IMI Annual Meeting

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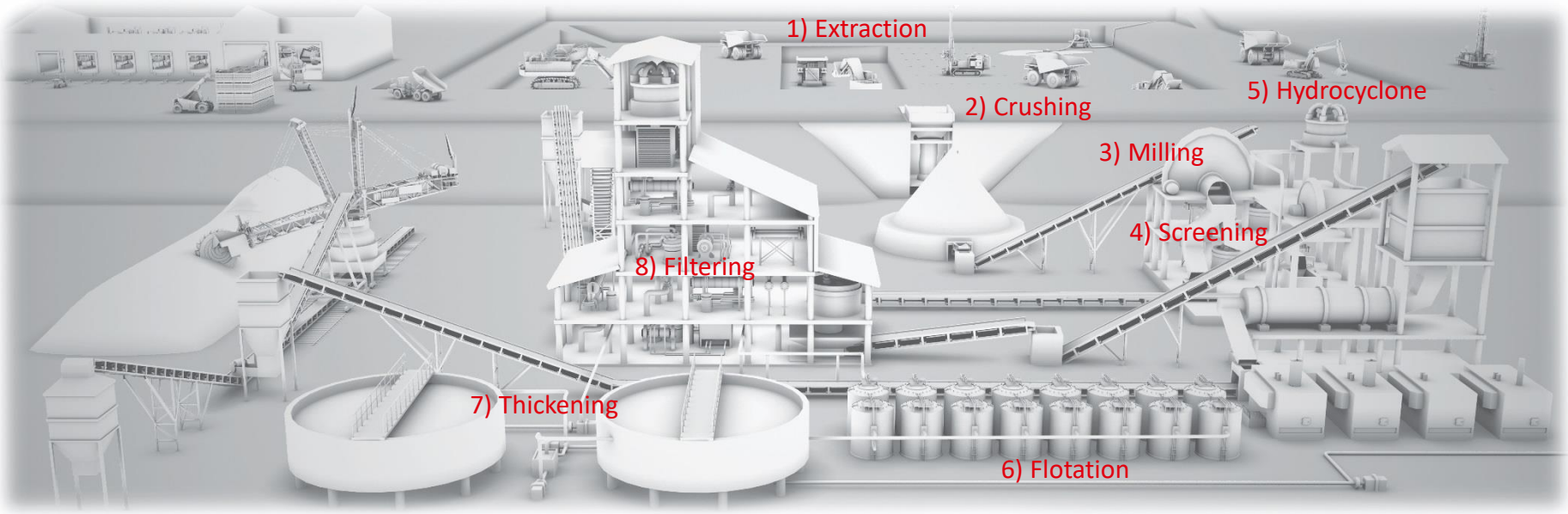
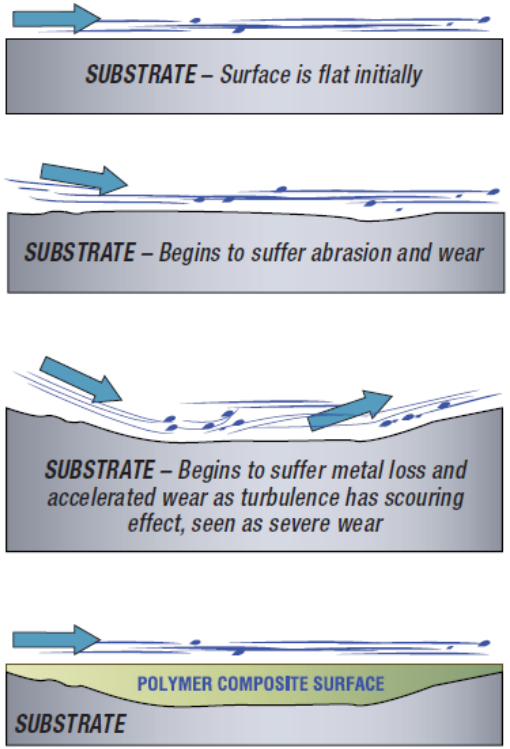
Mining Process
Basic Mining Flow



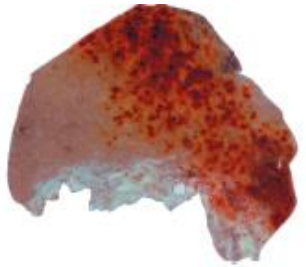
Types of Issues Faced

1. WEAR/ABRASION



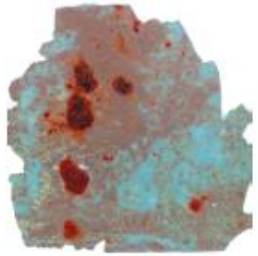
2. CORROSION/EROSION

Coating delamination



Excessive corrosion causing delamination of the coating

Underfilm corrosion signs



Active corrosion cells

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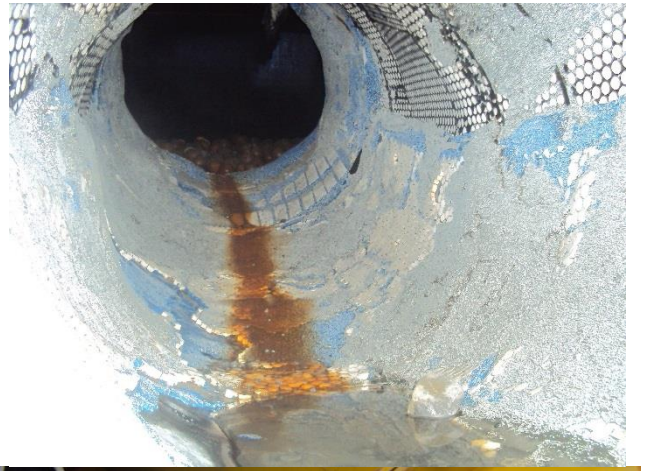
Background of Application
Chutes

- Chutes are defined as a sloping channel or slide that conveys things to a lower level
- In mining operations, chutes are used to feed and exit equipment or transfer between runs of belt conveyors
- Because the chute substrate is stationary, they are subjected to severe wear
- Chutes are found in nearly every process of the mine and are nearly impossible to access without disrupting operations

Other Related Applications
Chutes

- Chute Applications may also need:
  - Chemical Resistant Coatings
  - Metal Rebuild Epoxies
  - Rubber Repair/Bonding
  - Cleaners
  - Threadlockers
  - Welding Related Products
  - Anti-Slip Coatings for service areas
  - Grout/Anchoring/Chocking
  - Concrete Repair
  - Anti-Ice/Anti-Graffiti for buildup prevention

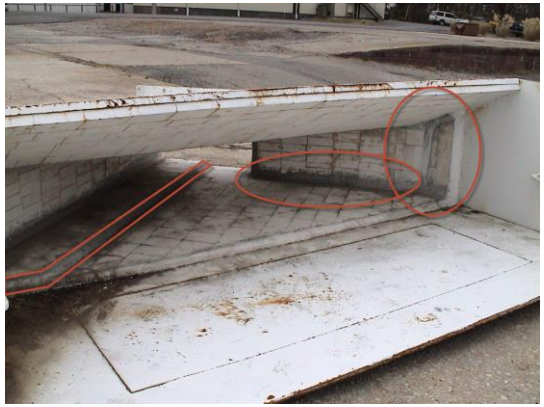
How Chutes Work
Chutes



Ceramic Tile Bonding
Chutes

- Ceramic Tiles provide extreme abrasion and impact resistance
- Henkel's Ceramic Tile Adhesive Line:
  - Loctite PC 7363 Ceramic Tile Adh
  - Loctite PC 7364 High Impact Ceramic Tile Adh
  - Loctite SI 5109 Tile Bond High Temp
- Product properties are specific to ceramic tile bonding:
  - High Green Strength
  - Long Open Time
  - High Viscosity

Wearing Compounds
Chutes



- Wearing Compounds offer wear protection in chute applications

Wearing Compounds can also be used:

- To fill the gaps between ceramic tiles
- Reinforce tiled areas and corners
- Patch areas where ceramic tiles are missing
- Line the walls and zones where ceramic tiles aren’t being used

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Vibrating Screens

- Screens produce particle sizes needed to ensure efficiency in cleaning and dewatering units
- Large particles pass through the vibrating deck while smaller particles are retained

Challenge: Extend the life of the screen structure against severe abrasion

Solution: Apply LOCTITE High Impact Wearing Compound/Pneu-Wear Wearing Compound

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LOCTITE PC® 7350 Conveyor Belt Repair

Target Industries

- Mining
  - Bulk Material Handling (All Types)
- Power Generation
  - Coal Power

Target Applications

- Resurfacing
- Holes
- Gouges/Tears
- Mechanical Splice Protection

Not for structural repair of the belt!

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Belt Repair

- **LOCTITE PC 7350 Belt Repair**
  - Equipment DOWNTIME drastically reduce
  - High adhesion both on rubber and metal
  - High elongation material
  - Thixotropic material
- **Benefits**
  - Protect Mechanical Splices
  - Excellent Adhesion to Belt + Splices
  - Excellent Abrasion Resistance over Scrapers
  - Protect Pulleys/Idlers

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Prevent fretting and corrosion while securing bearings
Loctite® 641™ Retaining Compound

Prevent rust and seizure of power end bolts
Loctite® Marine Grade Anti-Seize

Prevent key wallow
Loctite® 243™ Medium Strength Threadlocker
Repair key wallow
Loctite® 660™ Retaining Compound

Prevent set screws from working loose
Loctite® 222MS™ Threadlocker or
Loctite® 243™ Threadlocker
(depending on fastener size)

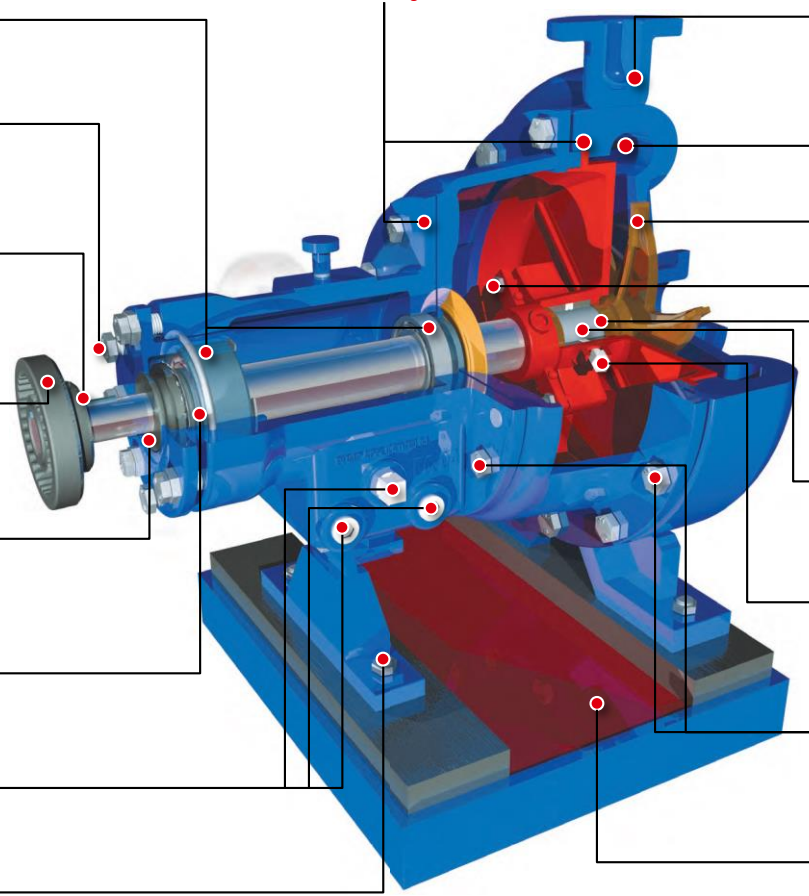
Secure and prevent leakage between oil seals and housing
Loctite® 243™ Medium Strength Threadlocker or
Loctite® 248™ Medium Strength Threadlocker Stick

Lubricate and prevent damage to O-rings
Loctite® ViperLube® High Performance Synthetic Grease

Seal threaded fittings
Loctite® 567™ Thread Sealant with PTFE

Keep mounting bolts tight
Loctite® 263™ High Strength Threadlocker

Make any size gasket
Loctite® 518™ Flange Sealant



Protect pump against chemical attack and erosion
Loctite® Nordbak® Chemical Resistant Coating

Rebuild and protect worn volutes
Loctite® Nordbak® Wearing Compound and/or
Loctite® Nordbak® Brushable Ceramic

Restore, coat, and protect impeller vanes
Loctite® Nordbak® Brushable Ceramic

Prevent corrosion and seizure of gland assembly nuts and seizure of the impeller to the shaft
Loctite® Marine Grade Anti-Seize

Rebuild worn shafts
Loctite® Fixmaster® Superior Metal

Seal and protect flushing connectors
Loctite® 567™ Thread Sealant with PTFE

Prevent corrosion and secure casing bolts and adapter bolts
Loctite® 243™ Medium Strength Threadlocker

Provide a solid mounting base
Loctite® Fixmaster® Super Grout

Ensure Proper Grouting of Pump Base

Grouts must be able to withstand	Reliable Grouting Tactics
• Shrinkage • Torsional stresses • Impact • Vibration • Corrosion	• Follow OEM grouting specs • Use a self-leveling and non-shrinking grout • Use a grout that can withstand the external forces

Solution: Fill the pump base with a Loctite® Fixmaster® epoxy grout system

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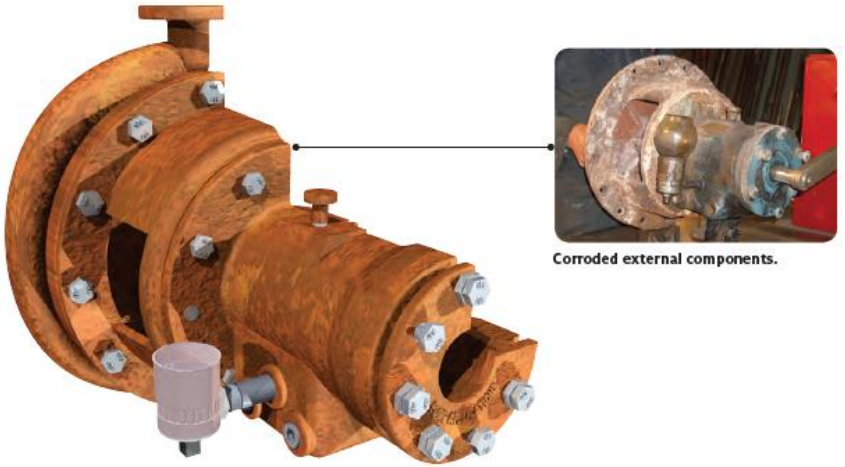
Protect Pumps from Chemical Attack

- Prevent rust, erosion, and chemical attack to both internal and external pump parts (casings, bearing fram adapters, etc)



Corroded external components.

Solution: Coat parts with Loctite® Nordbak® Chemical Resistant Coating™

Rebuild Worn Casings & Impellers

Casings and Impellers can wear from

- Abrasive slurries & solids
- Cavitation
- Chemical attack

Solutions

- Repair minor surface wear with Loctite® Nordbak® Brushable Ceramic
- Repair heavy surface wear with Loctite® Nordbak® Wearing Compound
- Repair and protect from chemical attack damage with Loctite® Nordbak® Chemical Resistant Coating
- Rebuild worn areas with Loctite® Fixmaster® Superior Metal

Energy Savings through Pump Refurbishment and Coatings (MCWA)

Loctite® Products Used

Like most publications, Pumps & Systems Magazine required that any editorial content be free of product endorsement, therefore in the article we weren't able to say exactly what two products MCWA used.

- ***Fixmaster® Superior Metal*** - used to repair deep gouges
- ***Nordbak® Brushable Ceramic Grey*** - used for coating, MCWA required NSF approval

Maintenance Matters

Energy Savings through Pump Refurbishment and Coatings

Karen Verosky, Henkel Corporation (Loctite®) and Paul Maier, Randy White, Steve Connell, Kurt Knoll, Chris King, George Hanley and Richard Metzger, Monroe County Water Authority

Find out how one water authority realized it could save hundreds of thousands each year by mechanical refurbishing, sandblasting and coating pumps.

Responsible for supplying an average of 60 million gallons of drinking water each day, the Monroe County Water Authority (MCWA) in Rochester, N.Y., depends on more than 100 centrifugal pumps with a total installed capacity of more than 35,000-hp. These pumps range in size from 5-hp to 1750-hp and consume an average 5-MW of power daily. In an era of conserving energy and increasing sustainability, the MCWA is attempting to reduce energy consumption, greenhouse gases and operations and maintenance costs.

Through computerized modeling of its water distribution system, the MCWA discovered many discrepancies in their pumps between the original manufacturer pump curve and the actual field pump curve. When inputting the pump curves into the model, they discovered that the model could not be calibrated using original manufacturer pump curve data. The MCWA staff went into the field and physically measured each pump's performance (head, flow, kW and RPM) to develop a set of field pump curves for the water

Figure 1. Pump interior with severe tuberculation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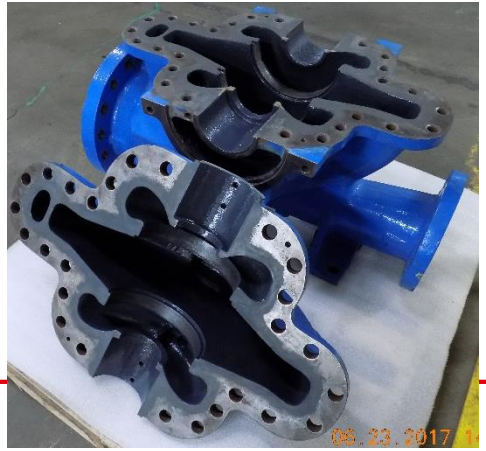
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Protective Coatings & Compounds

Product Application

How to apply the product?

Brush

Spray

Roller

Spatula

Surface Preparation

Abrasive blasting not only removes visible surface rust and contaminates, but also creates a rugged, miniature mountain and valley finish. This surface roughness is known as Surface Profile.

Surface Profile is critical to coating performance as it improves adhesion by increasing surface area and providing a keyed anchor pattern.

Surface Profiles will vary depending on the type of abrasive particles, equipment and technique utilized. It is critical to achieve the correct profile depth specified for a particular coating.

Chemical contaminants that are not readily visible, such as chlorides and sulphates, attract moisture through coating systems resulting in premature failure. Therefore it is fundamentally important to chemically clean all substrates with an industrial strength cleaner and degreaser such as Loctite® Natural Blue® Biodegradable Cleaner & Degreaser.

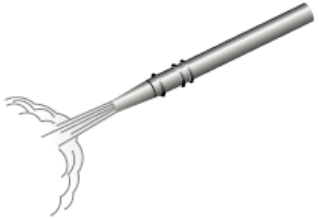


Figure 1. For best results, abrasive blast the application surface

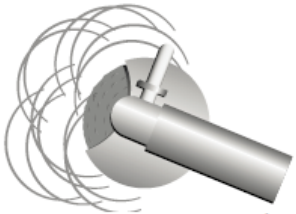
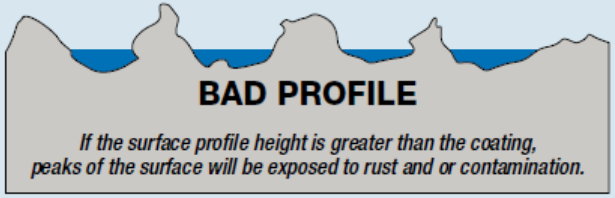
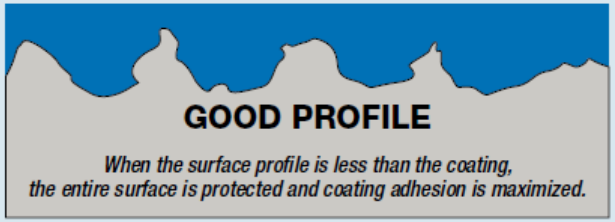


Figure 2. Coarse grinding of the surface is also recommended for surface preparation





Loctite® Composite applications require a minimum 75 micron surface profile.

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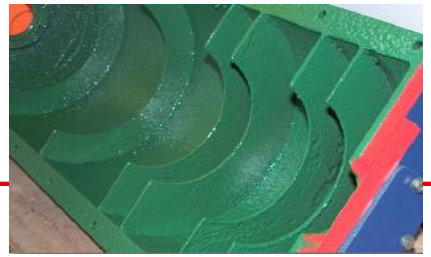
Loctite® Solutions:
Brushable Ceramic & Spray on Protective Coatings



Loctite® Nordbak® Brushable Ceramic: (Thin Mil) brushes on to form a smooth, corrosion-resistant coating. Protects against turbulence, abrasion, and cavitation. Can also be used as a top coat over Loctite Nordbak wearing compounds for surface rebuilding and lasting protection. Resists temperatures to 200°F.

Loctite® Nordbak® Sprayable Ceramic 7255™: #1389509
is a solvent-free ceramic filled two part epoxy coating. It is designed to protect metal surfaces against abrasive and corrosive agents. It can be used as smooth, protective coating on metal surfaces or as a low friction top coat over Loctite® Nordbak® wear resistant compounds. Typical applications are repairing and protecting of heat exchangers, condensers, lining tanks, chutes, pump impellers and housings.

Loctite® Solutions:
Wearing Compounds

Loctite® Nordbak® Wearing Compound:

Contains large ceramic beads and fine silicon carbide in a high performance epoxy system that protects against sliding abrasion to 250°F. Non-sagging. Trowelable.

- ✓ It is used to resist sliding abrasion when large particles are present (1⁄16 inch)
- ✓ **Applications**
  - ✓ Pump Housings
  - ✓ Elbows
  - ✓ Cyclones
  - ✓ Chutes

Varieties:

- Wearing Compound
- Fast Cure
- High Temperature

Loctite® Solutions:
Wearing Compounds

Loctite® Nordbak® Pneu-Wear:

Small ceramic beads and silicon carbide for maximum protection against fine particle abrasion to 250°F. Trowelable.

- ✓ (< 1⁄16 inch)
- ✓ **Applications:**
  - ✓ Chutes
  - ✓ Elbows
  - ✓ Cyclones
  - ✓ Pumps

Varieties:

- Wearing Compound
- Fast Cure
- High Temperature

Longwall Shields
Longwall

- A chronic issue in longwall mining, lift leg pockets are susceptible to and collect debris, such as dirt, rocks, coal, metal tools and cutting tips from the shear which become lodged under the hydraulic rams.
- Over time, the debris packs into the pocket, restricting movement.
- Wear begins to develop through the bottoms of the rams, damaging the shield causing catastrophic failure, expensive repairs, and extended or unexpected downtime.

Loctite MR 5898 Polyurethane Foam

Longwall

- Loctite MR 5898 is a cure-in-place two-component foaming polyurethane
- Expands 700%-1000% from liquid to foam within 5 minutes
- Functional cure within 15 minutes
- Fills in all crevices/geometries and bonds to the pocket to prevent pushout or separation from pocket and leg
- No special equipment required – easy to mix kits

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Loctite MR 5898 Flexible Foaming Polyurethane
Durability

- After 9 months in service:

- Customer has been using for over 3 years!

MRO Flexible Coatings

Loctite PC7383 Wear Resistant Rubber

Thank you!