# RETAINING RELIABILITY AND REVENUE

**Retaining compounds are essential in the machinery repair market. They should also be considered standard assembly materials in manufacturing.**

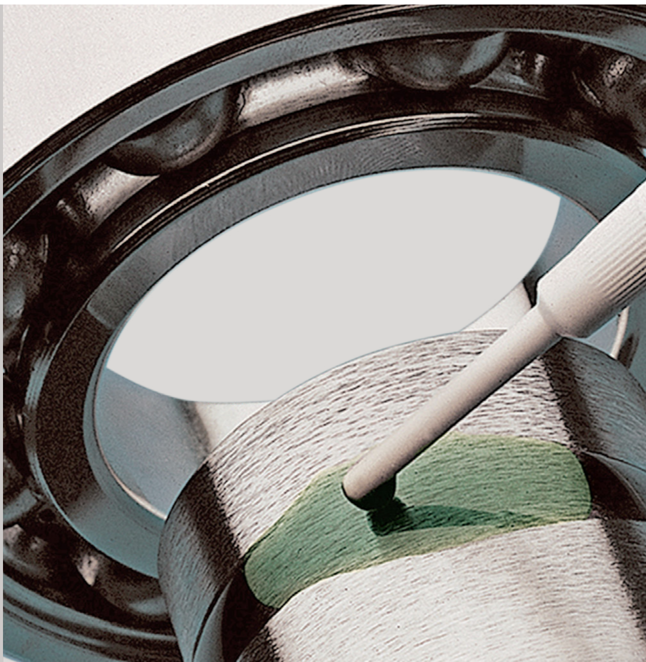
**Robert Dunkel**

**Retaining compounds are well-known in the machinery repair world but are not quite as illustrious in other industrial sectors. This is a significant missed opportunity. These adhesives enhance the assembly of cylindrical parts—press- and slip-fitted parts—like bearings, bushings, gears, and rotors onto housings or shafts. Their ability to adhere metal-to-metal components makes retaining compounds indispensable for machine repair and maintenance.**

## Could the materials also be helpful as standard protocol for initial product assembly? Definitely.

Even the most precise manufacturing processes may result in surface irregularities or gaps, which can be problematic in the long term due to issues like fretting corrosion and oxidation.

Retaining compounds can protect against these reliability-limiting conditions while also fortifying the assembly by distributing stress more uniformly. In addition to their use for maintenance and repair, strong consideration should be given to using retaining compounds in manufacturing.



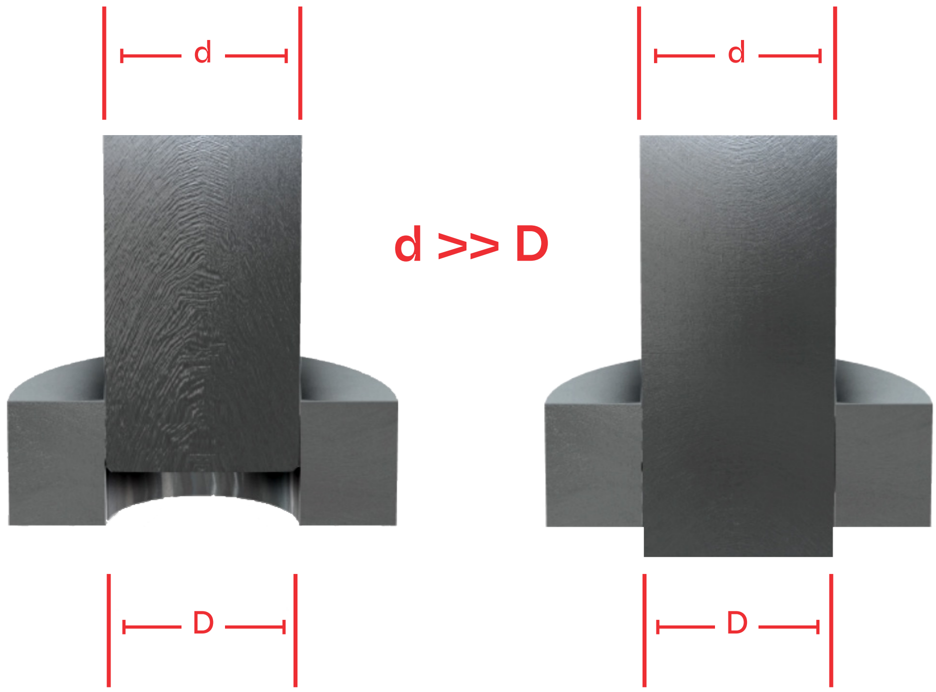
# Conventional Assembly Processes

Several methods are used to join cylindrical metal parts together. Conventional assembly techniques include interference fits (press or shrink), welding or soldering, and keyway and spline assemblies. Interference, keyway, and spline processes require precision machining to exact tolerances, while welding and soldering use extremely high temperatures to join compatible metal parts.

Interference fits are the most common, so they will be the focus of demonstrating retaining compound advantages, though the materials provide equal benefits for all cylindrical parts assembly. Interference fits aim to achieve consistent clearance on the components being joined. Because exact tolerances are required to meet specific load capacities, production costs are often high.

When assembling the parts using press fit, significant force is applied to tightly join the parts, which may stress the components being assembled and lead to problems down the line or, worse, cause damage during assembly. Shrink fit relies on the expansion and contraction of metal using high-temperature processes to expand the metal of one part, after which it is connected to its mating part.  Once it cools, the contraction holds the assembly in place.

## INTERFERENCE FIT



# Tolerance is slightly off. Now what?

When relying on interference fits alone to join the parts, the machining must be meticulous, as each side's tolerance can stack up. The assembly environment requires tight control, as temperature fluctuations will change the part tolerance. If the machining deviates for any reason, the shaft, bearing, bushing, or rotor will likely have to be remade, which adds time and cost to the project.

## INTERFERENCE FIT

High machining cost to achieve the desired interference

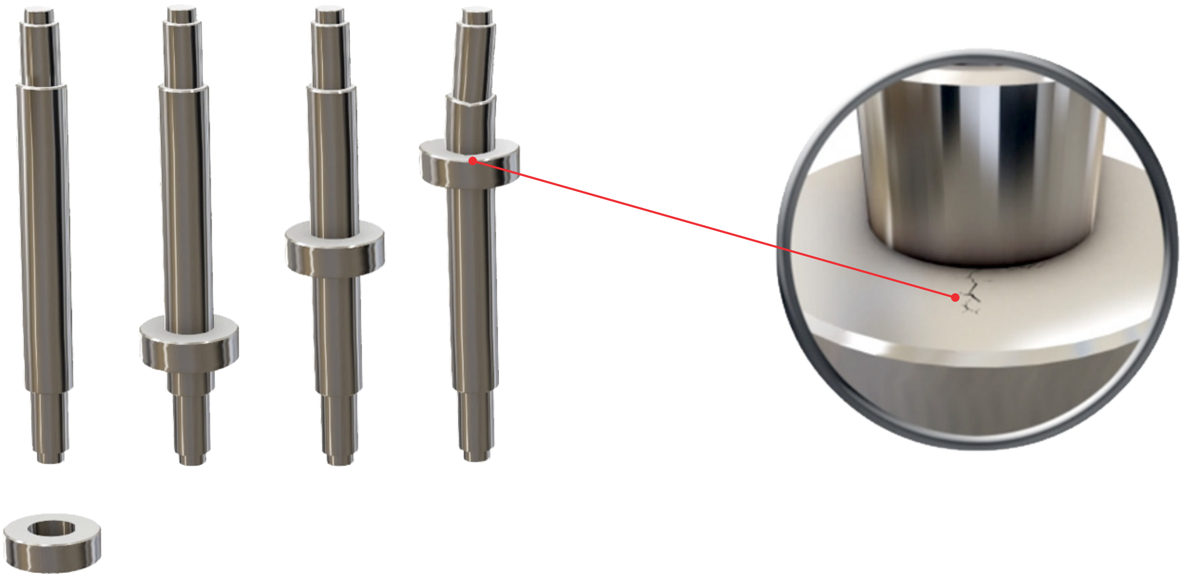
## LOCTITE®

Accommodates unexpected variances, resulting in a more capable process

**The more cost-effective alternative is to use a retaining compound liquid or paste.** The materials enable the assembly to work with a more cost-effective and repeatable machining tolerance while also delivering excellent reliability over the long term. Scrap can be eliminated or significantly reduced, saving valuable production time and expensive remanufacturing.

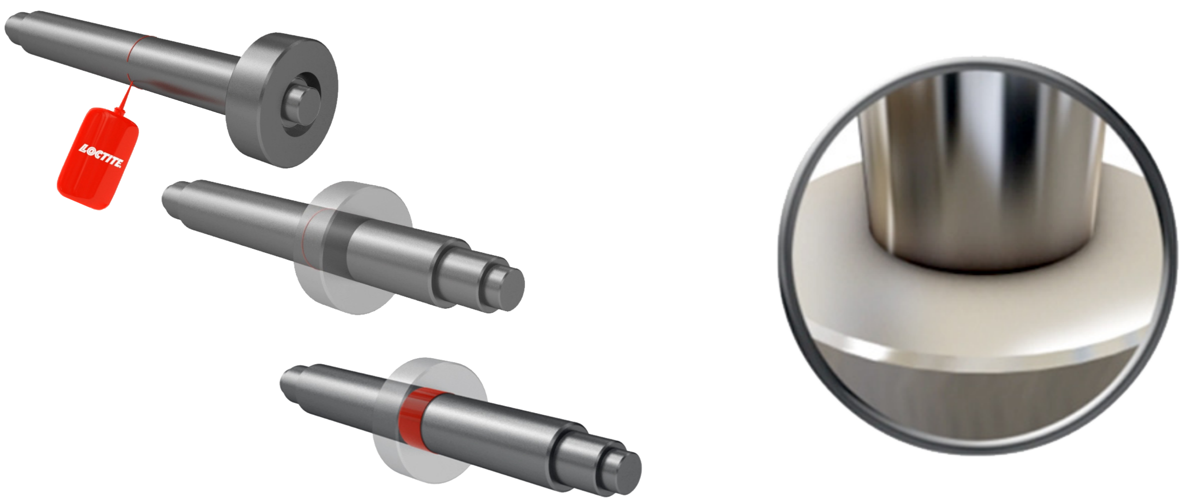
## INTERFERENCE FIT

**Scrap** due to stress cracking and distortion



LOCTITE®

**No scrap** cost or rework required

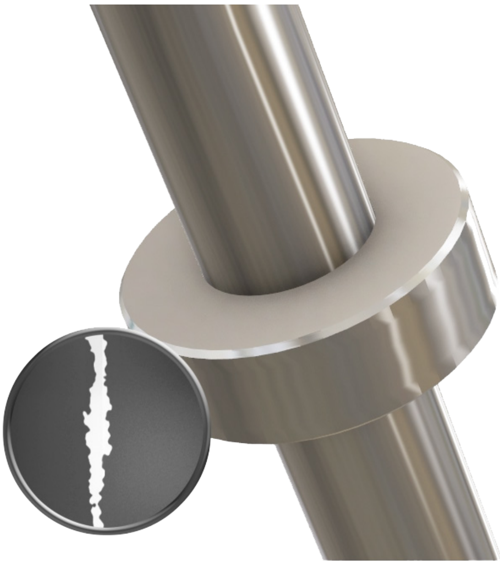


**Unfortunately, retaining compounds are not more widely employed in manufacturing because of the age-old tension between design specifications and manufacturing execution. If all parties in the value chain understood and embraced the benefits of retaining compounds, many production issues could be avoided or resolved.**

Tight and repeatable machining is still required when employing retaining compounds, but they accommodate wider machining tolerances and allow a very light, damage-avoiding press fit by filling the gaps between parts and producing more rigid, reliable assemblies.

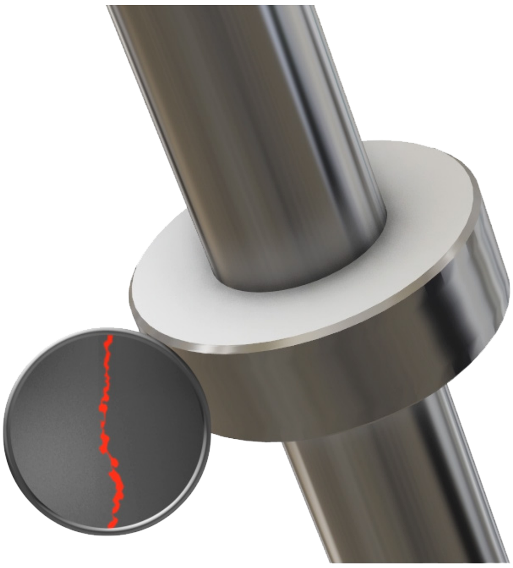
## INTERFERENCE FIT

Only **20—40%** metal-to-metal contact



LOCTITE®

**100% surface contact** which improves strength and heat transfer as air gap eliminated

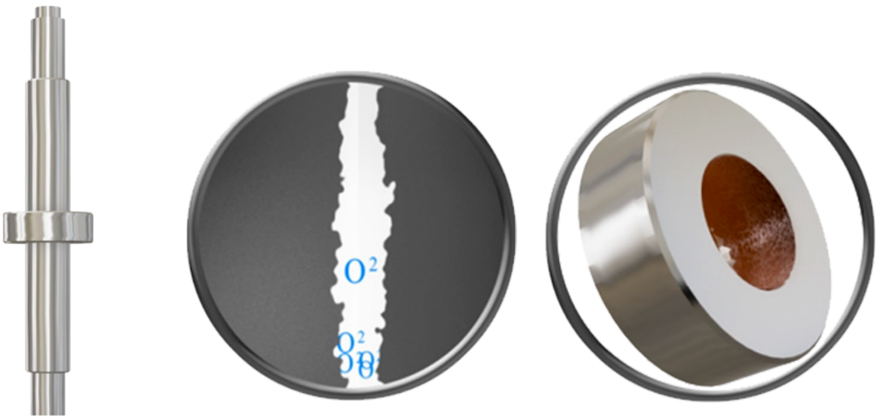


# Tolerance is perfect, but issues still arise.

Often, all parts are produced precisely within their specifications and there are no immediate challenges with the interference fit process. Even so, there is a high likelihood of degradation from oxidation and fretting corrosion over time. It's impossible to eliminate all surface irregularities and clearance gaps on metal parts, but oxidation and fretting corrosion can be avoided by filling 100% of the surface finish voids with retaining compounds.

## INTERFERENCE FIT

**Susceptible to fretting corrosion**

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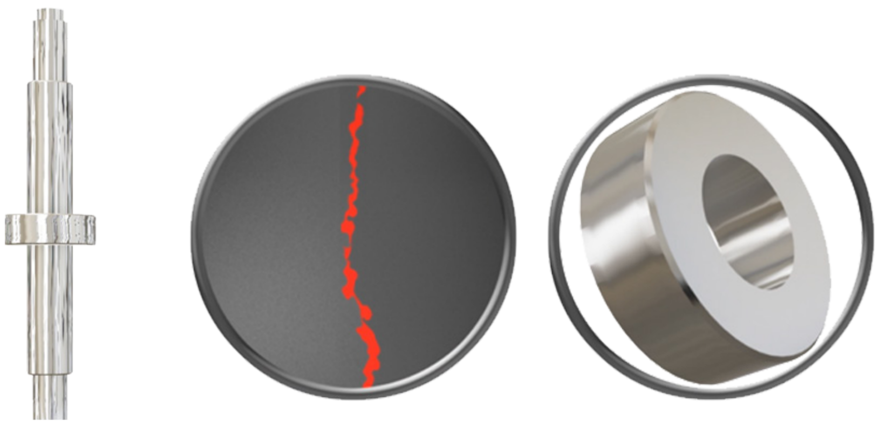
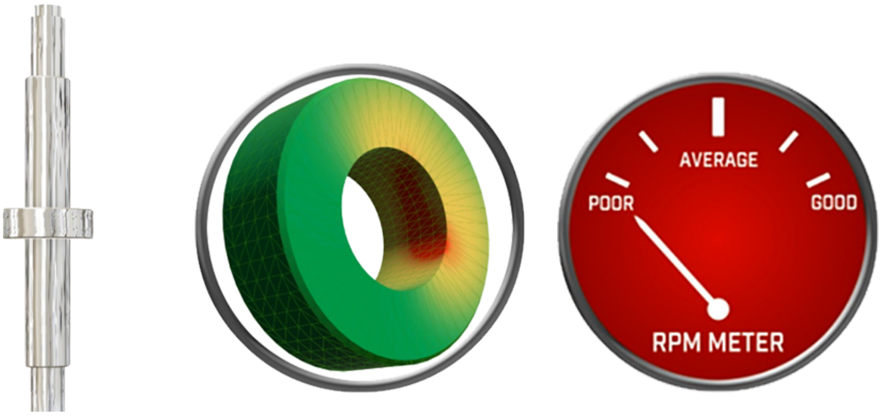
**Seals to protect against fretting corrosion**



**Retaining compounds increase the surface contact area and distribute the stress for improved reliability, offering a safeguard against potential future performance challenges.** Many end products powered by these parts are expected to operate dependably for a very long time, often up to 25 years or more. If they fail, warranty claims can wreak havoc on profitability and brand reputation.

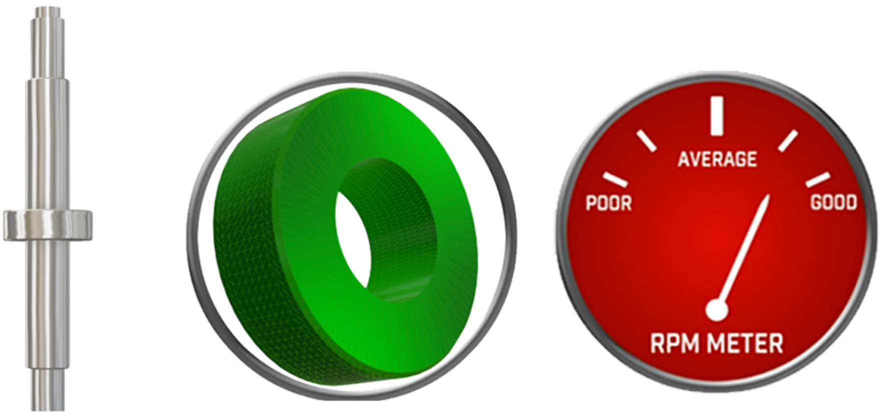
## INTERFERENCE FIT

**Inffective load transmission** due to uneven stress concentration




LOCTITE®

**Effective load transmission** due to uniform stress distribution



# Why risk it?
# Retain it.

**There are proven financial and performance benefits to using retaining compounds. Machinists already know this. Manufacturers should also include these highly effective materials in their toolbox to increase reliability and protect against unexpected challenges in production.**

**Don't risk having to remanufacture a part, address potential safety issues, or satisfy a warranty claim when simply adding retaining compounds to the bill of materials can raise reliability and revenue.**

Robert Dunkel

## The Author

Robert Dunkel is a Licensed Professional Engineer and currently serves as the Senior Principal Application Engineer within the Industrials business unit of Henkel Adhesive Technologies. More than 30 years of experience with multiple product lines and technologies, exposed him to incredibly wide amount of adhesives system types and applications. In his previous role as global lead for customer technical call centers operating in Americas and China, he was the main decision maker for the most challenging applications our customers could encounter. This valuable experience helped him to become one of the leading drivers of company's knowledge management systems to ensure sustainability of organization over time. In his free time, Robert is passionate about challenging himself with fixing things to see what adhesive solutions can bring and where the natural boundaries of technology exist. Based in Canada, Robert holds a bachelor's degree in Manufacturing Engineering from the McMaster University (Hamilton, Ontario).

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