LOCTITE®

Maintenance Reliability

Continuous Improvement Training Manual



Henkel Excellence is our Passion

RELIABILITY STARTS HERE . . .

The first step toward equipment reliability is to initiate a process of continuous improvement by empowering your maintenance personnel with the application-driven, plant-tailored, product-specific information and skills they need to meet your company's needs on a daily basis.

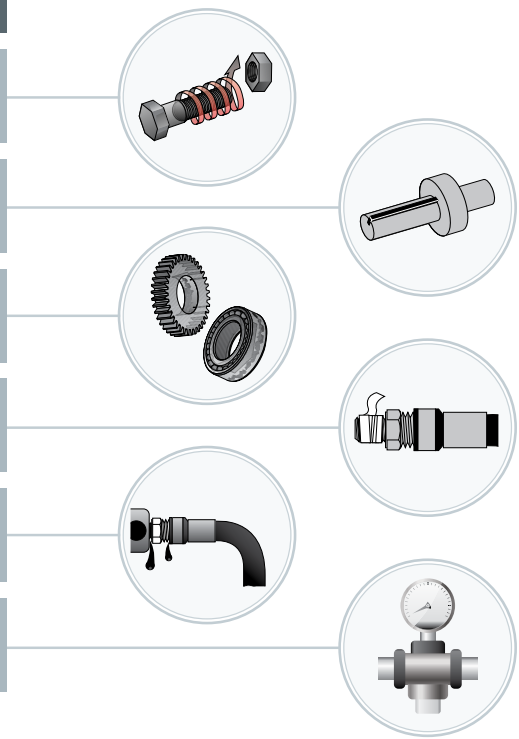
Zero Breakdown Principle

Expose hidden defects and prevent breakdowns before they happen.



TYPICAL CHRONIC FAILURES THAT MACHINERY ADHESIVES CAN ADDRESS

FAILURE	RESULT
Fastener Loosening:	# 1 cause of chronic failures
Key Wallow:	Downtime and replacement parts
Spun Bearings:	Downtime and replacement parts
Tape Fouled Valves:	Downtime and system flush
Hydraulic Leaks:	Fluid loss, cleanup, disposal
Air Leaks:	$192/year/leak (1/32 in. @ 100 psi)

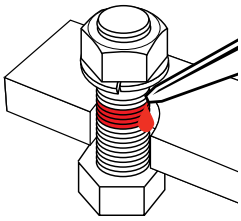
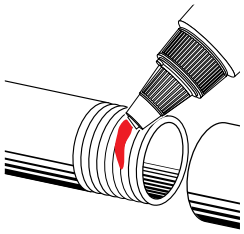
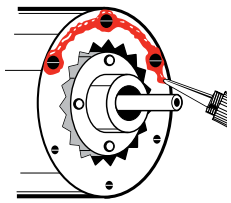
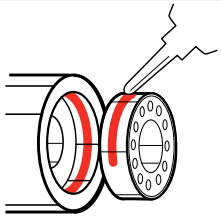


For more information about maintenance workshops and other Henkel training services, visit us on the web at www.henkelna.com/training.

INTRODUCTION TO LOCTITE® ANAEROBIC ADHESIVES AND SEALANTS

Anaerobic adhesives and sealants were developed by the founder of LOCTITE® Corporation, now Henkel Corporation, in 1953 and, since then, they have significantly evolved to meet the highest requirements of equipment manufacturers, maintenance and overhaul.

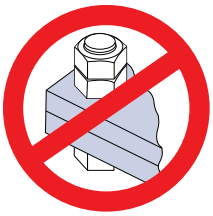
Anaerobic adhesives and sealants are resins that convert from liquid to a tough structural solid in the absence of air and the presence of metal. The primary functions of anaerobic resins are:

THREADLOCKING	THREAD SEALING	GASKETING	RETAINING
			

Each one of these functions is based upon control of five major variables: strength, viscosity, adhesion, flexibility and temperature resistance. These five parameters give anaerobics users considerable latitude in adjusting properties for optimum performance in specific application areas.

Another variable that should be considered is the substrate to which the adhesive will be applied. For certain substrates or other special requirements, the use of primer is recommended.

PROACTIVE MAINTENANCE APPLICATIONS FOR EQUIPMENT RELIABILITY



Eliminate the need for extraneous fasteners; prevent fastener loosening



Eliminate failures of PTFE tape; sealing pipe threads



Eliminate a huge inventory of cut gaskets; sealing gasket flanges



No more spun bearings; mounting shafts and bearings

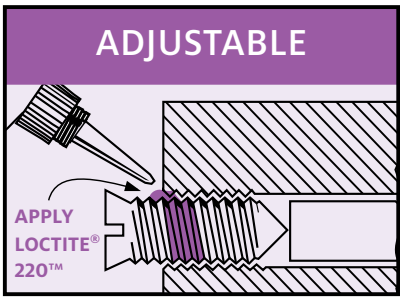
TRAINING PROCESS

1. *Review and explain reference tools*
2. *Discuss equipment reliability and how it affects your plant*
3. *Review anaerobic chemistry*

AVAILABLE CORE CONTENT

4. *Threaded fasteners*
5. *Threaded fittings*
6. *Flanged assemblies*
7. *Cylindrical fits*
8. *Recap and answer questions*

PREVENTING FASTENER LOOSENING WITH LOCTITE® THREADLOCKERS

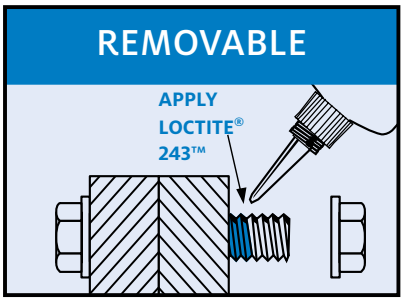


ON ADJUSTMENT SCREWS

Liquid Only Applications

1. Adjust the screw to proper setting.
2. Apply several drops of LOCTITE® **220™** Threadlocker if fastener is preassembled, or LOCTITE® **222™** Threadlocker at the screw and body juncture.
3. Avoid touching bottle tip to metal.

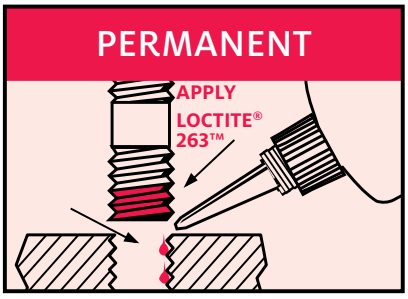
Note:
- If readjustment is difficult, apply heat to the screw with a soldering gun (450°F).
- LOCTITE® **220™** Threadlocker is a weaker version of LOCTITE® **290™** Threadlocker.



ON THRU HOLES

Liquid and Semisolid Applications

1. Clean all threads (bolt and nut) with LOCTITE® ODC-Free Cleaner & Degreaser.
2. If necessary, spray all threads with LOCTITE® **SF 7649™** Primer. Allow to dry.
3. Select the proper strength LOCTITE® threadlocker.
4. Insert the bolt into thru hole assembly.
5. Apply several drops of liquid threadlocker onto the bolt at the targeted tightened nut engagement area or, when using the stick product, completely fill the root of the threads at the area of engagement.
6. Assemble and tighten the nut as usual.

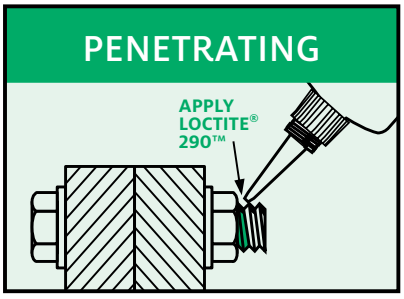


ON BLIND HOLES

Liquid Only Applications

1. Clean all threads (bolt and hole) with LOCTITE® ODC-Free Cleaner & Degreaser.
2. If necessary, spray all threads with LOCTITE® **SF 7649™** Primer. Allow to dry.
3. Squirt several drops of LOCTITE® **263™** Threadlocker down the sides of the female threads.

   Note: Use LOCTITE® **2047™** Threadlocker fastener greater than 7/8" in diameter.
4. Apply several drops of LOCTITE® **263™** Threadlocker onto stud threads.
5. Install studs.
6. Position cover, head, etc.
7. Apply drops of LOCTITE® **243™** Threadlocker onto exposed threads.
8. Tighten nuts as required.



ON PRE-ASSEMBLED

Liquid Only Applications

1. Clean bolts and nuts with LOCTITE® ODC-Free Cleaner & Degreaser.
2. Assemble components.
3. Tighten nuts.
4. Apply several drops of LOCTITE® **220™** or **290™** Threadlocker at the nut and bolt juncture.
5. Avoid touching bottle tip to metal.

   Note: For preventive maintenance on existing equipment: RETIGHTEN nuts and apply LOCTITE® **220™** or **290™** Threadlocker at the nut and bolt juncture.



The Reliable Solution

LOCTITE® Threadlockers

Cure to fill the gaps and eliminate all movement between the threads, dramatically increasing the reliability of threaded fasteners.

Benefits:

- Nuts and bolts are effectively locked against vibration and thermal expansion
- Seal against corrosion and leakage
- Reduce inventory costs
- Can be used with all shapes and sizes of fasteners



The Old-Fashioned Way

Mechanical Locking Devices

Split washers, tooth flange bolts, castle nuts, nylon nuts, etc.

Shortcomings:

- Loosen under vibration, thermal expansion and/or improper torque
- Do not seal threads
- Require extensive inventory of several shapes and sizes
- Prone to rust and corrosion

There's a LOCTITE® Threadlocker for Every Fastening Application

PRODUCT	LOCTITE® 222MS™	LOCTITE® 243™	LOCTITE® 248™	LOCTITE® 249™	LOCTITE® 263™	LOCTITE® 268™	LOCTITE® 290™	LOCTITE® 2047™
Color/Type	Purple/Liquid	Blue/ Liquid	Blue/ Semisolid	Blue/Tape	Red/ Liquid	Red/ Semisolid	Green/Liquid	Black
Fastener Size	Up to 1/4" (6 mm)	1/4" to 3/4" (6 mm to 20 mm)	1/4" to 3/4" (6 mm to 20 mm)	1/4" to 3/4"	Up to 1" (25.4 mm)	Up to 3/4" (20 mm)	#2 to 1/2" (2.2 to 12 mm)	Greater than 7/8"
Breakaway/ Prevail Torque (lbs.-in.)	53/30	230/40	226/36	74/47	275/290	311/83	90/260	375/80
Cure Time, Fixture/Full Cure*	10 min./ 24 hrs.	5 min./ 24 hrs.	10 min./ 24 hrs.	30 min./ 24 hrs.	10 min./ 24 hrs.	20 min./ 24 hrs.	20 min./ 24 hrs.	90 min./ 24 hrs.
Recommended Primer	LOCTITE® SF 7088™ SF 7649™ SF 7471™	Not required	Not required	LOCTITE® SF 7088™ SF 7649™	Not required	Not required	LOCTITE® SF 7088™ SF 7649™ SF 7471™	LOCTITE® SF 7649™ SF 7471™
Use	Low strength; applied BEFORE assembly	Primerless, removable strength; applied BEFORE assembly	Primerless, removable strength; applied BEFORE assembly	Threadlocker in a tape form. Easy to apply and can be preapplied for future assembly	Primerless, high strength; applied BEFORE assembly	Primerless, high strength; applied BEFORE assembly	Penetrating formula; applied AFTER assembly	High lubricity delivers high clamp load

*Values cited are for M10 steel nuts and bolts at 72°F (22°C)

WHY USE A PRIMER?

1. Primers activate inactive surfaces, which is not necessary when using with primerless products.
2. Primers speed cure times for faster return to service.
3. Primers speed curing through larger gaps and deep threads.
4. Primers substantially speed cure times on cold parts.
5. Primers act as cleaning agents.

Active surfaces (primer is optional): Brass, copper, bronze, iron, soft steel.

Inactive surfaces (primer is required): Pure aluminum, stainless steel, magnesium, zinc, black oxide, cadmium, titanium, nickel, and others.



AIDING ASSEMBLY AND DISASSEMBLY WITH LOCTITE® ANTI-SEIZE



For what specific applications would you use Anti-Seize instead of a Threadlocker?

- High heat application over 650°F
- Protection of mated metal parts
- Equipment parts that do not need to be locked in and disassembled frequently

What is the difference between a Lubricant and Anti-Seize?

Lubricants offer protection for industrial plants and equipment. The typical function of a lubricant is to protect against friction and wear. They also may be used to protect against corrosion by displacing moisture and leaving a continuous coating of the part.

Anti-seize products provide protection against rust, corrosion, seizing and galling, as well as lubrication. Anti-seizes are typically the products of choice for high temperature applications because of their unique ability to provide protection in extreme temperature conditions.





Where Should Anti-Seize Be Used?

- Equipment parts that are not designed to seize in place
- Equipment parts that need to be disassembled frequently
- Protects in environments exposed to:
  - Rust
  - High pressures
  - High temperatures
  - Water washout
  - Bi-metallic corrosion
  - Chemical attacks





Application Limitations

- Generally not for plastics or elastomers
- Not for oxygen service (e.g. O_2 gas)
- Metal content may be undesirable for specific operating environments

Types of anti-seize and benefits

Historically, there have been three types of anti-seize in the market place. Recently, heavy duty metal-free has become widely used in mining, quarrying, and manufacturing plants — particularly in oil and gas, where copper-based anti-seize is prohibited.

- **Copper-based anti-seize**: Offers a good general-purpose corrosion protection on steel, but not stainless steel. Copper can also fail under high pressure applications causing metal on metal and potential seizing of the fastener.
- **Aluminum-based anti-seize**: Offers good general-purpose corrosion protection and is good for use on stainless steel, but not on carbon steel.
- **Nickel-based anti-seize**: A multi-purpose anti-seize that offers corrosion protection for both steel and stainless steel. Good for high temperature and extreme chemical applications.
- **Metal-free Anti-Seize:** Functions on all metals, including galvanized iron, stainless steel, brass, aluminum and soft metals.

The Reliable Solution

LOCTITE® Anti-Seize

LOCTITE® METAL-FREE FORMULATIONS

A growing concern for all types of industries is the dispersal of “heavy” metals such as lead, nickel, zinc and others into the environment.

- Metal-free formulations offer the same performance as traditional products
- Henkel offers nine metal-free formulas, including Marine and Food Grade



LOCTITE® ANTI-SEIZE LUBRICANTS

Premium quality products, developed to protect metal parts from rust, corrosion, galling and seizing. Formulas available in traditional brush-top bottles, neat and clean semi-solid sticks and NEW easy-to-use brush top tubes, fulfilling nearly every need in the industry.

- Ease assembly and disassembly of slip-fit and threaded joints
- Reduces friction and wear on critical operating equipment
- Formulated for severe environments
- Protects under high temperatures, heavy loads, chemicals and fluids

Henkel also offers a wide variety of penetrants, greases and oils for lasting, general-purpose lubrication or specific applications.

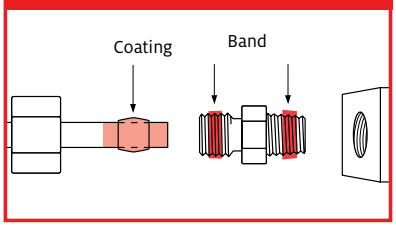


There’s a LOCTITE® Anti-Seize for Every Maintenance Application

PRODUCT	LOCTITE® LB 8007™ C5-A® ANTI-SEIZE	LOCTITE® LB 8150™ SILVER GRADE ANTI-SEIZE	LOCTITE® LB 771™ NICKEL ANTI-SEIZE	LOCTITE® LB 8009™ HEAVY DUTY ANTI-SEIZE	LOCTITE® LB 8023™ MARINE GRADE ANTI-SEIZE	LOCTITE® LB 8014™ FOOD GRADE ANTI-SEIZE
Color	Copper	Silver	Silver	Black	Black	White
Temperature Resistance	1800°F (982°C)	1600°F (871°C)	2400°F (1316°C)	2400°F (1316°C)	2400°F (1316°C)	750°F (399°C)
K Value	0.16	0.18	0.13	0.16	0.18	0.13
Metal-Free	N/A	N/A	Yes	Yes	Yes	Yes
MIL Spec Approved	✔	✔	N/A	N/A	N/A	N/A
Use	General-purpose industrial maintenance applications	Similar properties to C5-A®. ABS Approved	Good for severe environment, including direct exposure to chemicals	Great lubricity: outperforms general-purpose	Exceptional water spray and washout resistance. Great lubricity. ABS Approved	Meets NSF code H1 standards for incidental food contact.

SEALING PIPE THREADS WITH LOCTITE® THREAD SEALANTS

COMPRESSION FITTINGS



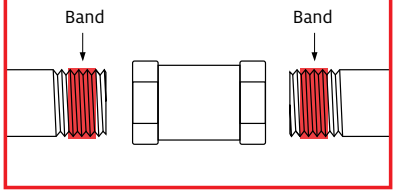
ON COMPRESSION FITTINGS

1. Slide fitting nut and ferrule back approximately 3⁄4" from end of tubing.
2. If necessary, spray the entire assembly with LOCTITE® **SF 7649™** Primer. Allow to dry.

   Note: Primer is not required for brass parts.
3. Apply a thin coating of LOCTITE® Thread Sealant to tubing where ferrule will be located.
4. Slide ferrule forward over LOCTITE® Thread Sealant coated tubing, then apply a thin bead of LOCTITE® Thread Sealant coating to ferrule.
5. Slide ferrule forward over LOCTITE® Thread Sealant coated tubing.
6. Apply a small band of LOCTITE® Thread Sealant to male threads.
7. Assemble and tighten normally.

   Note: Do not use on plastic fittings or tubing.

STANDARD PIPE FITTINGS: HYDRAULIC OR AIR



ON STANDARD PIPE FITTINGS

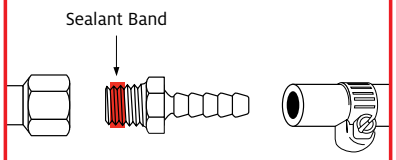
8. Clean parts of contamination. If necessary, spray LOCTITE® **SF 7649™** Primer onto threaded parts (male and female). Allow to dry.

   Note: Primer is not required for brass parts.
9. Apply a band of LOCTITE® Thread Sealant to male threads starting one to two threads from end of pipe.
10. Assemble parts snugly. Do not overtighten.
11. If initial pressure exceeds 1,000 psi*, wait 30 minutes before pressurizing.

    Note:
    - For stainless steel components, use LOCTITE® **567™** Thread Sealant.
    - For general purpose thread sealing, use LOCTITE® **565™** Thread Sealant or LOCTITE® **561™** Pipe Sealant Stick.
    - For fine filtration systems requiring zero contamination, use LOCTITE® **545™** Thread Sealant for hydraulic/pneumatic fittings or LOCTITE® **5452™** Fast Cure Thread Sealant.
    - For easier disassembly or large diameter fittings, use LOCTITE® **564™** Thread Sealant.
    - If using with sealing chemicals or strong acids/bases, refer to Fluid Compatibility Chart (LT-836).
    - Do not use with systems containing oxygen or strong oxidizers (chlorine).
    - For PVC or ABS pipe, use LOCTITE® **MR5438™** Pipe Sealant.

** Depending on conditions*

HOSE ENDS – AIR & HYDRAULIC

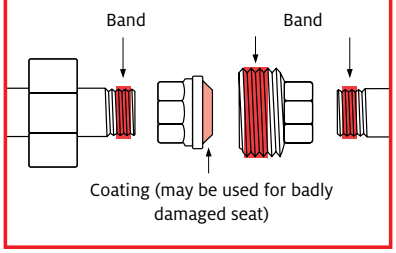


ON HOSE ENDS

12. If necessary, spray adapter threads with LOCTITE® **SF 7649™** Primer. Allow to dry.
13. Insert barbed hose stem into hose I.D. with slight twisting motion.
14. Install appropriate hose clamp.
15. Apply a band of LOCTITE® Thread Sealant to male hose stem threads upon installation or when adding accessory device. Tighten snugly.

    Note: LOCTITE® Thread Sealant may attack synthetic rubber tubing.

PIPE UNIONS



ON PIPE UNIONS

16. Disassemble and, if necessary, spray all components with LOCTITE® **SF 7649™** Primer. Allow to dry.
17. Apply a thin coating of LOCTITE® Thread Sealant to union face.
18. Apply a band of LOCTITE® Thread Sealant to male threads.
19. Assemble parts snugly.



The Reliable Solution

LOCTITE® Thread Sealants

Benefits:

- Complete contact between threads; 100% seal
- Will not creep, shrink, shred or block systems (including filters)
- Ease disassembly
- Prevent corrosion



The Old-Fashioned Way

Tapes, dopes, etc.

Shortcomings:

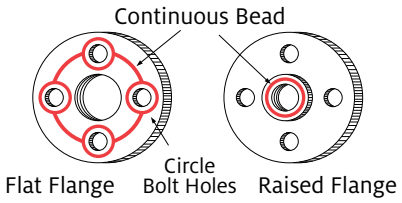
- Shred or contaminate lines
- Do not fill voids
- Do not prevent rust, seizing or galling
- May shrink, dry or crack

There's a LOCTITE® Thread Sealant for Every Sealing Application

PRODUCT	LOCTITE® 561™	LOCTITE® 564™	LOCTITE® 565™	LOCTITE® 567™	LOCTITE® 5452™	LOCTITE® 5770™
Appearance	White Semisolid	White Paste	White Paste	White Paste	Purple Gel	Off White Paste
Temperature Range	-65ºF to 300ºF (-54ºC to 149ºC)	-65ºF to 300ºF (-54ºC to 149ºC)	-65ºF to 300ºF (-54ºC to 149ºC)	-65ºF to 400ºF (-54ºC to 204ºC)	-65ºF to 300ºF (-54ºC to 149ºC)	-65ºF to 530ºF (-54ºC to 277ºC)
Pressure Resistance	10,000 psi	10,000 psi	10,000 psi	10,000 psi	10,000 psi	N/A
Recommended Primer	LOCTITE® SF 7088™ SF 7649™ SF 7471™	LOCTITE® SF 7088™ SF 7649™ SF 7471™	LOCTITE® SF 7088™ SF 7649™ SF 7471™	LOCTITE® SF 7088™ SF 7649™ SF 7471™	Not required	LOCTITE® SF 7088™ SF 7649™ SF 7471™
Use	Instant low pressure seal; general-purpose, convenient portable stick	Instant seal pipe sealant, lower strength for easy disassembly even on larger pipes	Instant seal general-purpose pipe sealant, controlled strength for easy disassembly	High performance sealant, ideal for stainless steel, aluminum, galvanized and other inert metals	High pressure fluid power systems; contains no fillers and will not foul valves or filtering systems	High temperature

SEALING GASKET FLANGES WITH LOCTITE® FLANGE SEALANTS

CAST RIGID FLANGES



ON CAST RIGID FLANGES

1. Remove old gasketing material and other heavy contaminants with LOCTITE® Paint Stripper. Use mechanical removal technique if required.

   Note: Avoid grinding.

2. Clean both flanges with LOCTITE® ODC-Free Cleaner & Degreaser.
3. Spray LOCTITE® **SF 7649™** Primer on only one surface. Allow 1 to 2 minutes to dry.
4. Apply a continuous bead of LOCTITE® Flange Sealant to the other surface.

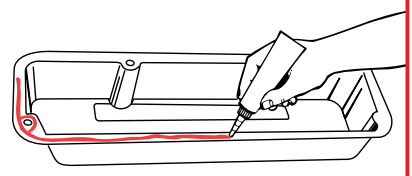
   Note: Circle all bolt holes with sealant, if appropriate.

5. Mate Parts. Assemble and tighten as required.

   Note: Immediate assembly not required; however, avoid delays over 45 minutes.

6. Allow to cure:
   a. No pressure – immediate service
   b. Low pressure (up to 500 psi) – 30 to 45 minutes
   c. High pressure (500 to 2,500 psi) – 4 hours
   d. Extreme high pressure (2,500 to 5,000 psi) – 24 hours

STAMPED FLANGES WITH LARGE GAPS



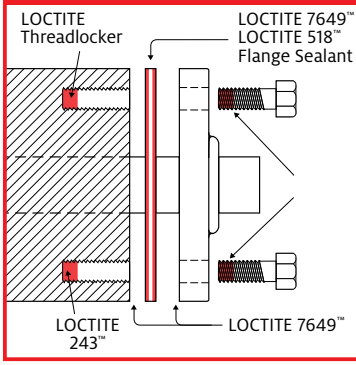
ON STAMPED/SHEET FLANGES

1. Remove old gasketing material and other heavy contaminants with LOCTITE® Paint Stripper.
2. Clean both flanges with LOCTITE® ODC-Free Cleaner & Degreaser.
3. Apply a continuous bead of LOCTITE® Instant Gasket or LOCTITE® high-performance silicones to sealing surface. Circle all bolt holes.

   Note: • Use proper bead diameter to seal flange width and depth.
   • Minimize excessive material “squeeze-out.”

4. Assemble within 10 minutes by pressing together. Tighten as required.
5. Clean up any excess or squeeze-out.
6. Cure times will vary with temperature, humidity and gap. Typical full cure time is 24 hours.

SEALED FLANGES WITH GASKET



ON SEALED GASKET FLANGES

1. Remove old gasketing material and other heavy contaminants with LOCTITE® Paint Stripper. Use mechanical removal technique if required.

   Note: Avoid grinding.

2. Clean both flanges with LOCTITE® ODC-Free Cleaner & Degreaser.
3. Spray LOCTITE® **SF 7649™** Primer on both flange faces and both sides of the precut gasket. Allow 1 to 2 minutes to dry.
4. Smear LOCTITE® Flange Sealant on both sides of precut gasket with a clean applicator.
5. Place coated gasket on flange surface and assemble parts immediately.

   Note: • If cover bolts into blind holes (as above), apply LOCTITE® **243™** Threadlocker into hole and on threads. Tighten normally.
   • If it is a thru hole bolt assembly, apply LOCTITE® **243™** or **248™** Threadlocker Stick to bolt threads.

6. Tighten normally.





The Old-Fashioned Way

Cut or molded gaskets

Shortcomings:

- Easily misaligned
- Need to keep large inventory
- Can become compression set
- Over-tightening can lead to breakage
- Can become brittle with age

The Reliable Solution

LOCTITE® Gasketing Products

Benefits:

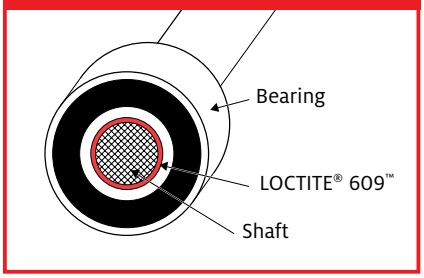
- Fill all voids
- Lower cost per application
- Ease of use
- Lower inventory costs
- No gasket creep
- No compression set

There's a LOCTITE® Sealant for Every Gasketing Application

PRODUCT	LOCTITE® 510™	LOCTITE® 518™	LOCTITE® 548™	LOCTITE® SI 587™	LOCTITE® SI 5900™ INSTANT GASKET
Color	Pink	Red	Orange	Blue	Black
Cured State	Rigid	Flexible	Flexible	Flexible Elastomer	Flexible Elastomer
Temperature Range	-65ºF to 400ºF	-65ºF to 300ºF	-65ºF to 300ºF	-75ºF to 500ºF	-75ºF to 550ºF
Sealing Time	Primed: 30 min. to 4 hrs. Unprimed: 4 to 24 hrs.	Primed: 30 min. to 4 hrs. Unprimed: 4 to 24 hrs.	Primed: 30 min. to 4 hrs. Unprimed: 4 to 24 hrs.	Tack-free: 30 min. Full cure: 24 hrs.	Operating strength 15 psi/ 1 min.
Gap Fill	Primed – 0.050" Unprimed – 0.010"	Primed – 0.050" Unprimed – 0.010"	Primed – 0.020" Unprimed – 0.010"	0.250"	0.250"
Recommended Primer	LOCTITE® SF 7649™	LOCTITE® SF 7649™	LOCTITE® SF 7649™	N/A	N/A
Use	High temperature for gaskets in rigid assemblies	Flexible seal under minor flange movement	Semi-solid formula ideal for on-the-spot repairs	Oil resistant, noncorrosive, oxygen sensor-safe	Oil resistant, flexible, noncorrosive, oxygen sensor-safe

MOUNTING SHAFTS AND BEARINGS WITH LOCTITE® RETAINING COMPOUNDS

PRESS FIT



ON PRESS FITS

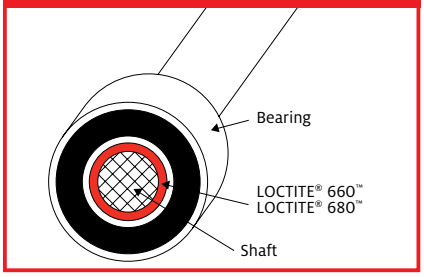
1. Clean shaft O.D. and component I.D.
2. Apply a bead of LOCTITE® **609™** or **641™** Retaining Compound to circumference of shaft at leading edge of insertion or leading area of engagement.

   Note: • Retaining compound will always be squeezed to the outside when applied to shaft.

   • Do NOT use with LOCTITE® Anti-Seize or similar product.
3. Press as usual. Wipe off excess.
4. No cure time required.

   Note: LOCTITE® **609™** or **641™** Retaining Compound is used due to low viscosity and wetting properties.

SLIP FIT - LIGHT/HEAVY DUTY



ON SLIP FITS

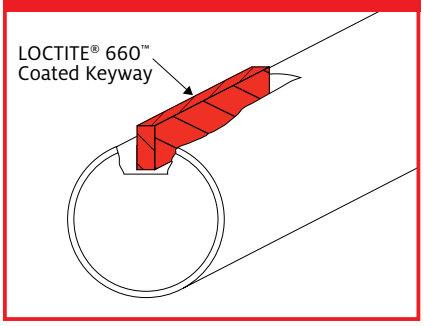
1. Machine shaft to 0.002" radial slip fit with 50 to 80 rms finish (second cut).
2. Clean all parts with LOCTITE® ODC-Free Cleaner & Degreaser.
3. Spray all parts (I.D. and O.D.) with LOCTITE® **SF 7649™** Primer. Do NOT use primer for heavy duty applications.
4. Apply a LOCTITE® **660™** Retaining Compound coating around shaft and engagement area.
5. Assemble parts with rotating motion.
6. Wipe off excess.
7. Allow 2 hours prior to service.

REPAIRING WORN SHAFTS

1. Follow slip fit directions above except:
2. Determine radial gap.
3. If radial gap exceeds 0.005”, LOCTITE® **SF 7649™** Primer must be used.
4. Take steps to maintain concentricity with large gaps.
5. Larger gaps require longer cure times (30 to 60 minutes).
6. LOCTITE® **660™** Retaining Compound is NOT recommended for radial gaps exceeding 0.010”.
7. See procedure for REPAIRING BADLY WORN SHAFT, page 19.

   Note: LOCTITE® **660™** Retaining Compound is very fast fixturing (30 seconds or less) with LOCTITE® **SF 7649™** Primer.

REPAIR BADLY WALLOWED KEYWAY



REPAIR WALLOWED KEYWAYS

1. Clean all parts with LOCTITE® ODC-Free Cleaner & Degreaser.
2. If necessary, spray all parts with LOCTITE® **SF 7649™** Primer. Allow to dry.
3. Apply a LOCTITE® **660™** Retaining Compound coating into keyway.
4. Assemble as required using LOCTITE® **660™** Retaining Compound.
5. Allow 30 to 60 minutes to cure.

   Note: • LOCTITE® **660™** Retaining Compound is NOT recommended for lateral gaps exceeding .010".

   • Higher strengths are obtained by NOT using LOCTITE® **SF 7649™** Primer with small (0.002" to 0.004") gaps, and allowing longer cure (4 to 24 hours).



The Reliable Solution

Retaining Compounds

Improve or eliminate shrink, press and slip fit assemblies using LOCTITE® Retaining Compounds.

Benefits:

- Significantly improve strength of assembly
- Reduce costs
- Looser tolerances required, producing less distortion and easing disassembly
- Resists corrosion
- Contact is 100%; load is distributed evenly over joint and is sealed against leaks
- Unitized keyed assemblies are stronger and resist key wallow

The Old-Fashioned Way

Securing cylindrical assemblies with shrink, press and slip fits.

Shortcomings:

- Costly machining to obtain very close tolerances
- Force and heat cause stress and distortion, often requiring re-machining
- Prone to fretting, corrosion and leaks
- Costly assembly equipment required

There's a LOCTITE® Product for Every Retaining Application

PRODUCT	LOCTITE® 609™ GENERAL-PURPOSE	LOCTITE® 620™ HIGH TEMP.	LOCTITE® 641™	LOCTITE® 648™	LOCTITE® 680™ HIGH STRENGTH	LOCTITE® 660™ PRESS FIT REPAIR
Appearance	Green Liquid	Green Liquid	Yellow Liquid	Green Liquid	Green Liquid	Silver Paste
Max. Gap Fill (Diametral)	0.005"	0.015"	0.006"	0.006"	0.015"	0.020"
Shear Strength	2,300 psi	3,800 psi	3,900 psi	3,900 psi	4,000 psi	3,335 psi
Temperature Range	-65ºF to 300ºF	-65ºF to 450ºF	-65°F to 300°F	-65°F to 355°F	-65ºF to 355ºF	-65ºF to 300ºF
Cure Speed, Steel	Fixture: 10 min. Full: 24 hrs.	Fixture: 30 min. Full: 24 hrs.	Fixture: 20 min. Full : 24 hrs.	Fixture: 4 min. Full: 24 hrs.	Fixture: 4 min. Full: 24 hrs.	Fixture: 20 min. Full: 24 hrs.
Recommended Primer	LOCTITE® SF 7088™ SF 7649™ SF 7471™	LOCTITE® SF 7088™ SF 7649™ SF 7471™	LOCTITE® SF 7088™ SF 7649™ SF 7471™	N/A	N/A	LOCTITE® SF 7088™ SF 7649™ SF 7471™
Use	Fast curing for rigid assemblies	High temp.; high viscosity	For cylindrical parts that require disassembly	Fast curing for clearance/interference fit parts	High strength for slip-fitted parts	Repairs worn machine parts

LOCTITE® PRODUCT SOLUTIONS: OTHER PROACTIVE TOOLS

LOCTITE® 454™ Instant Adhesive Gel
General-purpose instant adhesive gel in a unique, virtually indestructible package. Perfect for pocket or toolbox storage.



P/N	Package Size.
39202	4 g. bottle

LOCTITE® EA 3463™ 10 minute repair epoxy
Kneadable, two-part paste. Working time 3 minutes – sets in 10 minutes. Adheres to damp surfaces. Can be drilled, filed and painted. Ideal for emergency sealing of leaking tanks and pipes. Smooths welds, repairs small cracks in castings, fills oversized bolt holes.



P/N	Package Size.
98853	4 oz. stick

LOCTITE® PC 7227™, PC 7228™ Nordbak® Brushable Ceramic
Smooth, wear-resistant, low-friction coating to combat turbulence and cavitation on components such as pump housings and impellers. CFIA Listed.
NSF/ABSI 61 Certified (Grey Only)



P/N	Package Size.
98733	2 lb. kit Grey
98732	6 lb. kit Grey

LOCTITE® PC 7228™

P/N	Package Size.
96443	2 lb. kit White

LOCTITE® EA 3478™ Superior Metal
Formulated with fine alloy particles for high compressive strength and chemical resistance. Recommended for use on all metals. CFIA Listed



P/N	Package Size.
97473	1 lb. kit
40900	4 kg kit

LOCTITE® LB 8040™ Fast Acting Corrosion Release
The solution for releasing seized or corroded parts. Instantly freezes seized and rusted parts (bolts, nuts, studs) down to -38°F (-39°C) Dismantle parts in 1-2 minutes.



P/N	Package Size.
996456	13.52 fl. oz (400 ml) aerosol

LOCTITE® PC 7393™ Rapid Rubber Repair
Premium quality belt repair product designed to repair conveyor belts and other damaged rubber equipment quickly and easily. The 400 ml cartridge requires the use of a LOCTITE® Rapid Rubber Dispenser.



P/N	Package Size.
96677	400 ml kit
96675	400 ml cartridge

LOCTITE® Pipe Repair Kit
No tools required. Cures in 30 minutes. Easy-to-use repair kit. Use for temporary/medium-term repair of leaking pipes and reinforcement of weak areas. CFIA Approved.



P/N	Package Size.
96321	2 in. x 6 ft tape
96322	4 in. x 12 ft. tape

LOCTITE® PC 9410™ Concrete Repair Material
This two-component magnesium phosphate cement sets rapidly and has a very high early strength. Ideal for road and aircraft runway repairs. Bonds to new and old concrete, as well as most construction materials. CFIA Approved.



P/N	Package Size.
1012500	1 lb. kit
95551	1 gal. kit
95555	5gal. kit

LOCTITE® SF 7900™ Ceramic Shield for Welding
Innovative ceramic coating that protects welding equipment against spatter for eight hours without reapplication.



P/N	Package Size.
1616692	9.5 oz. aerosol

LOCTITE® SF 7070™ ODC-Free Cleaner & Degreaser
A non-aqueous, hydrocarbon-based solvent designed for cleaning and degreasing surfaces to be bonded with adhesives, as well as for general-purpose industrial cleaning. Intended for use on aluminum, rubber and most plastics; will not cause flash rusting on water-sensitive parts. Dries residue-free. NSF/ANSI K1 Certified.



P/N	Package Size.
22355	15 oz. aerosol
20162	16 fl. oz pump spray
20260	1 gal. can

LOCTITE® SF 7617™ Industrial Hand Wipes
Premoistened with a powerful citrus-scented formula, each wipe is abrasive enough to scrub off the toughest grease and grime without scratching hands.



P/N	Package Size.
34943	75 count canister
34944	130 count canister

LOCTITE® SI 5075™ Insulating and Sealing Wrap
This innovative self-fusing silicone wrap is ideal for electrical insulation and sealing application, even for pipes under pressure. Withstands extreme conditions such as salt water, fuel and acid fluids exposure.



P/N	Package Size.
1212164	1 in. x 10 ft. tape – Red
1540599	1 in. x 10 ft. tape – Black
1496756	2 in. x 36ft. tape – Black

LOCTITE® Quick Service Tool Kit
This compact kit contains everything needed to solve the most common mechanical failures.



P/N	Package Size.
00101	Quick Service Tool Kit

LOCTITE® O-Ring Making Kit
Eliminates the need for an inventory of different sized O-rings. Joints resist water and oil and are as strong as the rubber itself. Contains 3-ft lengths of common diameters of Buna N cord, LOCTITE® 404® Instant Adhesive, O-ring fixture, blade, waterproofing solutions and cleanup solution. CFIA Approved



P/N	Package Size.
00112	O-Ring Making Kit

CHOOSE FROM ADDITIONAL HENKEL SERVICES

PUMP REBUILD	• Let us show you how and where to use LOCTITE® brand products to increase pump reliability and pump efficiency.
INVENTORY CONSOLIDATION	• Let us conduct a shop chemical review to help you consolidate purchasing efforts. This will enable you to better manage the shop chemicals in the plant.
APPLICATION ASSISTANCE	• Let our expert engineering staff assist you with specific product and maintenance applications.
OPERATION STOP LEAK	• Let us identify air leaks in your plant. We'll provide you with the tools to eliminate the recurrence of these leaks to save you money.

Need It Now!

Please provide quantity needed below:

LOCTITE®

Name: _____ **Area:** _____

Quantity	Item No.	LOCTITE® Product	Pkg. Size
Threadlocking			
Quantity			
_____	39186	LOCTITE® 220™ Threadlocker – Wicking, Medium	50 ml
_____	29031	LOCTITE® 290™ Threadlocker – Wicking, High	50 ml
_____	135333	LOCTITE® 222MS™ Threadlocker – Low Strength	10 ml
_____	22231	LOCTITE® 222MS™ Threadlocker – Low Strength	50 ml
_____	1329837	LOCTITE® 243™ Threadlocker – Medium Strength	10 ml
_____	1329467	LOCTITE® 243™ Threadlocker – Medium Strength/Primerless	50 ml
_____	1330583	LOCTITE® 263™ Threadlocker – High Strength/Primerless	10 ml
_____	1330585	LOCTITE® 263™ Threadlocker – High Strength/Primerless	50 ml
_____	37087	LOCTITE® 248™ Threadlocker Stick – Medium Strength	19 g
_____	37686	LOCTITE® 268™ Threadlocker Stick – High Strength	19 g
_____	1134607	LOCTITE® 2047™ Threadlocker	50 ml
Thread Sealing			
_____	1537780	LOCTITE® MR5438™ Pipe Sealant	1 pt.
_____	1265769	LOCTITE® 5452™ Thread Sealant	50 ml
_____	56531	LOCTITE® 565™ Thread Sealant	50 ml
_____	2087067 **NEW!**	LOCTITE® 567™ Thread Sealant with PTFE	50 ml
_____	37127	LOCTITE® 561™ Pipe Sealant Stick with PTFE	19 g
_____	54531	LOCTITE® 545™ Thread Sealant	50 ml
_____	25882	LOCTITE® 554™ Refrigerant Sealant	10 ml bottle
_____	1138284	LOCTITE® 5770™ Thread Sealant	50 ml tube
_____	39152	LOCTITE® 548™ Flange Sealant Stick	18 g stick
_____	28754	LOCTITE® 564™ Thread Sealant	50 ml
Gasketing			
_____	2096064 **NEW!**	LOCTITE® 518™ Flange Sealant	50 ml
_____	58775	LOCTITE® SI 587™ Blue – High Performance	300 ml
_____	30507	LOCTITE® SI 5900™ Instant Gasket	7 oz.
_____	1241992	LOCTITE® 5203™ Flange Sealant	300 ml
_____	39156	LOCTITE® 534™ Hi-Tack Gasket Dressing Stick	19 g
_____	51031	LOCTITE® 510™ Flange Sealant	50 ml tube
Retaining			
_____	66040	LOCTITE® 660™ Retaining Compound	50 ml
_____	60921	LOCTITE® 609™ Retaining Compound	10 ml
_____	60931	LOCTITE® 609™ Retaining Compound	50 ml
_____	62015	LOCTITE® 620™ Retaining Compound	10 ml
_____	62040	LOCTITE® 620™ Retaining Compound	50 ml
_____	1835205	LOCTITE® 680™ Retaining Compound	10 ml
_____	68035	LOCTITE® 680™ Retaining Compound	50 ml
_____	1835922	LOCTITE® 648™ Retaining Compound	10 ml
_____	1835920	LOCTITE® 648™ Retaining Compound	50 ml
_____	28802	LOCTITE® 641™ Retaining Compound	10 ml
_____	21458	LOCTITE® 641™ Retaining Compound	50 ml
Primers			
_____	1069258	LOCTITE® SF SF 7088™ Primer Stick	17 g stick
_____	21348	LOCTITE® SF 7649™ Primer	4.5 oz.
_____	135337	LOCTITE® SF 7471™ Primer	4.5 oz. aerosol
Metal Rebuilding & Shaft Repair			
_____	98853	LOCTITE® EA 3463™ 10 Minute Repair Epoxy	4 oz. stick
_____	97473	LOCTITE® EA 3478™ Superior Metal	1 lb. kit
_____	40900	LOCTITE® EA 3478™ Superior Metal	4 kg. kit
Repair			
_____	96677	LOCTITE® PC 7393™ Rapid Rubber Repair	400 ml kit
_____	96675	LOCTITE® PC 7393™ Rapid Rubber Repair	400 ml cartridge
_____	96676	LOCTITE® PC 7393™ Rapid Rubber Repair	150 ml coaxial cart.

Quantity	Item No.	LOCTITE® Product	Pkg. Size
Anti-Seize Lubricants			
Quantity			
_____	1999560 **NEW!**	LOCTITE® LB 8009™ Heavy Duty Anti-Seize	7 oz. brush top tube
_____	51605	LOCTITE® LB 8009™ Heavy Duty Anti-Seize	9 oz. brush top
_____	51606	LOCTITE® LB 8009™ Heavy Duty Anti-Seize	1.2 lb. brush top
_____	41205	LOCTITE® LB 8070™ Heavy Duty Anti-Seize	20 g stick
General-Purpose			
_____	1999559 **NEW!**	LOCTITE® LB 8008™ C5-A® Anti-Seize Lubricant	7 oz. brush-top tube
_____	51147	LOCTITE® LB 8008™ C5-A® Anti-Seize Lubricant	8 oz. brush-top can
_____	51007	LOCTITE® LB 8008™ C5-A® Anti-Seize Lubricant	1 lb. brush-top can
_____	37229	LOCTITE® LB 8065™ Copper Anti-Seize Stick	20 g stick
_____	37230	LOCTITE® LB 8060™ Silver Grade Anti-Seize Stick	20 g stick
_____	1999141 **NEW!**	LOCTITE® LB 8150™ Silver Grade Anti-Seize	7 oz. brush-top tube
_____	76764	LOCTITE® LB 8150™ Silver Grade Anti-Seize	1 lb. brush-top can
_____	77124	LOCTITE® LB771™ Nickel Anti-Seize	8 oz. brush-top can
_____	77164	LOCTITE® LB771™ Nickel Anti-Seize	1 lb. brush-top can
_____	1786073	LOCTITE® LB 8007™ C5-A® Anti-Seize	12 oz. aerosol
High Performance			
_____	1999556 **NEW!**	LOCTITE® LB 8023™ Marine Grade Anti-Seize	7 oz. brush-top tube
_____	34395	LOCTITE® LB 8023™ Marine Grade Anti-Seize	8 oz. brush-top can
Specialty			
_____	1167237	LOCTITE® LB 8014™ Food Grade Anti-Seize	8 oz. brush-top can
Cleaning			
_____	22355	LOCTITE® SF 7070™ ODC-Free Cleaner & Degreaser	15 oz. aerosol
_____	20162	LOCTITE® SF 7010™ ODC-Free Cleaner & Degreaser	16 fl. oz. pump spray
_____	34943	LOCTITE® SF 7617™ Industrial Hand Wipes	75 count
_____	34944	LOCTITE® SF 7617™ Industrial Hand Wipes	130 count
Wear Prevention & Rebuilding			
_____	98733	LOCTITE® PC 7227™ Nordback® Brushable Ceramic	2 lb. kit grey
_____	98732	LOCTITE® PC 7227™ Nordback® Brushable Ceramic	6 lb. kit grey
_____	96443	LOCTITE® PC 7228™ Nordback® Brushable Ceramic	2 lb. kit white
Floor & Concrete Repair			
_____	1012500	LOCTITE® PC 9410™ Concrete Repair Material	1 lb. kit
_____	95551	LOCTITE® PC 9410™ Concrete Repair Material	1 gal. kit
_____	95555	LOCTITE® PC 9410™ Concrete Repair Material	5 gal. kit
Lubricants			
_____	996456	LOCTITE® LB 8040™ Fast-Acting Corrosion Release	13.52 fl. oz (400ml) aerosol
Instant Bonding			
_____	39202	LOCTITE® 454™ Instant Adhesive Gel	4 g bottle
Surface Protection			
_____	1616692	LOCTITE® SF 7900™ Ceramic Shield for Welding	9.5 oz. aerosol
Specialty & Emergency Kits			
_____	96321	LOCTITE® Pipe Repair Kit	2 in. x 12 ft tape
_____	96322	LOCTITE® Pipe Repair Kit	4 in. x 12 ft. tape
_____	1212164	LOCTITE® SI 5075™ Insulating & Sealing Wrap	1 in. x 10 ft. tape – Red
_____	1540599	LOCTITE® SI 5075™ Insulating & Sealing Wrap	1 in. x 10 ft. tape - Black
_____	00101	LOCTITE® Quick Service Tool Kit	
_____	00112	LOCTITE® O-Ring Making Kit	

Henkel

LET'S MAKE A DIFFERENCE TODAY

Improvement Suggestions





We want to know!

What did you do to...

- Reduce actual repair time?
- Reduce needless costs?
- Reduce future repair time?
- Improve operational safety?
- Improve reliability and output?

Name: _____

Area: _____

Reliability Improvement Suggestion

1. Problem Equipment: _____ Department or Area: _____

   Describe problem, including failing components: _____

   _____

   How often does this happen? _____ Times per month: _____ Times per year: _____

   Describe negative impact: _____

   _____

   Describe your intended actions, including products to be used: _____

   _____

   Necessary products issued? ☐ Yes ☐ No Need LOCTITE® rep help? ☐ Yes ☐ No

2. Problem Equipment: _____ Department or Area: _____

   Describe problem, including failing components: _____

   _____

   How often does this happen? _____ Times per month: _____ Times per year: _____

   Describe negative impact: _____

   _____

   Describe your intended actions, including products to be used: _____

   _____

   Necessary products issued? ☐ Yes ☐ No Need LOCTITE® rep help? ☐ Yes ☐ No

Additional Training Needed

Topics (Check appropriate boxes.)	**Comments**
☐ Mechanical Basics and Failure Root Causes	_____
☐ Rebuild/Resurface Shafts ☐ Wear Prevention	_____
☐ Machine Base Grouting	_____
☐ Belt Jointing and Repair	_____
☐ Floor Repair and Resurface	_____
☐ Anti-Slip Safety Flooring	_____
☐ Corrosion Protection (tanks, decking, etc.)	_____
☐ Pump Rebuild	_____

Training Critique

Check appropriate boxes	**Strongly Agree**	**Agree**	**Disagree**
I learned useful information and proactive techniques for my job:	☐	☐	☐
The instructor was well-informed and his/her style made it easy to learn:	☐	☐	☐
The examples helped me to understand where I can help increase reliability:	☐	☐	☐
The demos and visual aids were used effectively and helped me learn:	☐	☐	☐
The reference handouts are on target and will be helpful reminders:	☐	☐	☐

Length of class: ☐ Too Long ☐ Just Right ☐ Too Short

Pace of class: ☐ Too Fast ☐ Just Right ☐ Too Slow

Comments: _____

_____

Henkel Corporation, Engineering Adhesives
One Henkel Way, Rocky Hill, CT, U.S.A. 06067 • **1.800.562.8483** • **www.henkelna.com/mro** • **www.loctite.com**
2515 Meadowpine Blvd., Mississauga, Ontario, Canada L5N 6C3 • **1.800.263.5043 (within Canada)**

Name: _____

Area: _____

Reliability Improvement Suggestion

1. Problem Equipment: _____ Department or Area: _____

   Describe problem, including failing components: _____

   _____

   How often does this happen? _____ Times per month: _____ Times per year: _____

   Describe negative impact: _____

   _____

   Describe your intended actions, including products to be used: _____

   _____

   Necessary products issued? ☐ Yes ☐ No Need LOCTITE® rep help? ☐ Yes ☐ No

2. Problem Equipment: _____ Department or Area: _____

   Describe problem, including failing components: _____

   _____

   How often does this happen? _____ Times per month: _____ Times per year: _____

   Describe negative impact: _____

   _____

   Describe your intended actions, including products to be used: _____

   _____

   Necessary products issued? ☐ Yes ☐ No Need LOCTITE® rep help? ☐ Yes ☐ No

Additional Training Needed

Topics (Check appropriate boxes.)	**Comments**
☐ Mechanical Basics and Failure Root Causes	_____
☐ Rebuild/Resurface Shafts ☐ Wear Prevention	_____
☐ Machine Base Grouting	_____
☐ Belt Jointing and Repair	_____
☐ Floor Repair and Resurface	_____
☐ Anti-Slip Safety Flooring	_____
☐ Corrosion Protection (tanks, decking, etc.)	_____
☐ Pump Rebuild	_____

Training Critique

Check appropriate boxes	**Strongly Agree**	**Agree**	**Disagree**
I learned useful information and proactive techniques for my job:	☐	☐	☐
The instructor was well-informed and his/her style made it easy to learn:	☐	☐	☐
The examples helped me to understand where I can help increase reliability:	☐	☐	☐
The demos and visual aids were used effectively and helped me learn:	☐	☐	☐
The reference handouts are on target and will be helpful reminders:	☐	☐	☐

Length of class: ☐ Too Long ☐ Just Right ☐ Too Short

Pace of class: ☐ Too Fast ☐ Just Right ☐ Too Slow

Comments: _____

_____

Henkel Corporation, Engineering Adhesives
One Henkel Way, Rocky Hill, CT, U.S.A. 06067 • **1.800.562.8483** • **www.henkelna.com/mro** • **www.loctite.com**
2515 Meadowpine Blvd., Mississauga, Ontario, Canada L5N 6C3 • **1.800.263.5043 (within Canada)**

Name: _____

Area: _____

Reliability Improvement Suggestion

1. Problem Equipment: _____ Department or Area: _____

   Describe problem, including failing components: _____

   _____

   How often does this happen? _____ Times per month: _____ Times per year: _____

   Describe negative impact: _____

   _____

   Describe your intended actions, including products to be used: _____

   _____

   Necessary products issued? ☐ Yes ☐ No Need LOCTITE® rep help? ☐ Yes ☐ No

2. Problem Equipment: _____ Department or Area: _____

   Describe problem, including failing components: _____

   _____

   How often does this happen? _____ Times per month: _____ Times per year: _____

   Describe negative impact: _____

   _____

   Describe your intended actions, including products to be used: _____

   _____

   Necessary products issued? ☐ Yes ☐ No Need LOCTITE® rep help? ☐ Yes ☐ No

Additional Training Needed

Topics (Check appropriate boxes.)	**Comments**
☐ Mechanical Basics and Failure Root Causes	_____
☐ Rebuild/Resurface Shafts ☐ Wear Prevention	_____
☐ Machine Base Grouting	_____
☐ Belt Jointing and Repair	_____
☐ Floor Repair and Resurface	_____
☐ Anti-Slip Safety Flooring	_____
☐ Corrosion Protection (tanks, decking, etc.)	_____
☐ Pump Rebuild	_____

Training Critique

Check appropriate boxes	**Strongly Agree**	**Agree**	**Disagree**
I learned useful information and proactive techniques for my job:	☐	☐	☐
The instructor was well-informed and his/her style made it easy to learn:	☐	☐	☐
The examples helped me to understand where I can help increase reliability:	☐	☐	☐
The demos and visual aids were used effectively and helped me learn:	☐	☐	☐
The reference handouts are on target and will be helpful reminders:	☐	☐	☐

Length of class: ☐ Too Long ☐ Just Right ☐ Too Short

Pace of class: ☐ Too Fast ☐ Just Right ☐ Too Slow

Comments: _____

_____

Henkel Corporation, Engineering Adhesives
One Henkel Way, Rocky Hill, CT, U.S.A. 06067 • **1.800.562.8483** • **www.henkelna.com/mro** • **www.loctite.com**
2515 Meadowpine Blvd., Mississauga, Ontario, Canada L5N 6C3 • **1.800.263.5043 (within Canada)**

LOCTITE®

Henkel Corporation
Engineering Adhesives
www.henkelna.com/mro
www.loctite.com

U.S.A.
Henkel Corporation
Engineering Adhesives
One Henkel Way
Rocky Hill, Connecticut 06067
Tel: 1.800.LOCTITE (562.8483)
Tel: 860.571.5100
Fax: 860.571.5465

Canada
Henkel Canada Corporation
Engineering Adhesives
2515 Meadowpine Blvd.
Mississauga, Ontario L5N 6C3
Tel: 1.800.263.5043 (within Canada)
Tel: 905.814.6511
Fax: 905.814.5391

All marks used are trademarks and/or registered trademarks of Henkel and its affiliates in the U.S. and elsewhere.
® = registered in the U.S. Patent and Trademark Office. © 2016 Henkel Corporation. All rights reserved. 15017/LT-8179 (2/16)