down time.

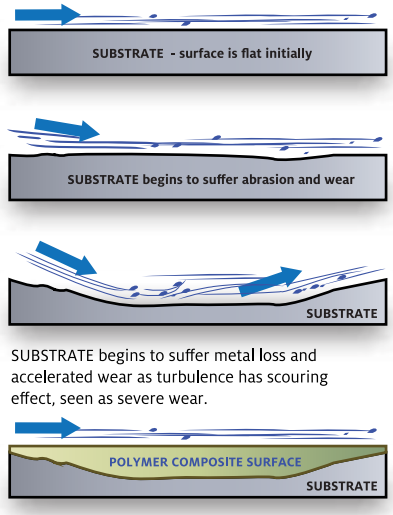
With extremely hard reinforcement fillers, Loctite® polymer composite products have excellent wear resistance and superior adhesion. They are designed to protect and extend the service life of a wide range of plant equipment. The composites act as a sacrificial and renewable working surface, protecting the structural integrity of the original substrate against the harshest industrial environments.

WEAR / ABRASION

Over time, even a softer solid material in flow will eventually abrade and wear the hardest alloys. As the surface becomes weak it is then subject to being stripped from the parent substrate, therefore gradually reducing the thickness and structural integrity of the substrate.

Wear and Abrasion can be minimized and reduced by utilizing polymer composite materials. These act in a sacrificial capacity and therefore wear in the first instance rather than the original substrate.

Loctite® has developed specific formulations for a wide variety of applications. These formulations can be selected to match the environment for which they are suited, such as heavy wear / abrasion, corrosive fluids or high temperature service.

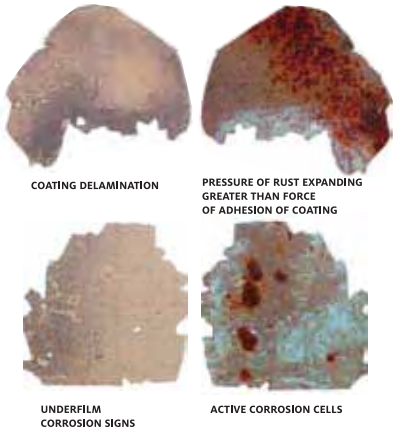


CORROSION / EROSION

As corrosion takes place it leaves a very weak and loose layer of oxide. As this oxide layer is continually stripped from the parent substrate this is often described as the Corrosion / Erosion Cycle.

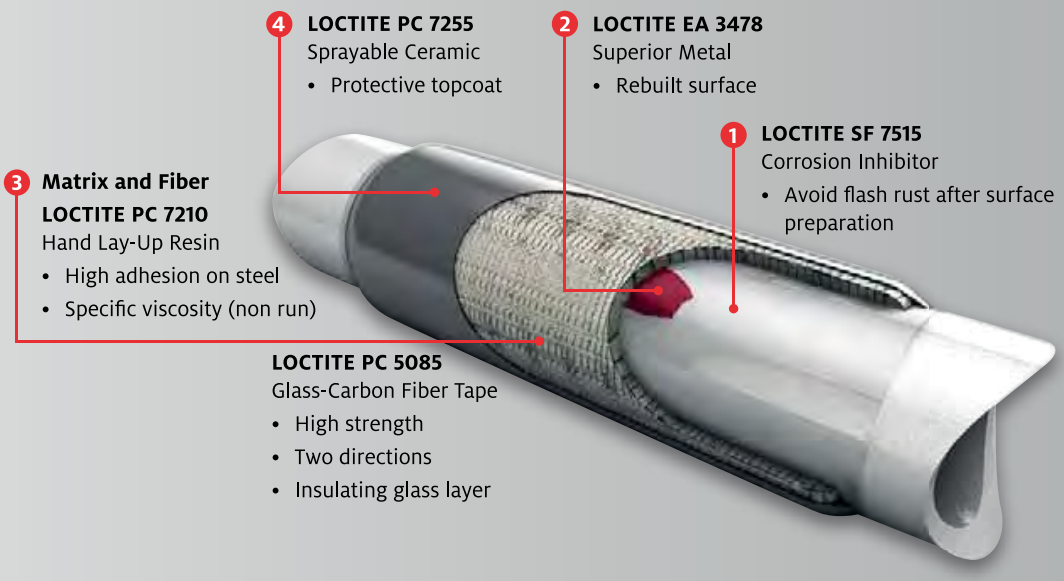
Underfilm corrosion remains active below the surface of a high build coating and continually challenges the strength of the coating system to remain attached to the substrate.

Loctite® Polymer Composites, applied to the correctly prepared surface, will bond with a higher force of adhesion than any pressure exerted by oxidizing metal.



Arrange a training workshop for your plant by contacting us!

Composite Repair System



ADD ANOTHER 20 YEARS

Extend pipe lifetime with LOCTITE Composite Repair System

Application areas

- Repair system for steel pipes, pipelines and tanks
- For inside and outside corrosion
- Equipment subject to chemical attack or mechanical wear
- Complex geometries: bends, tees, reducers and flanges
- Oil & Gas industry, refineries and petrochemical plants, power plants, water utilities, etc.

Benefits

- Fast and economical repair solution
- Increase pipe lifetime by up to 20 years
- No need to replace pipes
- In situ repair without interruption of operations
- Tailor-made repair solutions including specific calculations of repair designs
- Certified applicator and installer training program

Loctite® Composite Repair System

- Loctite® PC 7255 Sprayable Ceramic
- Loctite® EA 3478 Superior Metal
- Loctite® PC 7210 Hand Lay-Up Resin
- Loctite® PC 5085 Glass-Carbon Fiber Tape
- Loctite® SF 7515 Corrosion Inhibitor

Certified by

Germanischer Lloyd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Offshore oil platforms can be 40 stories tall and weigh 120,000 tons. That's a pretty complex structure. So engineers depend on LOCTITE adhesives, sealants and surface protective coatings to improve the reliability, efficiency and operating life of their equipment. For success above and below the water.
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Henkel Adhesives Technologies India Private Limited

Mumbai
Corporate Office

L & T Seawoods, Grand Central,
401, B Wing, 4th Floor, Tower 1,
Seawoods, Navi Mumbai - 400 706,
Maharashtra, India.
Phone : +91 22 7130 1300

Chennai

Arunodayam, No. 14 & 16,
Raman Street, North Boag Road,
T. Nagar, Chennai - 600 017,
Tamil Nadu, India.
Phone : +91 44 3354 6123

Pune

Survey No. 234, 235 and 245,
India Land Global Industrial Park,
Phase 1, Hinjewadi, Pune - 411 057,
Maharashtra, India.
Phone : +91 20 7199 7000

Delhi

74, Industrial Corporation,
Mehrauli Gurgaon road,
Gurgaon - 122 001,
Haryana, India.
Phone : +91 0124 509 7000

Factory

D3/D4, MIDC Industrial Estate,
Jejuri, Purandhar, Pune - 412 303,
Maharashtra, India.
Phone : +91 2115 718 000

www.henkel.in

www.henkel-adhesives.com/in

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