

# MORGOIL<sup>®</sup> BACK-UP BEARING UPGRADES<sup>1</sup>

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## **Abstract**

The MORGOIL<sup>®</sup> Bearing Division of Morgan Construction Company is continually improving back-up roll oil film bearing technology. Many improvements have been made to the KLX<sup>®</sup> bearing to increase load carrying ability, improve bearing accuracy, and reduce cost. In order for mills with older bearing designs to compete with product produced by these new designs, MORGOIL has also provided upgrades and conversions so these older mills can receive the benefits of the new technology without installing a new mill.

**Keywords:** Oil film bearings; Back-up roll bearings.

## **ATUALIZAÇÕES PARA MANCAIS DE APOIO MORGOIL<sup>®</sup>**

## **Resumo**

A divisão de mancais MORGOIL<sup>®</sup> da Morgan Construction Company vem continuamente desenvolvendo a tecnologia de mancais de filme de óleo aplicados aos cilindros de apoio. Muitos avanços foram obtidos no mancal KLX<sup>®</sup> para aumentar a capacidade de carga, melhorar precisão do mancal e redução de custos. Para os laminadores com mancais de gerações anteriores competirem com os produtos produzidos por estas novas tecnologias, MORGOIL também disponibiliza atualizações e conversões para que estes antigos laminadores usufruam dos benefícios das novas tecnologias sem a necessidade da instalação de um novo laminador.

**Palavras-chave:** Mancais de filme de óleo; Mancais para cilindros de apoio.

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## INTRODUCTION

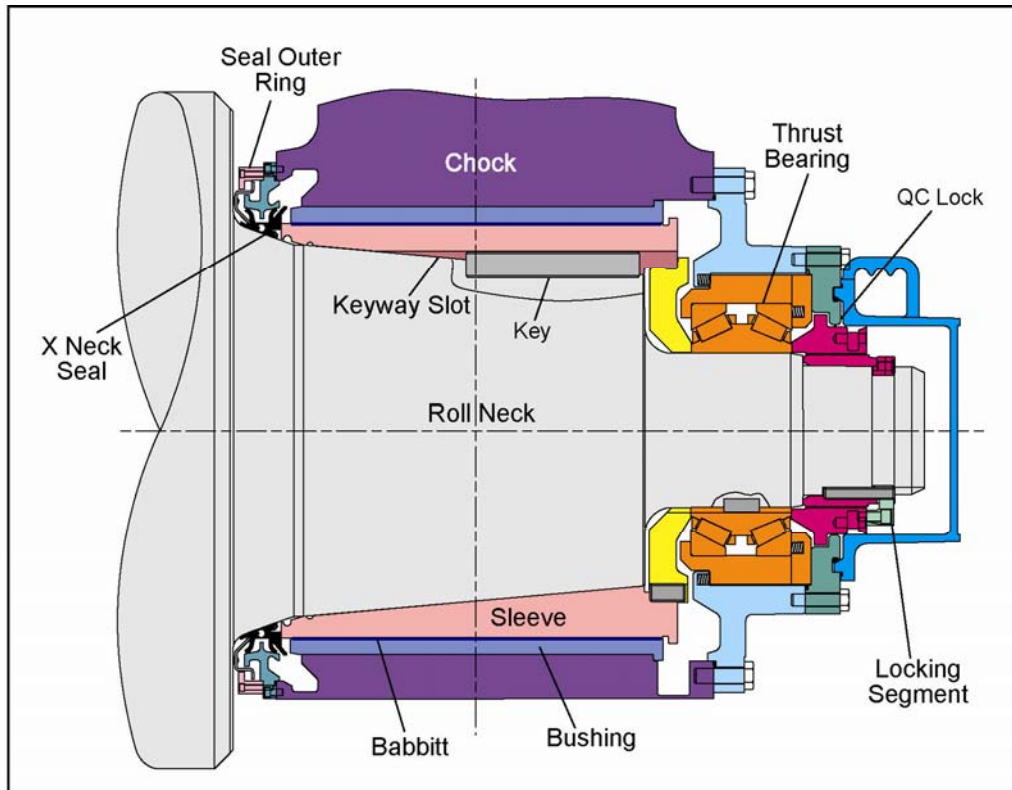
The MORGOIL<sup>®</sup> Bearing Division of Morgan Construction Company is constantly innovating and improving oil film bearings for rolling mills. This new technology is always available on new bearings, but MORGOIL also strives to retrofit the improvements to older bearing designs. This helps to ensure that an investment in MORGOIL bearings gives mills access to the latest technology throughout its life.

There are several major areas of upgrades and conversions:

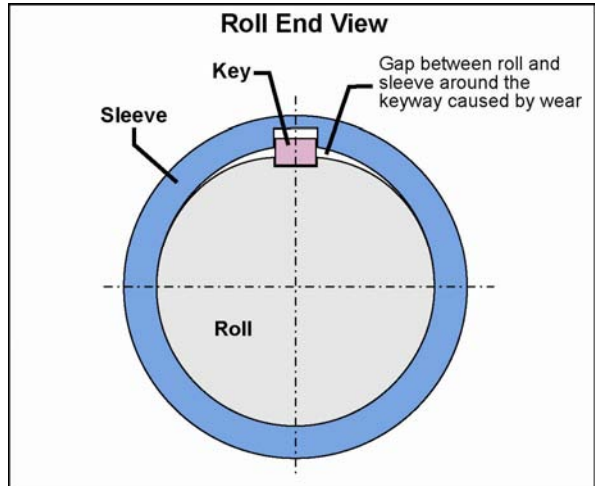
- Sleeves
- Seals
- Locks
- Complete Bearing Conversion

### Sleeves

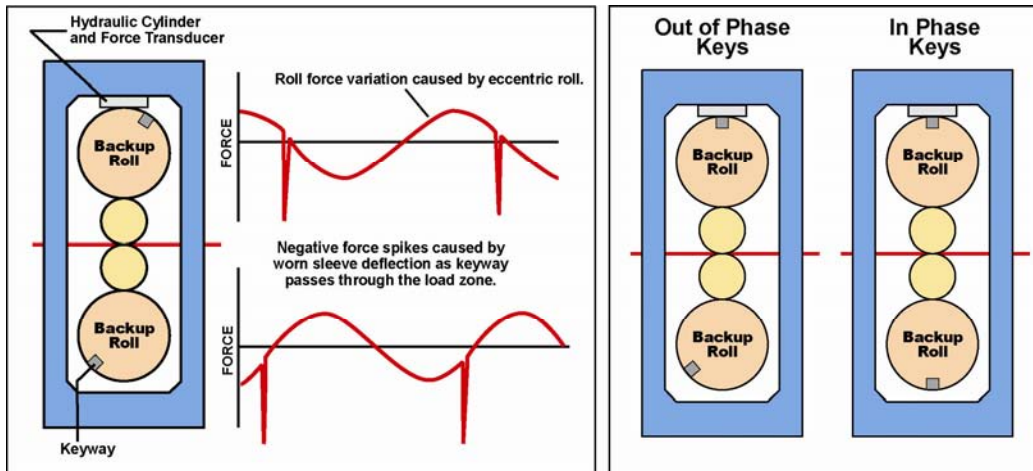
The original MORGOIL tapered sleeve was the “long key” or “T” type sleeve, Figure 1. The tapered neck bearing has advantages such as ease of mounting and dismounting as well as high precision. The problem came as the bearing aged; clearance would increase through wear around the key, Figure 2. This would produce a rapid drop in roll force variation as the keyway went through the load zone. The effect increases as the keys in the upper and lower bearings go in and out of phase, Figure 3. Figure 4 shows an example of roll force variation with keyway effect. This particular variation is very difficult to compensate with a hydraulic automatic gauge control (HAGC) system.



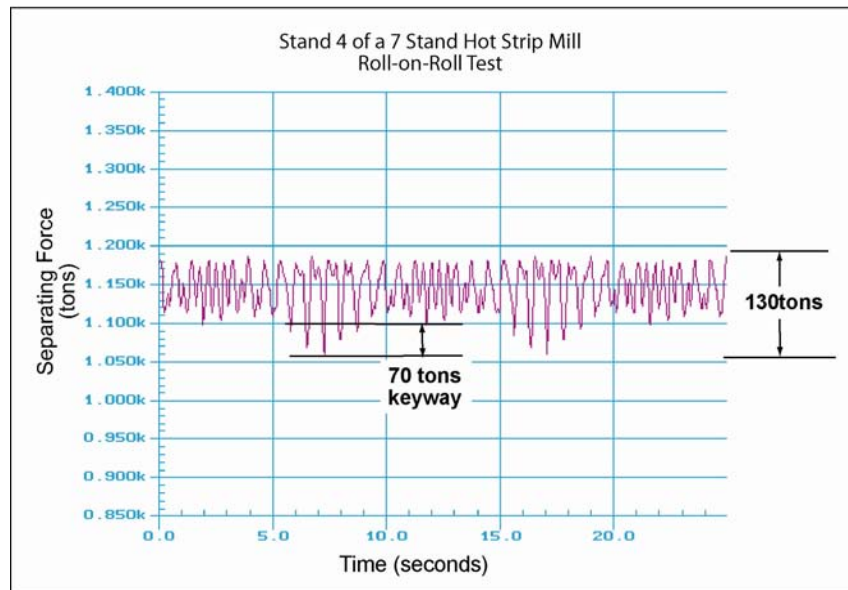
**Figure 1:** Bearing Design Comparison - Long Keyed “T” Type Bearing



**Figure 2: "T" Sleeve Wear in Keyway**

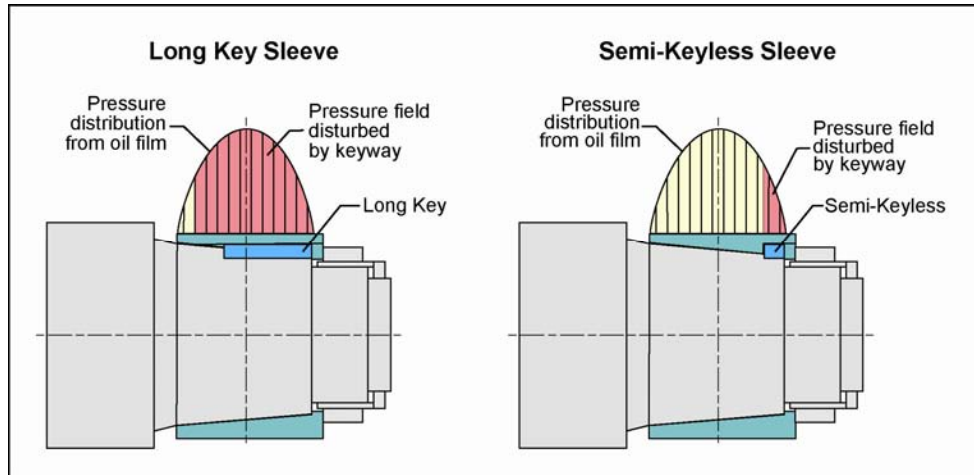


**Figure 3: Keyway Effect – Force Variation Caused by Keyway Wear**

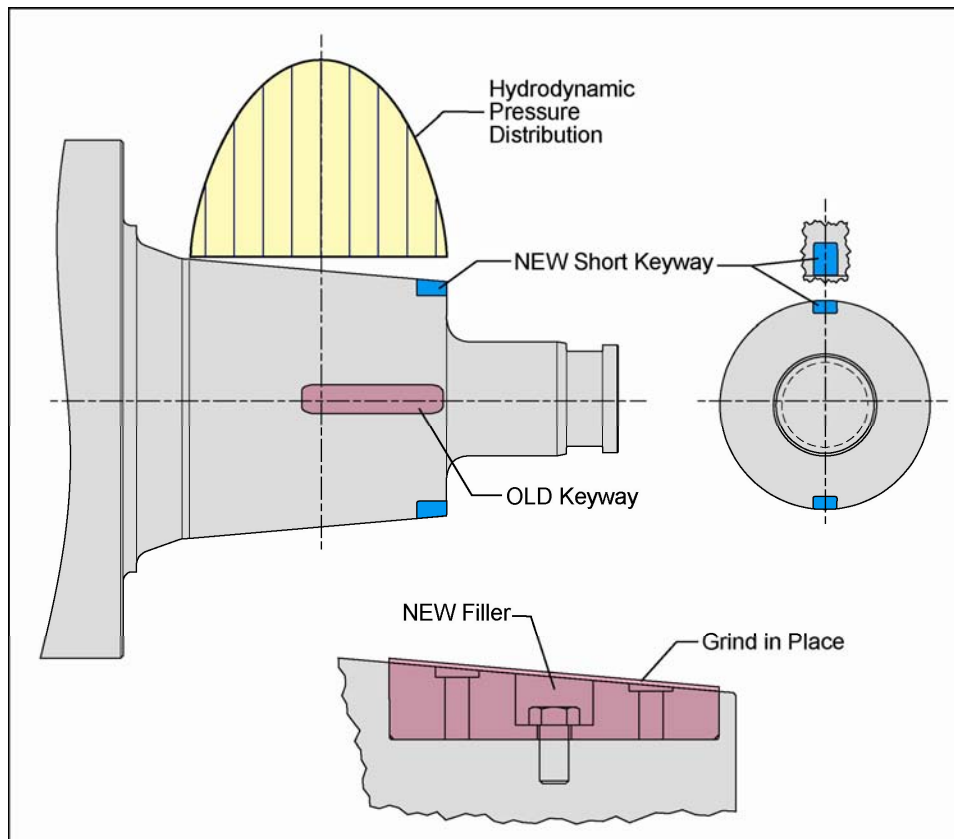


**Figure 4: Roll Force Variation with Keyway Effect**

MORGOIL has designed a sleeve conversion that replaces the long key that intrudes on the load zone with two shorter keys at the end of the bearing. These keys are located out of the high force area of the bearing, Figure 5. One of the benefits of this conversion is that old rolls can be used by filling the old keyways, regrinding the roll necks, and cutting two new short keyways, Figure 6.



**Figure 5:** Short Key K-Conversion – practically eliminates roll force variation due to keyway effect



**Figure 6:** Roll K-Conversion

In addition to producing a higher quality rolled product, this conversion will also increase the capacity of the mill. This has been a very successful conversion strategy for more than 20 years and the majority of long key mills in the world have converted to short keys. This is a conversion that must be done to compete on the world market, and is highly recommended for any mill being converted from screw-down force control to HAGC.

## Seals

The original MORGOIL neck seal was the “X” type seal. This seal had many advantages over lip seals that were previously used. The major problems with “X” seals occurred with bearings that had significant wear or with flooded bearings. MORGOIL can replace the “X” seal with a new “HD” or “DF” sealing system. These sealing systems provide the latest in sealing technology. Figure 7 shows the three seals. Figure 8 shows the conversion from “X” to “HD” and Figure 9 shows the conversion from “DF” to “HD”. Additionally, Figure 9 shows the two different Seal End Plates. The Seal End Plate used with the “HD” seal has many improvements including drainbacks and vents.

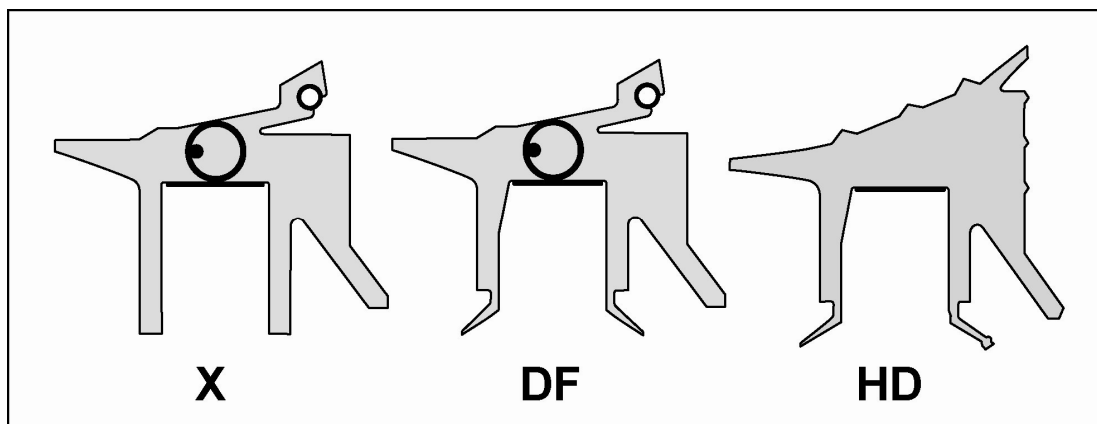


Figure 7: X, DF, and HD Seals

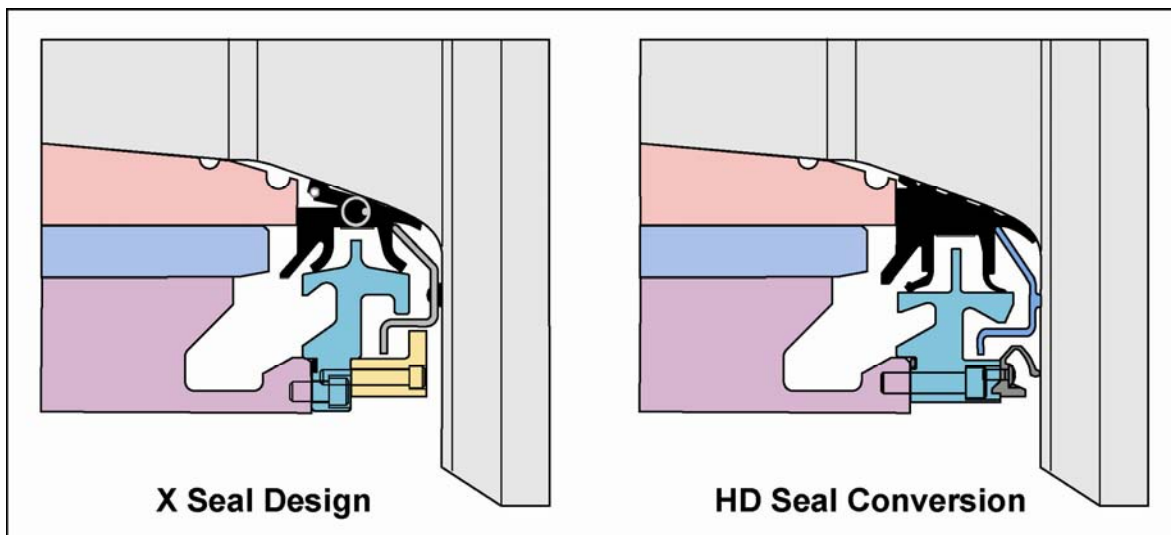


Figure 8: “X” Seal Conversion to HD

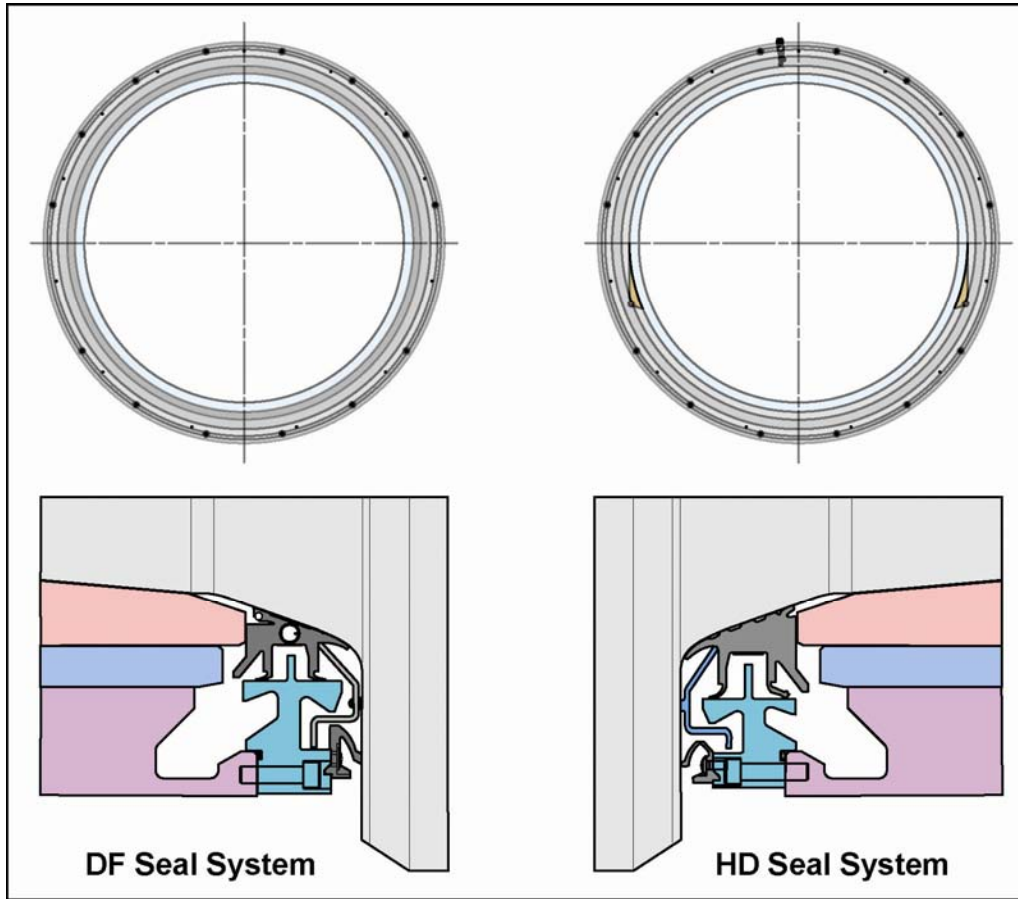


Figure 9: DF Seal Conversion to HD

MORGOIL can also provide seal conversions for MESTA® bearings, Figure 10.

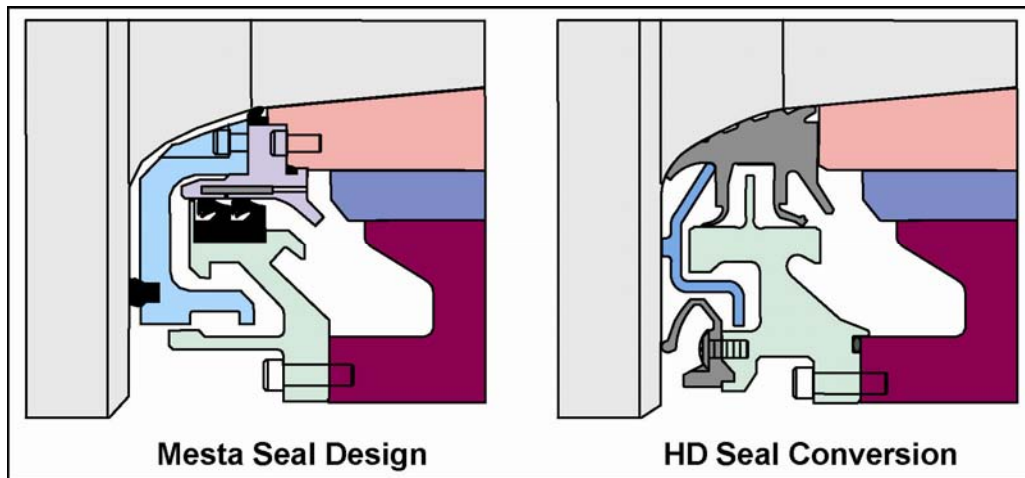


Figure 10: MESTA Seal Conversion to HD

## Locks

Bearing locks have advanced significantly over the evolution of the MORGOIL bearing, starting with the Threaded Ring (TR) design moving through the Quick Change (QC) design and on to the Hydraulic Bayonet (HB). The Removable Mechanical (RM) lock is the most recent locking advance for new tandem mills. Figure 11 shows the TR and QC Locks and Figure 12 shows the HB and RM Locks. If a mill is equipped with the HB lock, it already has the premier locking system. The RM Lock is a more economical version of the HB, where the hydraulics are located in an external tool rather than each lock having its own hydraulic cylinders. The RM can be used as a conversion from the TR and QC if bolt-on roll ends are used. MORGOIL also has other lock conversions for the TR and QC which require minimal roll conversion and modification of other parts. These are primarily the Hydraulic Mount (HM) and LD<sup>®</sup> Locks.

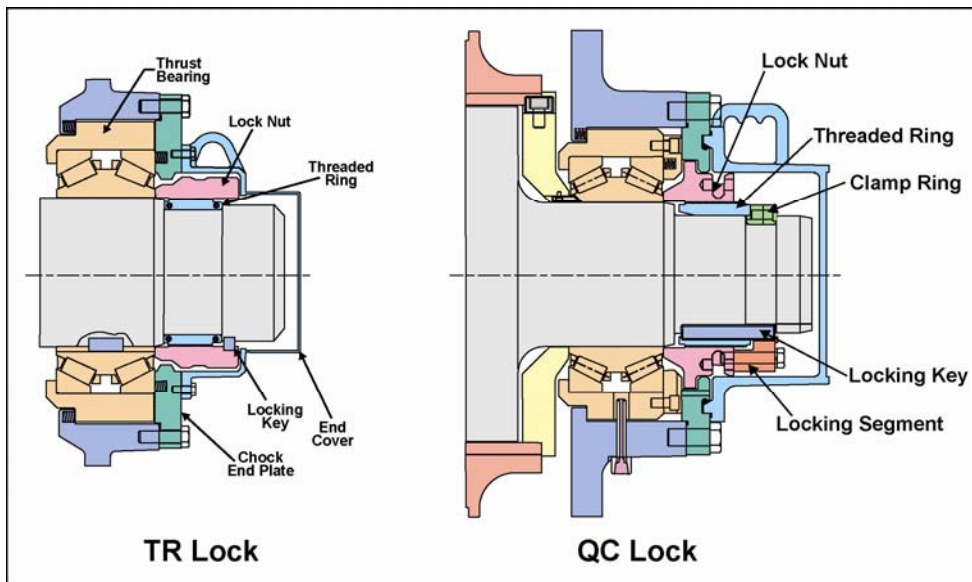


Figure 11: TR and QC Locks

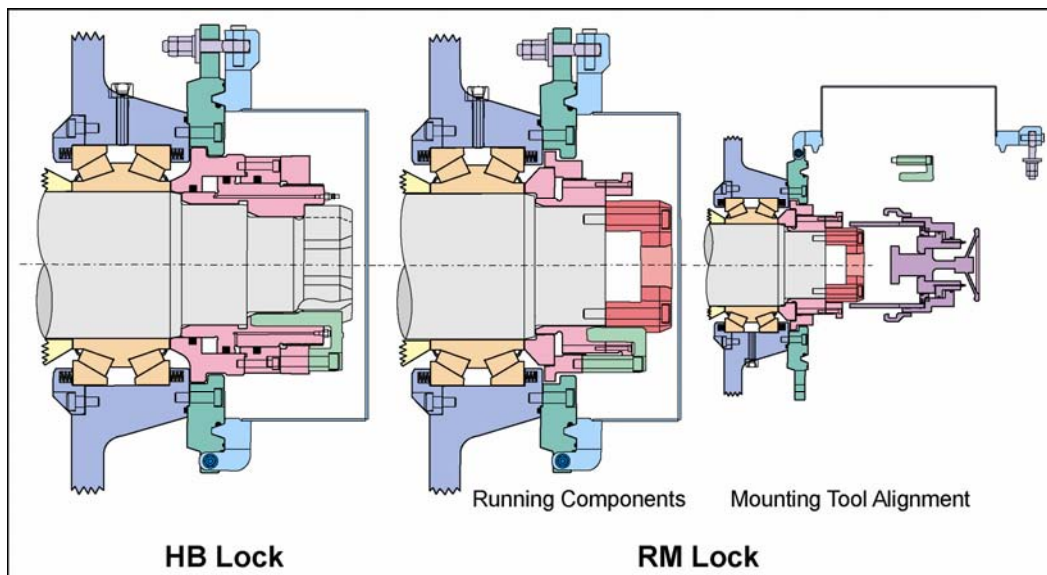


Figure 12: HB and RM Locks

The HM lock, Figure 13, is a fully hydraulic double acting locking system, designed to be easily retrofittable to mills having existing QC locks. No modifications are required to existing hardware. The HM provides extremely easy and accurate mounting combined with chock removal. The lock is operated by an external hydraulic power pack.



Figure 13: HM Lock

The MORGOIL LD lock, Figure 14, is designed to enable optimum mounting of rolling mill bearings. The system can be used on both oil film and rolling element bearings. Applications include hot and cold strip mills, plate mills, section mills, wire rod and bar mills. This locking system was specifically developed to improve accuracy, consistency and safety of bearing mounting. The system is extremely safe, quick and simple to use and does not require any special tools. The lock can be easily retrofitted without any roll modifications. A special Grease System can be provided for back-up roll applications.



Figure 14: LD Lock



The newest lock from MORGOIL is the Compact Bayonet (CB) lock, Figure 15, a special type of HB lock. It functions the same as an HB lock but uses less axial space. It is ideal for major retrofits of existing mills where space is limited. It is also applied to large plate mills to reduce the length of the roll and bearing package.

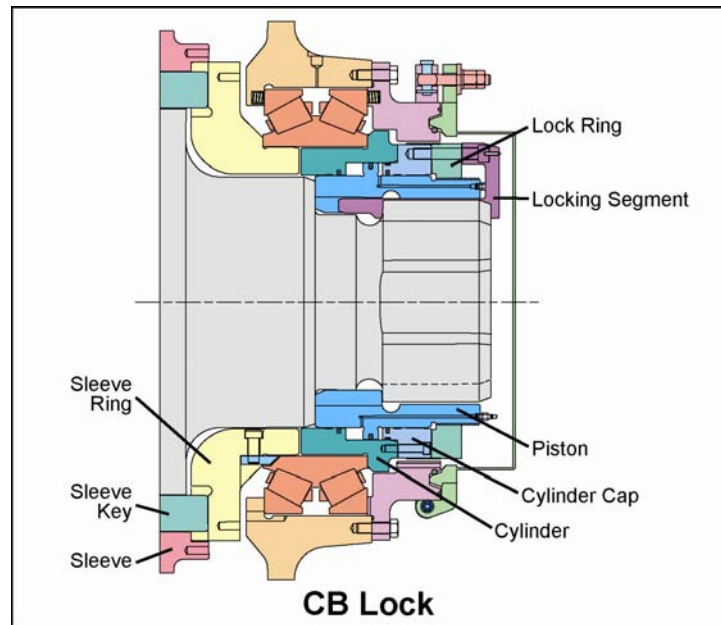


Figure 15: CB Lock

### Complete Bearing Conversion

In addition to upgrading various bearing components. MORGOIL can upgrade complete bearings, including upgrading older style “T” and “K” bearings to the latest “KLX” bearing technology, Figure 16.

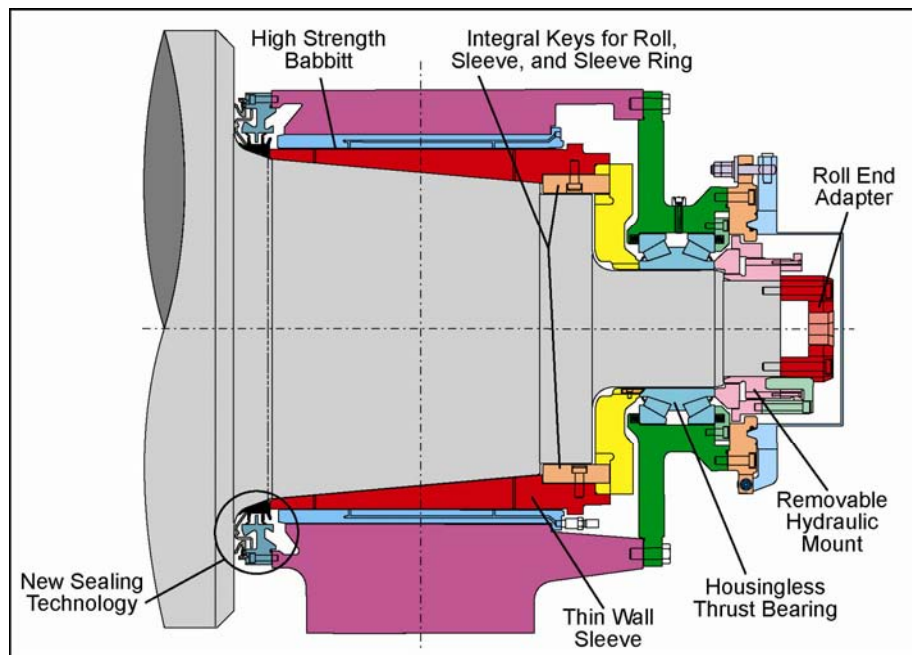


Figure 16: KLX Bearing

MORGOIL has also supplied conversions for mills with roller bearing back up rolls. The roller bearing is usually replaced with a MORGOIL straight neck bearing design. Figure 17 shows the “N”, sleeveless design, and the “SN”, sleeved design. This conversion can provide more economical mill operation with a broader operating spectrum.

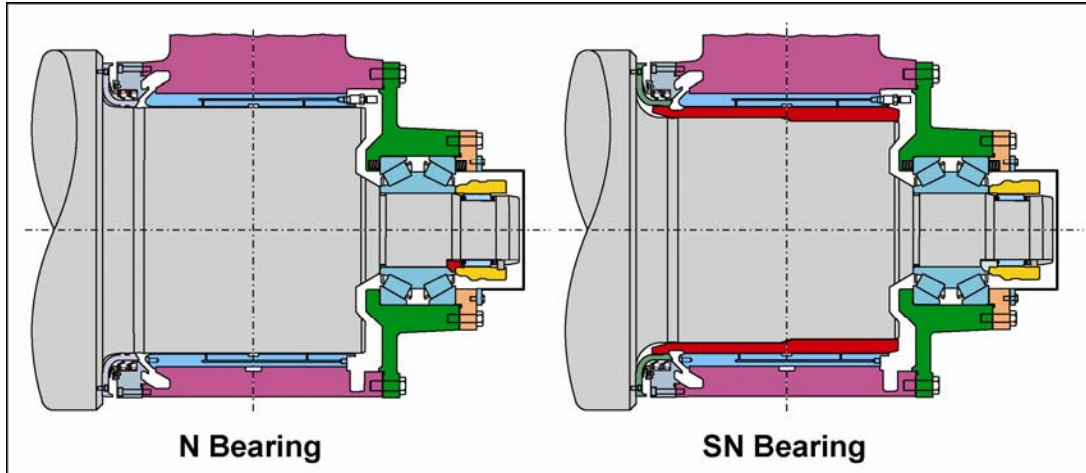


Figure 17: N and SN Bearing

## CONCLUSION

In conclusion, MORGOIL provides many upgrade paths for older bearings. This allows mill operators to keep their mill technology current and remain globally competitive.