User Manual for KC Model Hogs

Operating, Maintenance, Lubrication, and Safety Instructions

Bulletin 23-11-22

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TABLE OF CONTENTS

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Table of Figures

2017 Thelma Street Jacksonville, FL 32206
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Table of Tables

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SAFETY PRECAUTIONS

ANY MALFUNCTION OR OPERATION PROBLEM NOT COVERED IN THIS MANUAL SHOULD BE REPORTED TO THE FACTORY. OUR TRAINED ENGINEERS ARE AVAILABLE TO ASSIST YOU.

READ AND FOLLOW ALL INSTRUCTIONS IN THIS MANUAL BEFORE USING THIS EQUIPMENT.

- ✓ Check teeth in rotor daily to make certain they are tight. Normal operation will cause these parts to loosen over time. If not re-tightened on a timely basis, the parts will hit the anvils and/or the screen causing damage to the unit and possibly causing severe injury to personnel in the area. **It is the responsibility of the user to keep the teeth properly tightened at all times.**
- ✓ Due to the high inertia load of the hog rotor, multiple start-ups can cause excessive internal heat build-up in the motor, causing motor failure. **The hog should not be started more often than once in a two-hour period.**
- ✓ **Do not perform any maintenance work or any other operations on this equipment unless it is completely stopped, and all electrical circuits are deactivated and locked out.** We recommend that the person performing the maintenance work keep the lockout key on their person to ensure that no one else engages power without knowledge of maintenance work being performed.
- ✓ **Do not operate this hog or any other machinery without proper training and complete understanding of all instructions contained in this manual.**
- ✓ Guard covers are included with the hog for safety. **Do not operate this hog or any other machinery without all guard covers being installed.**

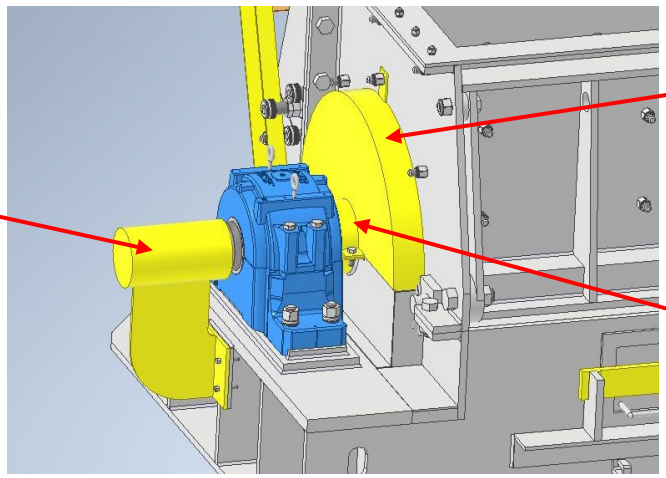

Figure 2.1: Guard Covers

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✓ **Do not remove inspection door while hog shaft is turning over.**

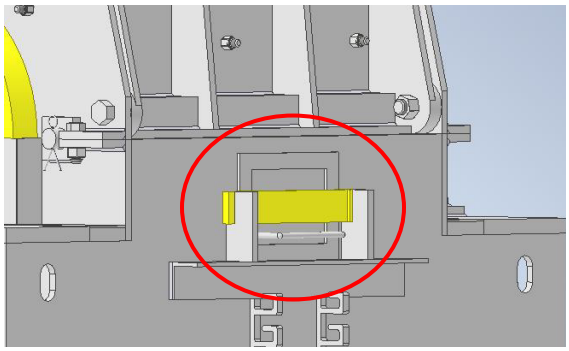

Figure 2.2: Hog Inspection Door

✓ **Do not turn the rotor over by hand or power with any part of the body between the teeth and anvil points.** This is a high inertia rotor and cannot be stopped easily once in motion. **Even when barely moving, it has enough momentum to cut off a finger.**

✓ Do not look into the machine when rotor is turning. Wear safety glasses any time you are working on or in near proximity to operating equipment.

✓ The noise level of this equipment when operating exceeds safe levels for unprotected ears. Wear hearing protection any time you are near this or other load machinery.

✓ Wear gloves any time you are working on this equipment.

✓ Under no circumstances should fingers be inserted in the holes of the hog screen to facilitate removing. A slip of the screen could easily remove a finger.

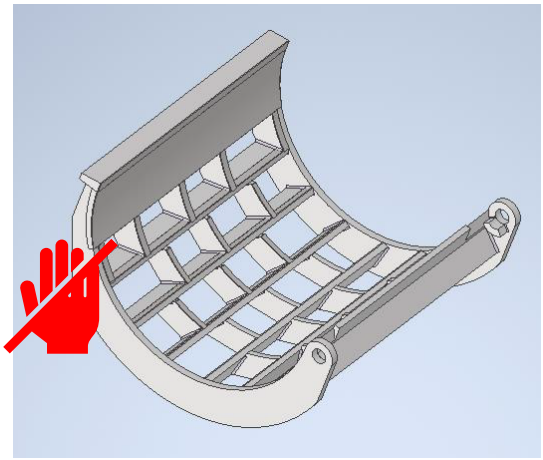

Figure 2.3: Screen

✓ Do not clear obstructions from screen holes with hands while screen is in the machine.

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✓ Use caution and proper lifting equipment to open the rear door of the hog. **The rear door is too heavy for one man to support.** Secure lifting equipment to the lifting padeyes any time the rear door is being opened or removed.

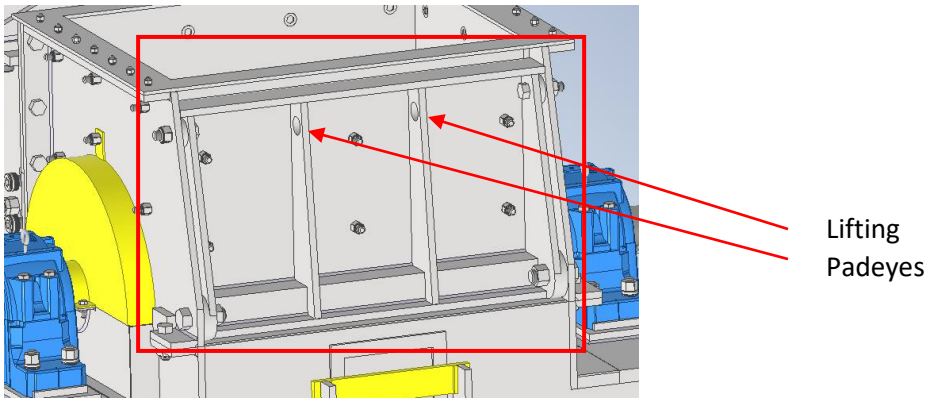

Figure 2.4: Rear Door

✓ Be careful when installing new rings on a shaft, as **fingers are easily smashed**.

✓ Be careful when installing new teeth into rings, as **fingers are easily smashed**.

✓ **Never wear loose clothing**, especially a necktie, which could get entangled in moving machinery. Similarly, long hair must be properly secured to avoid getting entangled in the machine.

✓ **Do not hand feed material directly into the hog.** If hand feeding is required, it should be onto a conveyor feeding into the hog.

✓ Do not poke sticks, poles, etc. into any access opening on the hog while it is operating. **The hog should be completely stopped before attempting to clear any blockages.**

✓ **Do not allow steel to enter the grinding area.** Steel (or other materials of similar strength) creates a safety hazard for personnel in the area and may cause major damage to the unit.

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INSTALLATION

➤ FOUNDATION PREPARATION

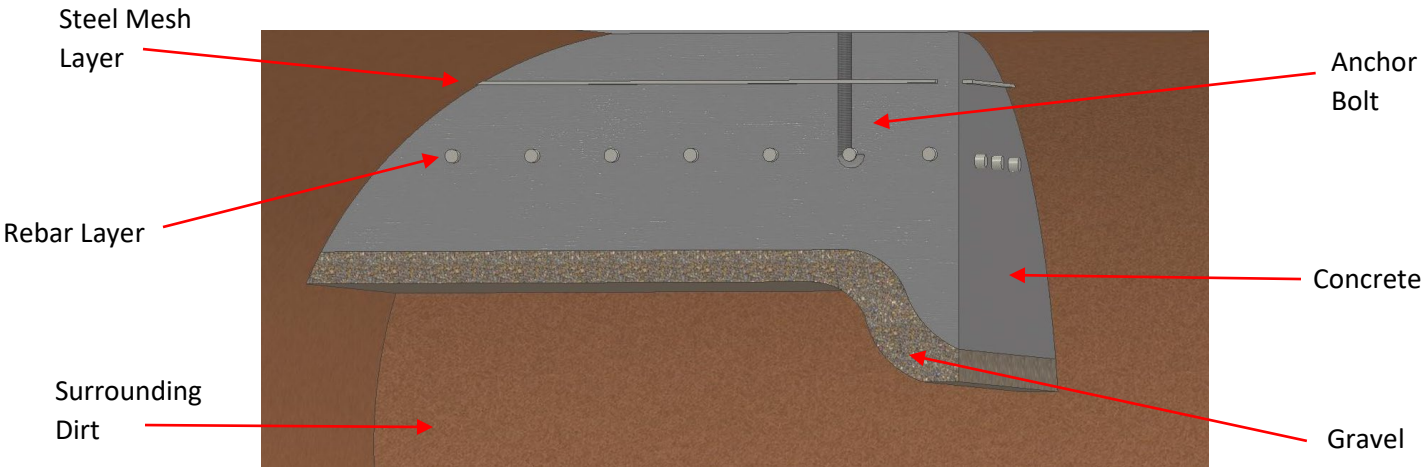

Figure 2.3.1: Slab-On-Grade Foundation (3D Cutaway View)

A reinforced concrete foundation is required for installation of the unit. **It is strongly recommended that the customer consult with a structural engineer to ensure their foundation is structurally sound and meets local codes.** The following guidelines are for reference only.

- ✓ The unit must be mounted on a reinforced concrete foundation which should extend at least 6” beyond the base plate of the unit on all sides.
- ✓ The foundation should be slab-on-grade, with a minimum thickness of 12”. Montgomery recommends a 12-18” thick slab, but **local codes and frost lines will determine the actual thickness required.**
- ✓ The concrete should have a strength of at least 4500 psi, with 5000 psi concrete being preferred. Adding fiber mesh to the concrete is strongly recommended.

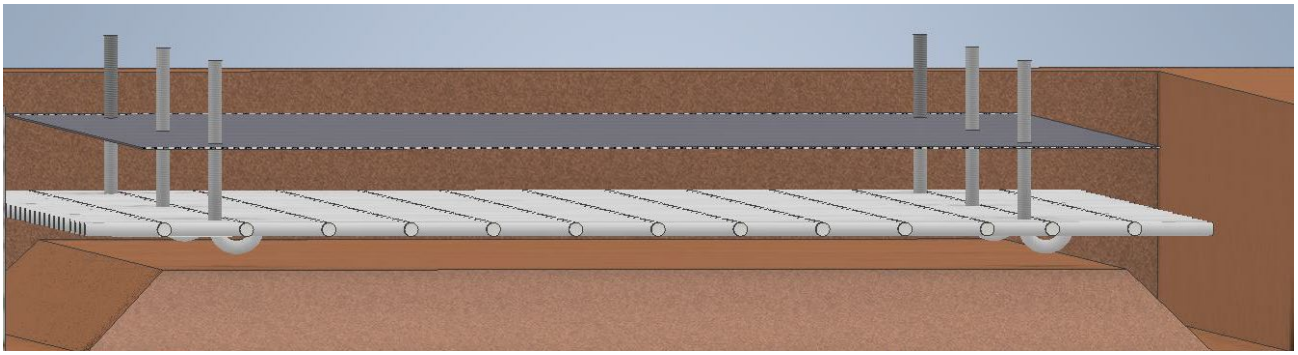

Figure 3.2: Rebar, Steel Mesh, and Anchor Bolt Placement

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- ✓ #8 rebar should be placed on a 6” grid pattern in the lower third of the foundation for structural reinforcement. Additionally, a layer of steel mesh should be placed in the top third of the foundation for temperature and shrinkage reinforcement. Either Grade 40 or Grade 60 rebar is acceptable.
- ✓ Anchor bolts should be long enough to hook around the layer of rebar reinforcement. They should be 1” NC and a minimum of 12” long. 3” should extend above the top of reinforced concrete for mounting the unit.

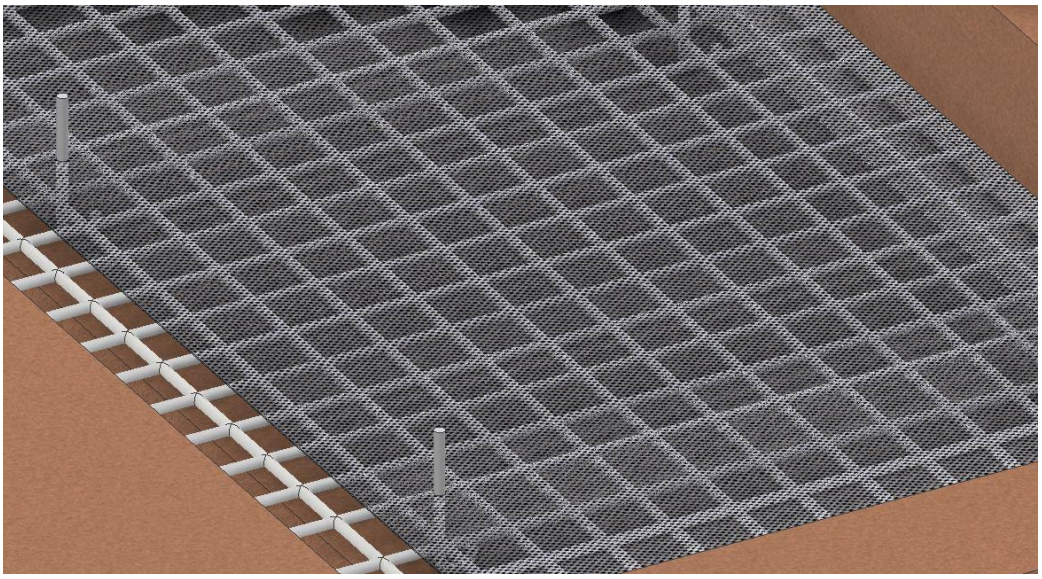

Figure 3.3: Reinforcements Prior to Concrete Pour

For further information on the hog foundation, see Appendix A: *Bulletin 25-01-22 Reinforced Concrete Calculations*.

➤ SHIM AND GROUT BASE PLATE

With the hog sitting flat on the foundation (do not bolt down), place shims under any corner which is not already flat.

After shimming corners where needed, insert shims 12”-16” apart down all four sides as needed. Each shim should be of a size to fill the gap between the floor and the bottom of the hog base plate.

Pack grout as far back under the base plate as possible, usually 2”-3”.

After the grout is dry, tighten all mounting bolts holding down the hog.

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➤ FINAL MOUNTING & TIGHTENING

The unit must be bolted down tightly. The foundation must be smooth, clean, and level. **The unit must be shimmed prior to tightening.** Otherwise, the unit can bow and bind, causing excessive stress if anchoring alters the inherent contour of the base plate.

When foundation is smooth, clean, and level, and base plate is shimmed and grouted, tighten all anchor bolts holding down unit.

The unit must be mounted with the base plate horizontal. Mounting on an angle may cause the bearings to fail.

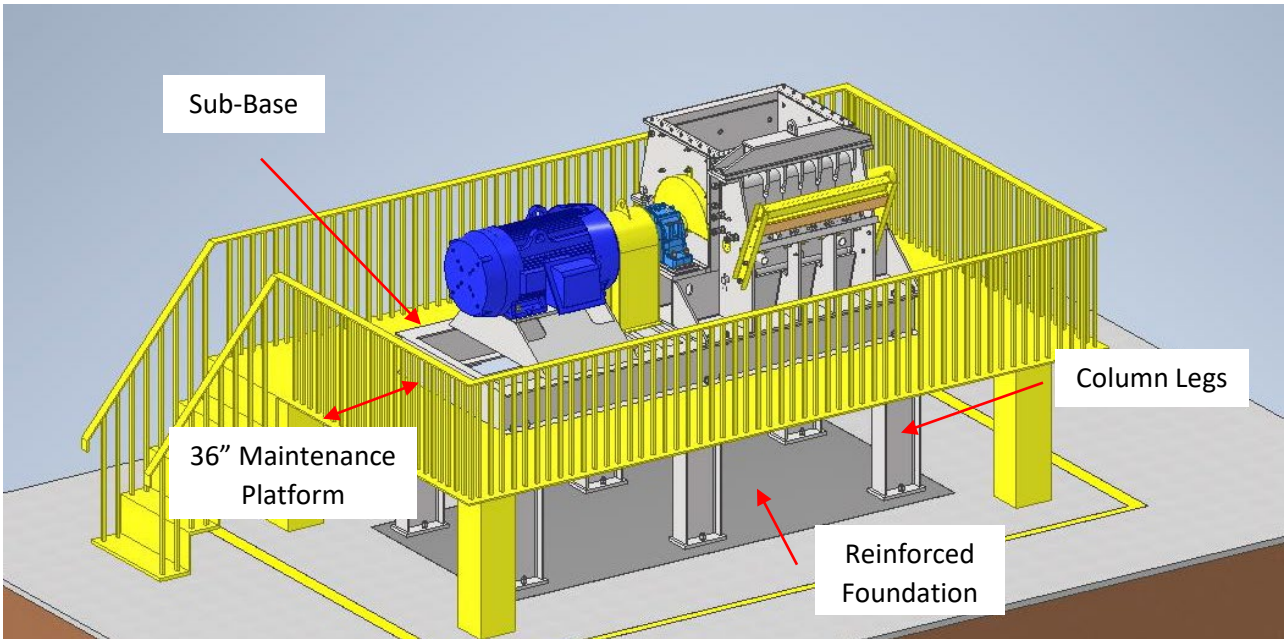

Figure 3.4: Hog Unit Mounted on Sub-Base with Column Legs

If the unit is mounted on steel columns, the supporting structural steel sub-base and the column legs should be designed for a minimum capacity of 2.5 times the total static weight of all equipment supported to account for dynamic loading.

The structure should incorporate rigid connections, support, and bracing both perpendicular and parallel to the rotor with vertical gussets in both planes.

Provide at least 36” of clearance on all sides of the unit for maintenance.

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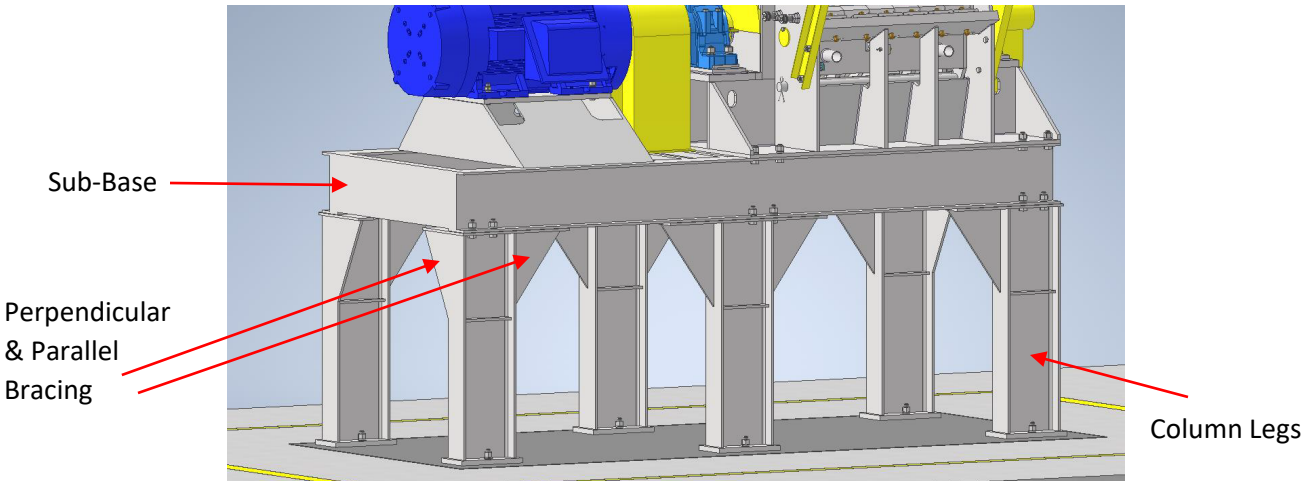

Figure 3.5: Supporting Columns & Structural Sub-Base

➤ INFEED INSTALLATION

Customers may choose to purchase a feed hopper through Montgomery Industries or to build their own. **If you choose to construct your own hopper, be sure it adheres to the following standards:**

- The hopper should drop the material for it to enter the cutting circle of the hog on the downstroke of the rotor (on the anvil rack side, NOT the rear door side).
- The throat angle of the hog should be approximately 25° off vertical. Any larger and the material will be subjected to friction on the hopper throat and may cause material to hit the back wall before the rotor can engage it.
- The hopper should be large enough that the infeed material is able to fall down the hopper chute. There should be enough room that the infeed can tip over the conveyor belt without getting caught on the rear wall or the ceiling of the hopper.
- The hopper should be tall enough that any material kicked back up from the rotor stays within the hopper. If the material is able to bounce back up and hit the infeed conveyor, it will cause damage to the infeed belts. At a minimum, the hopper should extend 5 feet above the companion flange.
- The infeed belts should be at an angle less than or equal to 15° off horizontal. Any steeper and material may slide back down the conveyor belt instead of entering the hog.

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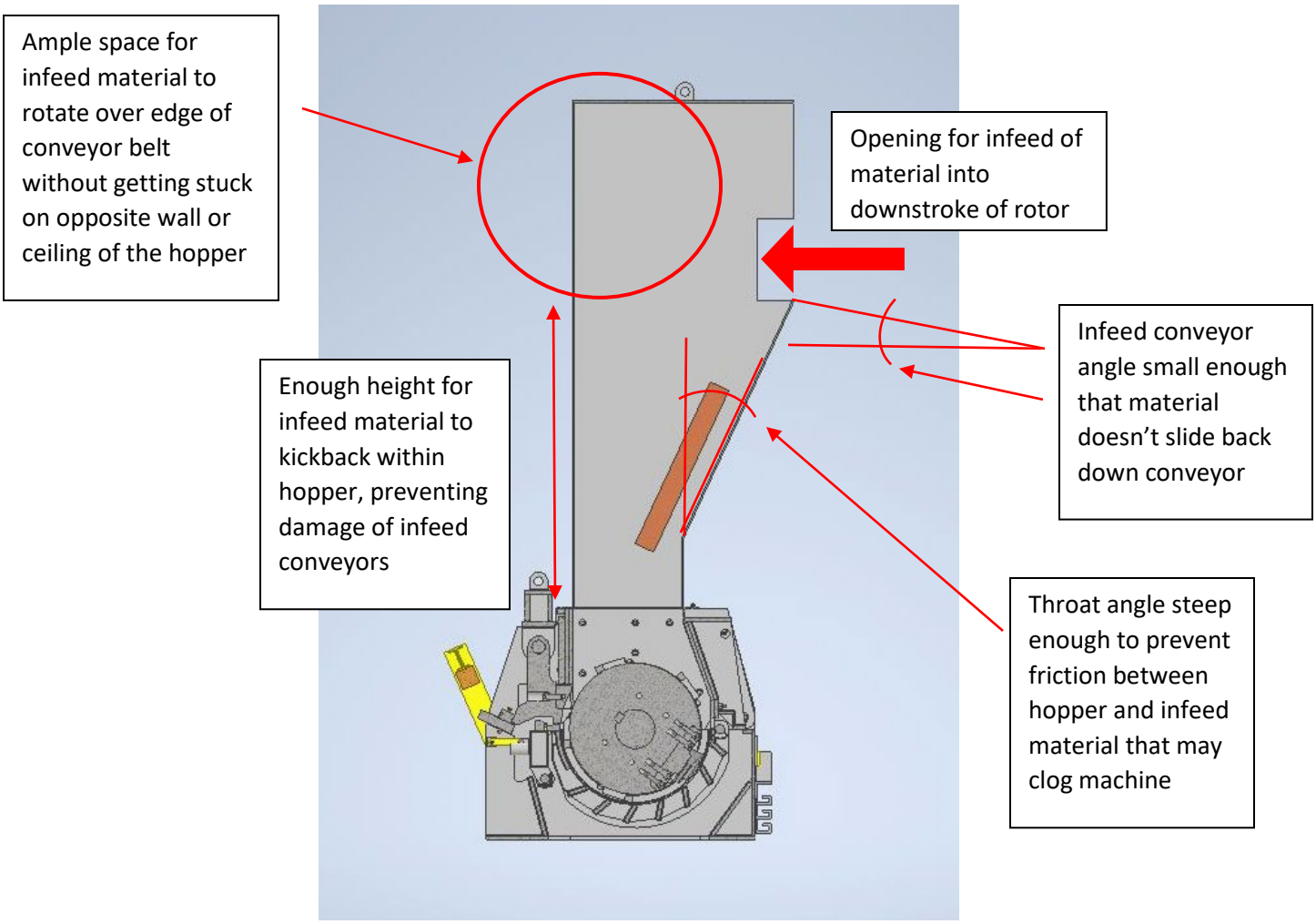

Figure 3.6: Feed Hopper Design

➤ START-UP PROCEDURES

There are ten key checkpoints that should be verified during hog start-up. A summary is included in the form of a Start-Up Checklist at the end of this section.

1. *Check bearings for proper lubrication.*

Grease Bearings

GREASE IS FLAMMABLE AND EXPLOSIVE IN CONTACT WITH PURE OXYGEN.

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The bottom half of the housing, with the bearing sitting in the housing, should be filled 1/3 to 1/2 full of grease. (See *Maintenance Procedures: Bearing Lubrication* for more information.)

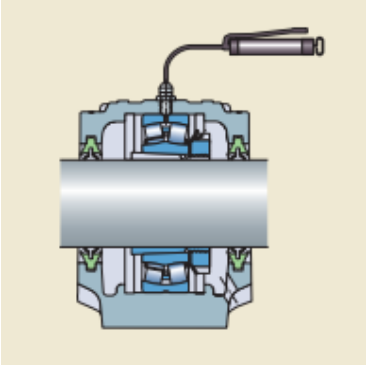

Figure 3.7: Replenishing Grease Bearings[1]

Static Oil Bearings

USE ONLY OIL WITH SPECIFICATIONS AS LISTED IN MAINTENANCE PROCEDURES.

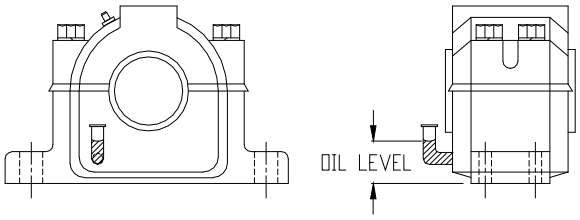

Figure 3.8: Oil Level for Static Oil Bearings

Check the sight gauge for proper oil level. Fill to oil levels based on bearing size. Oil level is measured from the bottom of the block base to the meniscus on the oil sight gauge. Oil should be at the level shown while the hog is shut down. When the hog is running, the level of oil may rise or drop from the shut down level.

Table 1: Static Oil Levels for Different Bearing Sizes

Bearing Series	Bearing Size	Static Oil Level
USAF 500	5-7/16”	2-3/32”
USAF 600	4-15/16”	2-9/16”
	5-7/16”	2-11/16”

(1) SKF Bearing Maintenance Handbook, Figure 5, p. 196

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Circulating Oil System

USE ONLY OIL WITH SPECIFICATIONS AS LISTED IN MAINTENANCE PROCEDURES.

Bearings using a Circulating Oil Lubrication System cannot also have a static oil level maintained inside the bearing. If static oil is present and more oil is introduced into the bearing, oil will flow out of the shaft seal.

a) Wire the 115 VAC power wiring for the Oil System from the starter to the machine so that the machine cannot be started until the oil pump starts and begins to pump oil into the bearings. If the main motor starter is wired for 230 VAC or 460 VAC, a step-down transformer will be required.
b) The Oil Pump Unit should be mounted so that the distance to each bearing from the pump is approximately the same.
c) The flow rate through each bearing for circulating oil is based on a hog speed of 1200 RPM.

Table 2: Oil Flow Rates for Circulating Oil Bearings

Bearing Series	Bearing Size	Flow Rate
USAF 600	4-15/16”	Approximately 2-3 pints/min (0.25-0.375 GPM)
	5-7/16”	Approximately 4 pints/min (0.50 GPM)

d) To measure the above flow rate, connect a line from the Oil Circulating Unit to one bearing only. Leave the other line free to check the flow.

   Obtain a clear container of at least one gallon capacity. Pour in a measured amount of liquid equal to the recommended flow rate per minute and mark that level on the container.

   Empty the container and be sure to dry the container completely if the measured liquid is not the oil being used for the bearings.

   Start the Oil Circulating Pump and pump oil from the open line to the bearing into the container. Adjust the needle valve as required to fill to the mark in one minute. Turn the needle valve clockwise to get less flow, or counterclockwise to get more flow.

   After getting the desired flow rate, check the flow to the other bearing in the same manner.
e) Refill the oil reservoir to the proper level shown on the sight gauge.

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2. *Check alignment of flexible coupling or V-belt drive.*
3. *Check tooth clearance*. Access the teeth by opening the rear door.

BEFORE OPENING THE REAR DOOR, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO THE PADEYE PROVIDED. USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS. DO NOT PUT FINGERS IN BOLT HOLES. KEEP CLEAR WHEN OPENING OR CLOSING.

Open the rear door by removing the side bolts at the top of the door and then loosening the side bolts at the bottom of the door.

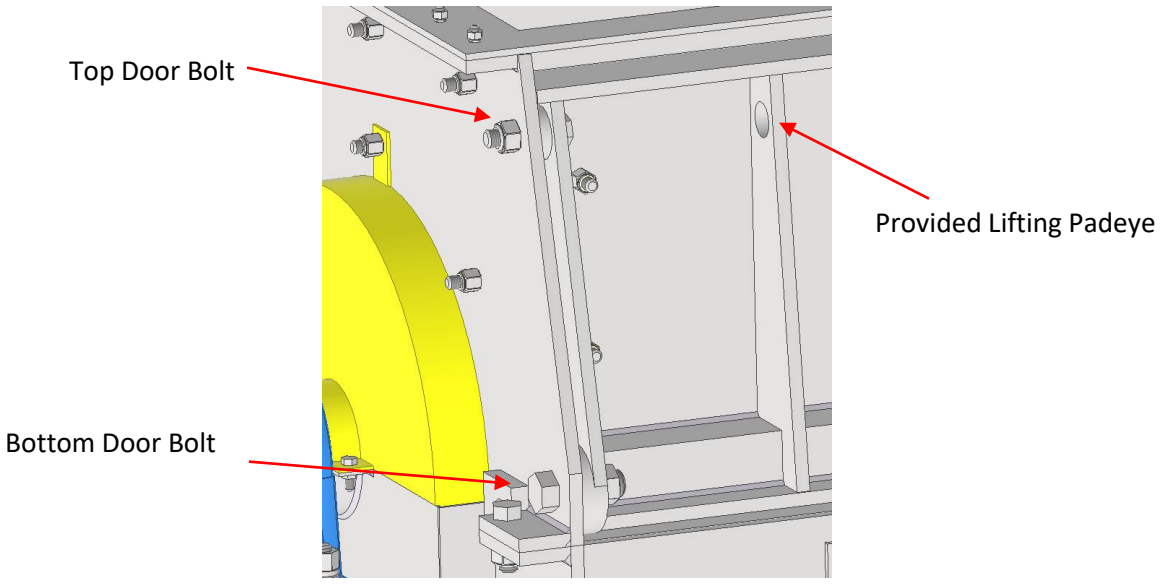

Figure 3.9: Rear Door Bolts

Clearances between the sides of the teeth and anvil points should be 1/32” to 1/16”. The radial clearance between the teeth and the anvil points should be approximately 3/16”.

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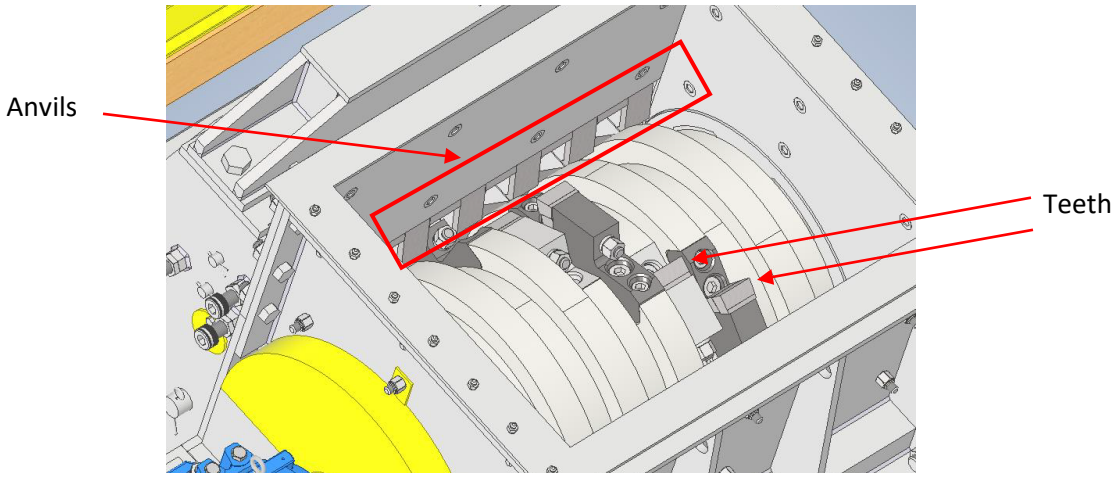

Figure 3.10: Teeth and Anvils

4. *Make certain all teeth are tight.* The recommended torques for KC teeth are given below.

Table 3: Recommended Torques for KC Teeth

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	330 ft-lbs
2-Part Teeth	450 ft-lbs
Manufactured Teeth	450 ft-lbs

Tightening beyond the elastic region of the steel can cause threads to stretch and/or the lock washer to permanently flatten or deform – any of which undermine the connection.

A LOOSE TOOTH CAN HIT THE ANVILS AND/OR THE SCREEN CAUSING DAMAGE TO THE UNIT AND POSSIBLY CAUSING SEVERE INJURY TO PERSONNEL IN THE AREA.

5. *Turn rotor by hand (or by pulling on the drive belt) for a few rotations to check for binding. The rotor should turn easily with no heavy spots.*
6. *Jog motor to verify correct shaft rotation under power.*
7. *Make certain that all guards are in place and secure.*

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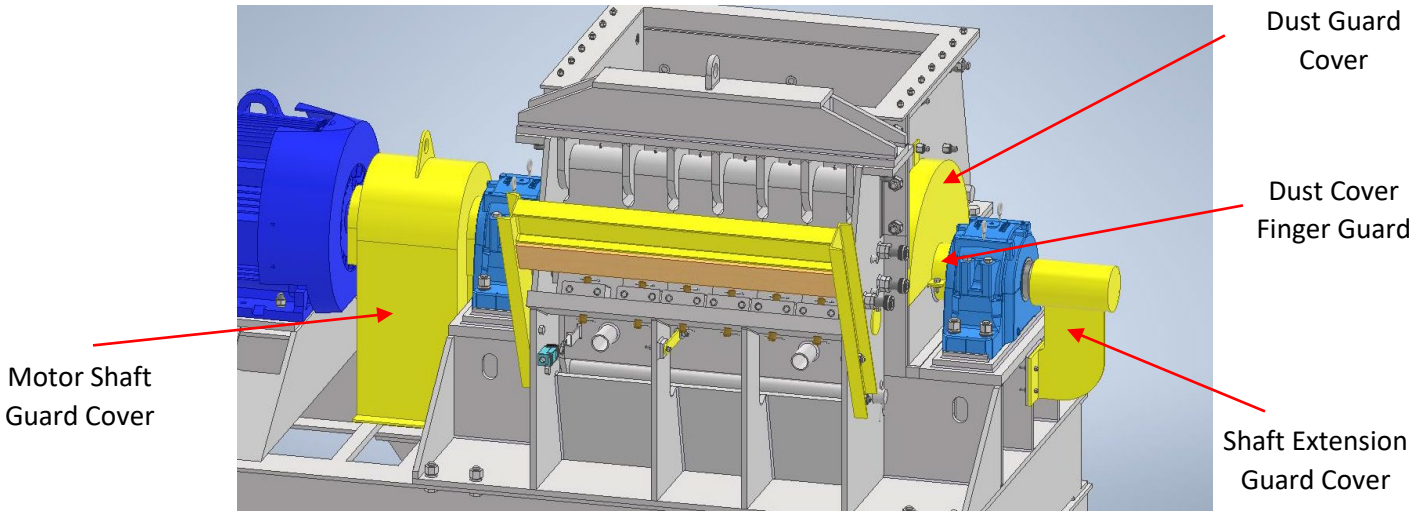

Figure 3.11: Guard Covers in Place

8. *If a blow-pipe connection is used to collect the shredded material, make certain there are no objects obstructing the air flow that could cause the discharge to plug.*
9. *If a mechanical conveyor is used to collect the shredded material, make certain that it is installed properly. Additionally, ensure that it has sufficient carrying capacity to keep up with the maximum processing capacity of the hog.*
10. *Ensure that all infeed components are in place and secure. Verify that the hopper does NOT feed against rotation. Additionally, ensure all conveyor belts are tight and at the proper angles to prevent slipping of infeed material.*

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➤ START-UP CHECKLIST

Table 4: Start-Up Checklist

Start-Up Checkpoint	Completed
(1) Check bearings for proper lubrication	
(2) Check alignment of flexible coupling or V-belt drive	
(3) Check tooth clearance	
(4) Make certain all teeth are tightened properly	
(5) Turn motor by hand (or by pulling on the drive belt) for a few rotations to check for binding and heavy spots	
(6) Jog motor to verify correct shaft rotation under pressure	
(7) Make certain that all guards are in place and secure	
(8) If a blowpipe connection is used to collect the shredded material, make certain there are no objects obstructing the flow that could cause the discharge to plug	
(9) If a mechanical conveyor is used to collect the shredded material, make certain that it is installed properly and has sufficient capacity	
(10) Make certain that all infeed components (hopper, conveyor belts, etc.) have been installed properly, are in place, and are secure	

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PRINCIPLES OF OPERATION

NOTE: YOU MAY ALSO USE THE HOG MATERIAL LIST AS A VISUAL AID IN REFERENCE TO THE ITEMS DISCUSSED IN THIS MANUAL.

➤ ANVIL POINTS

Positive cutting action between the teeth and anvil points performs what amounts to the first particle sizing function in a two-stage process.

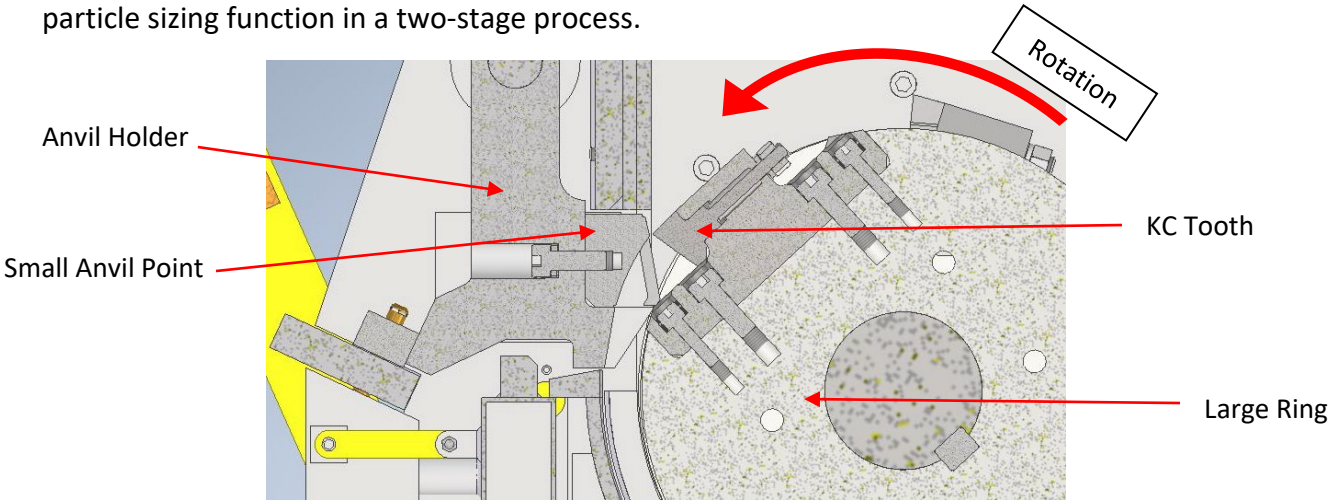

Figure 4.1: Small Anvil Point Cutting Action

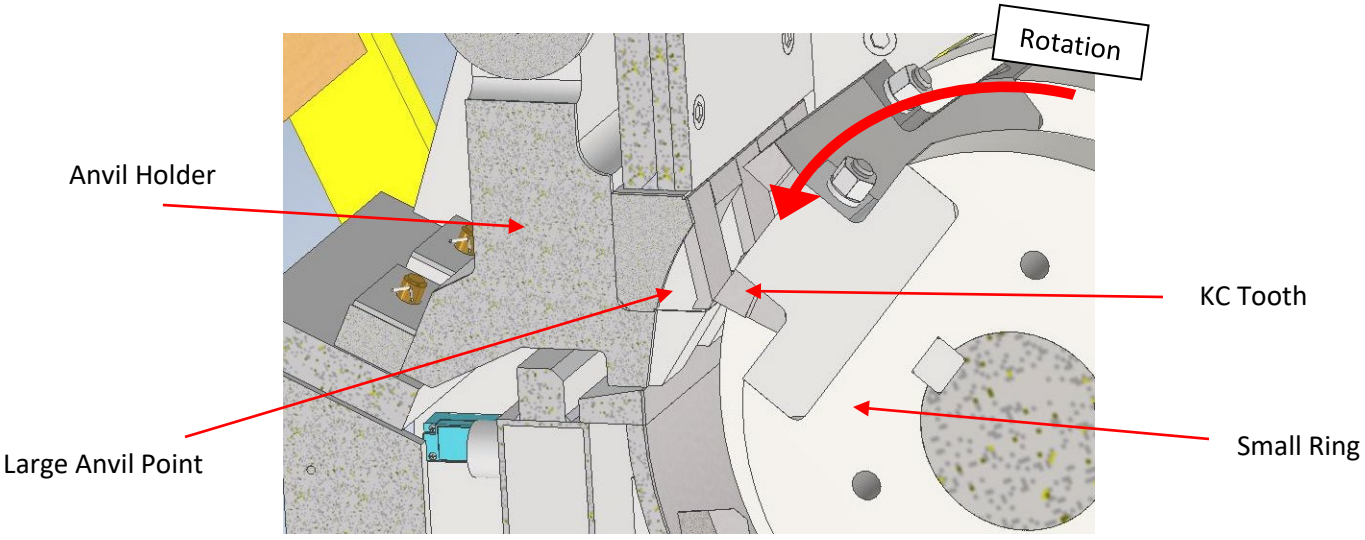

Figure 4.2: Large Anvil Point Cutting Action

The anvil rack assembly is set at the factory to maintain the proper tooth-anvil point clearance for efficient hogging. Once the anvil rack is set, radial clearance is not adjustable. For instructions

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on installing a replacement anvil rack assembly, see Appendix B: *Bulletin 57-01-21 Installing KC Anvil Rack Assembly*.

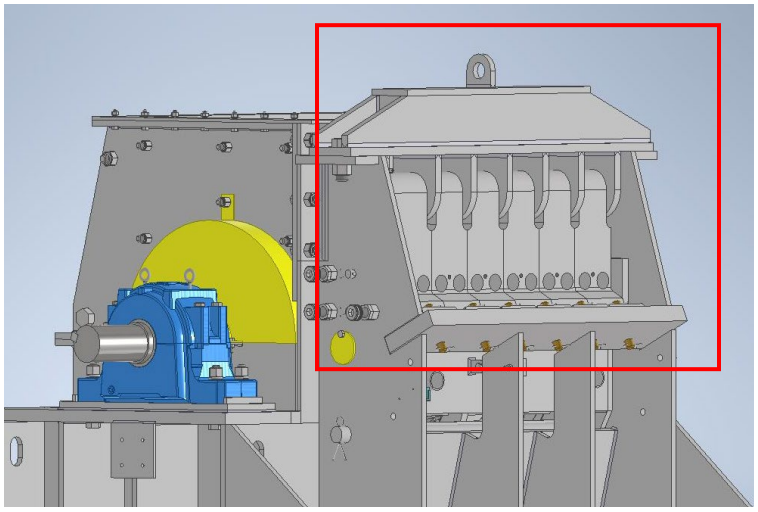

Figure 4.3: Anvil Rack Assembly

Anvil points are hardsurfaced on all wearing surfaces.

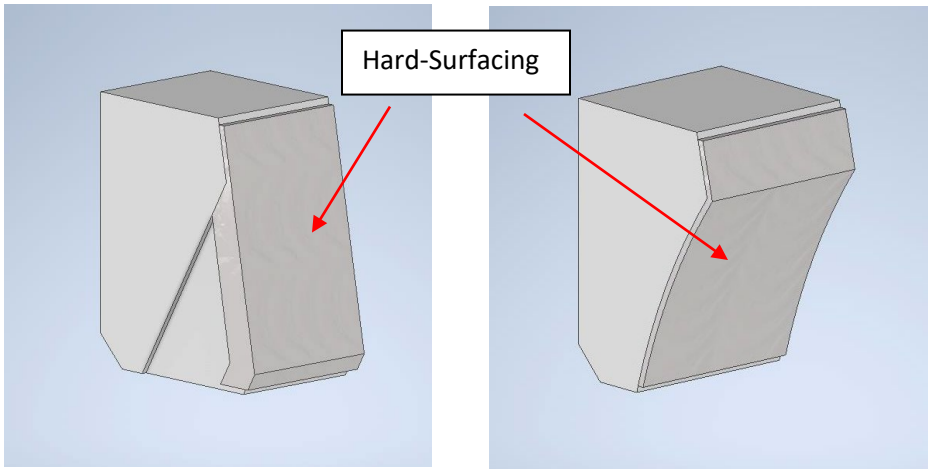

Figure 4.4: Anvil Point Hardsurfacing, Large (Left) & Small (Right)

Because of the different coefficients of thermal expansion between the mild steel and the hardening alloys, hairline cracks (cross-checking) may appear on cooling. Hairline cracks will not affect the life of these parts and the parts should not be considered defective because hairline cracks are present.

Maximum wear life from hardsurfaced parts results from using the proper hardsurfacing material and making sure that it has been applied correctly.

The proper hardsurfacing of parts is a complex and methodical process. **Using new and rebuilt factory parts is the best way to ensure that the hardsurfacing has been applied correctly and that you can expect excellent performance.**

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➤ FEED OPENINGS & HOPPERS

All KC model hogs have two available options for feed openings. The specific values vary, but the principles of operation remain constant across the different models.

Table 5: Feed Opening Dimensions

Model	Small Feed Opening	Large Feed Opening
PM-KC	17”	21”
CS-KC	24”	30”
XL-KC	24”	35-3/8”

The smaller feed opening option contains an angled rear door designed to deflect recirculation. When material drops into the hog, the door prevents it from falling directly into the upstroke and shooting straight back up into the air. This helps minimize turbulence and reduces the wear on the rotor.

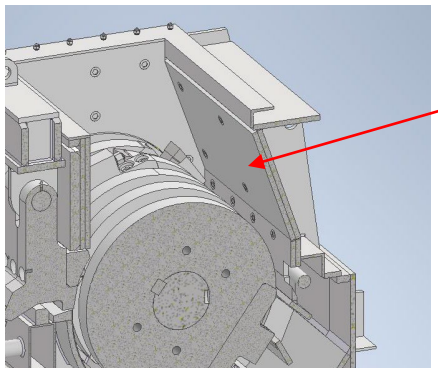

Figure 4.5: Angled Rear Door

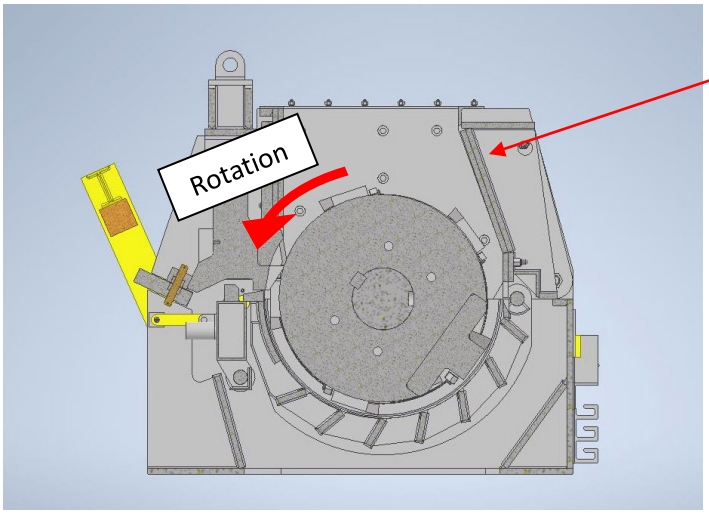

Figure 4.6: Deflecting Recirculation

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The larger feed opening option contains a vertical rear door and is best used for applications with smaller infeed material, like bark or small scrap processing. The larger feed opening allows for easier passage of material through the feed hopper. In applications where recirculation isn't an issue, the larger feed opening option prevents the hopper from getting bogged down with infeed material.

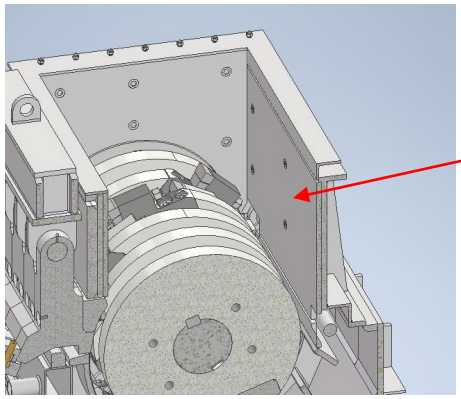

Figure 4.7: Vertical Rear Door

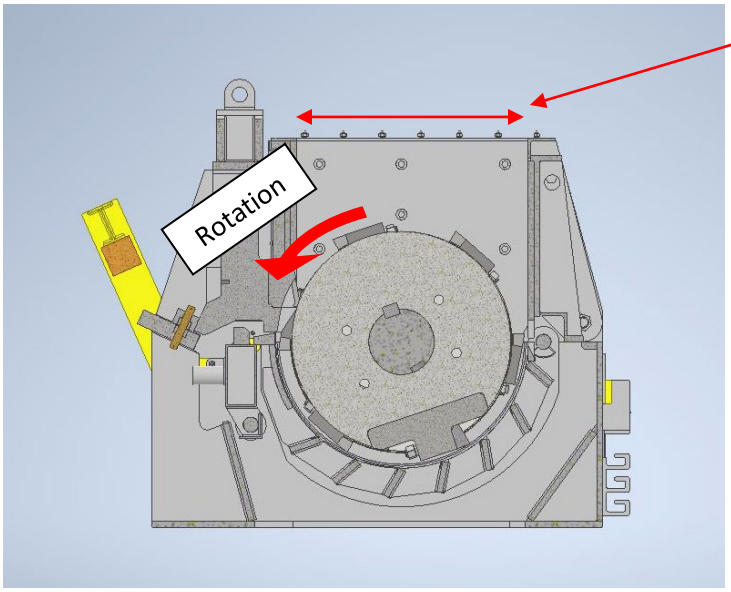

Figure 4.8: Larger Infeed

Do not feed against rotation. Feed may be any of the other three directions. Feeding against rotation increases turbulence and causes unnecessary wear on the hog and any supporting equipment. It will take longer to process material, and the hog will be more prone to excessive vibration and component failure.

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Feed hoppers help guide material into the hog so that it is directed into the downstroke. They can either be purchased from Montgomery Industries or constructed by the customer. (If you choose to build your own hopper, ensure it meets standards outlined in *Installation: Infeed Installation*.)

Hoppers extend at least 5 feet above the companion flange, so any bouncing of the infeed material doesn't reach back up to the infeed conveyors. **All turbulence should be contained within the hopper to contain kickback and prevent damaging of infeed belts.**

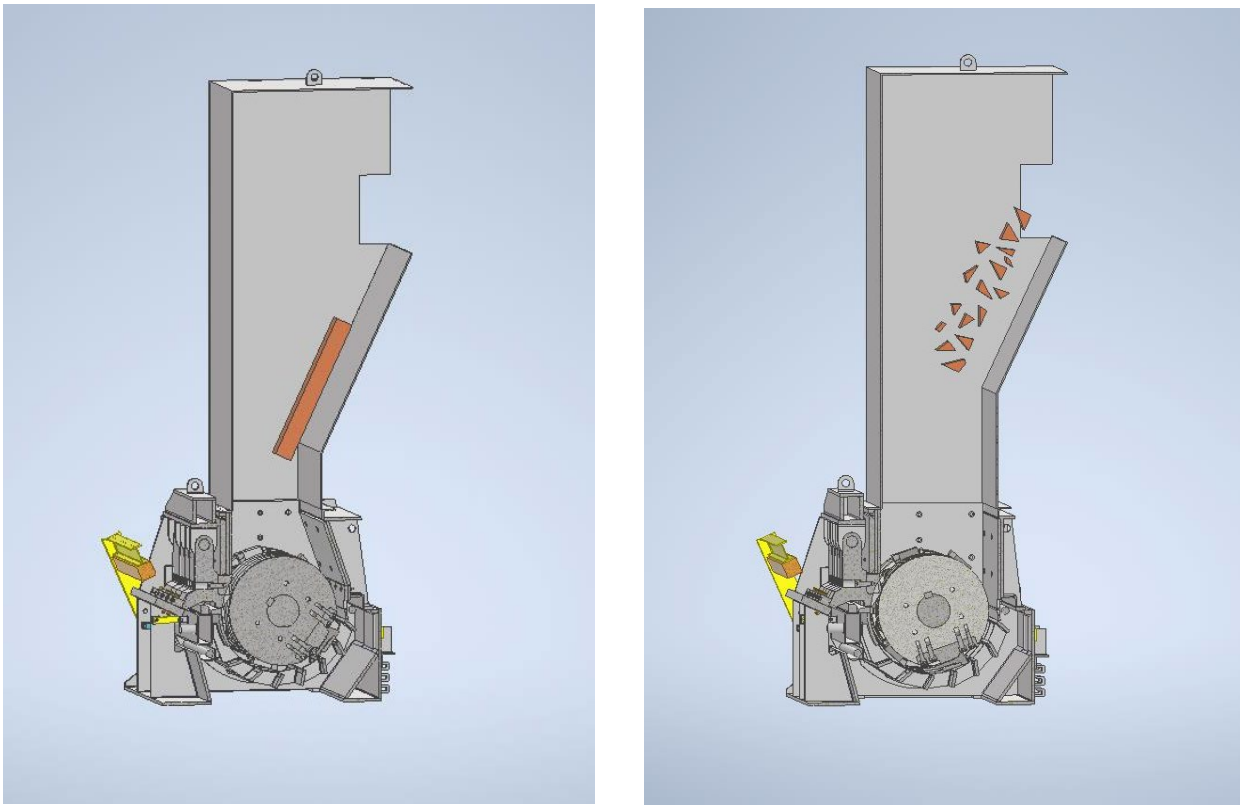

Figure 4.9: 6' Feed Hoppers for Small Feed Opening (Left) & Large Feed Opening (Right)

The hopper also provides a safe and repeatable feeding method by directing material into the downstroke of the rotor at the correct angle. Ample space is provided above the infeed conveyor to allow the material to tilt as it falls off the conveyor belt. The angled throat then directs the infeed to the proper side of the hog.

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➤ PUNCH AND DIE CUTTING

All KC model hogs employ a unique cutting action involving stationary anvil points positioned on the side of the machine with rotating teeth (hammers) that pass through rectangular pockets formed by these anvil points.

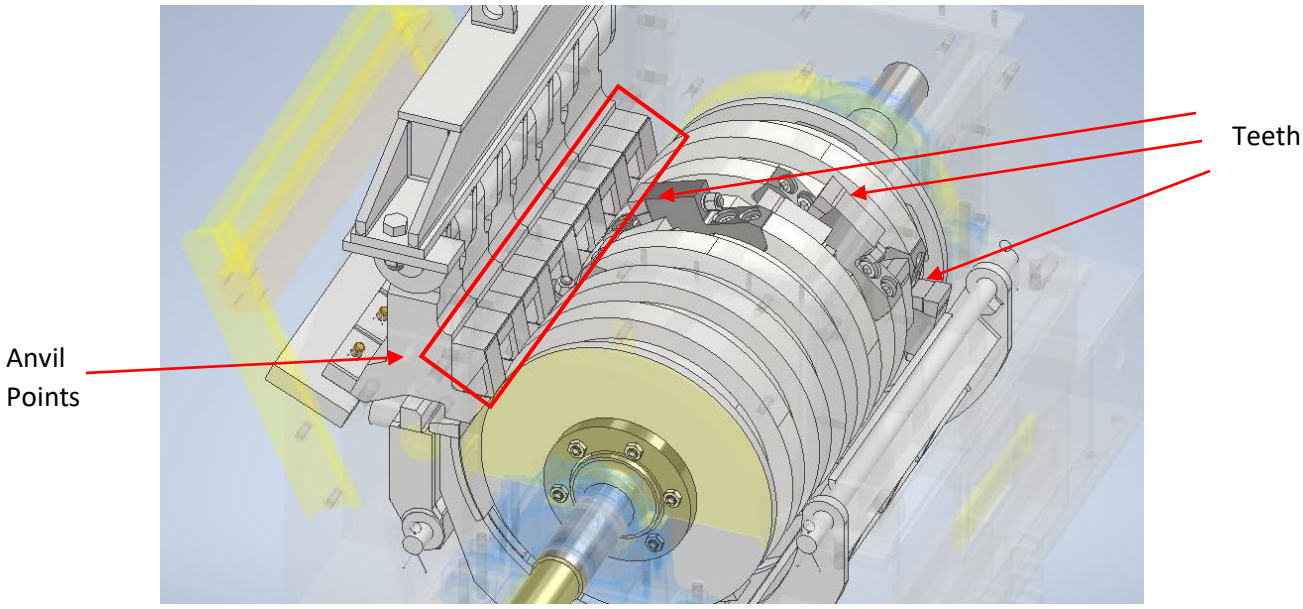

Figure 4.10: Cutting Teeth & Anvils

This positive cutting action between the teeth and anvil points performs what amounts to the first particle-sizing function in a two-stage process.

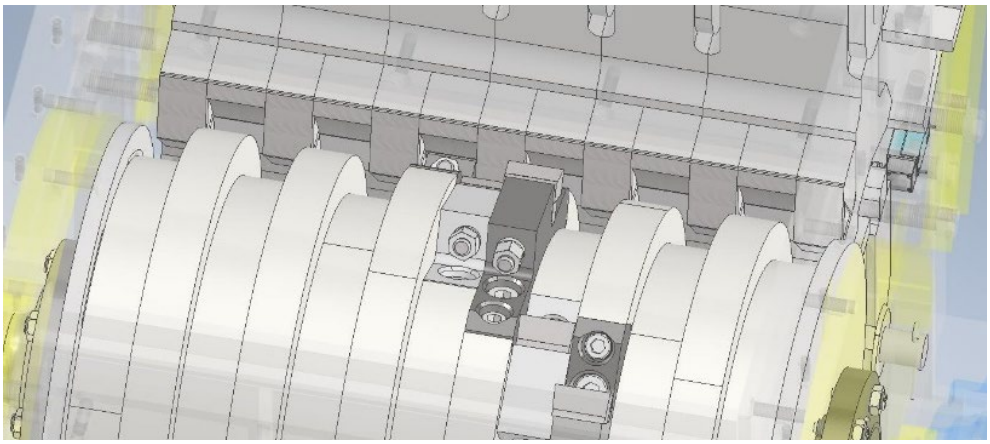

Figure 4.11: Teeth Passing Through Rectangular Pockets

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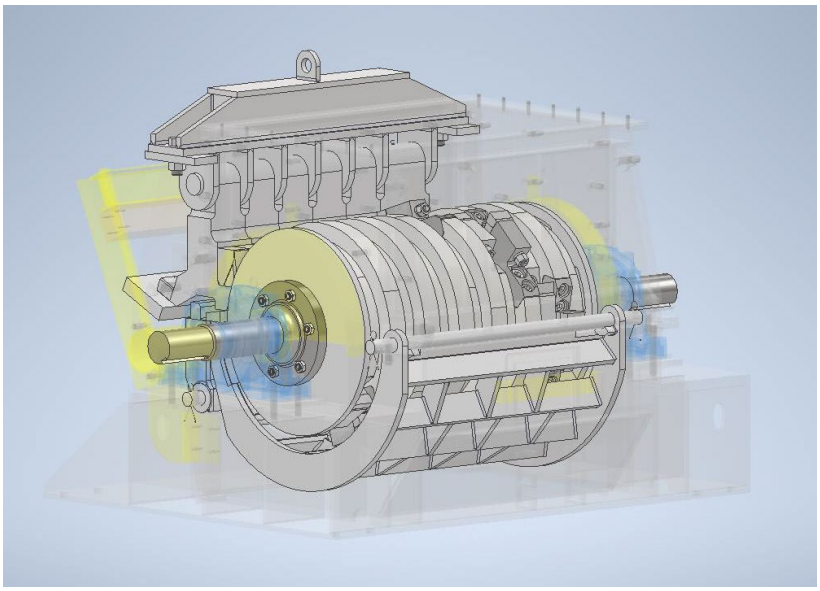

Figure 4.12: Particle-Sizing Screen

The second sizing action occurs when the material cut by the action of the teeth against the anvil points is directed downward and across a curved particle-sizing screen which fits underneath the rotating element.

The discharge from Montgomery hogs is generally quite uniform in size, containing a minimum of fines.

➤ ROTOR

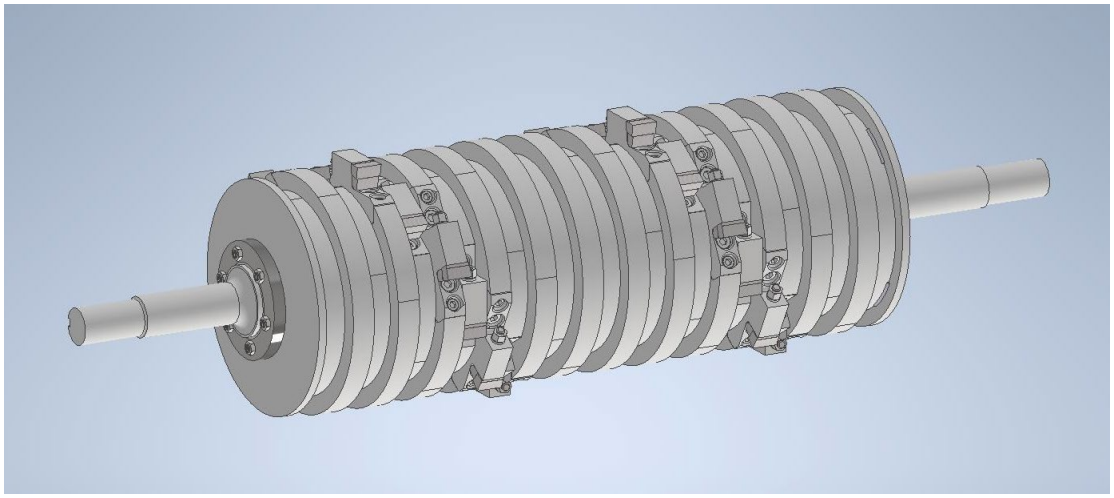

Figure 4.13: KC Rotor

The rotor assembly consists of a solid steel shaft, a series of steel rings that are keyed to the shaft, and hardsurfaced teeth that are bolted to the rings.

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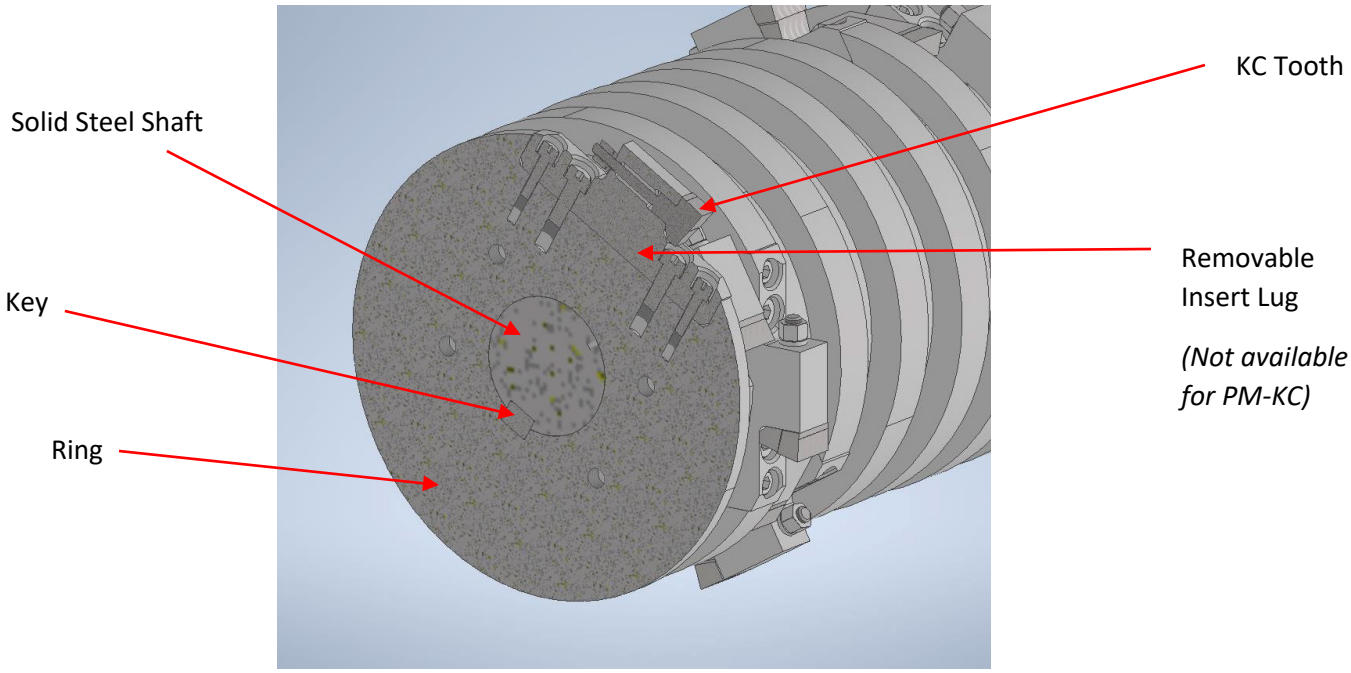

Figure 4.14: KC Rotor, Cutaway View

The shaft, rings, and teeth are manufactured to tight factory tolerances using CNC machinery. Precision machining is used to provide a tight fit of components and reduce the potential for undesirable movement and/or metal fatigue.

Because the Montgomery Hog uses a high-speed precision cut, unchecked wear or failure to use Montgomery Industries factory parts can result in a loose or unpredictable fit of components.

LOOSE FITTING PARTS CAN INCREASE THE POTENTIAL FOR PART FAILURE DUE TO METAL FATIGUE. PART MOVEMENT CAUSED BY LOOSE FITTING PARTS CAN RESULT IN CATASTROPHIC COLLISION.

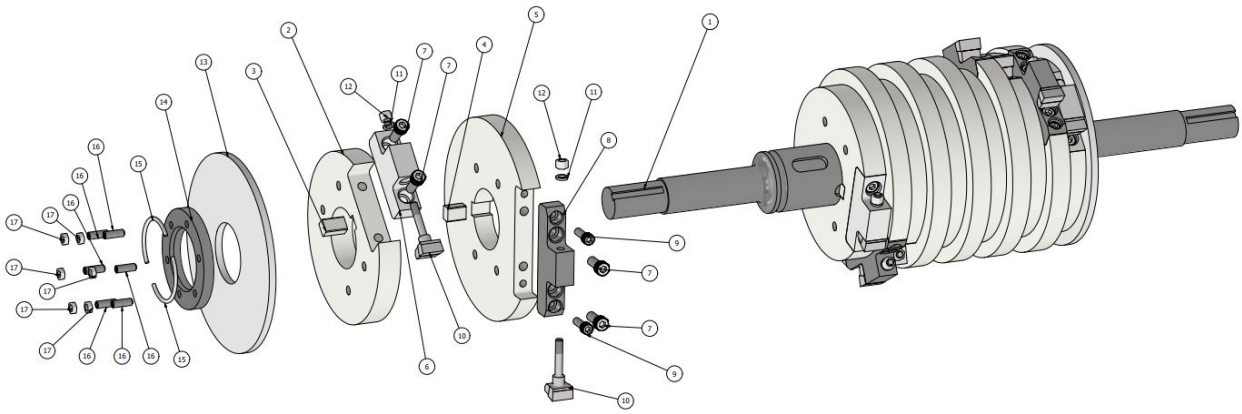

Figure 4.15: KC Rotor, Exploded View

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➤ SCREEN

The screen is used to control the size of the material discharged from the unit. It fits underneath the rotating element, where material is directed downward and out of the machine.

Screens may either be baffle screens or plate screens. Baffle screens consist of ribs and baffles welded together, whereas plate screens consist of a rolled steel plate with an offset pattern of holes. Baffle screens accommodate larger openings, and plate screens are used when smaller discharge material is desired.

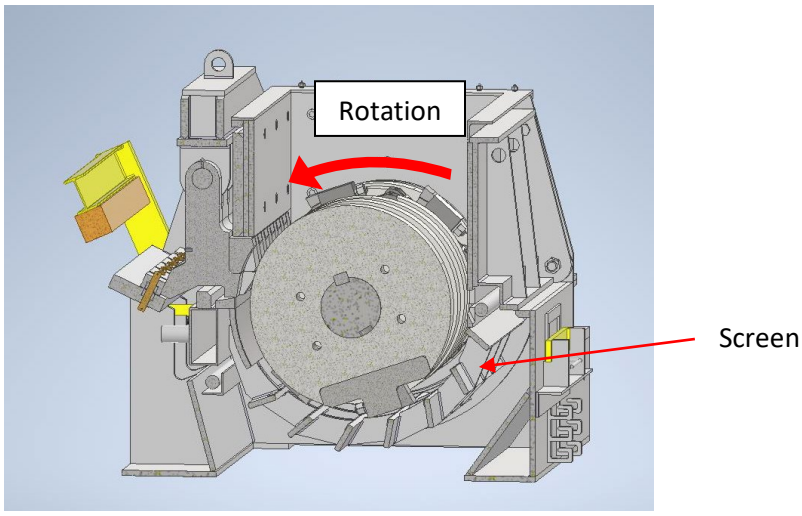

Figure 4.16: Baffle Screen in Hog

The smaller the openings in the screen, the smaller the end product will be.

However, with smaller screens capacity will be reduced compared to larger openings. This restriction means it will take longer to process a given amount of scrap, and more power will be consumed due to the longer grinding time. There will also be more wear on the cutting surfaces.

Therefore, the largest size openings that produce an acceptable end product should be selected to maximize capacity and minimize wear and power consumption.

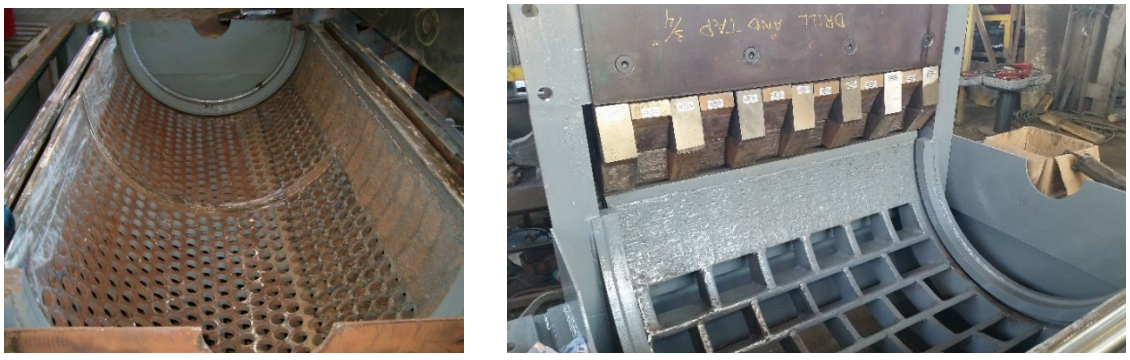

Figure 4.17: Plate Screen (Left) & Baffle Screen (Right)

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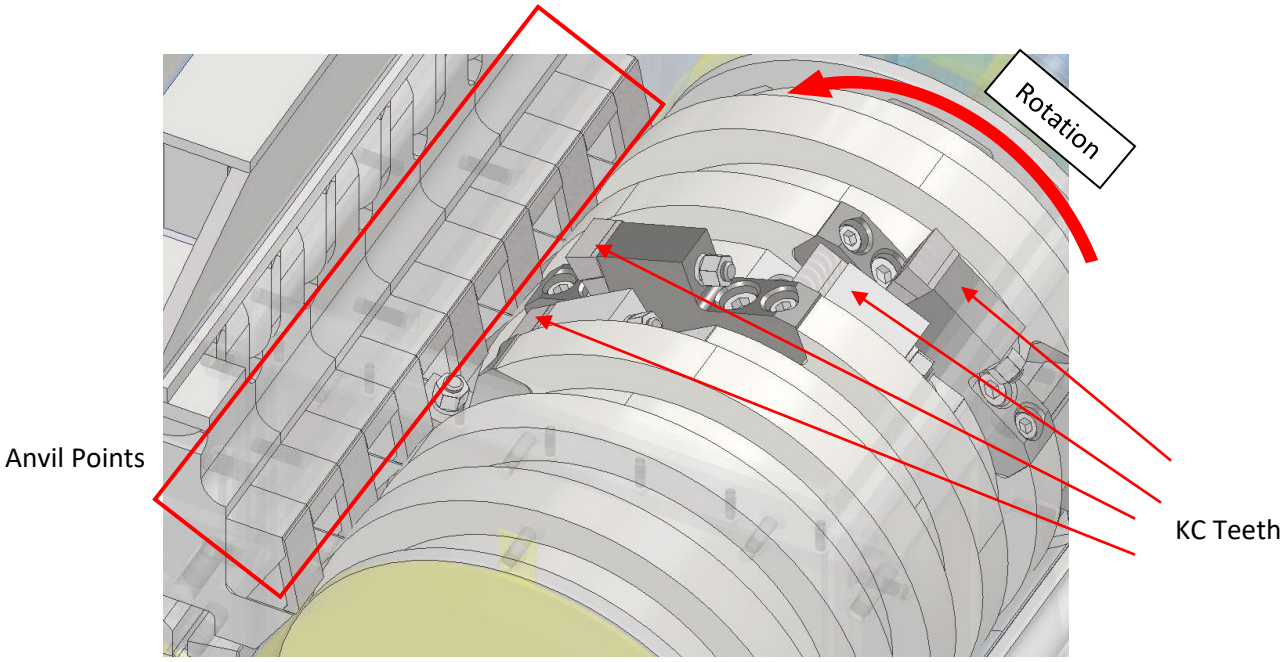
➤ TEETH

IT IS THE RESPONSIBILITY OF THE USER TO KEEP THE TEETH PROPERLY TIGHTENED AT ALL TIMES.

Positive cutting action between the teeth and anvil points performs what amounts to the first particle sizing function in a two-stage process.



Normal operation may cause the teeth to loosen over time. The time over which fastenings may loosen varies with each application, depending on the type of material processed, the quantity of material processed, the hours per day of operation, the integrity and fit of the parts, and the level of vibration/imbalance during operation.

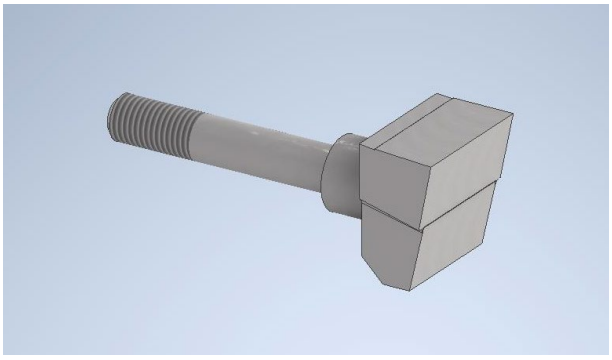


Figure 4.18: KC Tooth

Teeth are hardsurfaced on the sides, face, and top.

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Because of the different coefficients of thermal expansion between the mild steel and the hardening alloys, hairline cracks (cross-checking) may appear on cooling. Hairline cracks will not affect the life of these parts and the parts should not be considered defective because hairline cracks are present.

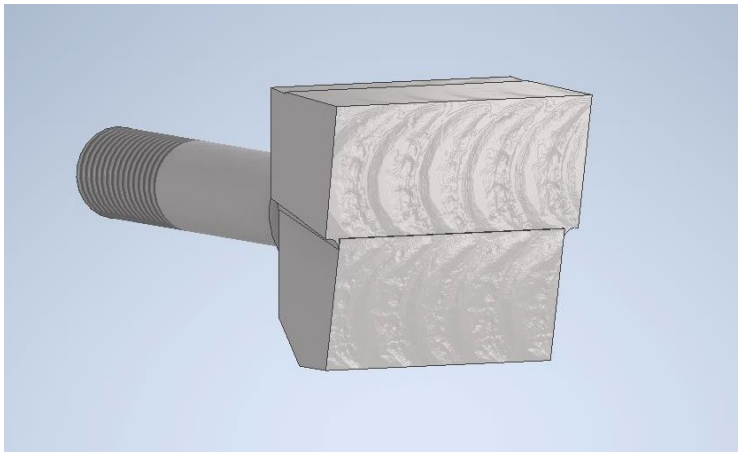
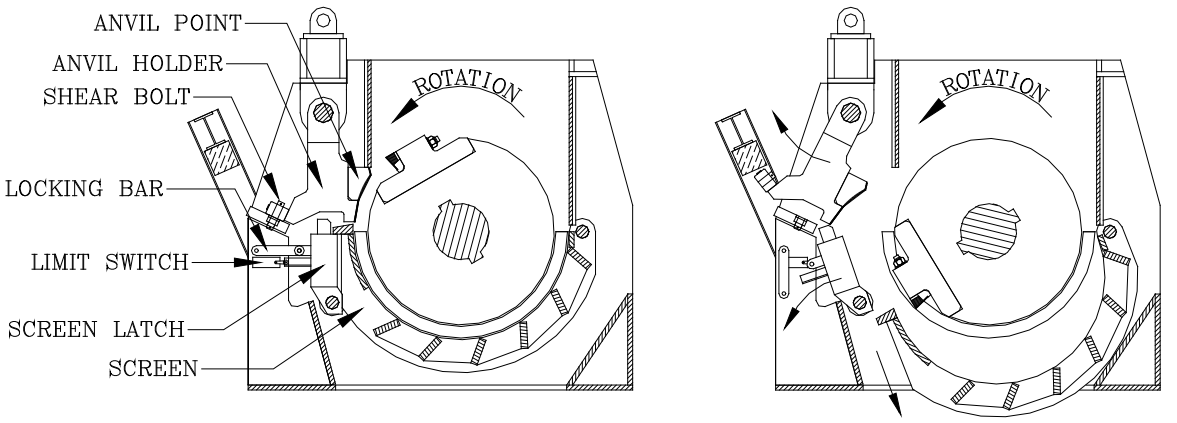


Figure 4.19: Tooth Hardsurfacing

Maximum wear life from hardsurfaced parts results from using the proper hardsurfacing material and making sure that it has been applied correctly.

The proper hardsurfacing of parts is a complex and methodical process. **Using new and rebuilt factory parts is the best way to ensure that the hardsurfacing has been applied correctly and that you can expect excellent performance.**

➤ TRAMP METAL PROTECTION – SHEAR BOLTS & SCREEN TRIP LATCH



Normal Operation

Tramp Metal Protection Activated

Figure 4.20: Tramp Metal Protection

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Tramp metal protection is provided on all KC model hogs by shear bolts which secure the anvil holders in position.

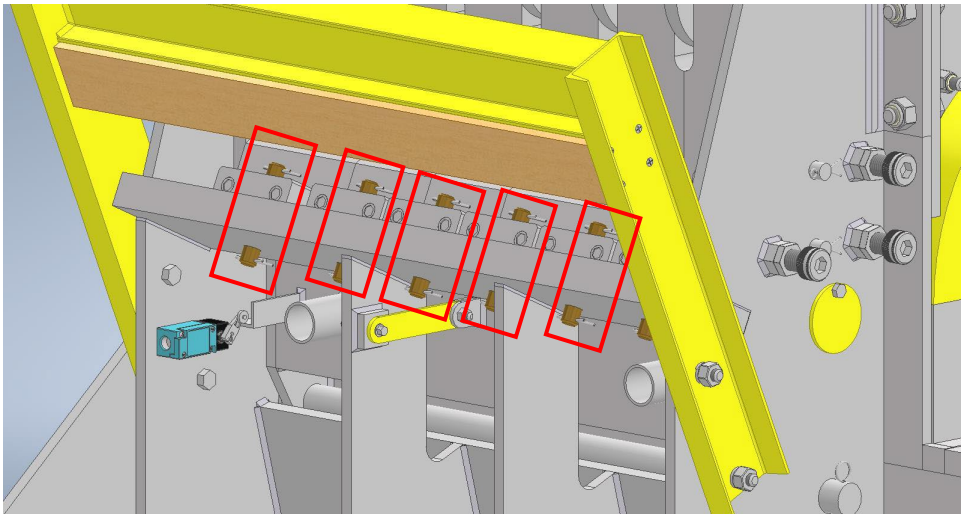

Figure 4.21: Shear Bolts

When heavy steel enters the hog, the shear bolts are sheared and the anvil holders are driven out of position, allowing the steel to pass by the anvil points.

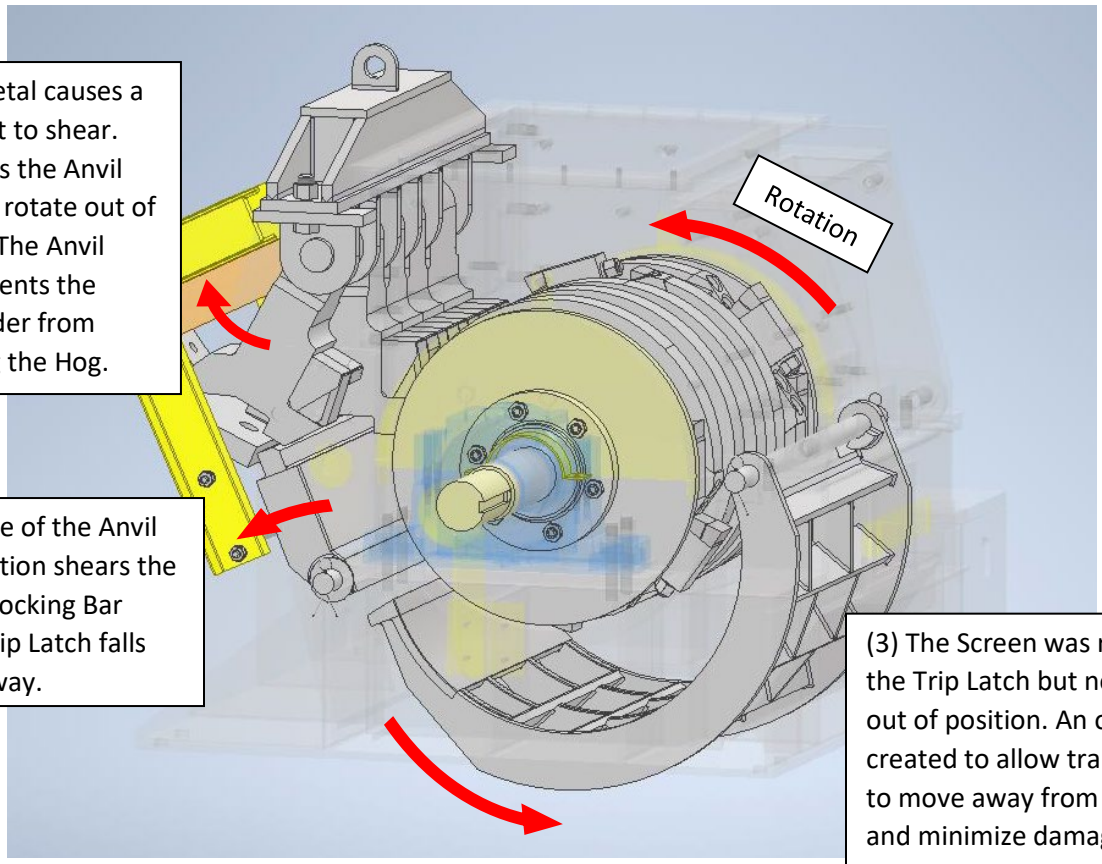

Figure 4.22: Tramp Metal Protection Diagram

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As the anvil holders are driven out of position, the **3/8" Grade 2 bolt** holding the locking bar to the housing is sheared and the latch holding the screen is tripped. A 1/2" Grade 5 bolt secures the locking bar to the trip latch.

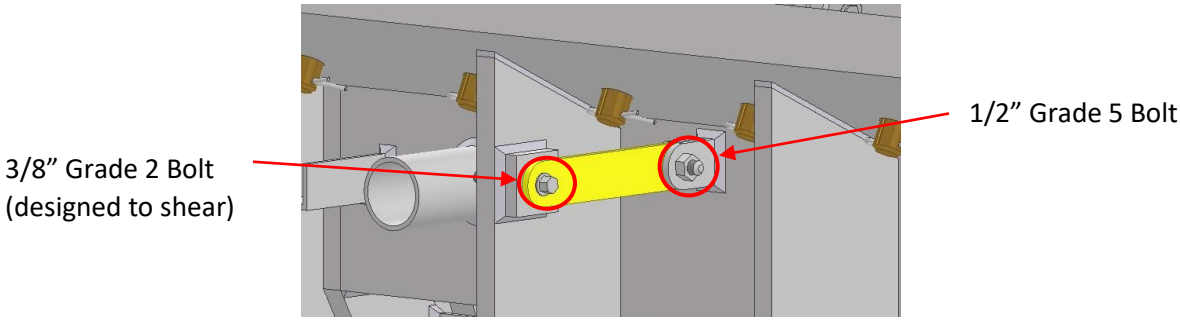

Figure 4.23: Trip Latch Locking Bar

Tripping the screen latch allows the screen to drop away from the rotor to minimize damage to the screen and allow the metal to exit the grinding area.

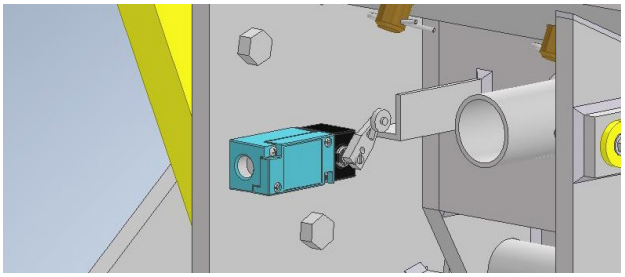

Figure 4.24: Limit Switch

A limit switch is provided on all KC model hogs which is activated by the screen being tripped.

The limit switch should be wired so that the hog and all conveyors delivering materials to the hog are stopped. The conveyors should be stopped so that the material is not processed with the screen out of position, and to prevent a pile-up of materials (a potentially heavy surge load) while the hog is being repaired.

It also may be desirable to connect a flashing light and/or alarm horn to this limit switch.

Once these events have occurred, the hog must be stopped. The screen must be raised back into position and the shear bolts replaced before operation is resumed.

Because the screen is very heavy, material handling equipment is required to provide sufficient mechanical advantage to safely reset the screen.

For this purpose, a hydraulic screen reset option is available for all KC model hogs.

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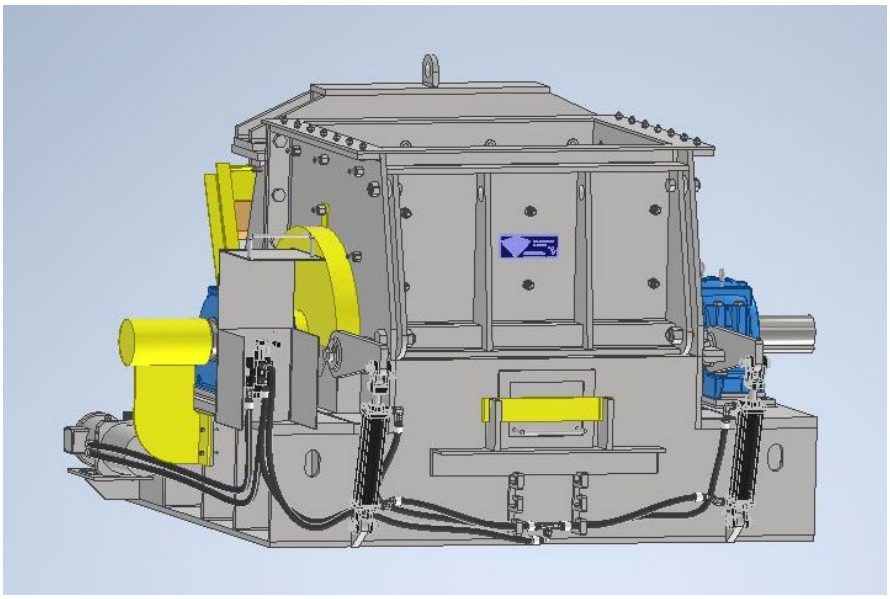

Figure 4.25: Hydraulic Screen Reset

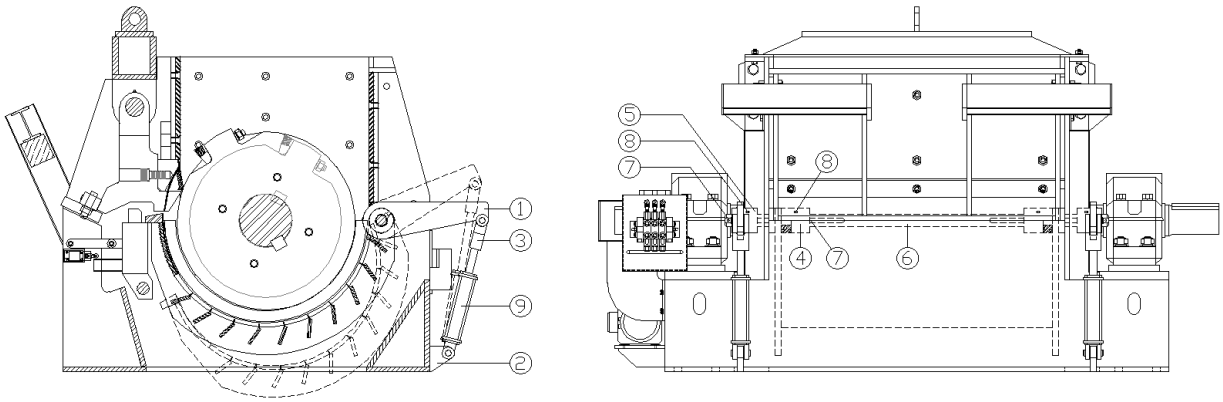

Figure 4.26: Components in Hydraulic Screen Reset

The hydraulic screen reset option consists of two hydraulic cylinders (9) connected to the housing via a padeye (2). The cylinders have a clevis (3) on the end that connects to screen pivot shaft (6) via a lever arm (1) and arm boss (5). A reset sleeve (4) aids in rotating the screen back into place. Both the reset sleeve and the arm boss are secured to the shaft via keys (7) and setscrews (8).

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MAINTENANCE PROCEDURES

Consistent maintenance is critical for ensuring optimal hog operation. Dull cutting surfaces, overheated bearings, or excessive wear can impact the performance of the hog and may affect the efficiency of the machine. Furthermore, routine maintenance is important to keep the end product consistent. Failure to maintain your hog may lead to catastrophic failure.

➤ REBUILDING TEETH AND ANVIL POINTS

The allowable wear before rebuilding becomes necessary will depend upon the material being hogged. Generally, when the cutting edges of the teeth have worn to a 1/8" radius, the effect upon operation will be noticeable.

The order in which the wear occurs is first at the tip and sides of the teeth, and usually much later on the cutting edges of the anvil points.

Teeth and anvil points should be removed and rebuilt before the hardsurfacing material has worn into the base material. After that point of wear has been reached, the base metal wears away rapidly and the cost of rebuilding soon matches the cost of complete replacement.

General practice is to rebuild the anvil points every second or third time the teeth are rebuilt or changed.

The teeth and anvil points should be inspected frequently until a wear pattern is established and the operator knows at what interval the parts must be rebuilt.

Maximum wear life from hardsurfaced parts results from using the proper hardsurfacing material and making sure that it has been applied correctly.

The proper hardsurfacing of parts is a complex and methodical process. **Worn teeth and anvils should be shipped to the factory and exchanged for parts rebuilt to factory standards.**

USING PARTS NOT MANUFACTURED BY MONTGOMERY INDUSTRIES MAY ENDANGER THE SAFETY OF PERSONNEL AND VOIDS ALL WARRANTIES.

For more information on teeth hardsurfacing and wear areas, see Appendix C: *Bulletin 23-30-12 Hardsurface Wear Zones on KC Teeth.*

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➤ ANVIL POINT REPLACEMENT

SECURE THE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK.

USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS.

1. Remove the allen head cap screws that hold the anvil points in place.

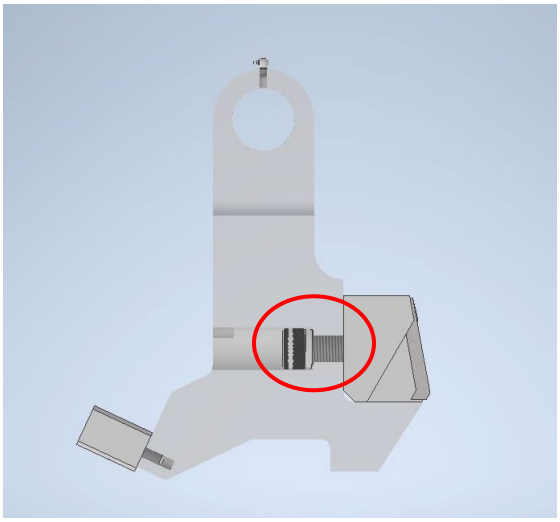

Figure 5.1: Anvil Point Allen Head Cap Screws

2. Remove the tooth in the breaker ring opposite the anvil point. Large rings correspond with small anvil points, and small rings correspond with large anvil points.

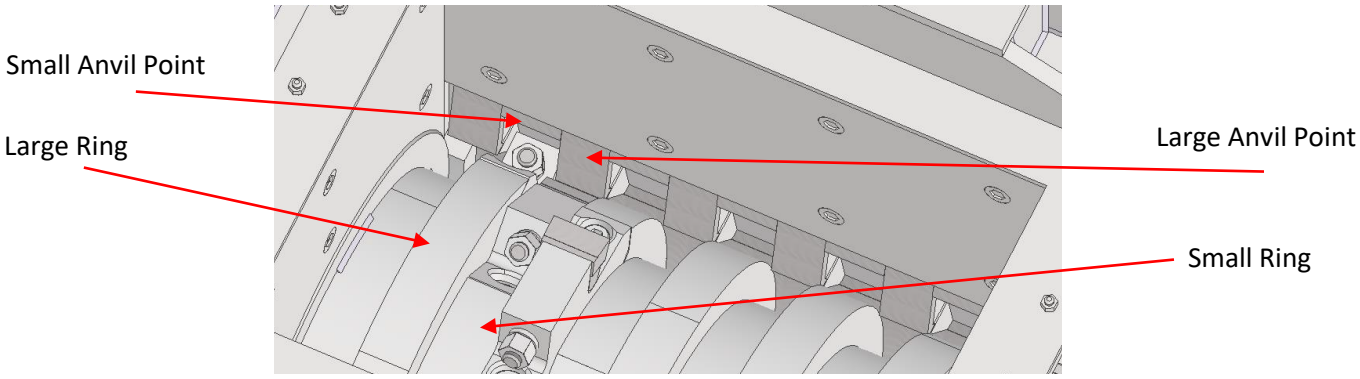

Figure 5.2: Rings and Anvil Points

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3. Align the rotor to remove the anvil points.

   To remove a small anvil point, rotate the rotor until the back of the large ring lug lines up with the bottom of the small anvil point.

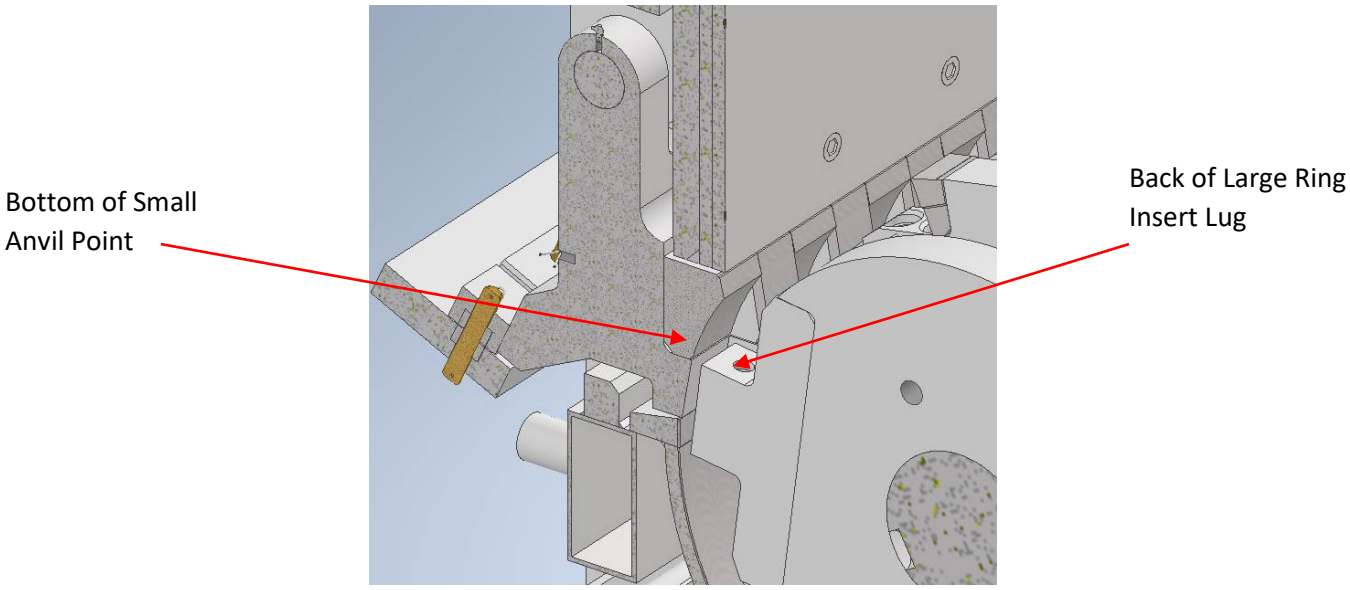

Figure 5.3: Alignment for Small Anvil Point Removal

   To remove a large anvil point, rotate the rotor until the back of the small ring lug lines up with the bottom of the large anvil point.

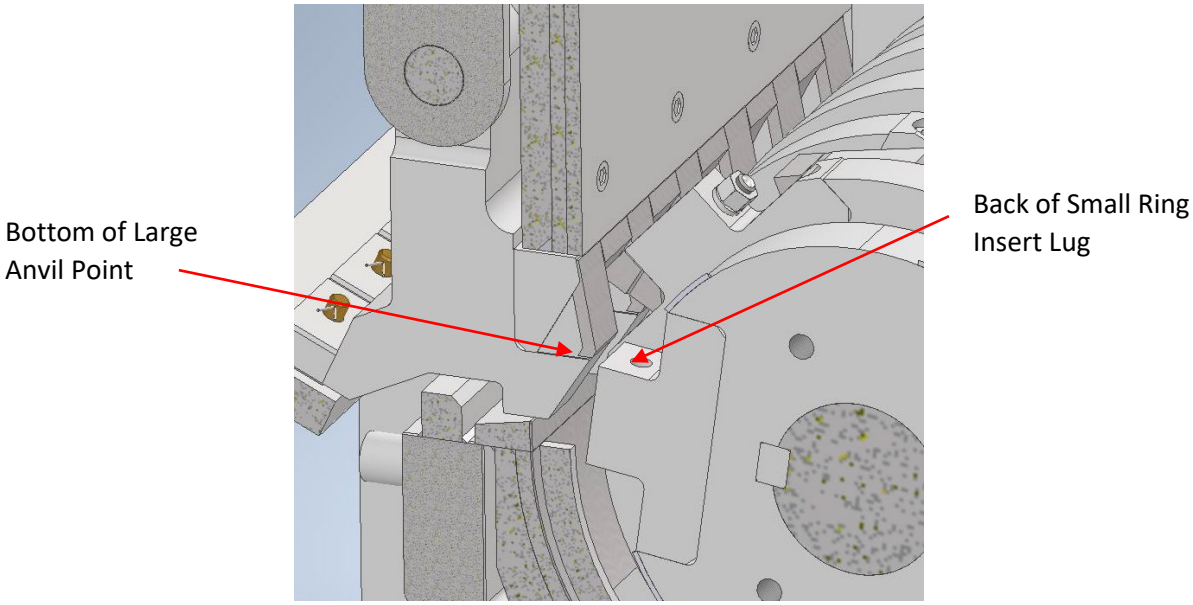

Figure 5.4: Alignment for Large Anvil Point Removal

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4. Drive the anvil point from its seat into the cavity of the lug ring.

   The anvil points can be driven from their seats by using a steel rod, about 1” in diameter. Place the rod in the hole where the allen head cap screws were removed from the anvil points. Hit the rod forward with a hammer until the anvil point comes out.

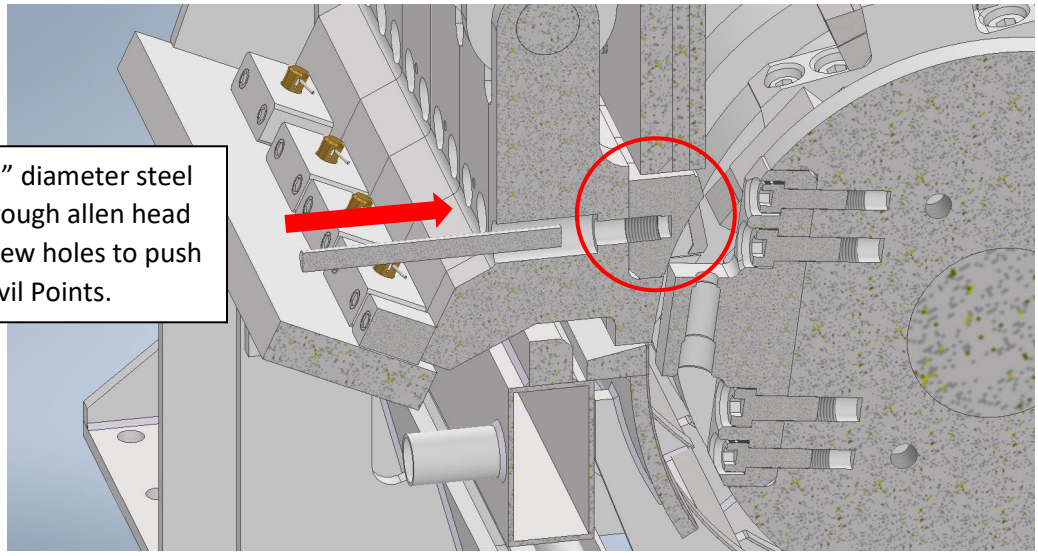

Figure 5.5: Driving Anvil Point from its Seat

5. Rotate the rotor back and remove the anvil point.

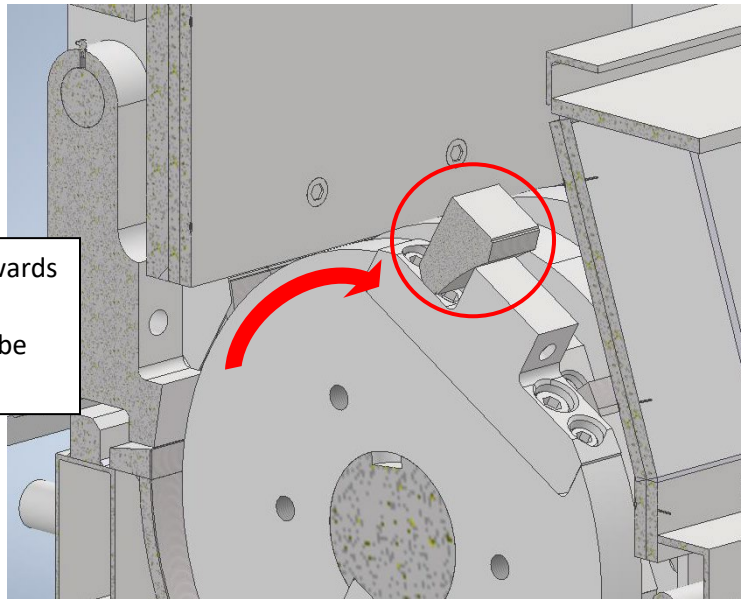

Figure 5.6: Rotor Rotated to Remove Anvil Point

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6. To replace anvil points, first clean all anvil holder seats thoroughly with a wire brush. Then reverse the above procedure.

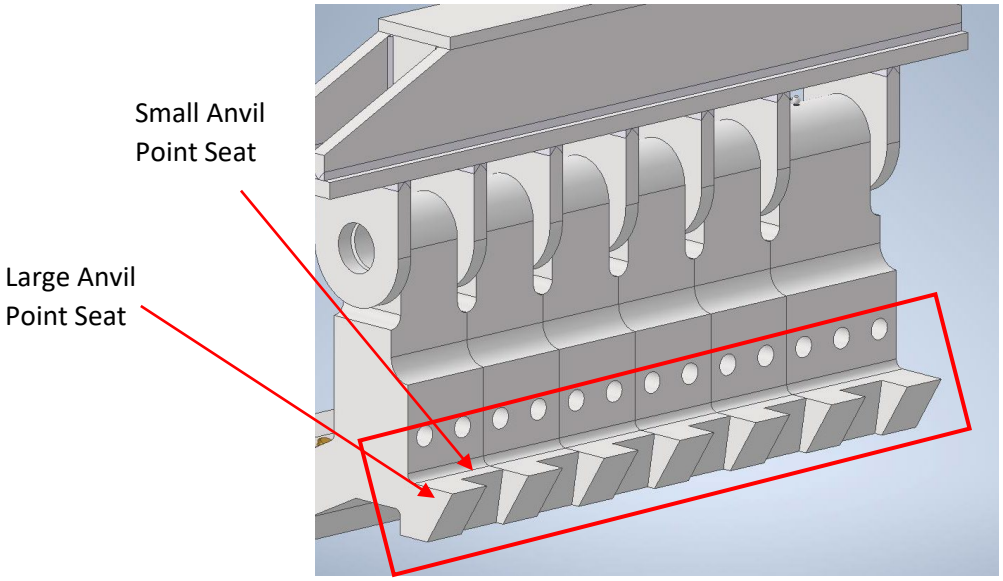

Figure 5.7: Anvil Holder Seats

7. **Be careful to orient the anvil points correctly. It is possible to incorrectly install anvil points upside down.** Refer to illustrations in this manual and the cross section of the hog in the material list to ensure that the anvil points are oriented correctly.

   The anvil points follow an alternating pattern (large – small – large – small). Both sides of the anvil rack assembly should end in a large anvil point. The numbers vary based on hog size, but there will always be one more large anvil point than small anvil point.

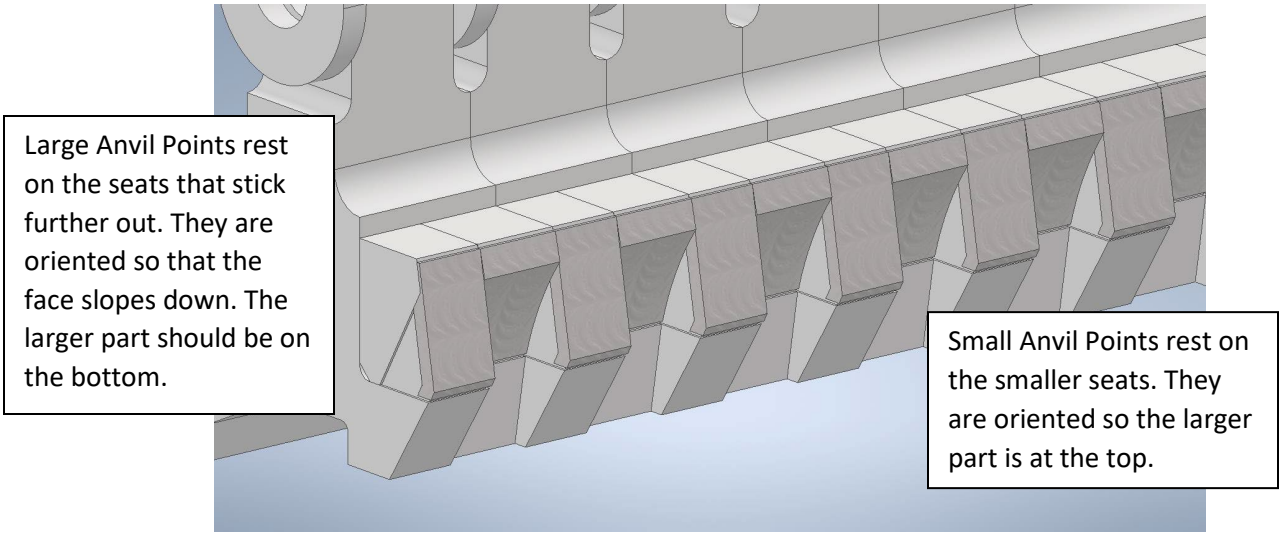

Figure 5.8: Anvil Point Orientation

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When all anvil points have been installed, they should be oriented so that the top faces line up evenly. The large anvil points should have the front face sloping down, and the small anvil points should have the front face sloping up. This is to ensure proper clearance with both the large and small rings. **If anvil points are installed incorrectly, they will interfere with the rotor and the hog will not function properly. Incorrect installation will damage the anvil points and the teeth.**

Because the Montgomery Hog uses a high-speed precision cut, unchecked wear or failure to use Montgomery Industries factory parts can result in a loose or unpredictable fit of components.

LOOSE FITTING PARTS CAN INCREASE THE POTENTIAL FOR PART FAILURE DUE TO METAL FATIGUE. PART MOVEMENT CAUSED BY LOOSE FITTING PARTS CAN RESULT IN CATASTROPHIC COLLISION.

➤ BEARING LUBRICATION – GREASE

USE EXTREME CAUTION. GREASE AND OIL ARE FLAMMABLE AND EXPLOSIVE IN CONTACT WITH PURE OXYGEN.

Hogs using grease lubricated bearings should be greased in accordance with the following specifications:

1. All model hogs use a Class 3 fit (C3 bearings).
2. The following types of grease may be used:

Table 6: Types of Grease for Grease Bearing Lubrication

Preferred Option	Acceptable Options
Chevron Duralith EP #2 - Viscosity at 210° F: 80 SUS - Drop Point: 370° F	**Shell Alvania EP #2** - Viscosity at 210° F: 80 SUS - Drop Point: 365° F
	Gulf Crown EP #2 - Viscosity at 210° F: 82.5 SUS - Drop Point: 348° F

3. Any equivalent grease should have the following characteristics:
    - Usable temperature range up to 200° F operating temperature
    - The viscosity of the oil in the grease should not be less than 100 SUS at the operating temperature

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- The drop point of the grease must be more than 300° F
- Grease compounds with Lithium or non-soap bases are preferred. The No. 2 consistency grades have been found to be the most satisfactory for normal operating speeds.

4. The re-lubrication cycle must be determined from experience. It is important that fresh grease reaches the internal surfaces of the bearing. Refer to Appendix D: *SKF Bearing Lubrication Guide* for proper relubrication procedures.

   When adding grease, a small amount at frequent intervals (approximately every 5 weeks) is preferable to a large amount at long intervals. A practical guide is given by the equation below.

   $$V = 0.25 * d * b$$

   "V" is the volume of grease to be added (in ounces), "d" is the depth of the bearing (in inches), and "b" is the bore of the shaft (in inches).

5. When replacing old grease with new, the grease should be worked into the available spacing in the bearing by hand, forcing grease in between the rollers and under the edge. The bottom half of the housing should be 1/3 to 1/2 full of grease, depending on the operating conditions.

   An oversupply of grease in the bearing will result in churning and break-down of the grease and overheating of the bearing. This could result in collapsed seals, rapid oxidation, and grease thickener build-up that results in accelerated wear and component failure.

6. The bearing housing must be cleaned, flushed with mineral spirits, and repacked with appropriate grease at least once per year.

➤ BEARING LUBRICATION – OIL

USE EXTREME CAUTION. GREASE AND OIL ARE FLAMMABLE AND EXPLOSIVE IN CONTACT WITH PURE OXYGEN.

Hogs using oil lubricated bearings should be lubricated in accordance with the following specifications:

1. If for any reason the bearings are switched from grease to oil lubrication, the bearing should be washed clean of all grease.

   In the bottom half of the bearing housing below the shaft seal (slinger ring) there is a vertical hole drilled in each side of the housing. These holes are used to return oil back to the oil chambers. They should be cleaned thoroughly because if they are plugged, the oil will not return and may soon empty the bearing.

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2. For hogs using oil lubricated bearings, either static lubrication or circulating oil systems, the following types of oil may be used:

Table 7: Types of Oil for Oil Bearing Lubrication

Preferred Option	Acceptable Options
Mobile DTE Oil AA - API Gravity: 0.897 - Minimum Flash Temperature: 460° F - Viscosity: 120-130 SUS at 210° F - Viscosity Index: 95	**Mobile DTE Oil HH** - API Gravity: 0.9 - Minimum Flash Temperature: 520° F - Viscosity: 140-155 SUS at 210° F - Viscosity Index: 95
	Shell Tellus Oil 976 - API Gravity: 27.6 - Minimum Flash Temperature: 495° F - Viscosity: 126 SUS at 210° F - Viscosity Index: 97

3. Any equivalent oil should have the following characteristics:
    - Usable temperature range up to 200° F operating temperature
    - Minimum Flash Temperature of 460° F
    - Viscosity at 210° F must be a minimum of 100 SUS

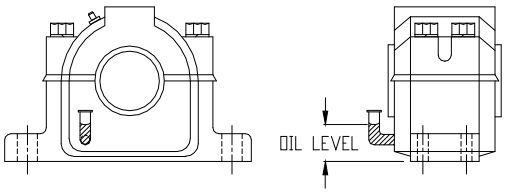

Figure 5.9: Oil Level Measurement

4. Check sight gauge for proper oil level. Fill to oil levels based on bearing size. Oil level is measured from the bottom of the block base to the meniscus on the oil sight gauge. Oil should be at level shown while hog is shut down. When hog is running, the level of oil may rise or drop from the shut down level.

Table 8: Static Oil Levels for Different Bearing Sizes

Bearing Series	Bearing Size	Static Oil Level
USAF 500	5-7/16”	2-3/32”
USAF 600	4-15/16”	2-9/16”
	5-7/16”	2-11/16”

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➤ BEARING REPLACEMENT

The information in this section is consolidated into Appendix E: *Bulletin 57-05-22 Replacing a Bearing* for convenience.

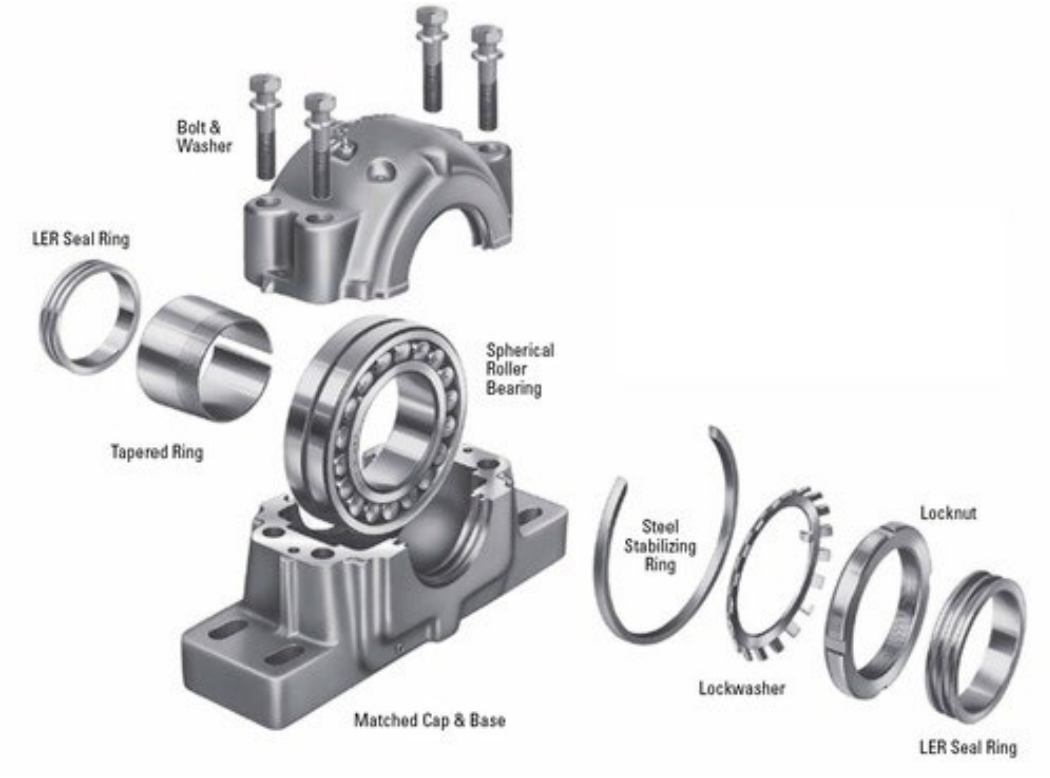

Figure 5.10: Bearing Components[2]

Due to the tight clearances between the rotor and the hog housing, is almost impossible to remove an old bearing with the rotor still in the hog. We strongly encourage removing the rotor before attempting to replace bearings. See *Maintenance Procedures: Rotor Removal* for more information.

[Removing an Old Bearing]

STOP THE HOG BEFORE PERFORMING MAINTENANCE.

REMOVE THE ROTOR FROM THE HOG BEFORE ATTEMPTING TO REPLACE THE BEARINGS.

(2) Timken Spherical Roller Bearing Catalog, Figure 26, Page 92

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1. Remove the outer oil seal. If the bearing being removed is on the drive side of the hog, the stabilizing ring also must be removed.

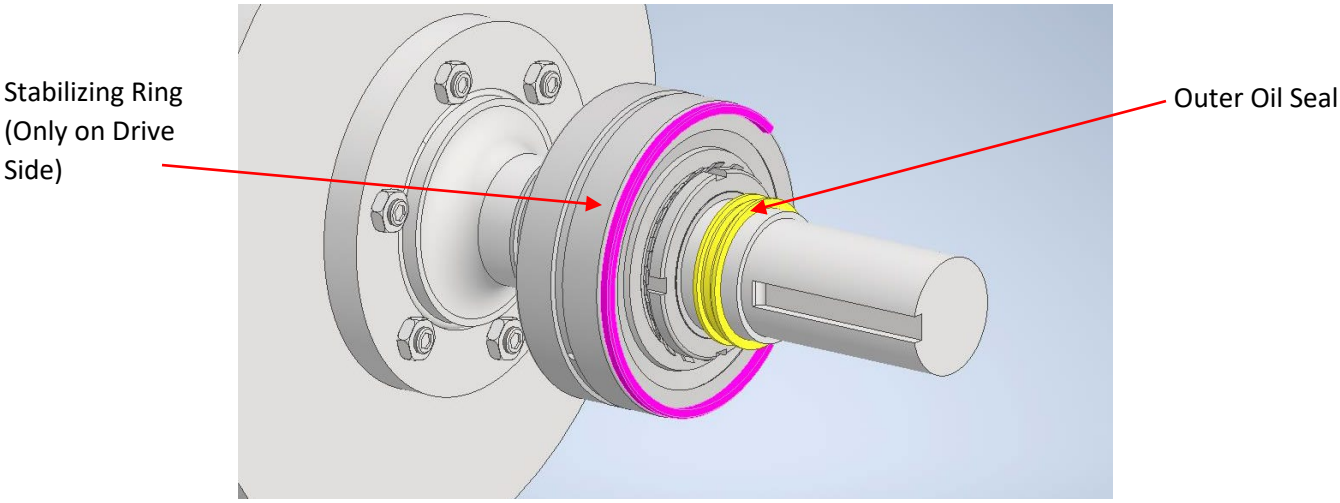

Figure 5.11: Bearing Oil Seal (Yellow) and Stabilizing Ring (Pink)

2. Bend out the locking washer on the lock ring to release the nut.

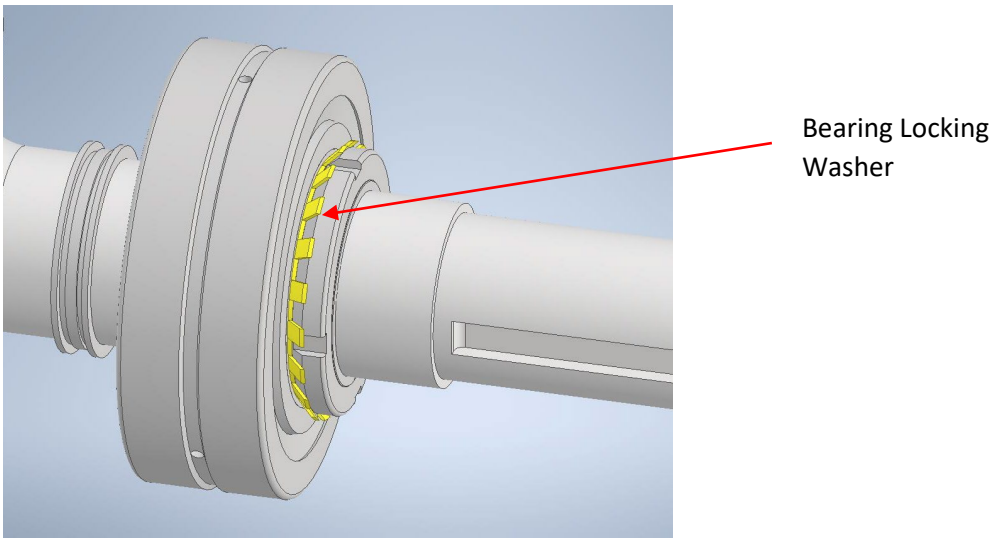

Figure 5.12: Bearing Locking Washer (Yellow)

3. Loosen the nut about two or three turns.

   To loosen the nut, place a spanner wrench or heavy bar of brass or bronze against the nut. Use a heavy sledgehammer to hit the wrench or bar and keep moving around the nut with the wrench or bar. **Do not keep pounding in one place** as this will ruin the threads on the sleeve and nut.

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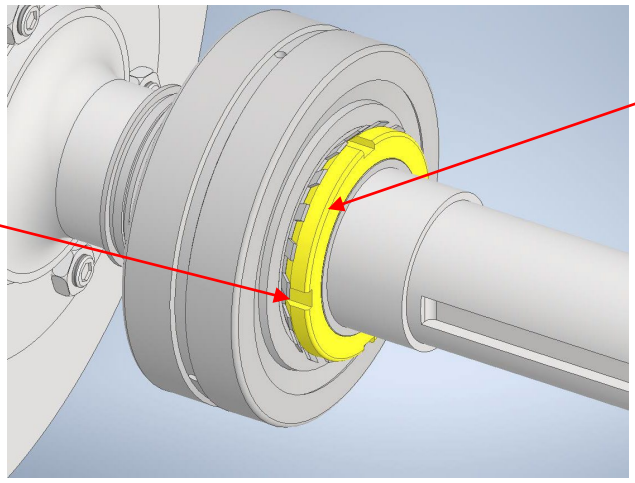

Figure 5.13: Bearing Locking Nut (Yellow)

4. Place a cylinder against the bearing unit locking nut (part of the adapter assembly). The cylinder should be slightly larger than the bearing journal of the hog shaft and long enough to clear the end of the shaft.

Figure 5.14: Bearing Removal Device

5. Using a sledgehammer, strike the end of the cylinder **with a level swing to the center of the shaft** to jar the bearing loose from the tapered sleeve. Swinging at an angle will shift the bearing around on the tapered sleeve but will not actually loosen it.

   If the bearing unit resists separating from the tapered sleeve, use wood blocks as a wedge behind the bearing unit so that it cannot move.

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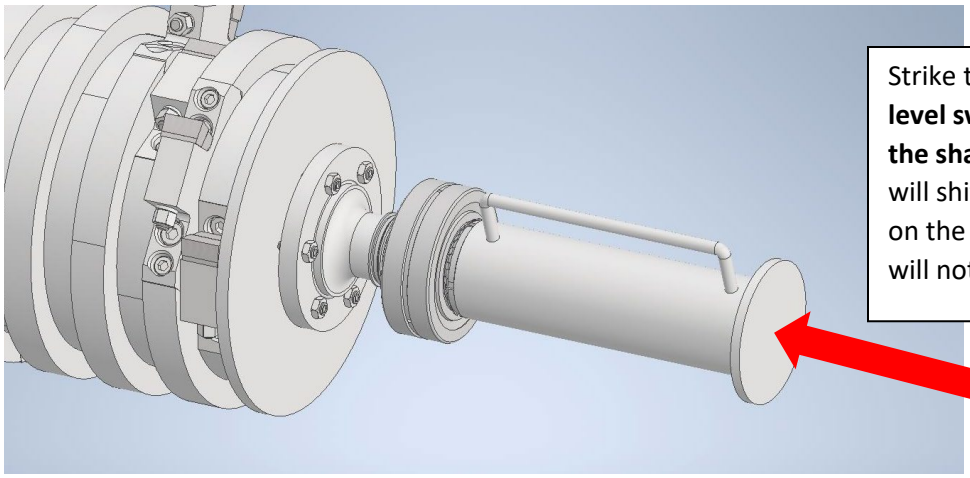

Figure 5.15: Dislodging Bearing Unit from Tapered Sleeve

6. Once the bearing unit is loose, all the bearing components will easily slide off the shaft.

[Installing a New Bearing]

1. Clean the shaft thoroughly and remove any rough spots with either a file or an emery cloth.
2. Screw off the nut and remove the locking washer.

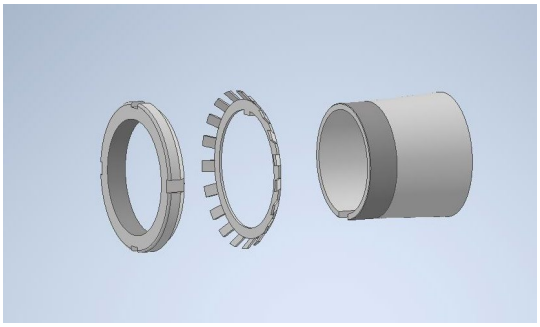

Figure 5.16: (Left to Right) Bearing Nut, Locking Washer, and Tapered Sleeve

3. Wipe the preservative from the surface of the sleeve and then oil the bore surface lightly. Use a thin mineral oil.

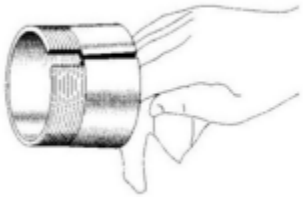

Figure 5.17: Wiping Sleeve with Thin Mineral Oil

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4. Slide the inner bearing oil seal onto the shaft prior to sliding on the adapter.

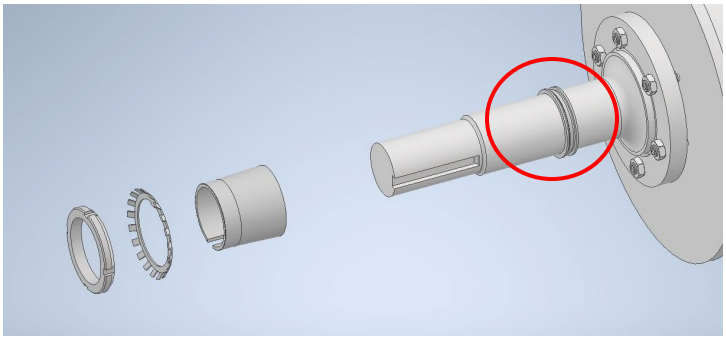

Figure 5.18: Inner Bearing Oil Seal

5. Open up the sleeve by inserting a screwdriver into the slit. Then, slide the sleeve along the shaft to the correct position.

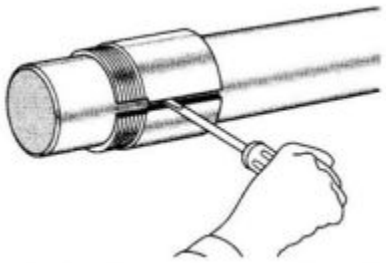

Figure 5.19: Sliding Sleeve onto Shaft

6. Wipe the preservative from the bore of the bearing and then oil the surface lightly. Use a thin mineral oil.

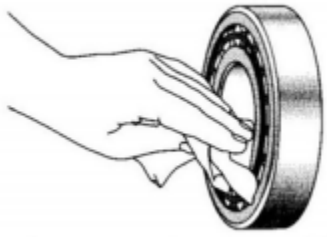

Figure 5.20: Wiping Bearing with Thin Mineral Oil

7. Place the bearing on the sleeve. Screw on the nut with its chamfer facing the bearing, but do not mount the locking washer. Do not push the inner ring up on the taper.

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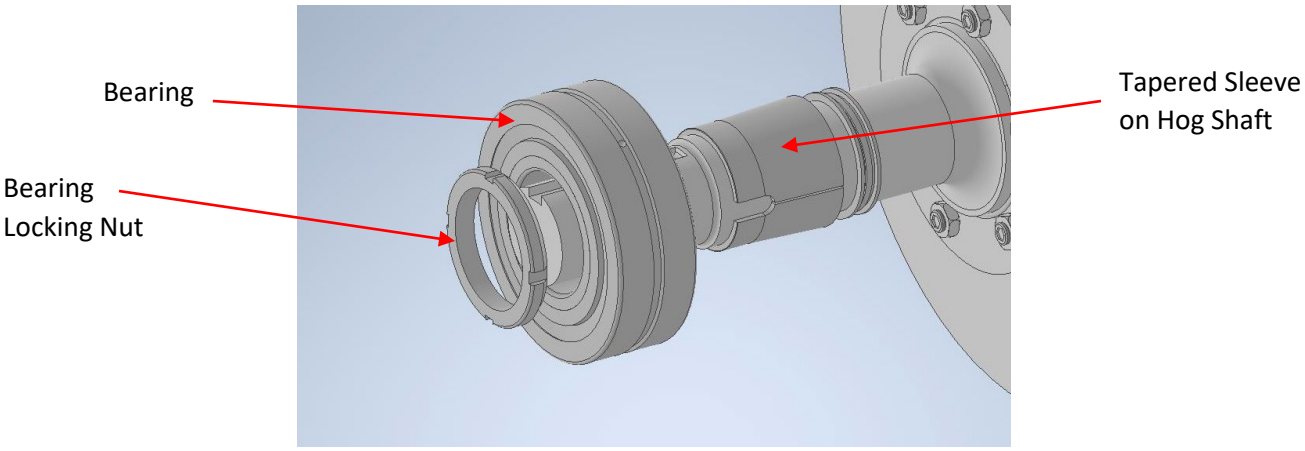

Figure 5.21: Bearing Nut, Bearing, and Tapered Sleeve

8. The bearing unit is secured on the shaft by tightening the lock nut with a spanner wrench or with a blunt chisel and hammer. Turn the nut sufficiently to ensure that the shaft makes proper contact (self-locking) with the sleeve, but do not drive the bearing any further up the sleeve until you begin checking the mounted clearance.

Figure 5.22: Securing Bearing Unit on Shaft

9. While continuing to tighten the nut, keep checking the clearance between the top roller and outer race with a feeler gauge until the proper clearance is reached. Refer to the table below for clearance requirements, based on the bearing manufacturer's recommendations.

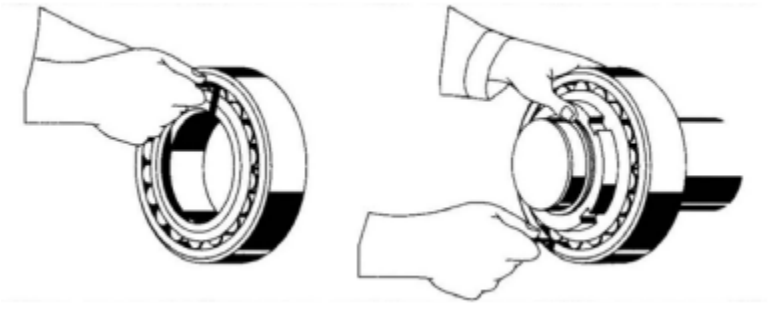

Figure 5.23: Checking Clearance Against Table Values

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Table 9: Clearance Requirements for SKF Bearings

Shaft Journal	Bearing	Bore (mm)	Unmounted Clearance	Reduction in Internal Clearance	Mounted Clearance
2.9375	22217 CCK/C3W33	85	0.0043-0.0055	0.0018-0.0025	0.0025-0.0030
3.9375	22222 CCK/C3W33	110	0.0053-0.0067	0.0020-0.0028	0.0033-0.0039
4.4375	22226 CCK/C3W33	130	0.0063-0.0079	0.0025-0.0035	0.0038-0.0044
4.9375	22328 CCK/C3W33	140	0.0063-0.0079	0.0025-0.0035	0.0038-0.0044
5.4375	22232 CCK/C3W33	160	0.0071-0.0091	0.0030-0.0040	0.0041-0.0051

**Note: Values are in inches unless noted. The above clearances are based on a Class 3 fit.*

10. Once the proper mounted clearance is achieved, unscrew the nut, place the locking washer in position, and tighten the nut firmly again.

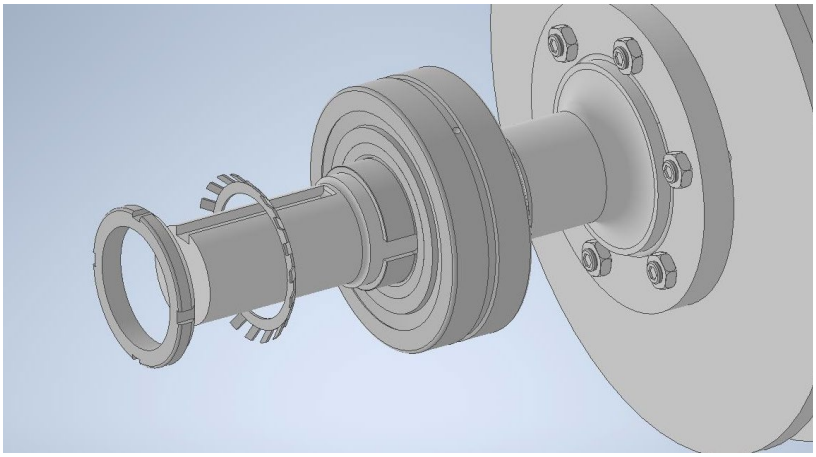

Figure 5.24: Installing Locking Washer and Locking Nut

11. Check that the shaft or outer ring can be easily rotated by hand.

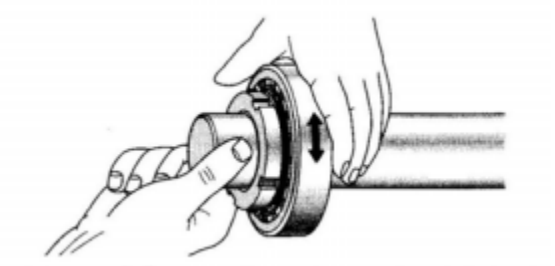

Figure 5.25: Checking Outer Ring Rotation

CAUTION: A loose adapter sleeve can lead to the inner ring turning on the adapter sleeve and/or the adapter sleeve turning on the shaft. To ensure that the nut is not excessively tight,

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make certain the outer ring of the bearing rotates freely. For a Class 3 fit bearing, the outer ring will swivel freely.

12. Allow rotor and bearing unit to rest in the bottom half of the housing for final tightening.

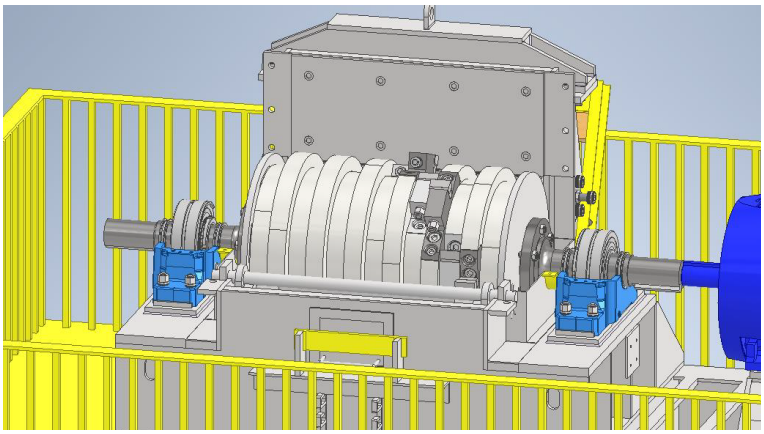

Figure 5.26: Rotor and Bearing Units Resting in Lower Housing

13. Verify mounted clearance and tighten further as needed. Refer to Table 8 for clearance requirements, based on the bearing manufacturer's recommendations.

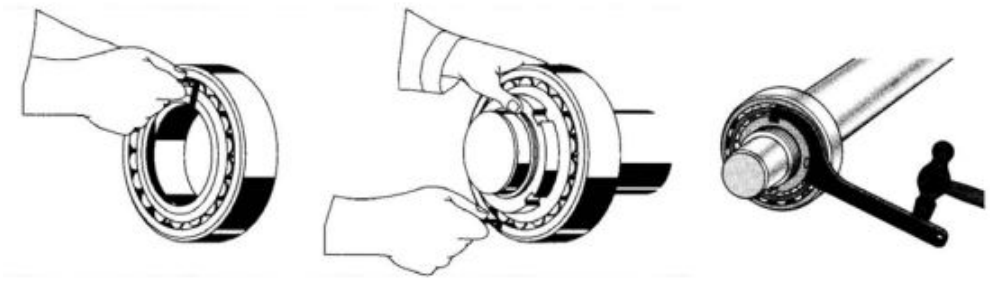

Figure 5.27: Verifying Mounted Clearance

14. Lock the lock nut in place by bending one of the locking washer's tabs down into one of the slots in the nut. Do not bend it to the bottom of the slot.

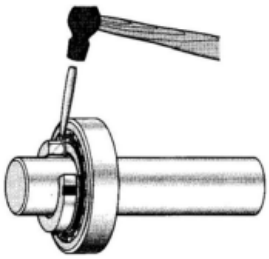

Figure 5.28: Locking the Locking Nut and Locking Washer

15. Apply lubrication. See *Maintenance: Bearing Lubrication* section for more information.

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16. Slide the outer bearing housing oil seal onto the shaft and insert the stabilizing ring, if applicable.

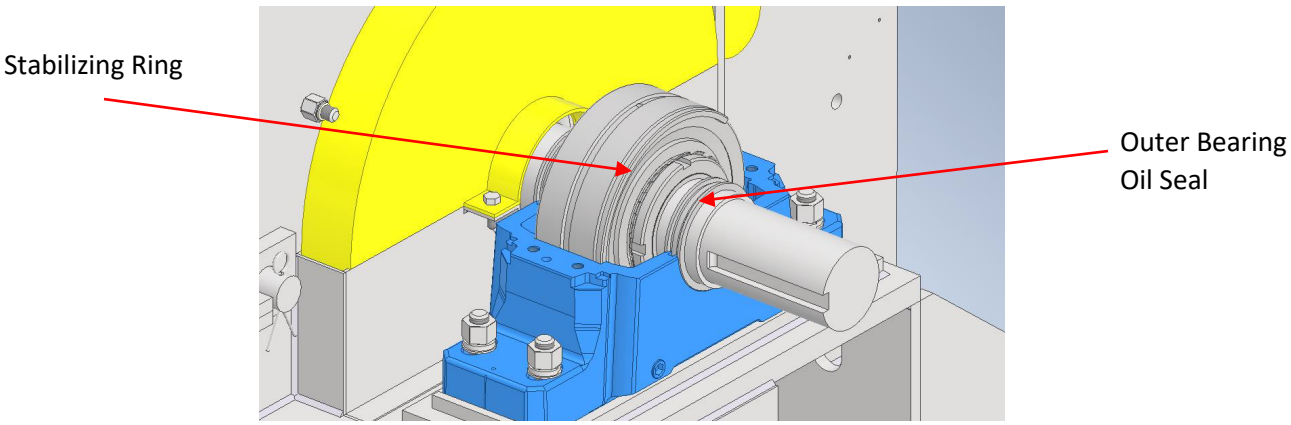

Figure 5.29: Stabilizing Ring & Outer Oil Seal

The hog uses only one stabilizing ring per set of bearings, customarily installed on the drive end. The stabilizing ring is a partial ring that can be installed around the shaft and located inside the bearing housing after the bearing has been attached.

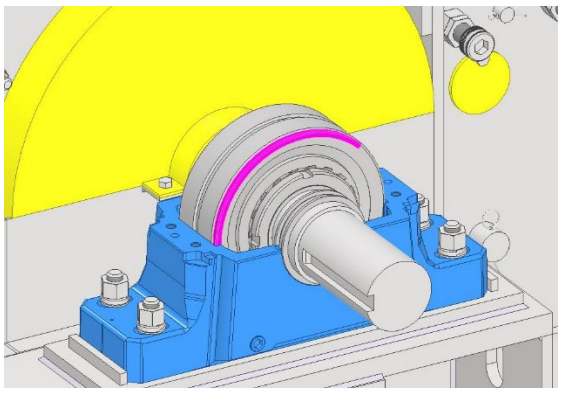

Figure 5.30: Stabilizing Ring (Highlighted in Pink)

17. Replace the upper housing of the bearing.

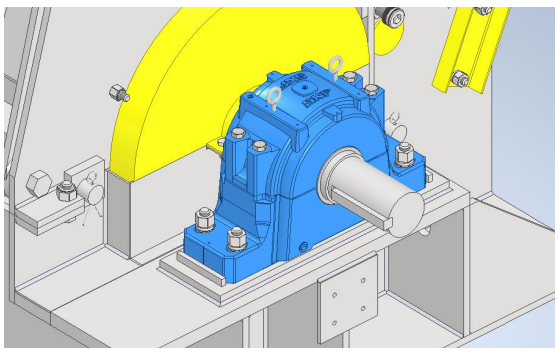

Figure 5.31: Complete Bearing Unit Installed

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➤ ROTOR REMOVAL

For certain maintenance procedures (such as replacing bearings) it is strongly encouraged that the rotor be removed from the housing. The upper housing of the hog must be removed, as well as the hopper, the bearing upper housings, and guard covers.

USE EXTREME CAUTION WHEN REMOVING HOUSING COMPONENTS AND THE ROTOR. FINGERS ARE EASILY MASHED OR CUT. PROPER LIFTING EQUIPMENT SHOULD BE USED FOR MECHANICAL ADVANTAGE WHEN REMOVING THE ROTOR.

1. Remove the hopper.

   The hopper is welded to the companion flange, which is then bolted to the top of the hog. In order to remove the hopper, the companion flange must be unbolted.

   PM-KC:

   For 17” feed opening units, there are eight 1/2" diameter bolts that must be removed (4 on each side). For 21” feed opening units, there are ten 1/2" diameter bolts that must be removed (5 on each side).

   CS-KC:

   For 24” feed opening units, there are twelve 1/2” diameter bolts that must be removed (6 on each side). For 30” feed opening units, there are fourteen 1/2” diameter bolts that must be removed (7 on each side).

   XL-KC:

   For 24” feed opening units, there are fourteen 1/2” diameter bolts that must be removed (7 on each side). For 35-3/8” feed opening units, there are sixteen 1/2" diameter bolts that must be removed (8 on each side).

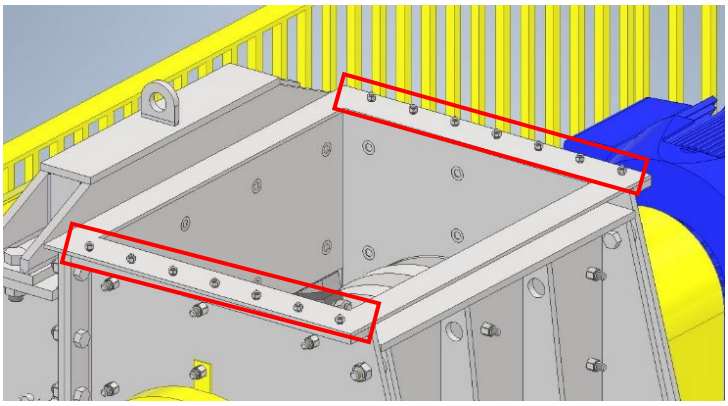

Figure 5.32: Companion Flange Bolts

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2. Remove the rear door.

BEFORE OPENING OR REMOVING THE REAR DOOR, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO THE PADEYE PROVIDED. IT IS TOO HEAVY TO HANDLE WITHOUT PROPER MATERIAL HANDLING EQUIPMENT.

The rear door is attached to the housing with four bolts (two on each side). Each side has a 1" diameter bolt at the top and a 1-1/2" diameter bolt at the bottom. All four bolts must be removed before the door can be lifted out of place.

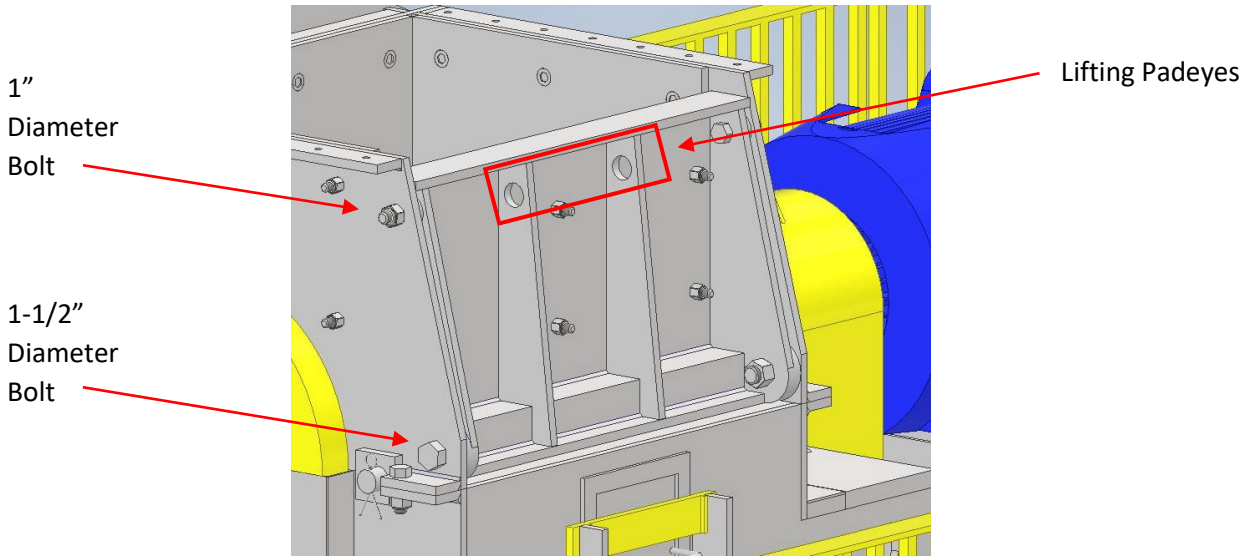

Figure 5.33: Rear Door Bolts

If the rear door is equipped with hydraulics, remove the clevis pin from the clevis to disconnect the cylinders from the door.

3. Remove the hog upper housings.

If the rear door is equipped with hydraulics, the upper door cylinders must be unbolted from the upper housing mounting plates before the upper housing side plates can be removed.

Both the left and right upper housings must be removed. They are attached to the lower housing via eight 1" diameter bolts (4 on each side). There is one bolt on the rear door side of the hog that must be removed, and three bolts on the anvil side of the hog.

Note: on the XL-KC, there are a total of 12 bolts – each upper housing has 4 bolts on the anvil side and 2 bolts on the rear door side.

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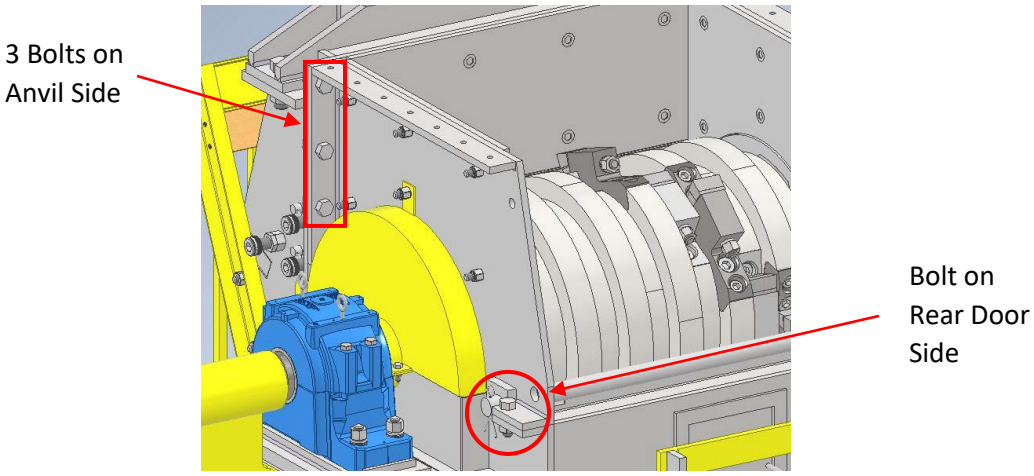

Figure 5.34: Upper Housing Bolts

Additionally, the bolts securing the finger guard covers in place must be removed. They are 1/2” diameter bolts, and there are two on each side of the hog.

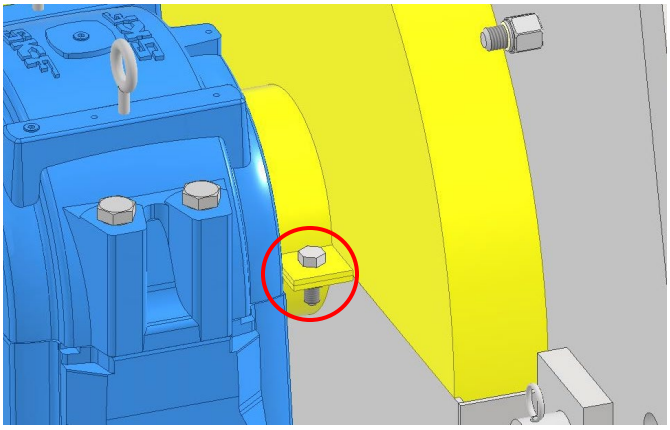

Figure 5.35: Finger Guard Cover Bolts

4. Remove the bearing upper housings and remaining shaft guards.

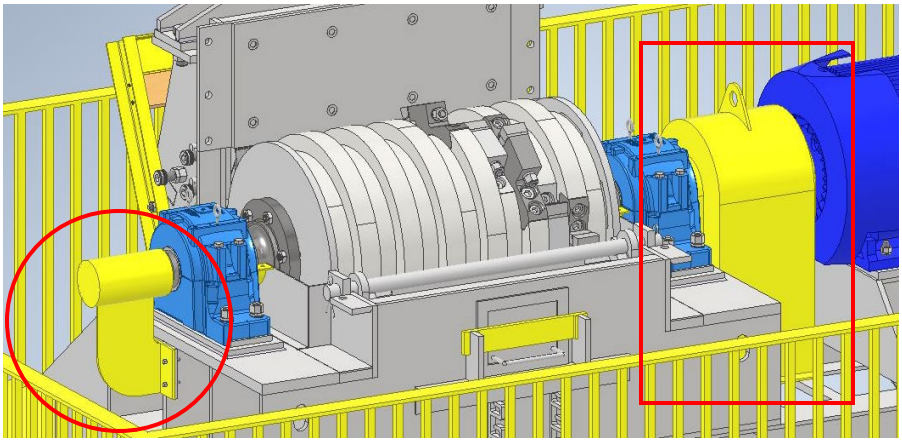

Figure 5.36: Shaft Guards

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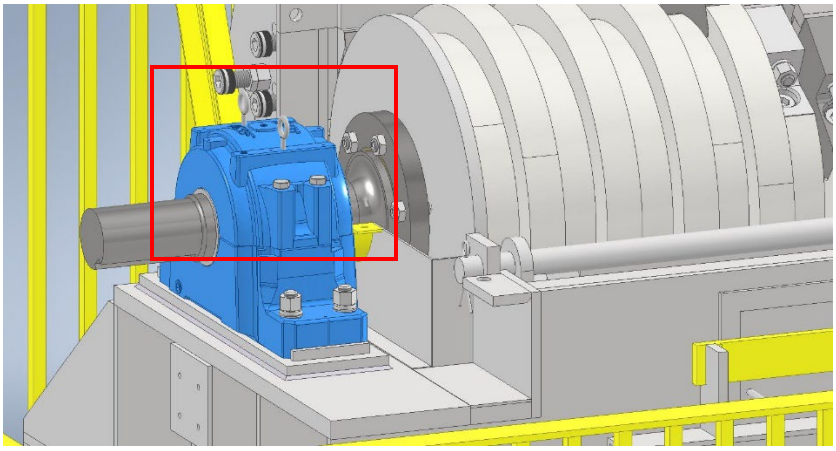

Figure 5.37: Bearing Upper Housing

5. Remove the coupling between the rotor shaft and the motor.

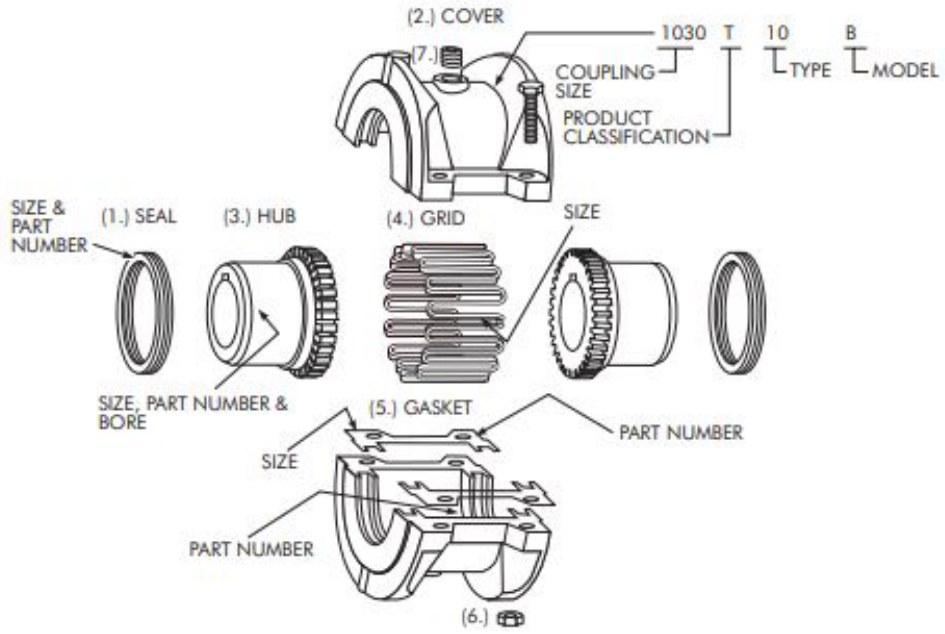

Figure 5.38: Motor Coupling Components[3]

First, the cover halves and grid must be removed. A round rod or screwdriver is required to fit into the open loop ends of the grid.

(3) Falk 428-110 Steelflex Installation and Maintenance Guide, Page 6

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Begin at the open end of the grid section and insert the rod or screwdriver into the loop ends. Use the teeth adjacent to each loop as a fulcrum and pry the grid out radially in even, gradual stages, proceeding alternately from side to side.

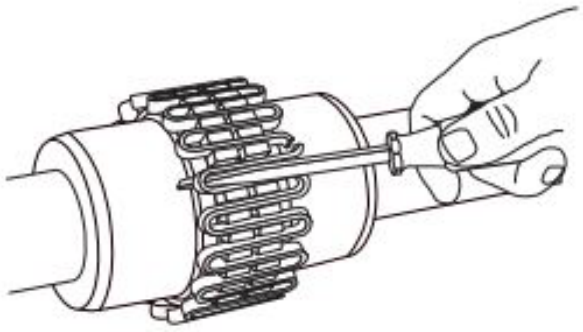

Figure 5.39: Grid Removal[4]

6. The rotor is now ready for removal.

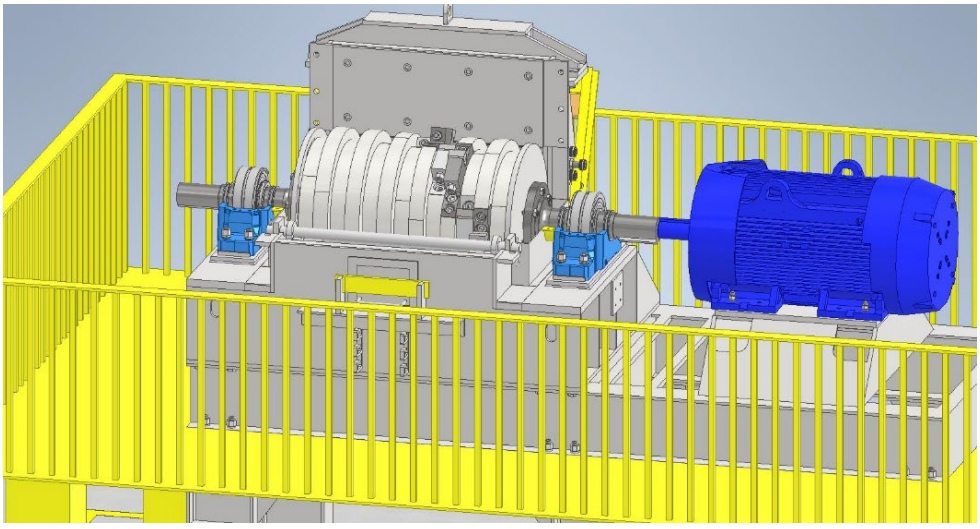

Figure 5.40: Rotor Ready for Removal

Chains should be run under the body of the rotor so it can be lifted out of the housing. A chain must be run on both sides of the rotor to balance the weight. Chains should wrap around the small rings (the lower rings) to prevent slipping or twisting.

If the bearing on the motor side is being removed, the hub on the hog side of the coupling must be removed. The hub is keyed and temperature fit, so the unit must be heated for removal.

(4) Falk 428-110 Steelflex Installation and Maintenance Guide, Page 4

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1. Check temperature of bearings.

   Temperature monitor decals are attached to the top of the bearing to aid in determining the operating temperature of the bearing.

Figure 5.41: Temperature Monitor Decal

   The normal operating temperatures are between 140° F and 160° F (between 60° C and 71° C). Operating temperatures are allowable up to 200° F (93° C).

   During the first day or two of operation, new bearings may heat up to temperatures exceeding the normal range. Although this occurrence is expected, bearings should be checked daily for one week to ensure that the temperature has decreased to a normal operating range after the bearing has seated and adjusted to the housing.

   Operating temperatures above 200° F (93° C) will cause most lubricants to break down, which can result in damage to the bearing and hog.

2. Check the tightness of teeth daily.

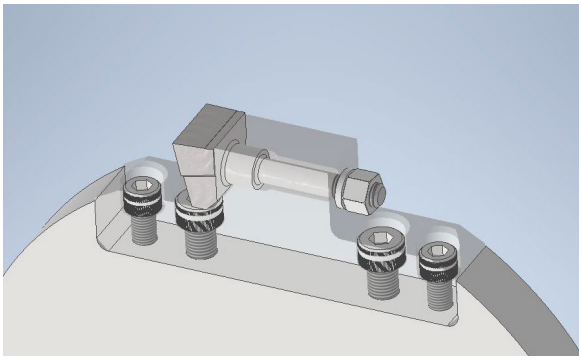

Figure 5.42: KC Tooth in Ring

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The recommended torques for KC teeth are given below.

Table 10: Recommended Torques for KC Teeth

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	330 ft-lbs
2-Part Teeth	450 ft-lbs
Manufactured Teeth	450 ft-lbs

Tightening beyond the elastic region of the steel can cause threads to stretch and/or the lock washer to permanently flatten or deform – any of which will undermine the connection.

IT IS THE RESPONSIBILITY OF THE USER TO KEEP THE TEETH PROPERLY TIGHTENED AT ALL TIMES.

3. Check the teeth and anvils for wear.

   The teeth and anvils should be inspected frequently until a wear pattern is established and the operator knows at what interval the parts must be rebuilt.

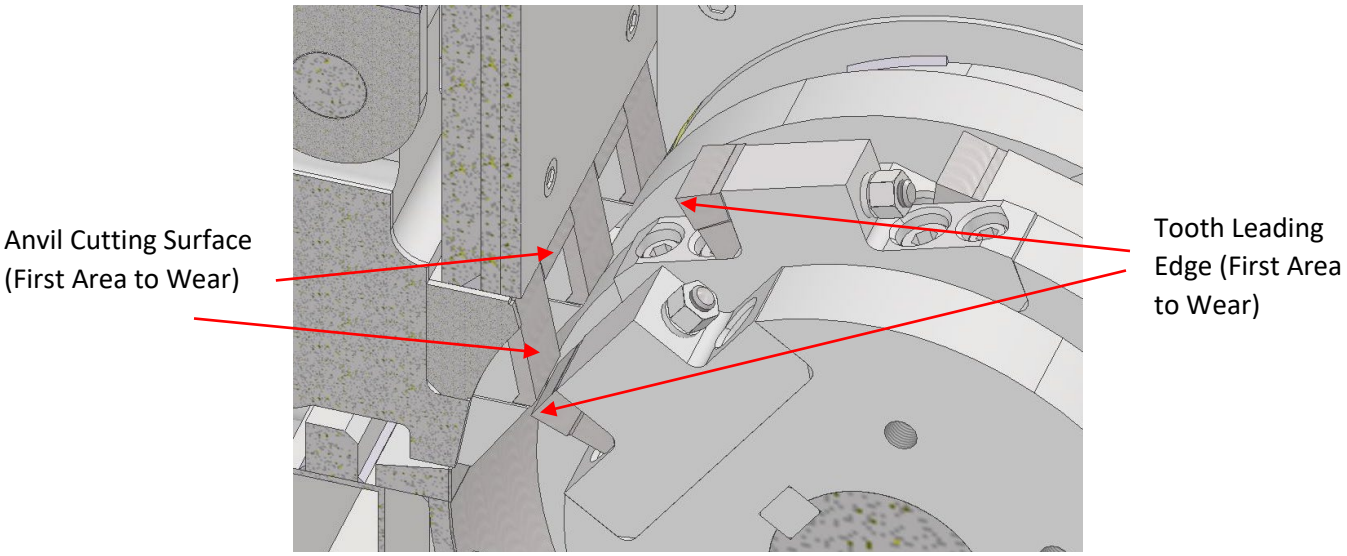

Figure 5.43: Teeth and Anvil Point Wear Zones

For further information on teeth wear, see Appendix C: *Bulletin 23-30-12 Hardsurface Wear Zones on KC Teeth.*

4. If the hog is V-Belt driven, V-Belts should be initially re-checked and re-tightened after one to two weeks of operation. After this initial break-in period, the belts should be checked periodically.

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➤ SCREEN REMOVAL AND INSTALLATION

The screen in a KC model hog is held in place by the screen pivot shaft, the screen latch, and the screen latch locking bar.

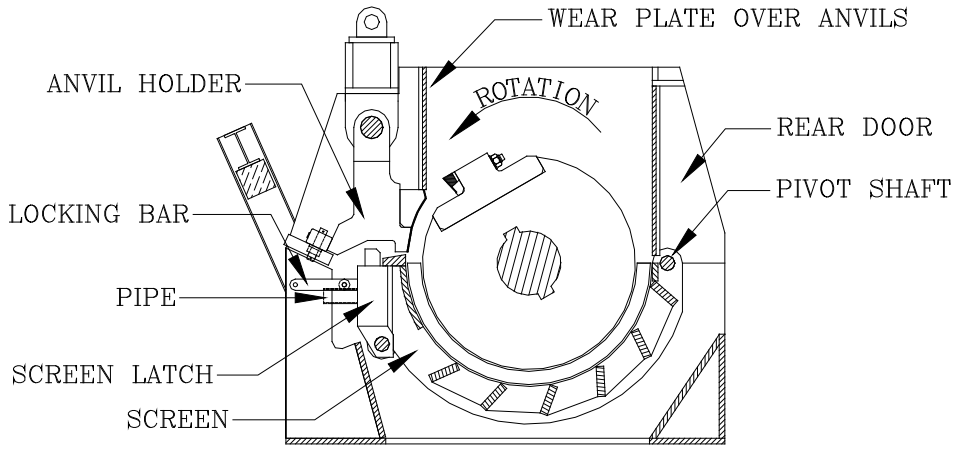

Figure 5.44: Screen Removal Components

STOP THE HOG.

DO NOT STICK FINGERS THROUGH HOLES IN THE SCREEN AT ANY TIME. SECURE THE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK. USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS.

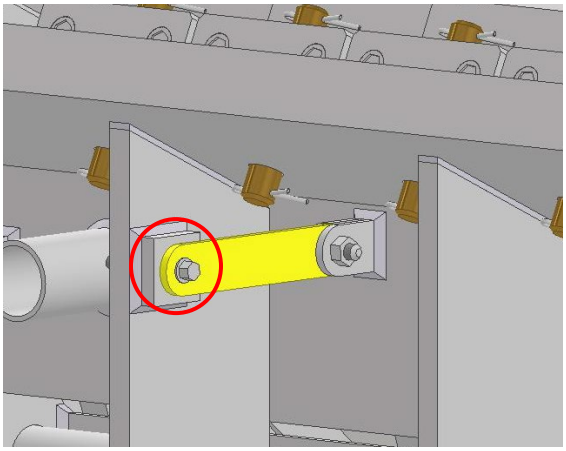

Figure 5.45: 3/8" NC Grade 2 Cap Screw

1. Remove the 3/8” NC Grade 2 cap screw from the locking bar located under the anvil holders.

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2. Place a steel bar in the short piece of pipe welded to the screen latch and press down, allowing the screen to trip and fall out of position.

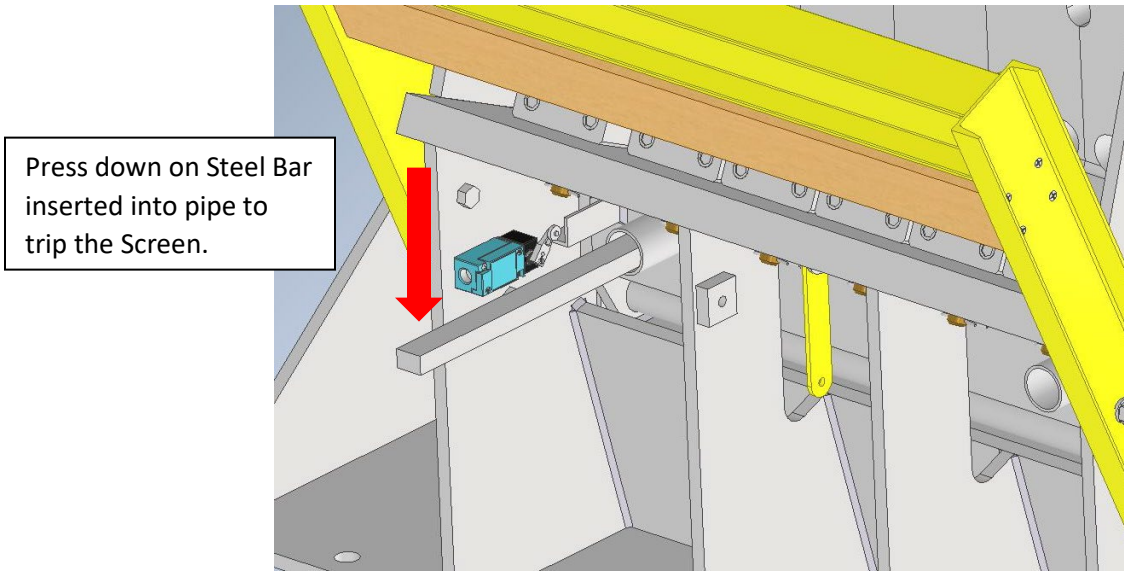

Figure 5.46: Steel Bar in Pipe

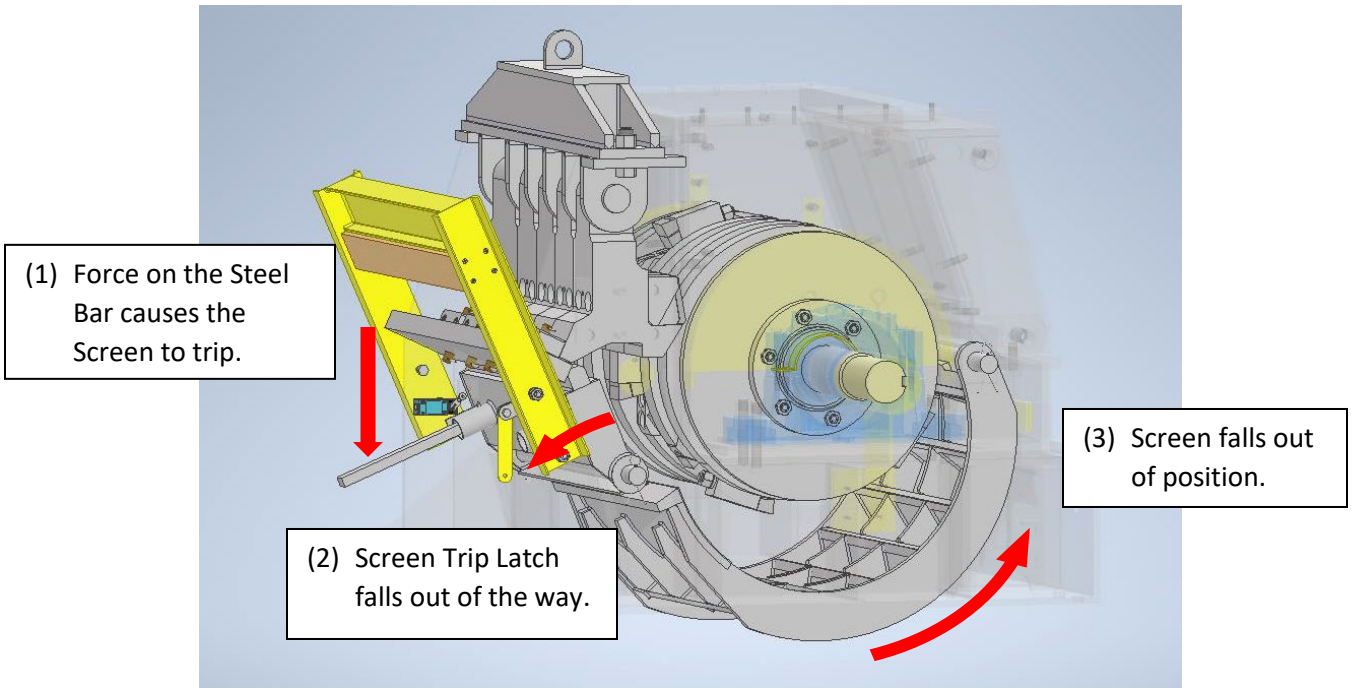

Figure 5.47: Tripped Screen Falls Out of Position

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3. Open the rear door.

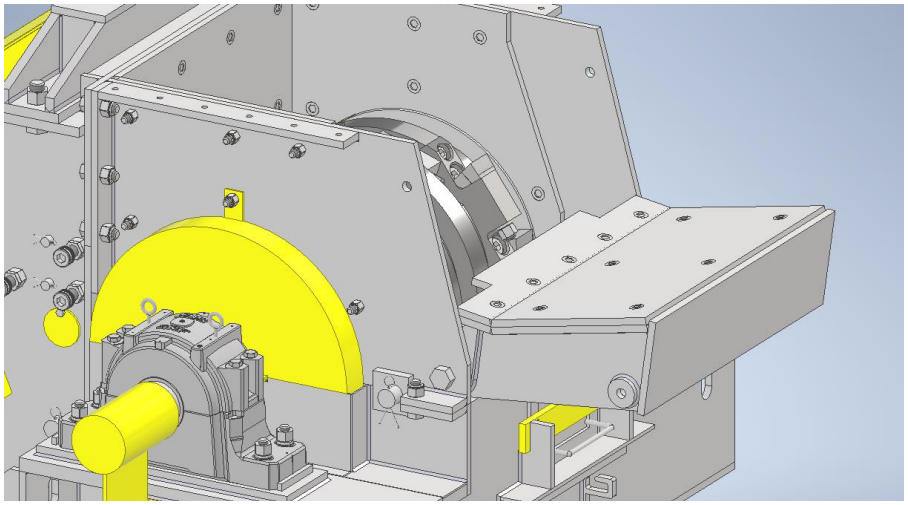

Figure 5.48: Opened Rear Door

BEFORE OPENING THE REAR DOOR, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO THE PADEYE PROVIDED.

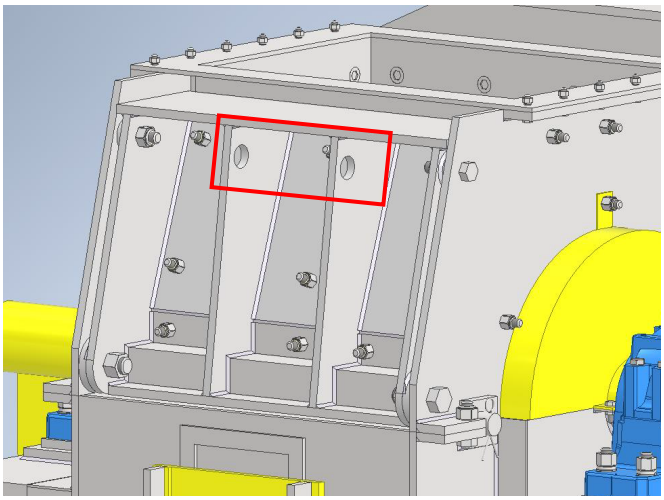

Figure 5.49: Lifting Padeyes

USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS.

DO NOT PUT FINGERS IN BOLT HOLES.

KEEP CLEAR WHEN OPENING OR CLOSING REAR DOOR.

BE SURE THAT ALL PERSONNEL ARE CLEAR OF SCREEN FALLING AREA.

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4. Remove the wear plates if necessary (on older models).
5. Fasten a sling or chain hook to the screen next to the pivot shaft, approximately in the center of the screen.

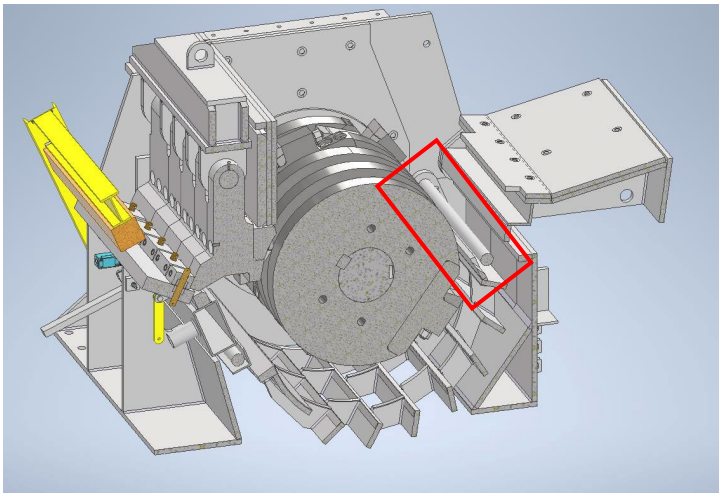

Figure 5.50: Screen Pivot Shaft

6. Lift up with chain until pressure is off the pivot shaft. Then remove the pivot shaft.

   If the unit is not equipped with a hydraulic screen reset, remove the cotter pins holding the pivot shaft in place. Then, use a sledgehammer to drive the shaft out one side of the hog.

   If a hydraulic screen reset has been installed, the hydraulic components must be removed. First remove the hydraulic cylinders and cotter pins. Then, remove the setscrew from three of the four notched collars to allow the screen to move sideways within the hog. The shaft can now be driven out with a sledgehammer. Make certain to keep all keys and spacers for proper reinstallation of the screen.

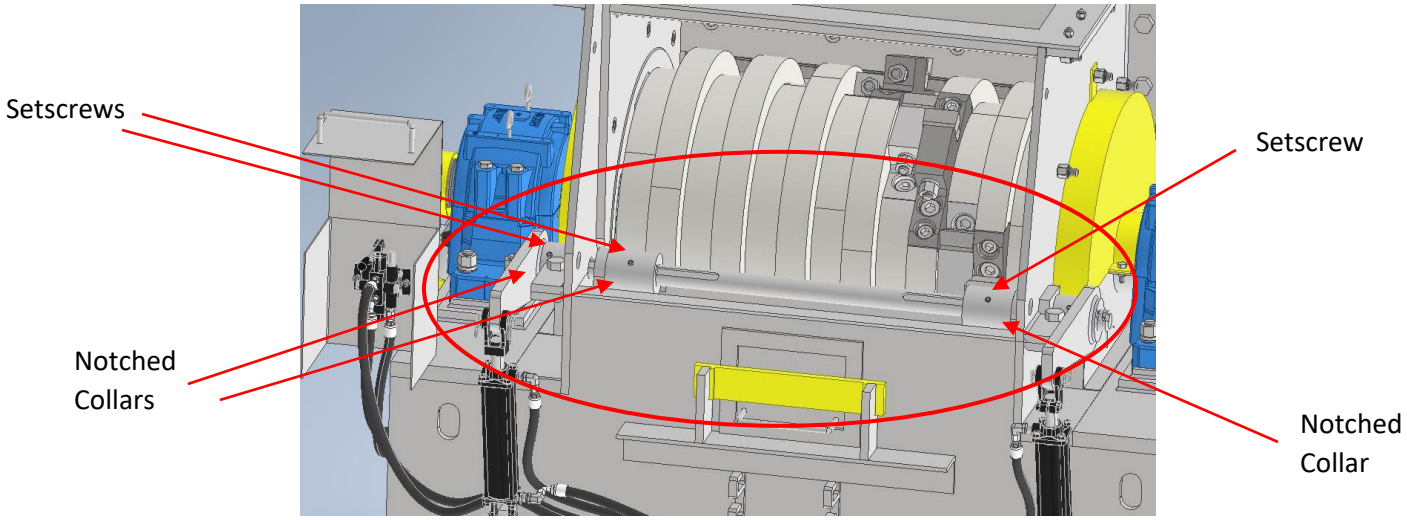

Figure 5.51: Hydraulic Screen Reset Components

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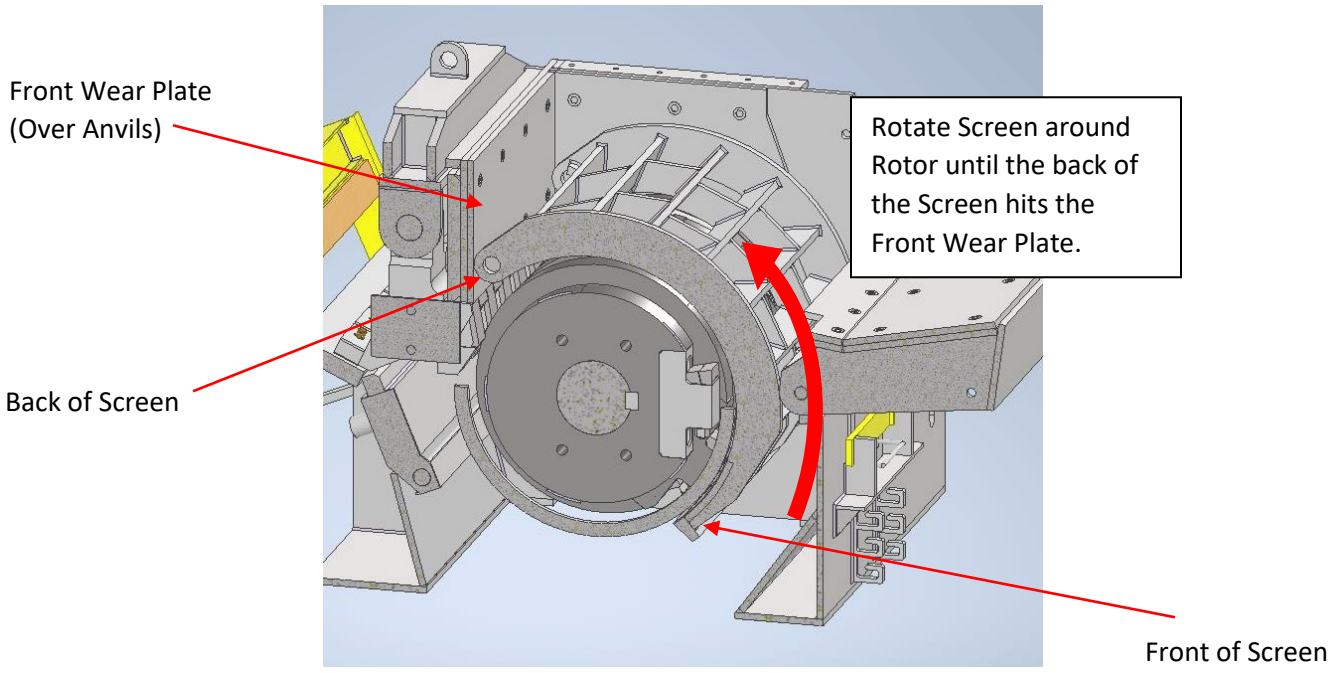

Figure 5.52: Screen Rotated Around Rotor

7. Roll the screen up and forward around the rotor until the back of the screen hits the wear plate over the anvils on the front of the housing. A pry bar inserted through the holes in the screen may be helpful for rolling the screen around the rotor.
8. Continue to lift with chain until the front of the screen clears the rear door.

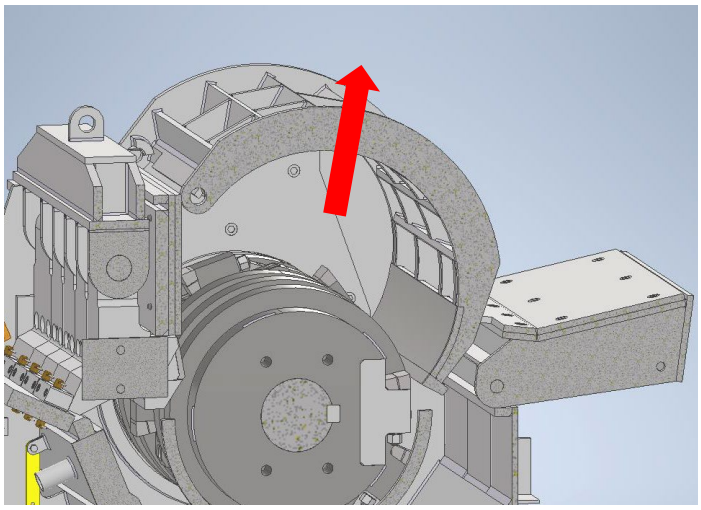

Figure 5.53: Lifting Screen out of Hog

On small feed opening doors (see *Principles of Operation: Feed Openings & Hoppers*), it may be required that the rear door be removed completely for the screen to clear.

9. Let the screen down.

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This procedure is reversed for installing the screen. Once the screen is back in the housing, it must be set back into operating position.

1. The screen must first be lifted so the screen bar (leading edge) is just above the trip latch. If the hog has been equipped with hydraulics, this is done using the hydraulic screen reset.

   Otherwise, the screen is raised by inserting a lever through the inspection door and prying the screen up. On PM-KC and CS-KC hogs, the inspection door is found below the rear door of the hog. On XL-KC hogs, the inspection door is found at the lower front of the hog under the screen latch.

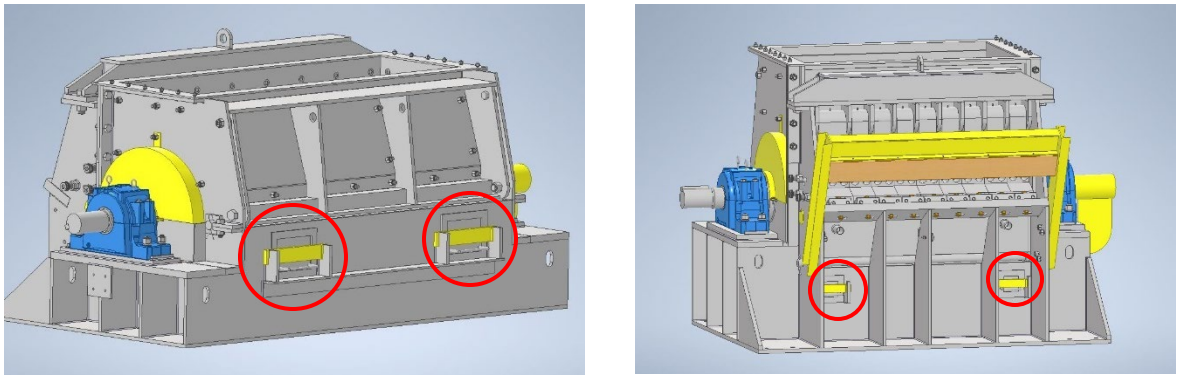

Figure 5.54: PM-KC & CS-KC Inspection Door (Left) & XL-KC Inspection Door (Right)

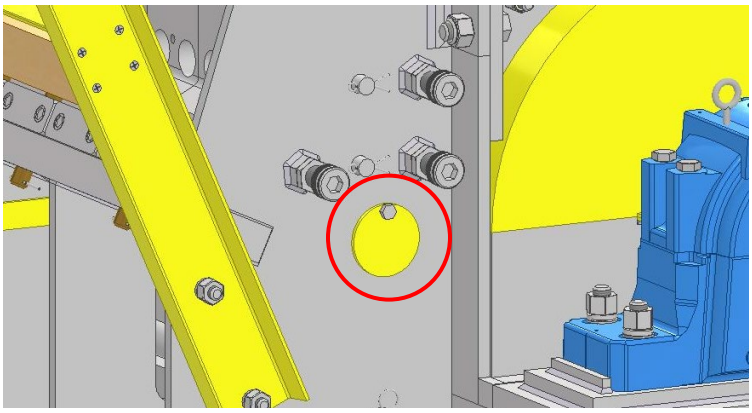

Figure 5.55: Inspection Hole Cover

2. Return the screen trip latch to the upright position. This can be accomplished by inserting a steel bar into the short piece of pipe and lifting up.

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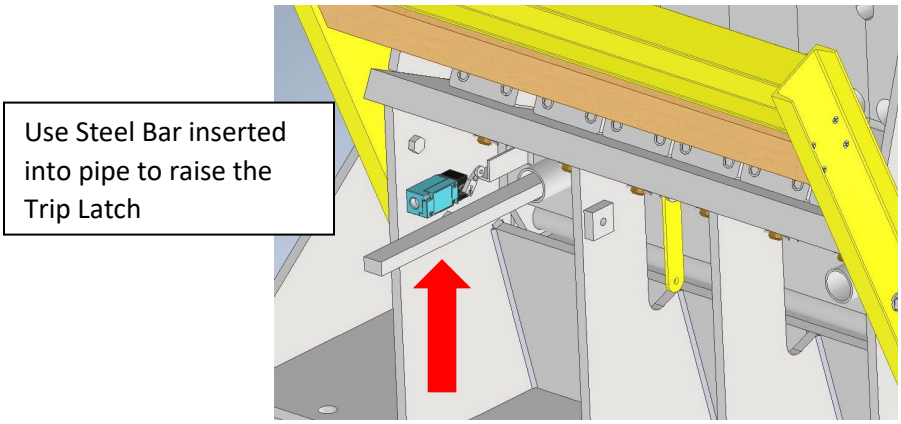

Figure 5.56: Lifting Trip Latch into Position

3. Secure the trip latch locking bar to the housing. A new 3/8” NC Grade 2 cap screw should be installed to hold it in place.

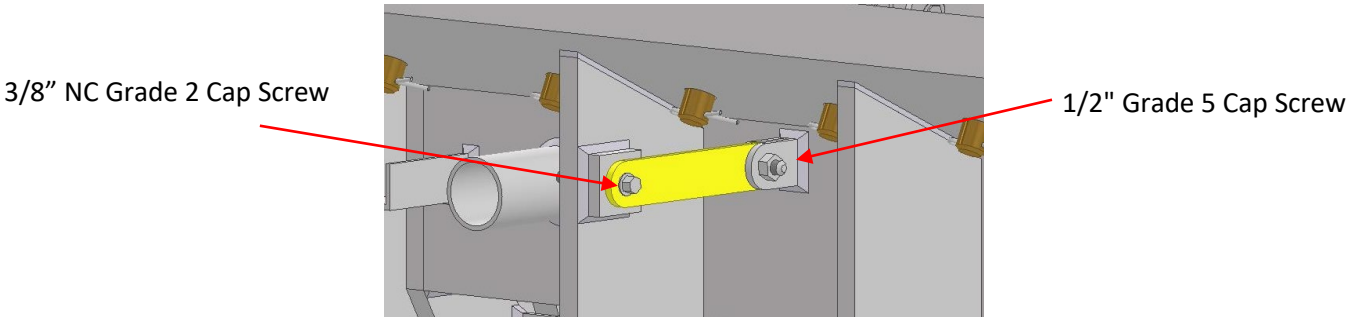

Figure 5.57: Fasteners in Screen Trip Latch Locking Bar

4. Lower the screen so the leading edge of the screen rests on the trip latch. An inspection hole is provided on each side of the hog to aid in determining if the screen has been properly reset in position.

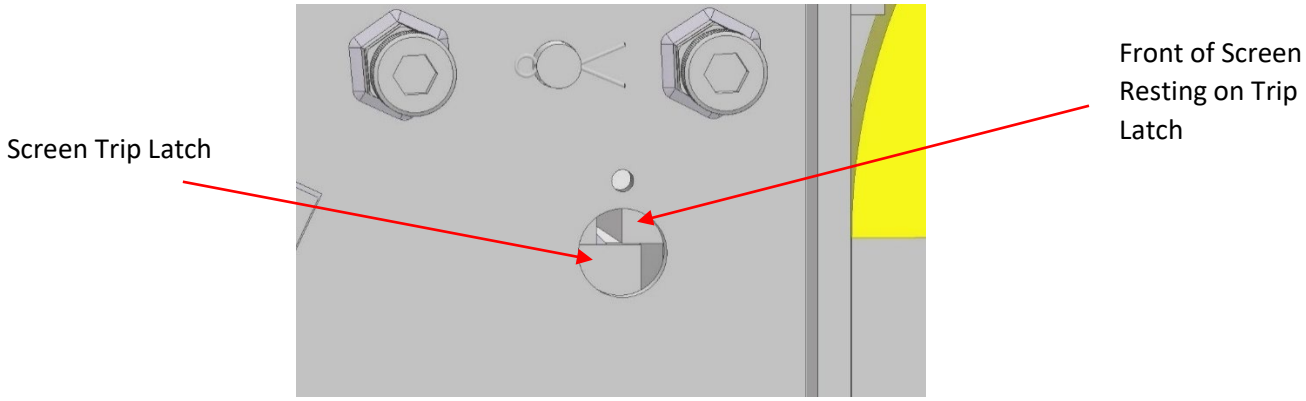

Figure 5.58: Screen & Trip Latch Viewed Through Inspection Hole

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➤ SHEAR BOLT REPLACEMENT

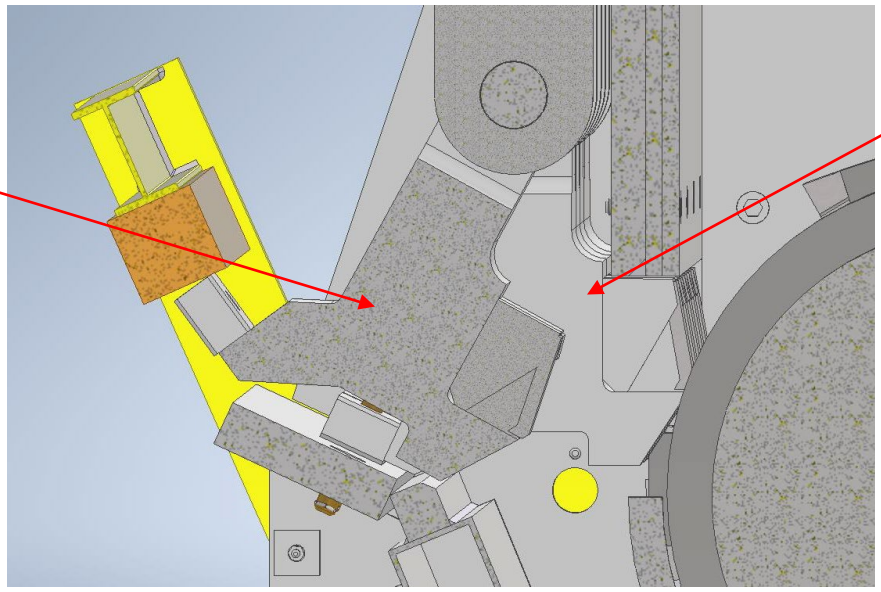

Figure 5.59: Sheared Shear Bolt, Anvil Holder out of Position

If a shear bolt has been sheared, allowing the swinging anvil holder to be knocked out of position, it is necessary to clear all foreign material out of the anvil holder seat. The pressure plate at each end of the anvil rack assembly must be loosened before the swinging anvil holder can be returned to its operating position and a new shear bolt inserted.

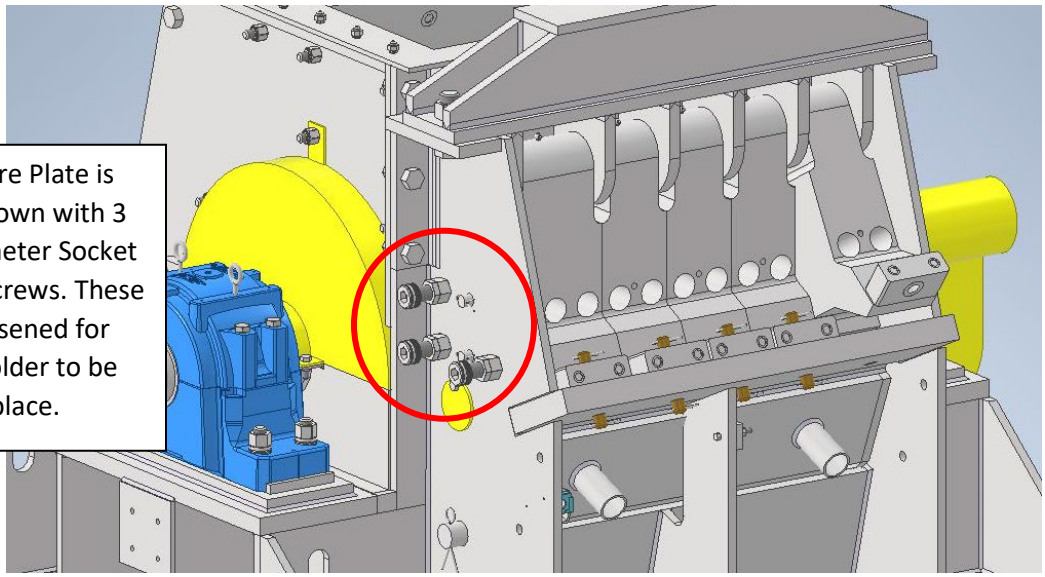

Figure 5.60: Pressure Plate Fasteners

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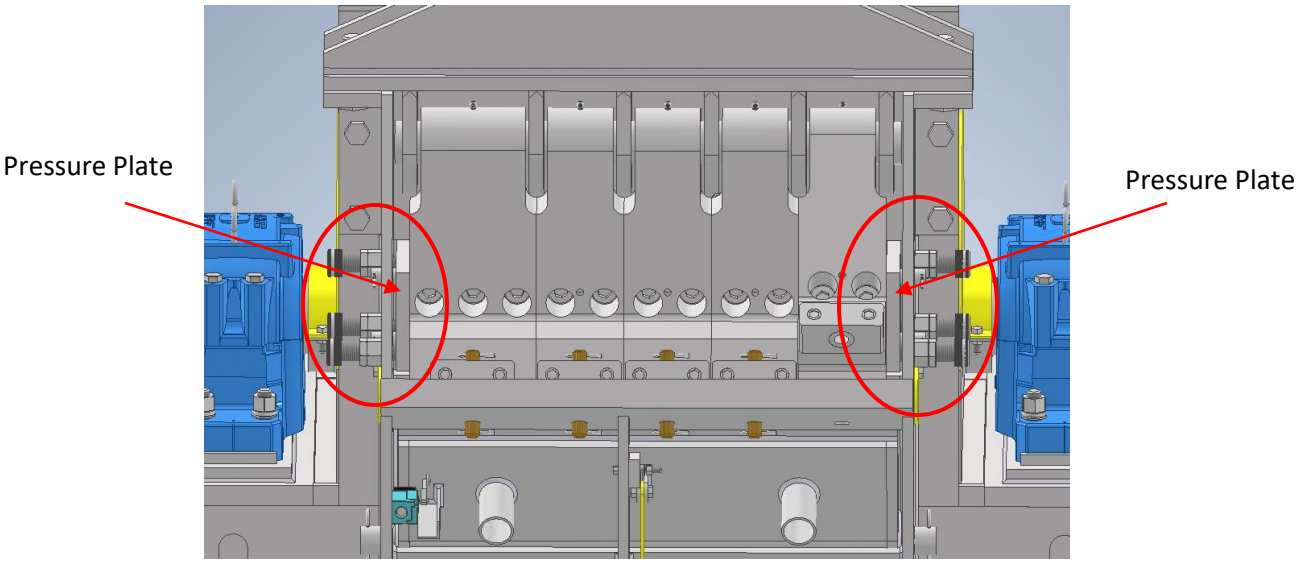

Figure 5.61: Pressure Plates

Shear Bolts are made from a brass alloy. No other type of material should be used unless approved by the factory.

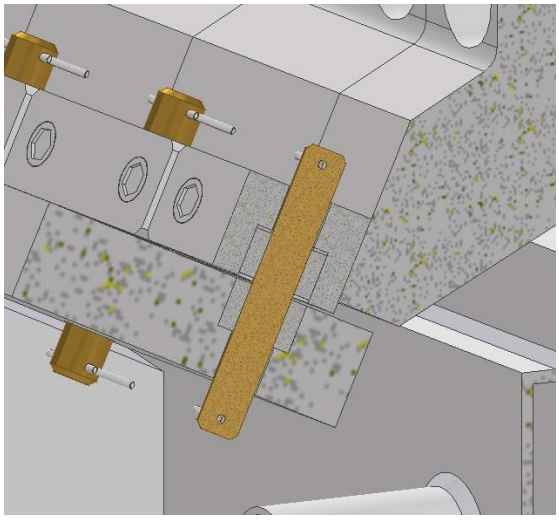

Figure 5.62: Bronze Alloy Shear Bolts

Re-tighten pressure plates after new shear bolts are installed.

Reset screen. See *Maintenance Procedures: Screen Removal and Installation* and follow the instructions for lifting the screen back into operating position.

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➤ TEETH – CHANGING

SECURE THE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK.

USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS.

To remove KC teeth, loosen the nut on the end of the tooth until it covers the end threads of the tooth shank. This protects the threads during removal.

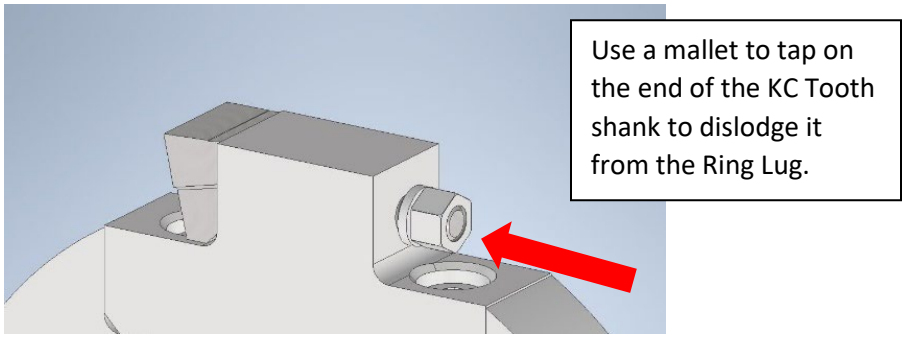

Figure 5.63: Loosened Hex Nut for Tooth Removal

Using a mallet, tap on the end of the tooth shank until the tooth dislodges from the ring lug. Once the tooth is loose, the hex nut and lock washer can be removed. The tooth can then be removed from the ring lug.

Before installing KC teeth, be sure that the face of the ring lug is clean and free of debris.

A wire brush should be used to clean the face of the ring lug before new teeth are inserted. This is critical for proper tightening of teeth.

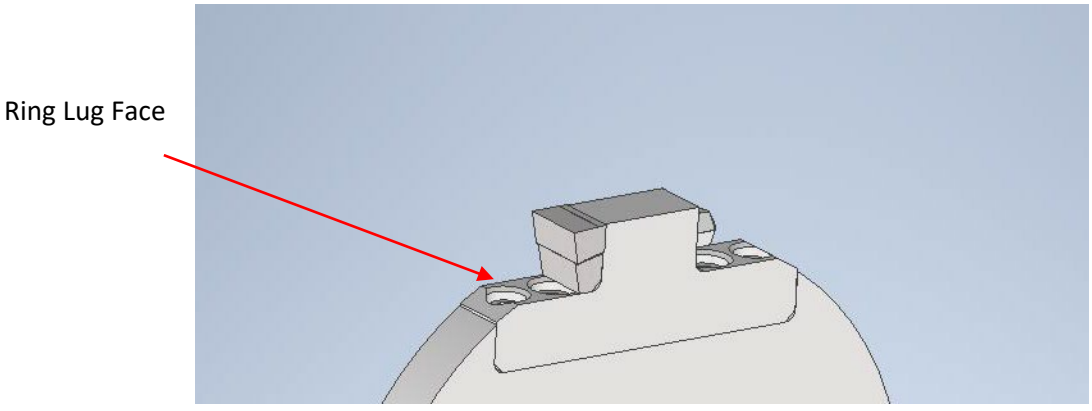

Figure 5.64: Face of Ring Lug

All new and factory repaired teeth are shipped with a heavy-duty hex nut and lock washer, which should be replaced each time parts are changed to ensure the integrity of the fastener.

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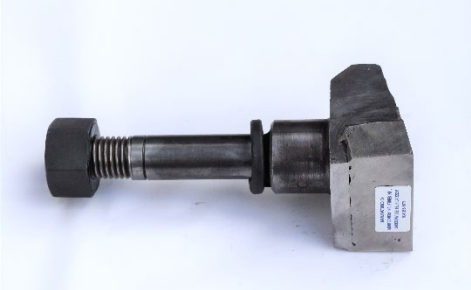

Figure 5.65: KC Tooth & Included Fasteners

When installing KC 2-Part Teeth, use Grade-5 bolts and lock washers.

Make certain all teeth are tight. The recommended torques for KC teeth are given below.

Table 11: Recommended Torques for KC Teeth

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	330 ft-lbs
2-Part Teeth	450 ft-lbs
Manufactured Teeth	450 ft-lbs

Tightening beyond the elastic region of the steel can cause threads to stretch and/or the lock washer to permanently flatten or deform – any of which will undermine the connection.

A loose tooth can hit the anvils and/or the screen, causing damage to the unit and possibly causing severe injury to personnel in the area.

While changing teeth, inspect the anvil points for wear and determine if they also need changing. As a practical matter, the anvil points can only be removed after the teeth have been removed. See *Maintenance Procedures: Anvil Point Replacement* for more information.

Because the Montgomery Hog uses a high-speed precision cut, unchecked wear or failure to use Montgomery Industries factory parts can result in a loose or unpredictable fit of components.

LOOSE FITTING PARTS CAN INCREASE THE POTENTIAL FOR PART FAILURE DUE TO METAL FATIGUE. PART MOVEMENT FROM LOOSE FITTING PARTS CAN RESULT IN CATASTROPHIC COLLISION.

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➤ TEETH – CLEARANCE

The clearance between the sides of the teeth and anvil points is normally 1/32” to 1/16”.

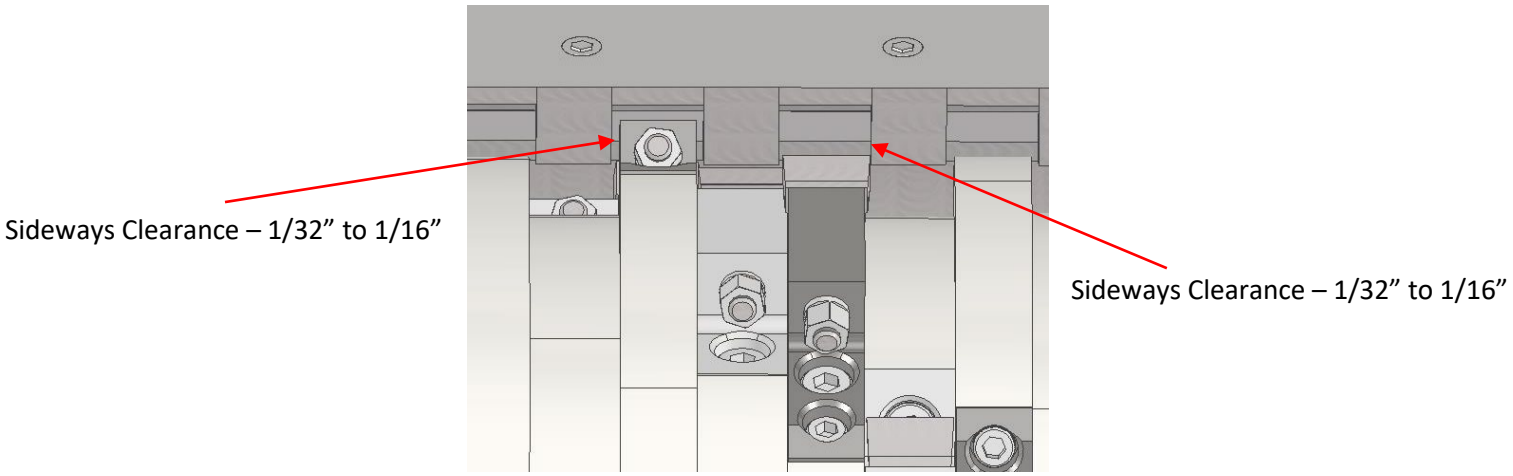

Figure 5.66: Anvil Points & Teeth – Side Clearance

The radial clearance between the teeth and anvil points is approximately 3/16”.

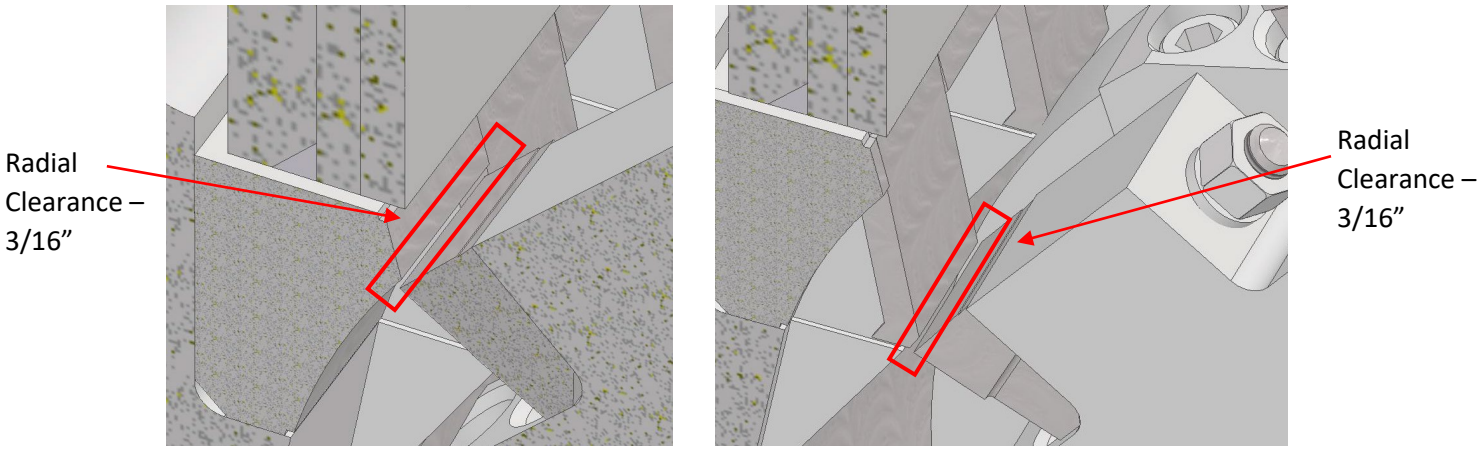

Figure 5.67: Radial Clearance of Teeth Between Small Anvil Point (Left) and Large Anvil Point (Right)

While insufficient clearance will result in a physical interference, too much clearance can result in loss of some capacity and stringy material passing through the hog uncut.

Teeth and anvil points should be rebuilt at the factory to Montgomery Industries’ factory specifications to ensure that proper clearances are maintained, and that no interference will result when rebuilt parts are installed in the hog.

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➤ TEETH – TIGHTNESS

Check the tightness of teeth daily.

The recommended torques for KC teeth are given below.

Table 12: Recommended Torques for KC Teeth

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	330 ft-lbs
2-Part Teeth	450 ft-lbs
Manufactured Teeth	450 ft-lbs

Tightening beyond the elastic region of the steel can cause threads to stretch and/or the lock washer to permanently flatten or deform – any of which will undermine the connection.

A LOOSE TOOTH CAN HIT THE ANVIL POINTS AND/OR THE SCREEN, CAUSING DAMAGE TO THE UNIT AND POSSIBLY CAUSING SEVERE INJURY TO PERSONNEL IN THE AREA.

The time over which the teeth will loosen varies with each application. Common factors that affect tightness include the following:

- Type of material processed
- Quantity of material processed
- Hours per day of operation
- Tramp metal occurrence
- Integrity of the tooth
- Initial torque/tightness
- Integrity of the ring
- Integrity of the lug insert
- Amount of vibration/balance of the hog

IT IS THE RESPONSIBILITY OF THE USER TO KEEP THE TEETH PROPERLY TIGHTENED AT ALL TIMES.

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TROUBLESHOOTING INFORMATION

➤ BEARINGS ARE OVERHEATING

Temperature monitor decals are attached to the top of the bearing to aid in determining the operating temperature of the bearing.

Figure 6.1: Tempilabel Decal

The normal operating temperatures are between 140° F and 160° F (between 60° C and 71° C). Operating temperatures are allowable up to 200° F (93° C).

Operating temperatures above 200° F (93° C) will cause most lubricants to break down, which can result in damage to the bearings and hog.

DO NOT RUN THE HOG WITH BEARING CAP BOLTS OR ANCHOR BOLTS LOOSE.

Potential Cause: Bearings are Adjusting to Housing

During the first day or two of operating, new bearings may heat up to temperatures exceeding the normal range. Although this occurrence is expected, bearings should be checked daily for one week to ensure that the temperature has decreased to a normal operating range after the bearing has seated and adjusted to the housing.

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Potential Cause: Bearings are Over-Lubricated

Too much grease or oil will cause overheating. Make sure that the bearing is well lubricated but not over lubricated.

When a bearing is overheating, it is common to assume that it needs lubrication. However, if a bearing is hot from too much lubrication, adding lubrication only worsens the problem.

Oil Bearings: To check for an excess amount of oil, inspect the oil sight gauge.

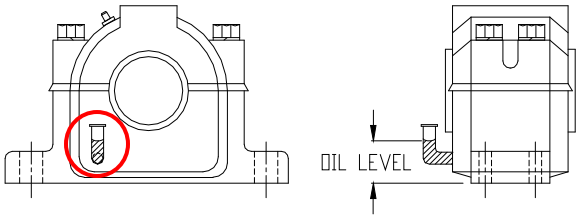

Figure 6.2: Oil Bearing Sight Gauge

Grease Bearings: **SHUT DOWN THE HOG.** To check for an excess amount of grease, remove the bearing cap and inspect.

If there is too much grease, it will be necessary to remove one (and only one) drain plug while the hog is running to permit excess grease to escape. Be sure to replace the drain plug.

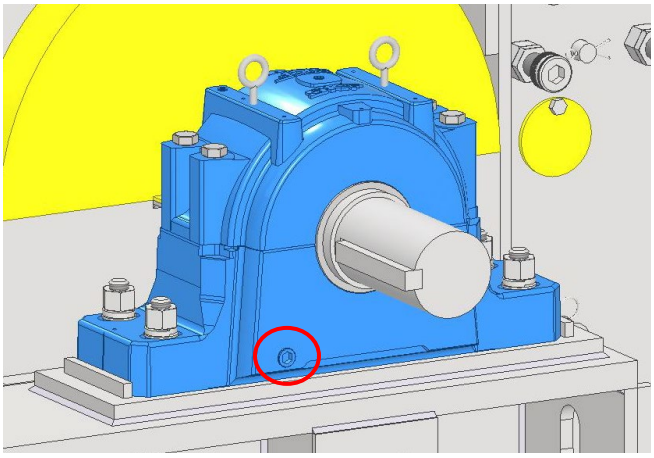

Figure 6.3: Grease Bearing Drain Plug

A good procedure to follow when lubricating a bearing is to remove one drain plug after lubricating. If a bearing has been over lubricated, the excess will escape. This procedure should be followed each time the bearing is lubricated to avoid overheating due to over lubrication.

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Potential Cause: Bearings are not Level on Hog Housing

A bearing tightened on an uneven surface will cause overheating.

Bearing plates are milled at the factory to meet strict tolerances. However, if a bearing has been changed and debris was not removed prior to installation, it may be resting uneven on the bearing plate.

SHUT DOWN THE HOG. Loosen the bearing bolts and check between the bottom of the bearing and the bearing plate with a feeler gauge. If there is material under the bearing, the bearing housing can warp – causing excessive heat under operation.

The bearing housing must be removed. A wire brush should be used to remove any dust or debris from the surface of the bearing plate. A new bearing housing can then be installed.

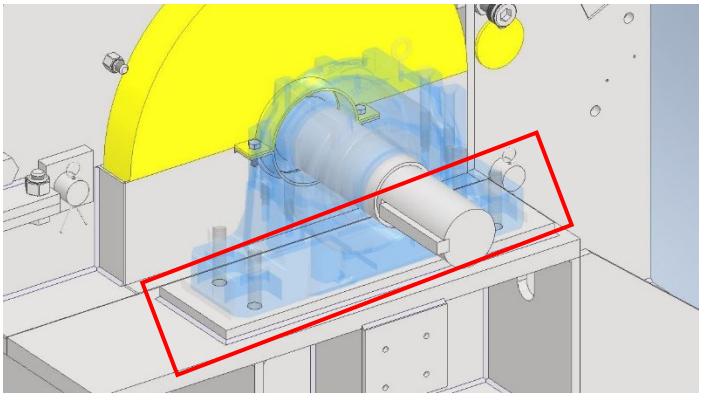

Figure 6.4: Bearing Plate

Potential Cause: Bearing Cap is not Level on Lower Bearing Housing

An uneven surface between the upper and lower bearing housings can result in overheating.

SHUT DOWN THE HOG. Remove the bearing cap and check for debris where the cap rests on the bottom housing.

First, clean off these surfaces with a wire brush. If dust got between the bearing cap and the bottom housing during maintenance, this could cause an uneven fit. Replace the bearing cap and attach the cap bolts so they are just snug but not tight.

There should now be zero gap between the upper and lower bearing housing. If a feeler gauge will still go between the upper and lower housing, the bearing housing unit has been warped or damaged and will need to be replaced.

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➤ BENT TOOTH SHANKS/TOOTH BREAKAGE

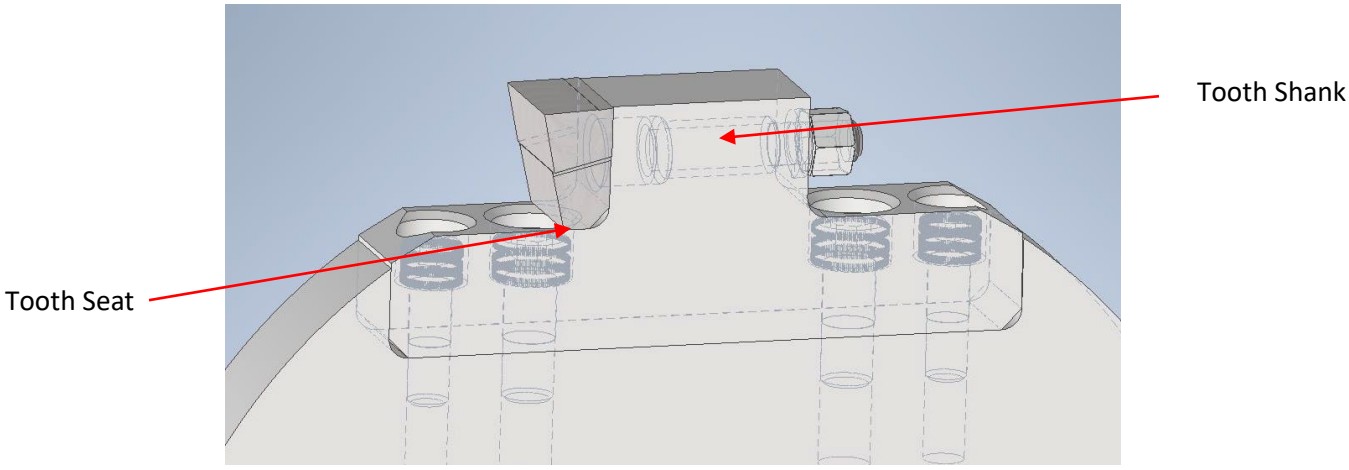

Figure 6.5: Tooth Seat and Shank

Bent shanks on KC teeth can indicate an improper tooth seat and the need for immediate repair or replacement of the lug and/or ring to avoid failure of the tooth.

There should be no more than a 0.010” gap between the bottom of the tooth and the tooth seat.

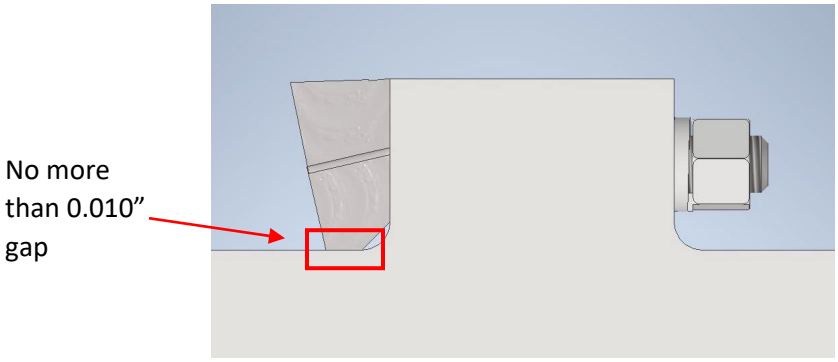

Figure 6.6: Gap on Tooth Seat

Additionally, there should be no room for movement in the lug counterbore. To check this, attempt to wiggle the tooth around within the lug. If the counterbore has hollowed out to an egg shape and the tooth can shift from side to side, the lug insert will need to be replaced.

To prevent repeated bending or breaking in the future, it is important to find the root cause of the above issues.

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Potential Cause: Abrasion Wear, Tramp Steel Damage, or Abuse

An improper seat for a tooth can be caused by wear from abrasion, damage from tramp steel, or more commonly from abuse (i.e., hammering on the seat to turn the ring when the tooth is not in position in the ring lug).

If a tooth head has been broken off, damage is usually sustained to the tooth seat before the machine can be stopped.

A damaged seat results in bending movement in the tooth when under impact load during operation. This movement typically results in metal fatigue, as evidenced by crystallization of the tooth shank, and will eventually result in part failure.

Check teeth daily so they can be rebuilt before excessive wear. Additionally, check all teeth and anvils for damage if tramp steel has passed through the hog.

Potential Cause: Gap between the Tooth and Breaker Ring

A gap between the bottom of the tooth and the breaker ring of more than 0.010” will allow sufficient movement of the tooth head to cause metal fatigue, as evidenced by crystallization of the tooth shank. This condition will eventually result in part failure.

If such a gap exists, it can be welded up as a short-term repair; however, if the gap accompanies an egg-shaped counterbore, the insert lug must be replaced.

The gap should be welded up and hand ground to provide a snug fit on the bottom surface of the tooth.

WE STRONGLY ADVISE THAT YOU DO NOT WELD THE INSERT LUG WHILE THE ROTOR IS STILL IN THE HOG. However, if it is absolutely necessary, be sure that you ground the welding lead to the lug insert itself (or ring if the hog does not have removeable lug inserts).

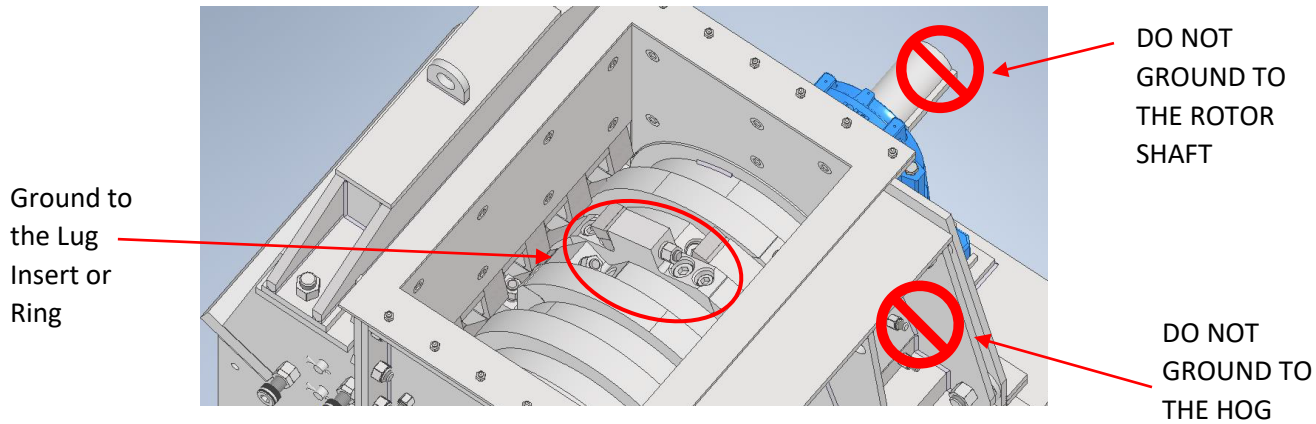

Figure 6.7: Location for Welding Ground

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GROUNDING THE WELDING LEAD TO THE HOG HOUSING OR SHAFT CAN CAUSE IRREVERSIBLE DAMAGE.

Grounding to the housing or shaft can result in rings or bearings fusing to adjacent metal. These issues cannot be easily fixed, and will likely result in costly repairs.

Potential Cause: Over-Tightening of the Hex Nut

Over-tightening of the hex nut on the KC tooth can cause elongation of the shank at the beginning of the threads. Stretched threads can reduce the ability of the threads to hold the tooth and it can eventually loosen enough to strike the anvils and break the tooth.

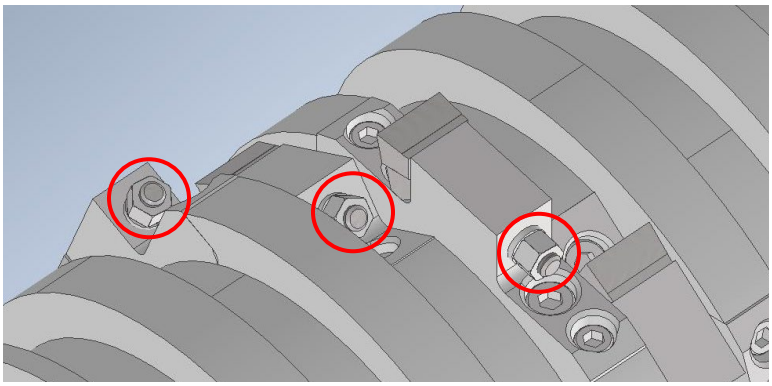

Figure 6.8: Hex Nuts on KC Teeth

The nut should first be tightened only until the lock washer is flat and the nut is snug. Once it reaches this point, the user should switch to a torque wrench for final tightening. It is important that teeth are tightened to the recommended values.

Table 13: Recommended Torques for KC Teeth

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	330 ft-lbs
2-Part Teeth	450 ft-lbs
Manufactured Teeth	450 ft-lbs

Further information on recommended torque values is given in Appendix F: *Montgomery Industries Recommended Torque Values*.

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➤ EXCESSIVE RING WEAR

Potential Cause: Rings Have Gone Too Long Between Rebuilds

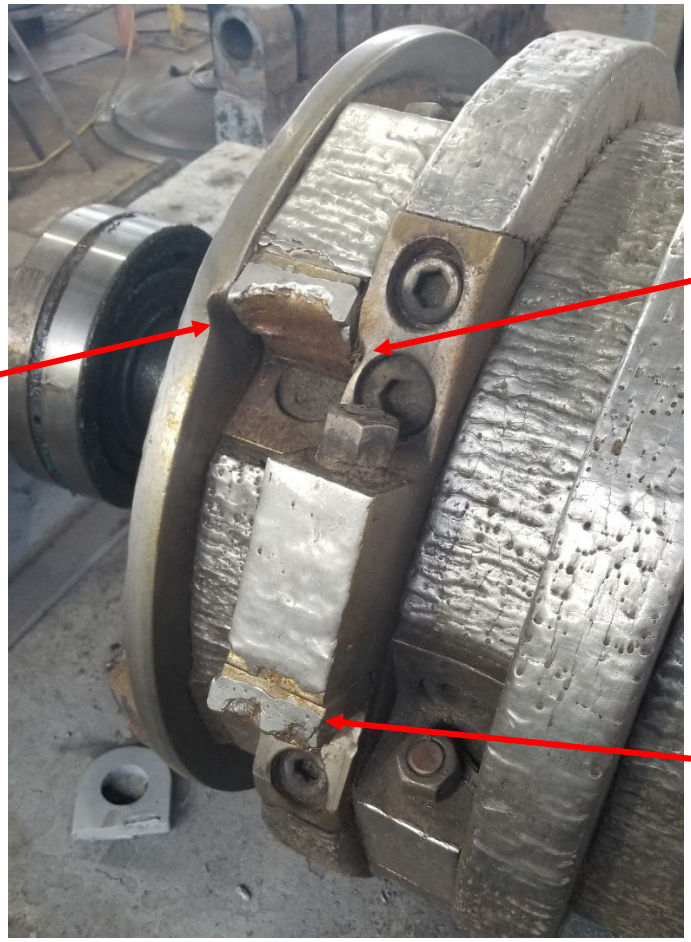

Figure 6.9: Excessive Wear

Due to abrasion over the normal course of operation, rings may eventually wear to the point that they start to show signs of excessive wear.

When the edges of the rings begin to show excessive wear (beyond about a 1/8" radius) or when the face of the lug where the tooth sits is damaged, the rings should be returned to the factory for reconditioning. If the rings are not allowed to wear excessively, they can be rebuilt to factory specifications at a fraction of the replacement cost.

Removeable lug inserts are a feature that eliminates having to remove the ring from the shaft when lugs and tooth seats need rebuilding or repairing. It is a simple matter of rebuilding or replacing only the portion of the rings that receive most of the wear and impact.

Rings that do not have removable lug inserts can be converted when a new rotor is ordered, or when an existing rotor is returned to the factory for reconditioning.

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➤ EXCESSIVE VIBRATION

Potential Cause: Mass Imbalance

1. Unbalanced Rotor: New hog rotors are dynamically balanced before leaving the factory. However, due to abrasion over the normal course of operation, the rings may eventually wear to a point where the original balance weights no longer serve to balance the hog. Trim balancing may be required to bring the hog back into balance.

Figure 6.10: Old Rotor (Left) vs. New Rotor (Right)

Figure 6.11: Excessive Wear Leading to Mass Imbalance

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Potential Cause: Looseness

1. Hog Bearings: As bearings wear over time, the original tolerances between the bearing unit and the bearing housing can loosen, resulting in increased vibration of the hog. A severe shock from metal-on-metal contact can potentially knock the bearing loose from the taper lock adapter assembly. Use a feeler gauge to check the mounted clearance of the bearings. Tighten if needed.

2. Inadequate Hog Foundation: It is important that the installation instructions be followed when preparing the foundation. It is especially important that elevated platforms be properly engineered to support the dynamic loading of the hog.

   If the hog is not securely bolted to its foundation, there is possibility for vibration. Hogs should be fastened to the foundation with 1" diameter J-bolts to a torque of 450 ft-lbs.

3. Motor Bearings: Much like the hog bearings, motor bearings can wear over time. Refer to the motor manufacturer's operation instructions for bearing troubleshooting.

4. Bolts: Check all around the hog to ensure that bolts are tight. This includes the teeth fasteners, housing bolts, bearing bolts, and any sub-base or foundation bolts.

5. Pressure Plates: Ensure that pressure plates on either end of the rotor are tight. Usually these become loose from other sources of vibration that have not been addressed.

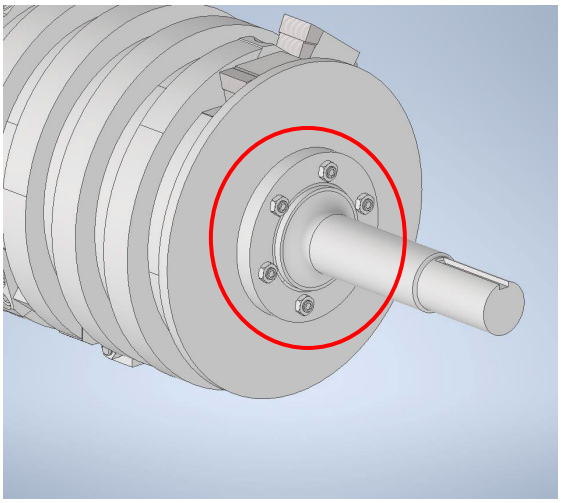

Figure 6.12: Rotor Pressure Plates

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Potential Cause: Misalignment

1. Bent Shaft: If a significant amount of tramp metal gets into the hog, the shaft may bend. How much a shaft can bend before it is no longer usable depends upon the drive configuration and where along the shaft it is bent.

   Note: The values in the table below are based on field experience of operating Montgomery Hogs. They may be beyond the recommendations of the bearing manufacturer.

   Table 14: Maximum Allowable Deviation for Bent Shafts

Drive Type	Maximum Deviation from True (Shaft Extension)	Maximum Deviation from True (Bearing Journal)
Direct Drive	0.003”	0.003”
V-Belt Drive	0.010”	

   It is important to recognize that operating a hog with a bent shaft will decrease the expected life of the bearings and may put stress on the motor. As long as the shaft is within the tolerances in the above table, the imbalance of the rotor can usually be mitigated with trim balancing. **It is the responsibility of the user to weigh the cost-benefit analysis of continuing to operate with a bent shaft.**

   If a shaft is bent further than the maximum deviation given above, accelerated wear on the bearings and motor should be expected.

2. Drive Misalignment: Ensure that the hog motor/v-belt drive is level with the shaft. Check that no bolts have loosened, causing the drive to not be square to the hog shaft.

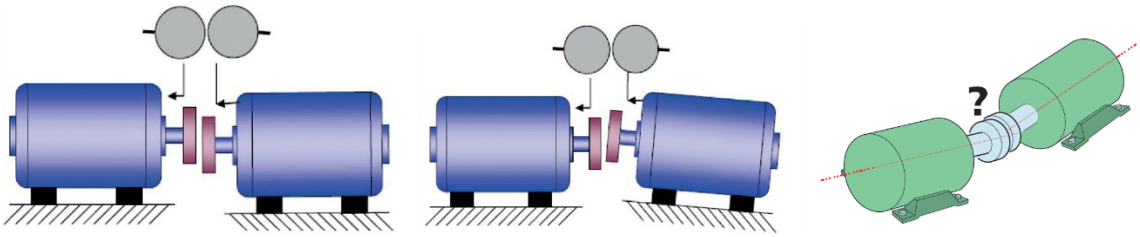

Figure 6.13: Examples of Misalignment

3. Bearing Misalignment: Bearings are set at the factory to ensure they have been installed properly. However, if the user has replaced the bearings incorrectly, the bearings may not be properly aligned. Ensure all bolts are tightened and all clearance requirements have been met. When replacing bearings, be sure to follow the procedure given in *Maintenance Procedures: Bearing Replacement.*

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➤ SCREENS – LONG STICKS/PLUGGING

Screens of various designs and sizes are used to control the end product from the hog.

Potential Cause: Components are Worn

Long pieces coming through the hog or the screen plugging up is usually the result of a worn screen or worn teeth and anvils. Check the cutting surfaces as well as the screen itself for signs of wear. Teeth, anvils, and/or the screen may be in need of replacement.

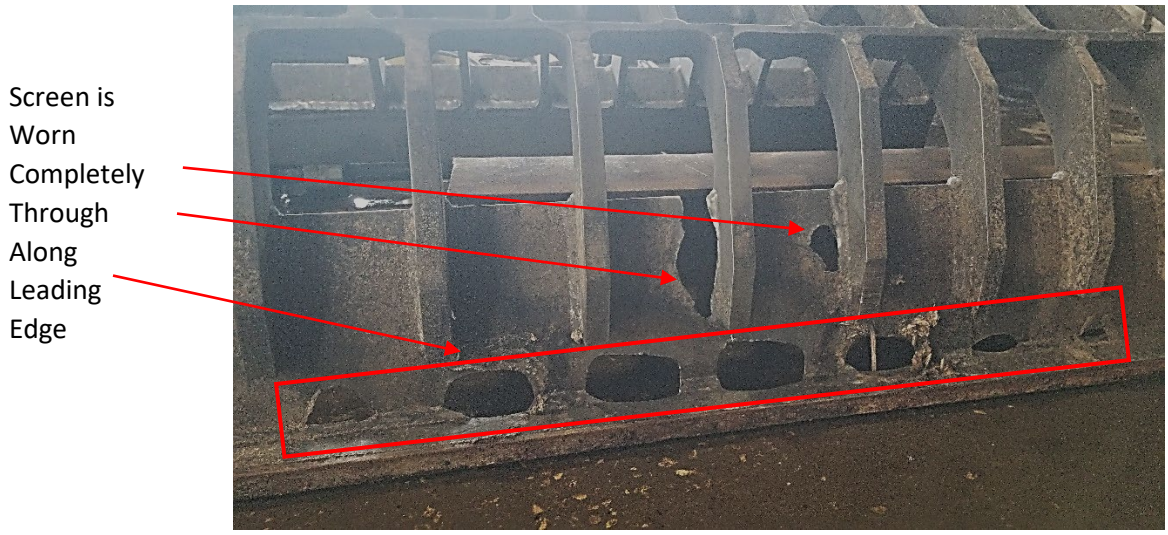

Figure 6.14: Worn Screen

Potential Cause: Incompatible Screen

An incorrect screen selection which is not compatible with the material being processed can cause the screen to plug. For stringy or wet material, a minimum hole size may be required. Additionally, feeding the hog faster than it can process the material may result in the screen plugging. Sizing up to larger holes may help mitigate this issue.

Potential Cause: Screen Has Tripped

If the screen has tripped without the user realizing it, material can discharge out the bottom of the hog without passing through the particle sizing screen. Check to make sure all anvils are in place, no shear bolts have sheared, and the trip latch locking bar is still attached to the housing.

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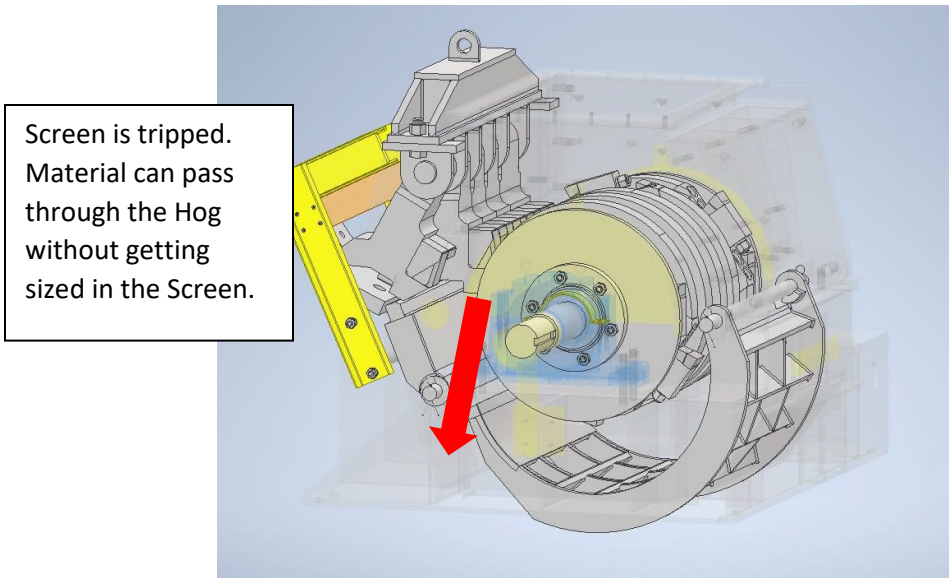

Figure 6.15: Tripped Screen

If the screen has tripped, follow the procedure in *Maintenance Procedures: Shear Bolt Replacement* to reset the anvils. To lift the screen back into operating position, see *Maintenance Procedures: Screen Removal and Installation* and follow the instructions for resetting the screen.

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WARRANTY INFORMATION

The Warranty on parts manufactured by Montgomery Industries is for one year from the date of shipment excluding normal wear and tear and excluding abuse of the equipment.

The Warranty on parts manufactured by Montgomery Industries covers replacement cost of the parts only. No labor expense incurred in replacing the parts under the Warranty is covered.

The Warranty on components not manufactured by Montgomery Industries is the standard Warranty offered by the actual manufacturer of the parts. These components include all electrical components, all hydraulic system components, and all mechanical drive components.

DO NOT ATTEMPT TO ALTER THE EQUIPMENT IN ANY WAY OR DO ANYTHING YOU ARE NOT SPECIFICALLY QUALIFIED TO DO. If there is any question whatsoever concerning the safety or advisability of your intended action, do not proceed without written permission from Montgomery Industries.

Any malfunction or operation problems not covered in this manual should be reported to the factory, as a quick and simple answer may save many hours of unsatisfactory operation.

A factory engineer is available for discussion of any problems which may arise.

USING PARTS NOT MANUFACTURED BY MONTGOMERY INDUSTRIES MAY ENDANGER THE SAFETY OF PERSONNEL AND VOIDS ALL WARRANTIES.

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APPENDIX

Appendix A: Bulletin 25-01-22 – Reinforced Concrete Calculations

Appendix B: Bulletin 57-01-22 – Installing KC Anvil Rack Assembly

Appendix C: Bulletin 23-30-12 – Hardsurface Wear Zones on KC Teeth

Appendix D: SKF Bearing Lubrication Guide

Appendix E: Bulletin 57-05-22 – Replacing a Bearing

Appendix F: Montgomery Industries Recommended Torque Values

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Reinforced Concrete Calculations

Supporting Documentation

Bulletin 25-01-22

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[Overview]

Montgomery Industries recommends pouring a reinforced concrete slab 12-18” thick extending at least 6” beyond the base plate of the unit on all sides. #8 rebar should be placed on 6” spacing in the bottom third of the slab for structural reinforcement. Additionally, it is recommended to place a steel mesh in the top third of the slab to prevent cracking. 5000 psi strength concrete is strongly recommended, but 4500 psi concrete is also permissible.

These values are provided as recommendations based on the nature of the equipment. They are not a substitute for structural engineering. It is the responsibility of the customer to ensure that their slab is structurally sound and meets local codes. It is strongly recommended that customers consult with a licensed structural engineer. The following document provides calculations and background information but is not comprehensive. It should be used for reference only.

[Information & Calculations]

The reinforced concrete suggestions were determined using several formulas and cross-referencing multiple sources. Montgomery Industries has historically recommended a 12-18” thick 5000 psi concrete slab with 1” thick rebar reinforcements. These variables were taken to be constant, with both the upper and lower end of the thickness range calculated.

First, the type of slab to be used in calculations was determined. The installation of a slab-on-grade foundation[1] (also commonly referred to as slab-on-ground with turned-down footings) was selected to remain consistent with what Montgomery Industries uses in their own facility. The 12-18” depth of the slab is deeper than the frost line in most areas, so the slab-on-grade foundation would not be at risk of frost damage.

In cases with more extreme weather, it is the responsibility of the customer to ensure that the foundation extends below the frost line or includes the proper insulation. Movement caused by the slab freezing and thawing may unbalance the hog, resulting in excess wear to components that may damage the machine.

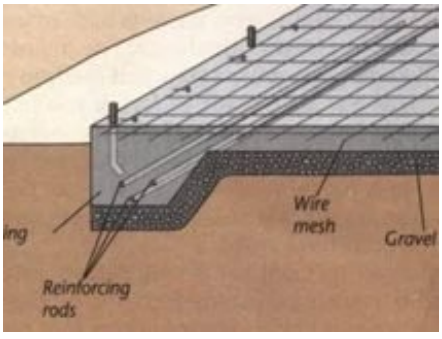

Figure 1: Slab-On-Grade Foundation[1]

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Next, the percentage of steel to concrete was calculated. Using the criteria for Reinforced Concrete Slabs-On-Grade Subjected to Heavy Loads, as defined by the Unified Facilities Criteria, it was determined that the minimum steel to concrete ratio required is 0.15% for 12" concrete slabs.[2] The value fell between 0.14% and 0.15% but was rounded up to err on the side of caution. Similarly, the minimum ratio for 18" slabs was determined to be 0.27%. Figure 5-4 from UFC 3-320-06A is included below for reference.

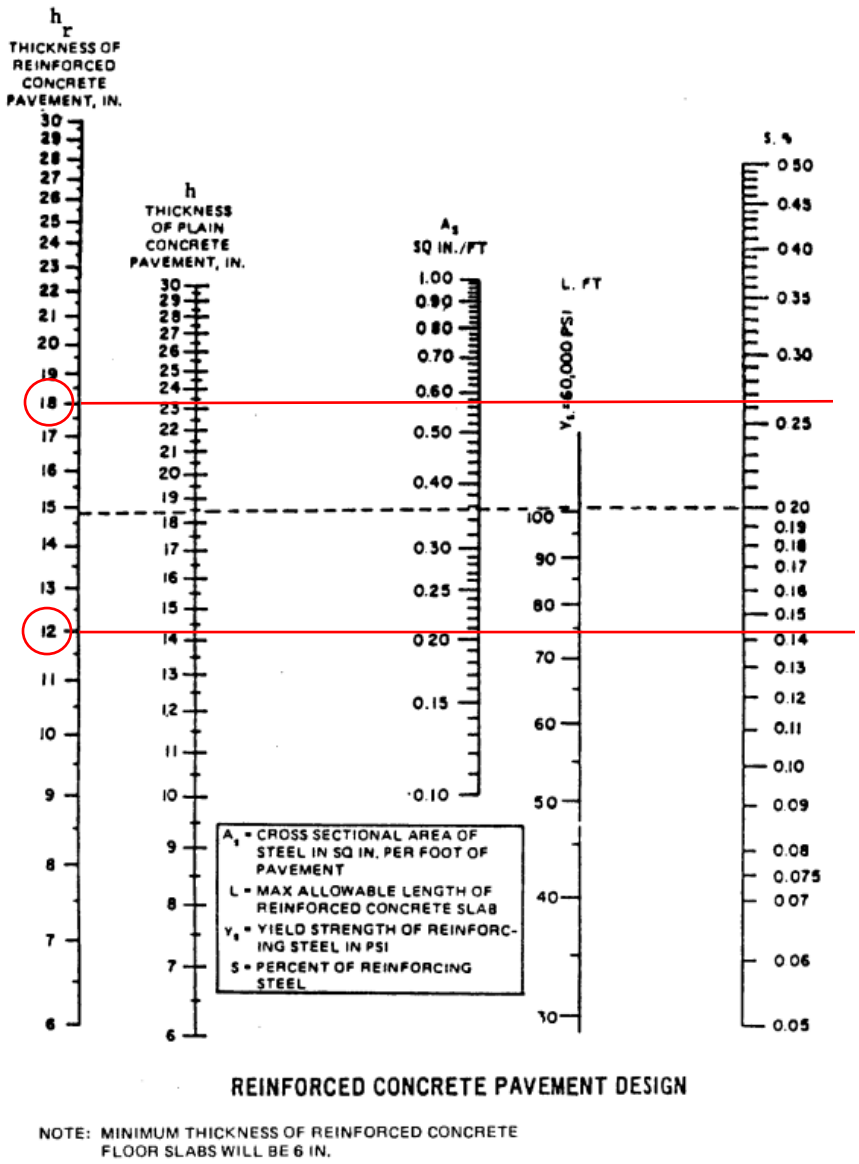

Figure 2: Reinforced Concrete Design Chart[2]

These values were then checked against the American Concrete Institute's standards, which define the minimum slab-on-ground reinforcement ratio as 0.10% (half of the minimum

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ratio for suspended slabs).[3] Since the found values of 0.15% and 0.27% exceeded that of the code, it was determined that these values would be safe to use moving forward.

The calculated percentages were then inputted into the rebar-to-spacing multiplier[4], which is defined below in Equation 1. Sample calculations are provided for the 12" thick option.

$$M = 0.9\sqrt{\rho t} \tag{1}$$

"M" represents the multiplier, "ρ" represents the percentage of steel required, and "t" represents the thickness of the slab in inches. Plugging in the 12" thickness and corresponding percentage, "M" was determined to be 1.207.

$$M = 0.9\sqrt{(0.15)(12)} = 1.207$$

Finally, the multiplier and the nominal rebar size were used to determine the minimum spacing.[4] In remaining consistent with past practices, #8 rebar was selected (1" diameter). These values were put into Equation 2, which is defined below.

$$n = M\sqrt{s} \tag{2}$$

"n" represents the nominal rebar size, "M" is the multiplier found from Equation 1, and "s" is the spacing in inches. Equation 2 was rearranged to solve for "s", which was determined to be 43.930 inches.

$$s = \left(\frac{n}{M}\right)^2 = \left(\frac{8}{1.207}\right)^2 = 43.930\ inches$$

Based on these calculations, the minimum rebar spacing required for a 12" slab-on-grade foundation with #8 rebar would be roughly 3.66 feet. By placing the rebar on 6" spacing, the recommended values from Montgomery Industries surpass the minimum requirements.

These calculations were repeated for a thickness of 18" and a reinforcement ratio of 0.27%. This yielded a minimum rebar spacing of 16.258 inches. Again, the recommended values from Montgomery Industries adhere to code and meet the minimum requirements.

To verify the recommended values further, Equations 1 and 2 were combined and reordered to find the actual reinforcement ratio of the foundation slabs. Equation 3 and the subsequent sample calculations find the ratio for the 12" slab.

$$\rho = \frac{1}{t}\left(\frac{n}{0.9\sqrt{s}}\right)^2 \tag{3}$$

$$\rho = \frac{1}{12}\left(\frac{8}{0.9\sqrt{6}}\right)^2 = 1.097\%$$

The calculated reinforcement ratio for the 12" slab was found to be 1.097%, and the calculated reinforcement ratio for the 18" slab was found to be 0.732%. Both values fall

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underneath the maximum reinforcement ratios, as defined by the American Concrete Institute.[3] Either Grade 40 or Grade 60 reinforcing rebar may be used; the ratios do not exceed the maximum ratios for both grades of rebar. Table 5.11.4.2 from ACI 314R-16 is included below for reference.

Table 5.11.4.2—Maximum flexural reinforcement ratio ρ_{max} for solid slabs

		f_y, psi (MPa)	
		40,000 (280)	60,000 (420)
f_c', psi (MPa)	3000 (21)	0.0190	0.0100
	3500 (25)	0.0220	0.0125
	4000 (28)	0.0250	0.0140
	4500 (32)	0.0270	0.0160
	5000 (36)	0.0290	0.0170

Note: Different values of f_y and f_c' can be interpolated.

Figure 3: Maximum Reinforcement Ratios[3]

By placing the rebar on 6” spacing, the recommended installation for a 12” thick slab has a factor of safety of 7.31. Similarly, for an 18” thick slab, the values recommended by Montgomery Industries have a factor of safety of 2.71. In the case of the hog becoming slightly unbalanced, the slab foundation should not lose structural integrity. Table 1 summarizes these results for both ends of the recommended thickness range.

Table 1: Calculation Results

Foundation Thickness	Minimum Reinforcement Ratio	Minimum Rebar Spacing	Calculated Reinforcement Ratio (6” Spacing)	Factor of Safety
12”	0.15%	43.930”	1.097%	7.31
18”	0.27%	16.258”	0.732%	2.71

Montgomery Industries adheres to a minimum factor of safety of 2.5 to account for dynamic loading. In the case that the hog becomes unbalanced, it is critical that damage to the machine or supporting equipment is minimal. Both of these factors of safety adhere to the company’s standards. This informed the decision to recommend #8 rebar on 6” spacing for hog foundations.

Following the American Concrete Institute’s standards, it was determined that shrinkage and temperature reinforcements be placed at approximately 1/3 of the slab thickness from the upper surface.[3] This informed the decision to recommend a layer of steel mesh. Additionally, the rebar placement was determined to be in the bottom third of the slab to maximize structural

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reinforcement.[5] The combination of a structural rebar layer and a crack-preventing steel mesh layer ensures the slab can withstand the dynamic loading of the hog.

These values are provided as recommendations based on the nature of the equipment. They are not a substitute for structural engineering. It is the responsibility of the customer to ensure that their slab is structurally sound and meets local codes. It is strongly recommended that customers consult with a licensed structural engineer.

[References]

1. https://www.concretenetwork.com/concrete/foundations.htm
2. https://d6s74no67skb0.cloudfront.net/course-material/ST702-Design-of-Heavy-Duty-Concrete-Floor-Slabs-on-Grade.pdf
3. https://herbycalvinpascal.files.wordpress.com/2019/05/aci_314r_16_guide_to_simplified.pdf
4. https://homesteady.com/13367457/how-to-determine-rebar-size-and-spacing-in-a-concrete-pad
5. https://www.forconstructionpros.com/concrete/equipment-products/rebar-accessories-equipment/article/10116892/how-to-reinforce-concrete-slab-on-ground-to-control-cracking

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Installing KC Anvil Rack Assembly

Procedure Notes

Bulletin 57-01-21

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PROCEDURE

1. Secure the rotor assembly into position.

⚠ **USE EXTREME CAUTION AND PROPER LIFTING EQUIPMENT TO SECURE THIS ROTOR.**

⚠ **THIS IS A HIGH INERTIA ROTOR AND CANNOT BE STOPPED EASILY ONCE IN MOTION.**

⚠ **DO NOT TURN ROTOR OVER BY HAND OR POWER WITH ANY PART OF THE BODY BETWEEN THE TEETH AND ANVIL POINTS. EVEN WHEN BARELY MOVING, IT HAS ENOUGH MOMENTUM TO CUT OFF A FINGER.**

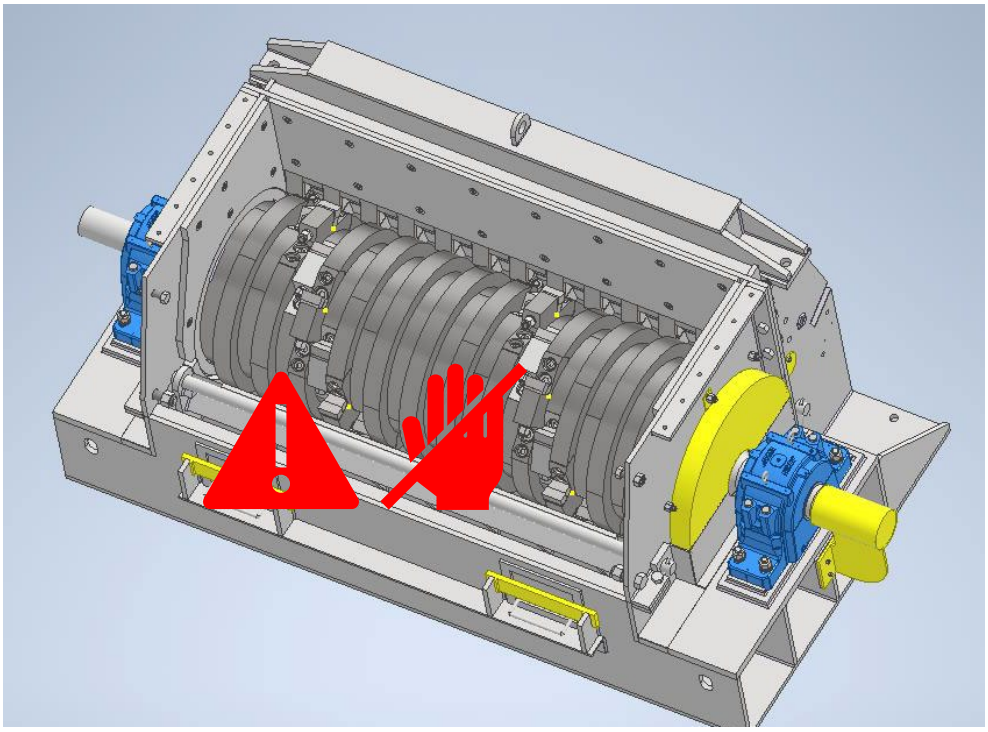

Figure 1: Positioned Rotor Assembly (Rear Door and Hopper Removed for Clarity)

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2. Lift Anvil Rack Assembly and place into position as shown. There should be a 3/16” gap between the inside face of the Anvil Rack and the outside face of the Side Housing.

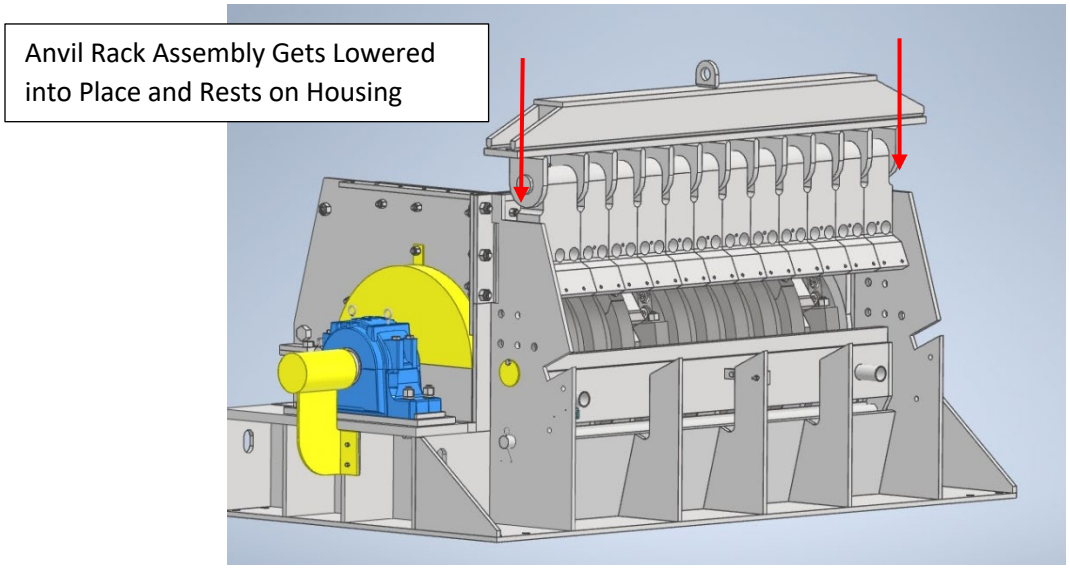

Figure 2: Hog with Anvil Rack Assembly Being Lowered into Place

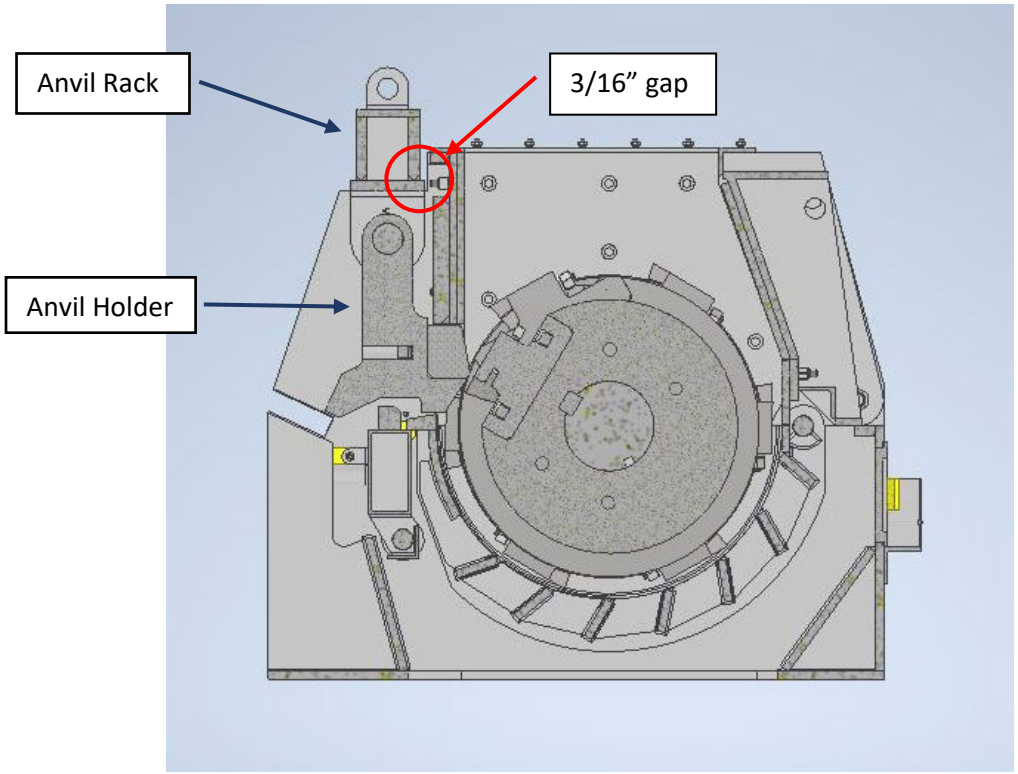

Figure 3: Cross Sectional View of Hog with Anvil Rack Assembly

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3. Connect a Bushing Block to each Anvil Holder and securely tighten.
4. Use machine bolts and nuts in lieu of Shear Bolts during alignment and adjustment. Insert machine bolts into the Anvil Holder Bushing Block Bushings and corresponding Anvil Plate Bushings. Loosely tighten nuts to align Anvil Holders to Anvil Plate.
5. **Do not weld the Anvil Plate to the hog until all alignments have been made.** The Anvil Plate being loose will aid the alignment process.
6. Insert a 1/16” (0.0625”) shim (as needed) between the bottom of the Bushing Block and the Anvil Plate to ensure proper clearance between the Anvil Plate and Anvil Holders.

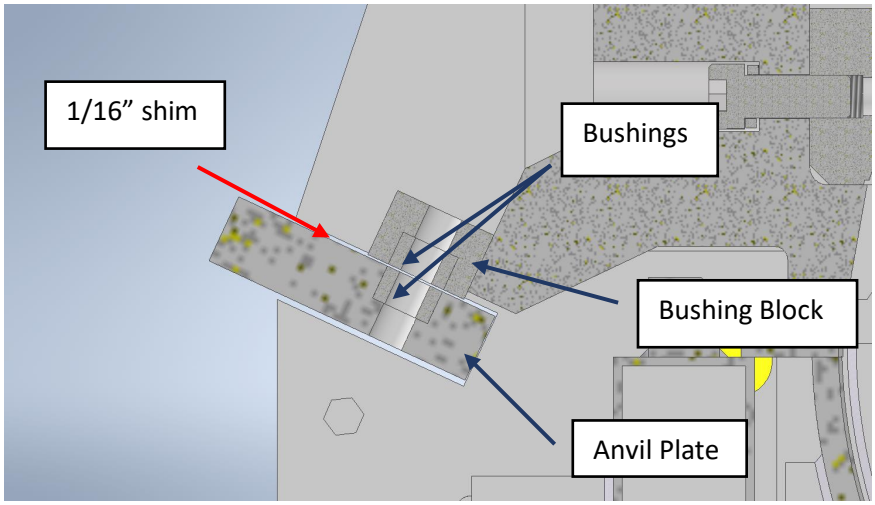

Figure 4: Cross Sectional View of Anvil Plate and Bushing Block (Machine Bolt Removed)

7. Once all the Anvil Holder Bushing Blocks are connected to the Anvil Plate and the shims are in place, tighten bolts to firmly align the Anvil Plate to the Anvil Rack Assembly.
8. By moving/shimming/adjusting the Anvil Rack Assembly, align the Anvil Points with the Teeth on the Rotor Assembly so that there is a 1/16” to 3/16” gap between the Teeth and the Anvil Points. Make sure that the Anvil Rack Assembly remains square to the Rotor Assembly.

Figure 5: Cross Sectional View of Anvil Points and Teeth

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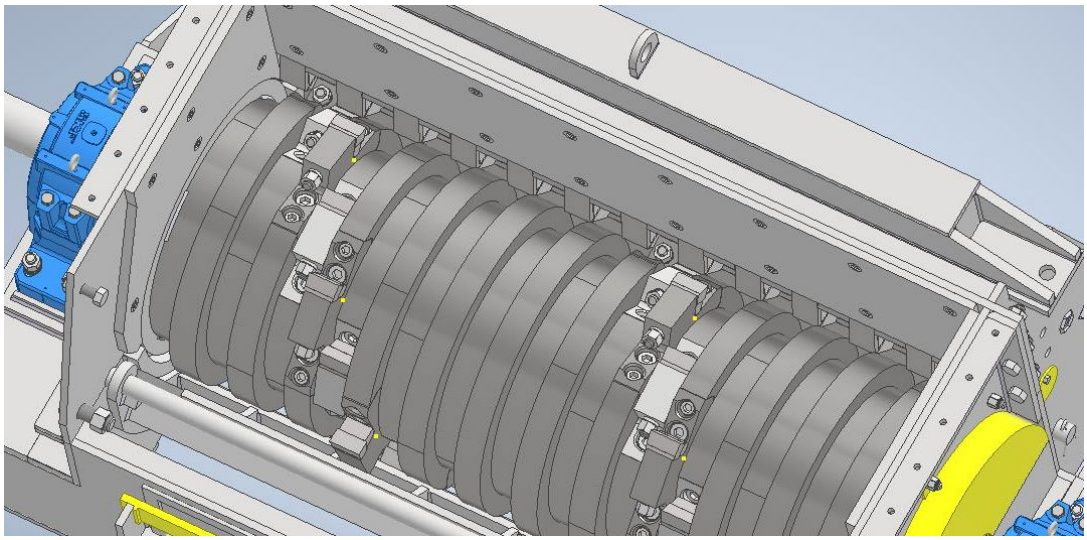
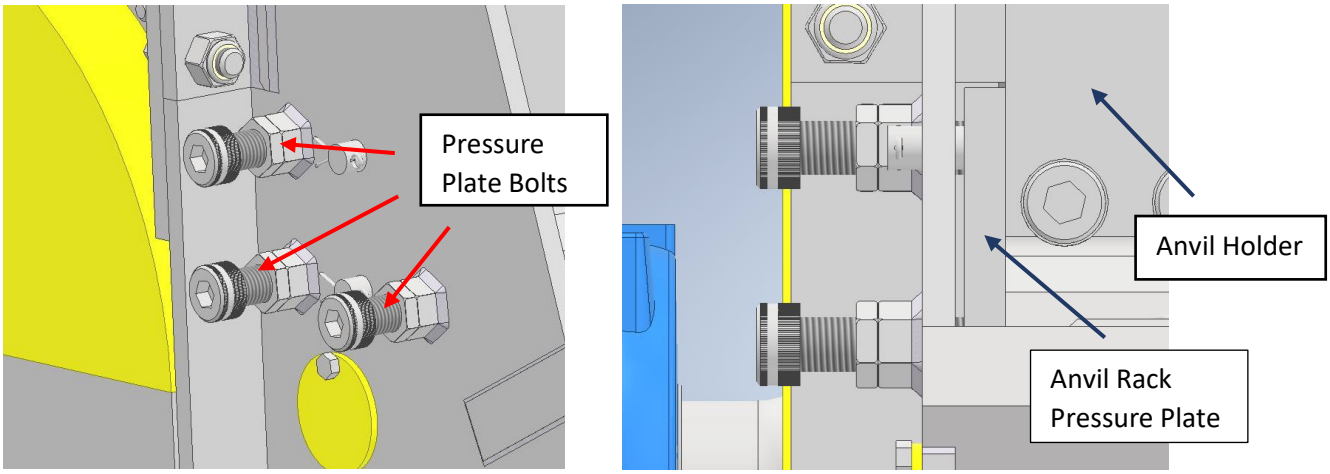


Figure 6: Proper Alignment of Anvil Rack - Anvil Points Align with Teeth, Assembly is Square to Rotor

9. After all aligning and adjusting is complete, tack the Anvil Rack Flanges and the Anvil Plate in place to prevent movement.
10. Tighten the Bolts in the Anvil Rack Pressure Plates to compress the Anvil Holders. Align the centerlines of the pockets formed by the Anvil Points to the centerlines of the teeth on the Rotor.



Figures 7 & 8: Anvil Rack Pressure Plates - End View (L) and Side View (R)

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11. Weld the Anvil Rack Flanges and the Anvil Plate to the Lower Housing.

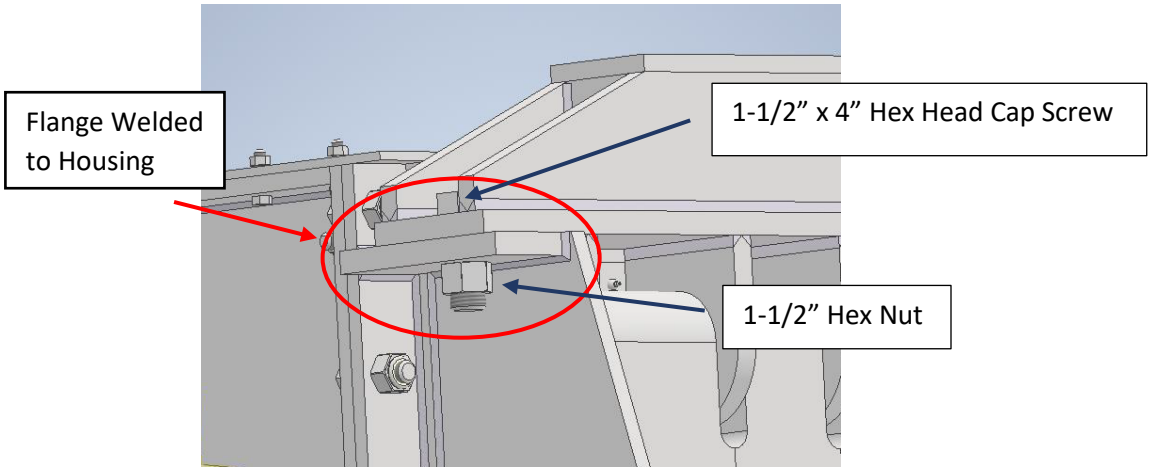
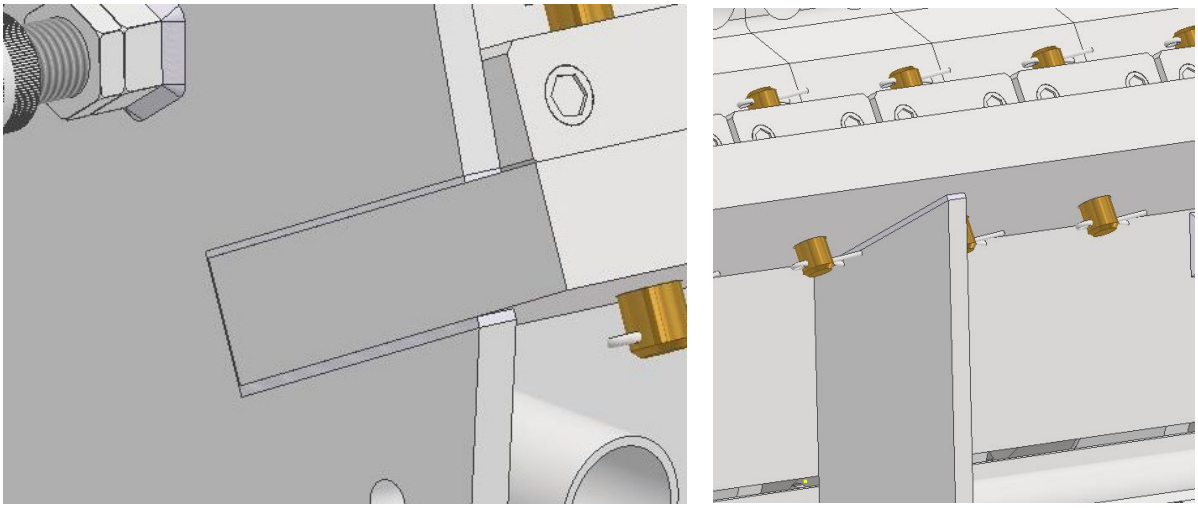


Figure 9: Welded Anvil Rack Flange, Secured to Anvil Rack with Proper Hardware



Figures 10 & 11: Anvil Plate Welded to Lower Housing

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12. Remove machine bolts and shims. Insert Shear Bolts and secure each with (2) Cotter Pins. Install/Tap in Shear Bolts from underneath to hide any hammer galling.

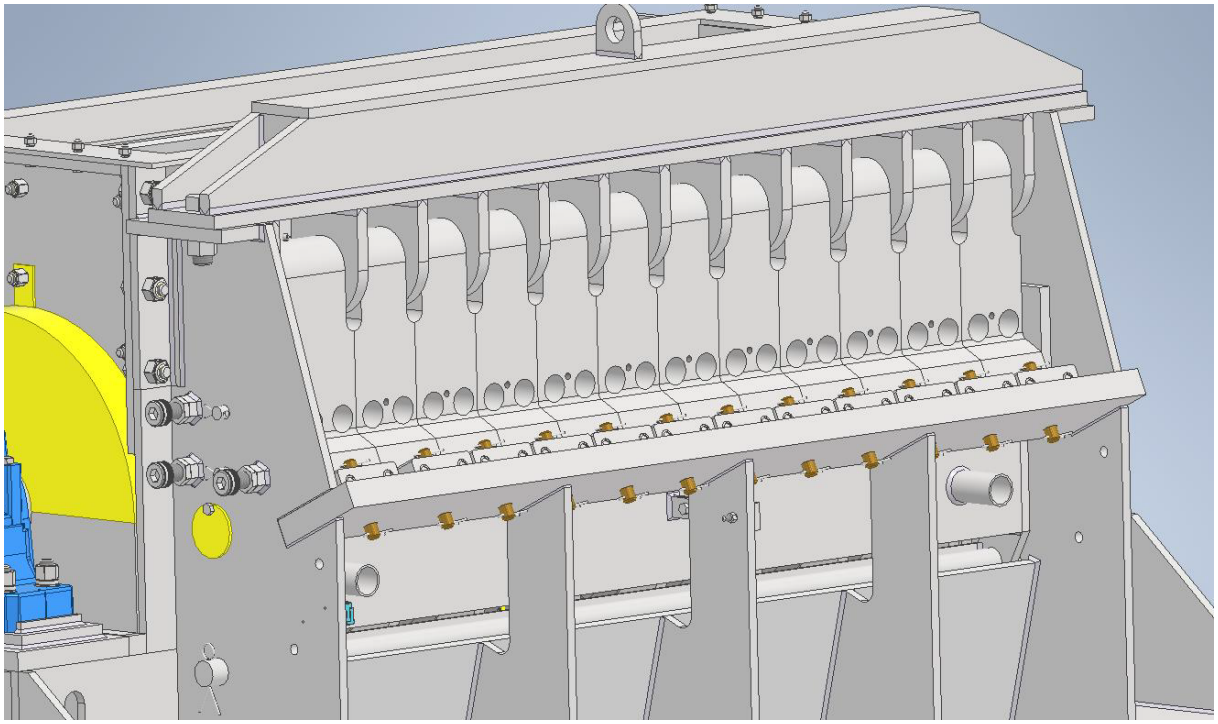

Figure 11: Complete Installation of Anvil Rack Assembly with Shear Bolts and Cotter Pins

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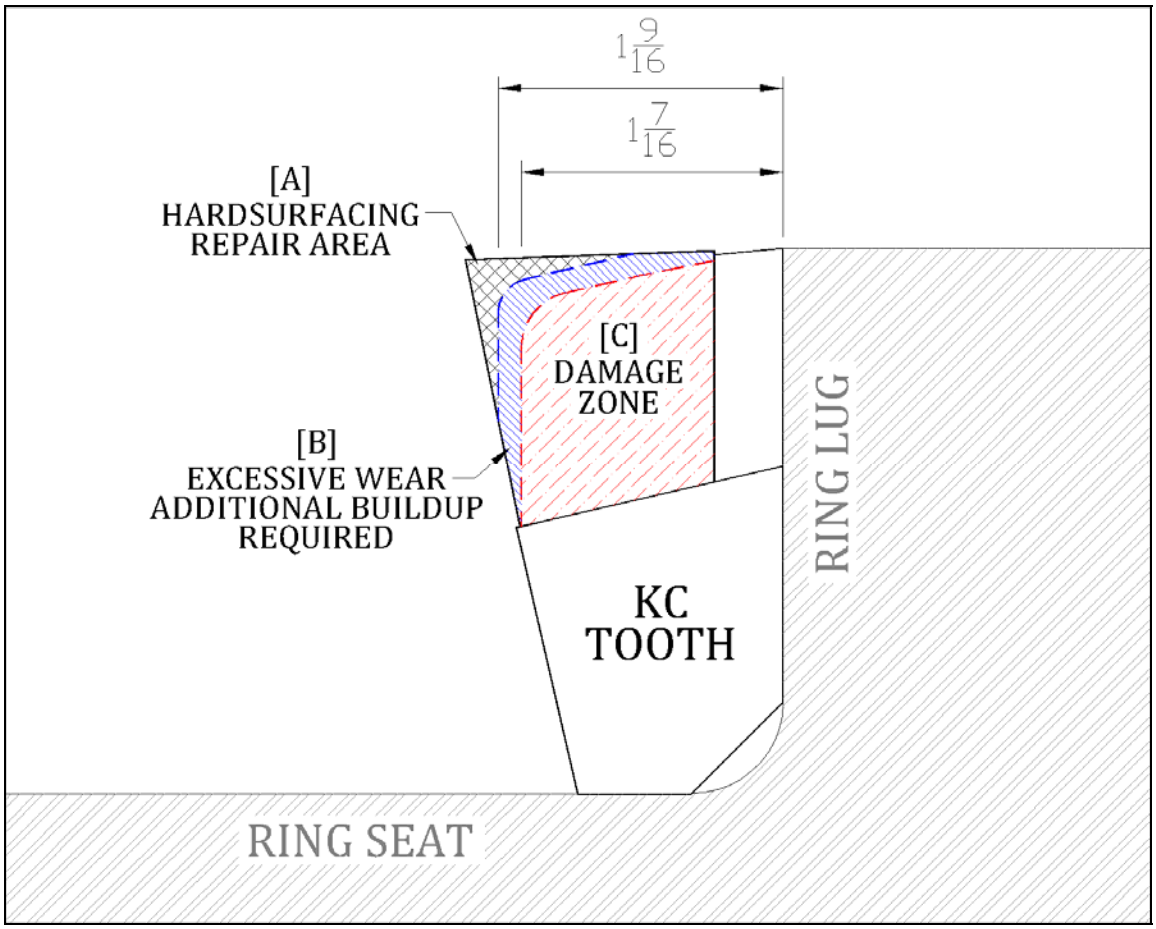
Hardsurface Wear Zones – KC Teeth

- √ The teeth and anvil points should be inspected frequently until a wear pattern is established and the operator knows at what interval the parts must be rebuilt.

- √ General practice is to rebuild the anvil points every second or third time the teeth are rebuilt or changed.



[A] Normal Repair Area The allowable wear before rebuilding becomes necessary will depend upon the material being hogged. Generally, when the cutting edges of the teeth have worn to a 1/8" radius, the effect upon operation will be noticeable as capacity and end product begin to degrade.

[B] Excessive Wear Area Teeth and anvil points should be removed and rebuilt before the hardsurfacing material has worn into the base metal. After that point of wear is reached, the base metal wears away rapidly and the cost of rebuilding soon reaches the cost of replacement. Capacity and end product continue to degrade.

[C] Damage Zone Wear is well into the base metal and other parts are exposed to accelerated wear. The cost of rebuilding exceeds the cost of replacement. Capacity and end product degrade significantly.

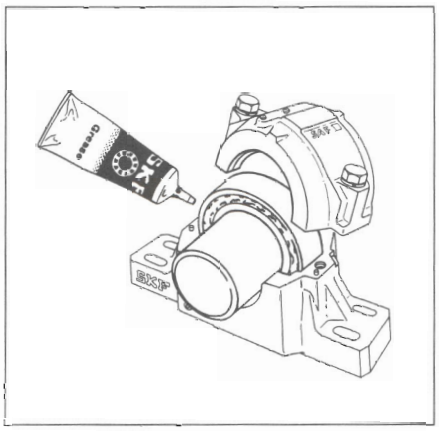
Initial Grease Charge for Split Pillow Block Housings

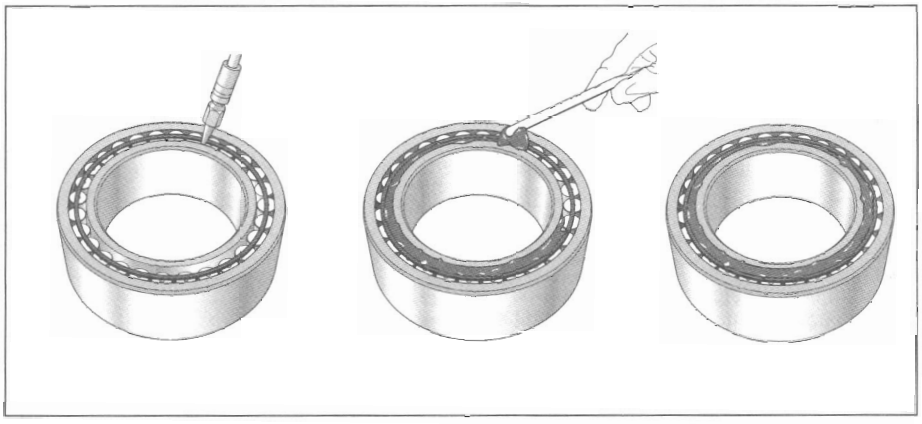
The recommended initial grease charge (weight) for split pillow block and bearing assemblies are listed in the accompanying tables. Values apply for spherical roller bearings, toroidal roller (CARB) bearings and self-aligning ball bearing units. The initial charge is intended to fill approximately ½ of the free space in the housing cavities and should be used for applications operating at slow to moderate speeds under ⅔ of the grease speed rating shown in the bearing tables. For higher operating speeds or applications running in clean environments, the recommended initial grease charge may be reduced by approximately ⅓ in order to minimize churning. For operation over the bearing grease speed ratings or less than 10 RPM, consult SKF Applications Engineering.

At initial assembly of the unit, spherical roller bearings and self-aligning ball bearings should be internally packed 100% around the cage and rolling elements. Toroidal roller (CARB) bearings should be filled approximately 50% full of grease at installation with that grease being placed under the cage totally filling the space between the cage and inner ring. The remainder of the grease should be applied to the side cavities in the housing base and the labyrinth grooves of the ring seals.

Initial Grease Charge for SAF pillow block assemblies

SAF	SAF	SAF	SAF	SAF	Initial Charge (oz)	(lbs)
		507			2.5	
		509			3.0	
		510			4.0	
	308				4.5	
	309		609		5.0	
		511			5.0	
	310		610		6.5	
		513			7.5	
	311		611		8.0	
		515			9.0	
	312				10.0	
216	313	516	613		13.0	
217		517			13.0	
	314				14.0	
218	315	518	615		14.0	
	316		616		16.0	
	317		617		20.0	
220		520		024	21.0	
	318		618		22.0	
222		522		026	28.0	
224	320	524	620	028	40.0	
226	322	526	622	030		3¼
				032		3¼
228		528		034		3¼
230	324	530	624			3¾
232	326	532	626	036		4¼
				038		4¼
234	328	534	628	040		5¼
236	330	536	630			6
238	332	538	632	044		7¼
240	334	540	634	048		8½
244	338	544	638	052		11½
	340		640	056		15½





The information presented in this section is intended to provide the user with basic and practical information on the lubrication of unit roller bearings. It does not include theoretical background. As the world leader in rolling bearing technology, SKF has extensive information available on the subject of bearing lubrication theory. Some of this information can be found in other SKF publications including the **General Catalog** and the **Bearing Installation and Maintenance Guide**. If you have questions regarding bearing lubrication not addressed here or in these other SKF publications, please contact SKF Applications Engineering.

Lubrication

SKF unit roller bearings are supplied pre-lubricated with enough grease for initial operation. They are also supplied with a grease fitting to be used when relubrication is necessary due to contamination or because the original grease has worn away. Relubrication is performed by attaching a grease gun to the fitting and slowly adding grease, preferably while the shaft is rotating, until clean grease emerges from the seals. **If grease is added too quickly, such as with high–pressure equipment, the seals may be blown out or otherwise damaged.**

What kind of grease should be used when relubricating?
The grease supplied in unit roller bearings is SKF LGEP2, a lithium soap based grease, NLGI 2 consistency, with a mineral base oil that has a viscosity of 190 cSt @ 40°C. This grease is suitable for the majority of unit roller bearing applications and will provide effective lubrication up to operating temperatures of 180°F (82°C). When relubricating, a grease with similar soap base, consistency, base oil type and viscosity should be used. Greases with different soap bases or consistencies are sometimes incompatible and can cause bearing failure. Bearings with greases other than LGEP2 can be supplied by special order; bearings also can be supplied without grease when customers wish to use their own grease. If this is the case, the grease should be selected using the same guidelines as outlined in the Lubrication section for Split Pillow Blocks on pages 202 and 203.

How much grease should be used?
Relubrication is best performed while the bearing is rotating to help ensure even distribution. The correct quantity is simply that amount which causes clean grease to emerge from the seal contact surface.

How often should the bearing be relubricated?
The bearing should be relubricated as often as necessary to prevent the build up of contaminants at the seal contact surface. If the bearing is operating in a clean environment, then relubrication intervals can be calculated according the charts and information on page 207 (in the splits section of the catalog).

Relubrication intervals

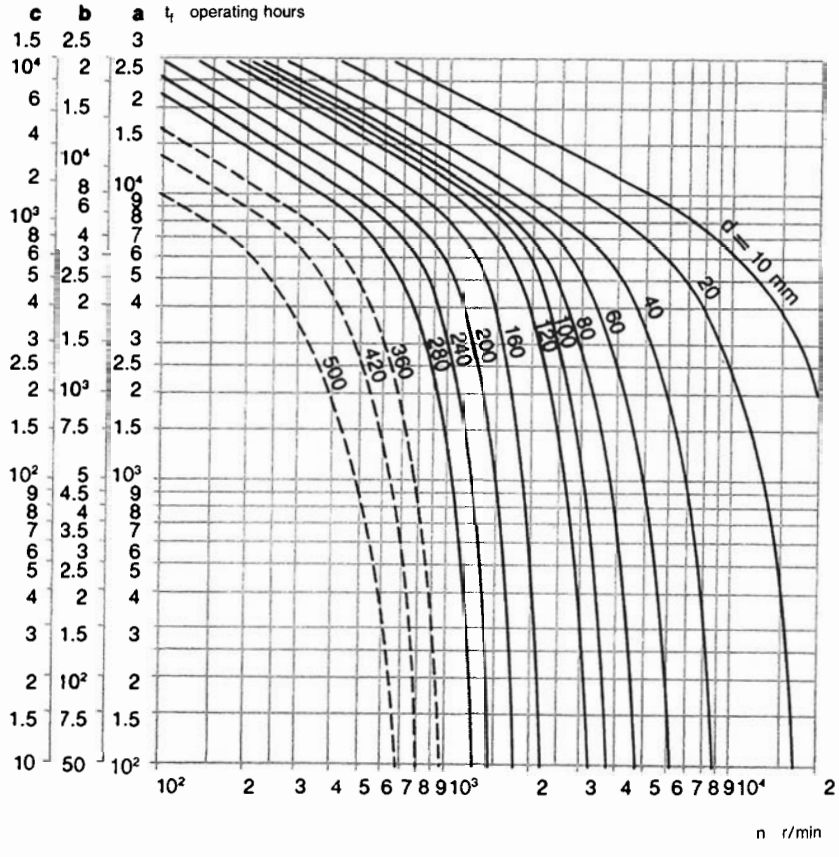
The relubrication intervals t_f for normal operating conditions can be read off as a function of bearing speed n and bore diameter d of a certain bearing type from Diagram 1. The diagram is valid for bearings on horizontal shafts in stationary machines under normal loads. It applies to good quality lithium base greases at a temperature not exceeding 70 °C. To take account of the accelerated ageing of the grease with increasing temperature it is recommended that the intervals obtained from the diagram are halved for every 15° increase in bearing temperature above 70 °C, remembering that the maximum operating temperature for the grease given in the tables on pages 128 and 129 should not be exceeded. The intervals may be extended at temperatures lower than 70 °C but as operating temperatures decrease the grease will bleed oil less readily and at low temperatures an extension of the intervals by more than two times is not recommended. It is not advisable to use relubrication intervals in excess of 30 000 hours. For bearings on vertical shafts the intervals obtained from the diagram should be halved.

For large roller bearings having a bore diameter of 300 mm and above,the high specific loads in the bearing mean that adequate lubrication will be obtained only if the bearing is more frequently relubricated than indicated by the diagram, and the lines are therefore broken. It is recommended in such cases that continuous lubrication is practiced for technical and economic reasons. The grease quantity to be supplied can be obtained from the following equation for applications where conditions are otherwise normal, i.e. where external heat is not applied (recommendations for grease quantities for periodic relubrication are given in the following section)

$$G_k = (0.3 \ldots 0.5)\ D\ B \times 10^{-4}$$

where

G_k = grease quantity to be continuously supplied, g/h
D = bearing outside diameter, mm
B = total bearing width (for thrust bearings use total height H), mm



Scale a: radial ball bearings
Scale b: cylindrical roller bearings, needle roller bearings
Scale c: spherical roller bearings, taper roller bearings, thrust ball bearings; full complement cylindrical roller bearings (0.2 t_f); crossed cylindrical roller bearings with cage (0.3 t_f); cylindrical roller thrust bearings, needle roller thrust bearings, spherical roller thrust bearings (0.5 t_f)

Diagram 1

Relubrication procedures

One of the two procedures described below should be used, depending on the relubrication interval t_f obtained:

- if the relubrication interval is shorter than 6 months, then it is recommended that the grease fill in the bearing arrangement be replenished (topped up) at intervals corresponding to 0.5 t_f; the complete grease fill should be replaced after three replenishments, at the latest;
- when relubrication intervals are longer than 6 months it is recommended that all used grease be removed from the bearing arrangement and replaced by fresh grease.

The six-month limit represents a very rough guideline recommendation and may be adapted to fall in line with lubrication and maintenance recommendations applying to the particular machine or plant.

Replenishment

By adding small quantities of fresh grease at regular intervals the used grease in the bearing arrangement will only be partially replaced. Suitable quantities to be added can be obtained from

$$G_p = 0.005\ D\ B$$

where

G_p = grease quantity to be added when replenishing, g
D = bearing outside diameter, mm
B = total bearing width (for thrust bearings use total height H), mm

To facilitate the supply of grease using a grease gun, a grease nipple should be provided on the housing. It is also necessary to provide an exit hole for the grease so that excessive amounts will not collect in the space surrounding the bearing. This might otherwise cause a permanent increase in bearing temperature. However, as soon as the equilibrium temperature has been reached following a relubrication, the exit hole should be plugged or covered so that the oil bled by the grease will remain at the bearing position. The danger of excess grease collecting in the space surrounding the bearing and causing temperature peaking, with its detrimental effect on the grease as well as the bearing, is most pronounced when bearings operate at high speeds. In such cases it is advisable to use a grease escape valve rather than an exit hole. This prevents over-lubrication and allows relubrication to be carried out without the machine having to be stopped. A grease escape valve consists basically of a disc which rotates with the shaft and which forms a narrow gap together with the housing end cover. Excess and used grease is thrown out by the disc into an annular cavity and leaves the housing through an opening on the underside of the end cover. Further details regarding the design and dimensioning of grease escape valves will be supplied on request.

To ensure that fresh grease actually reaches the bearing and replaces the old grease, the lubrication duct in the housing should either feed the grease adjacent to the outer ring side face or, better still, into the bearing which is possible, for example, with spherical roller bearings and double row full complement cylindrical roller bearings.

Where centralized lubrication equipment is used, care must be taken to see that the grease has adequate pumpability over the range of ambient temperatures.

If, for some reason, it is necessary to change from one grease to another, a check should be made to see that the new and old greases are compatible (see under "Miscibility", page 128).

Renewing the grease fill

When the end of the relubrication interval t_f has been reached the used grease in the bearing arrangement should be completely removed and replaced by fresh grease. As stated on page 127, under normal conditions, the free space in the bearing should be completely filled and the free space in the housing filled to between 30 and 50% with fresh grease. The requisite quantities of grease to be used for SKF housings are given in the section "Bearing housings".

In order to be able to renew the grease fill it is essential that the bearing housing is easily accessible and easily opened. The cap of split housings and the cover of one-piece housings can usually be taken off to expose the bearing. After removing the used grease, fresh grease should first be packed between the rolling elements. Great care should be taken to see that contaminants are not introduced into the bearing or housing when relubricating, and the grease itself should be protected. Where the housings are less accessible but are provided with grease nipples and exit holes or grease valves it is possible to completely renew the grease fill by relubricating several times in close succession until it can be assumed that all old grease has been pressed out of the housing. This procedure requires much more grease than is needed for manual renewal of the grease fill.

Replacing a Bearing

Procedure Notes

Bulletin 57-05-22

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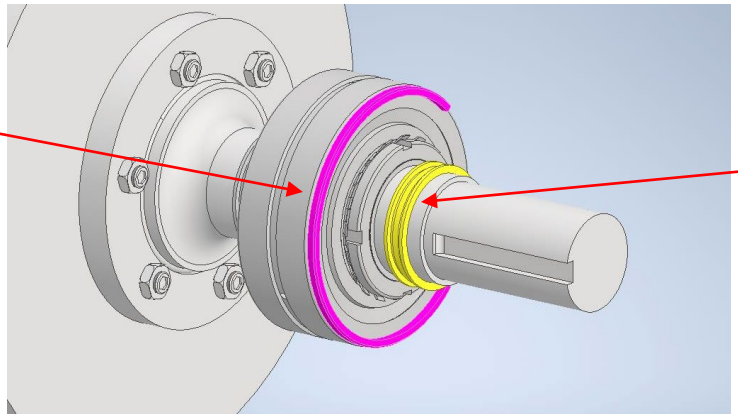
REMOVING AN OLD BEARING

Due to the tight clearances between the rotor and the hog housing, it is almost impossible to remove an old bearing with the rotor still in the hog. We strongly encourage removing the rotor before attempting to replace bearings. The procedure for doing so varies based on hog type. See the maintenance manual for your specific model for further information on rotor removal.

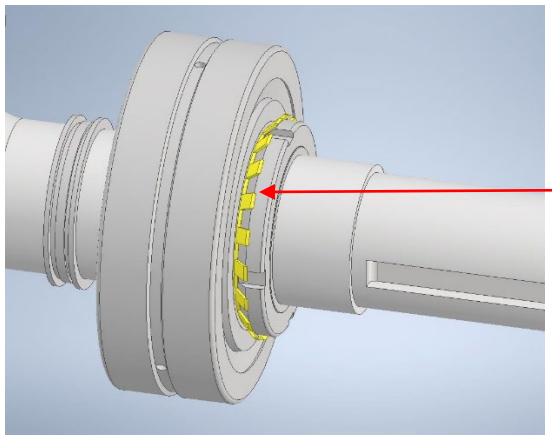
STOP THE HOG BEFORE PERFORMING MAINTENANCE.

REMOVE THE ROTOR FROM THE HOG BEFORE ATTEMPTING TO REPLACE THE BEARINGS.

1. Remove the outer oil seal. If the bearing being removed is on the drive side of the hog, the stabilizing ring must also be removed.



2. Bend out the locking washer on the lock ring to release the nut.



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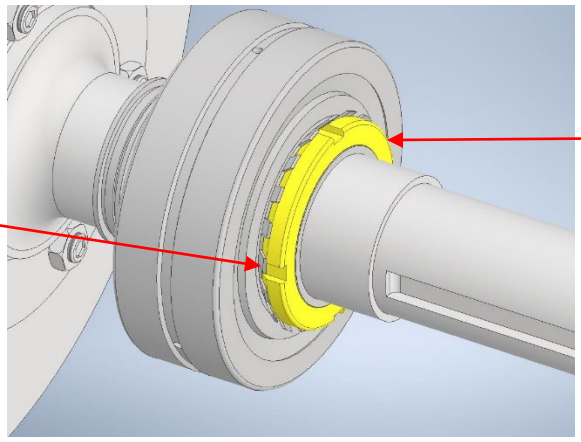
3. Loosen the nut about two or three turns.

Hit the Locking Nut on indentations, moving in a circular pattern around the nut.



Bearing Locking Nut – Highlighted in Yellow

To loosen the nut, place a spanner wrench or heavy bar of brass or bronze against the nut. Use a heavy sledgehammer to hit the wrench or bar and keep moving around the nut with the wrench or bar. **Do not keep pounding in one place** as this will ruin the threads on the sleeve and nut.

4. Place a cylinder against the bearing unit locking nut (part of the adapter assembly). The cylinder should be slightly larger than the bearing journal of the hog shaft and long enough to clear the end of the shaft. An example is shown below.

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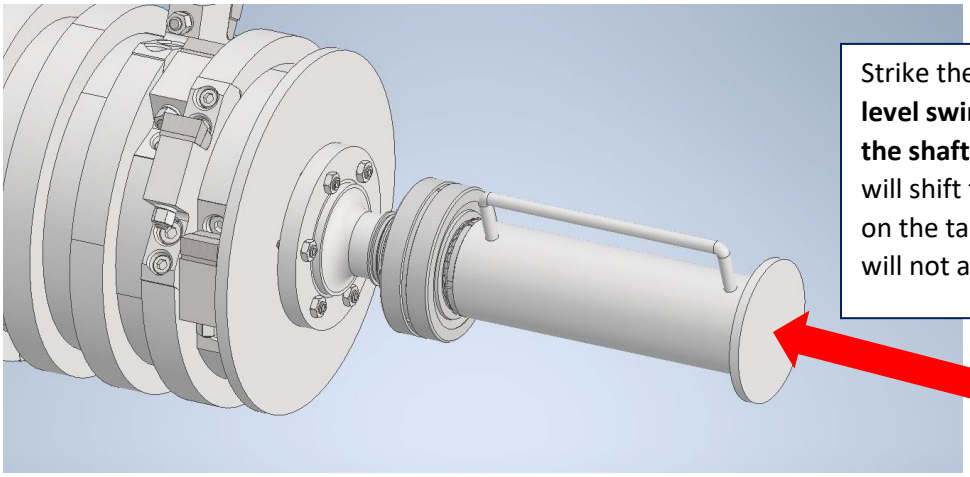
5. Using a sledgehammer, strike the end of the cylinder **with a level swing to the center of the shaft** to jar the bearing loose from the tapered sleeve. Swinging at an angle will shift the bearing around on the tapered sleeve but will not actually loosen it.

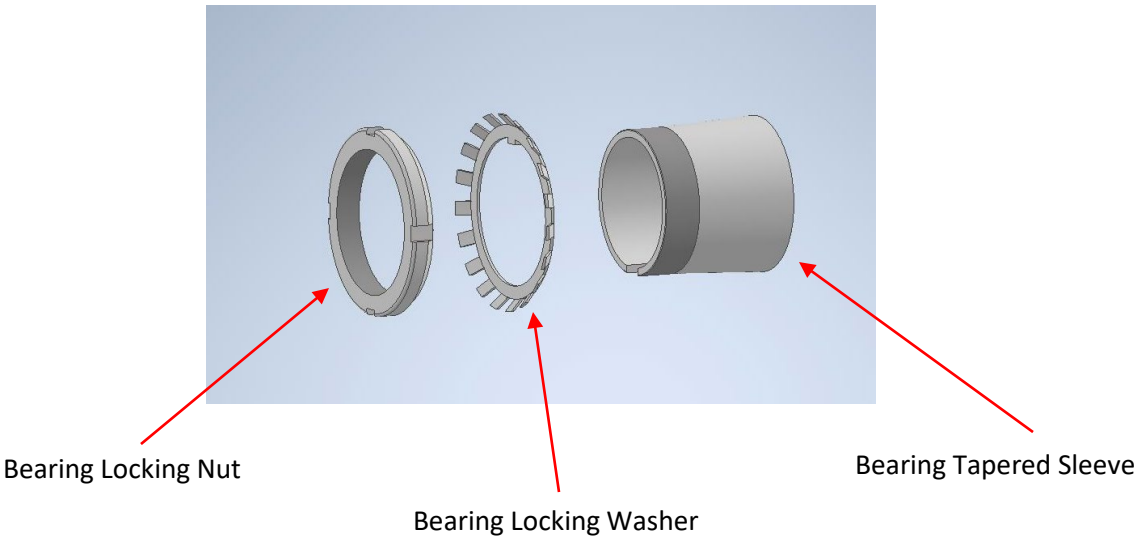
   If the bearing unit resists separating from the tapered sleeve, use wood blocks as a wedge behind the bearing unit so that it cannot move.



6. Once the bearing unit is loose, all the bearing components will easily slide off the shaft.

INSTALLING A NEW BEARING

1. Clean the shaft thoroughly and remove any rough spots with either a file or an emery cloth.
2. Screw off the nut and remove the locking washer.



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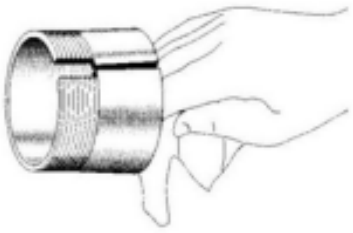
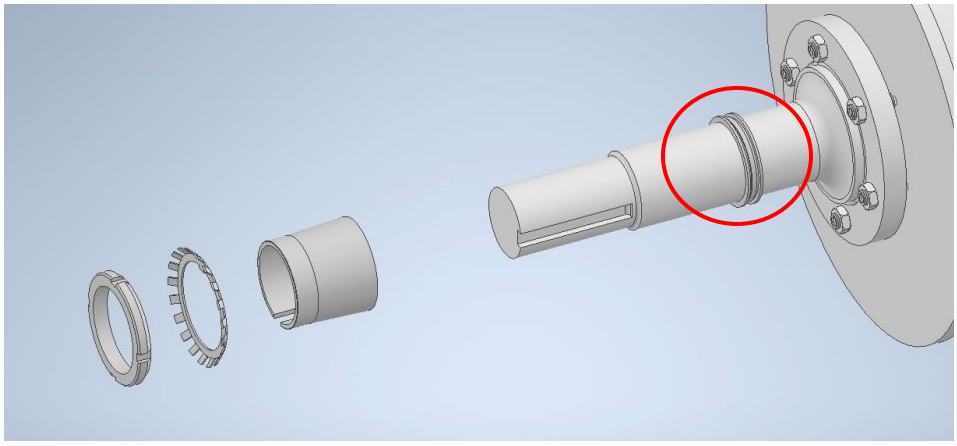
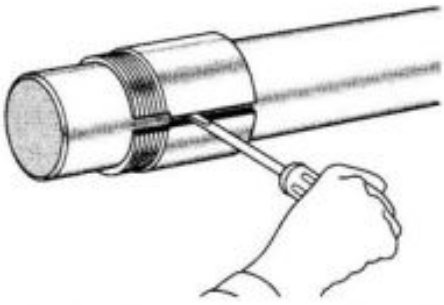
3. Wipe the preservative from the surface of the sleeve and then oil the bore surface lightly. Use a thin mineral oil.



4. Slide the inner bearing oil seal onto the shaft prior to sliding on the adapter.



5. Open up the sleeve by inserting a screwdriver into the slit. Then, slide the sleeve along the shaft to the correct position.



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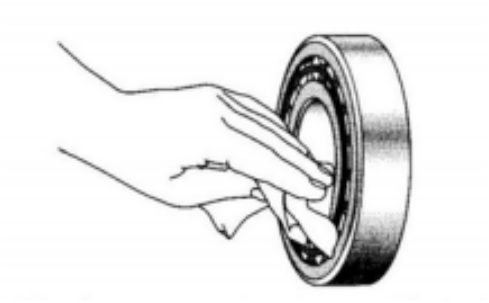
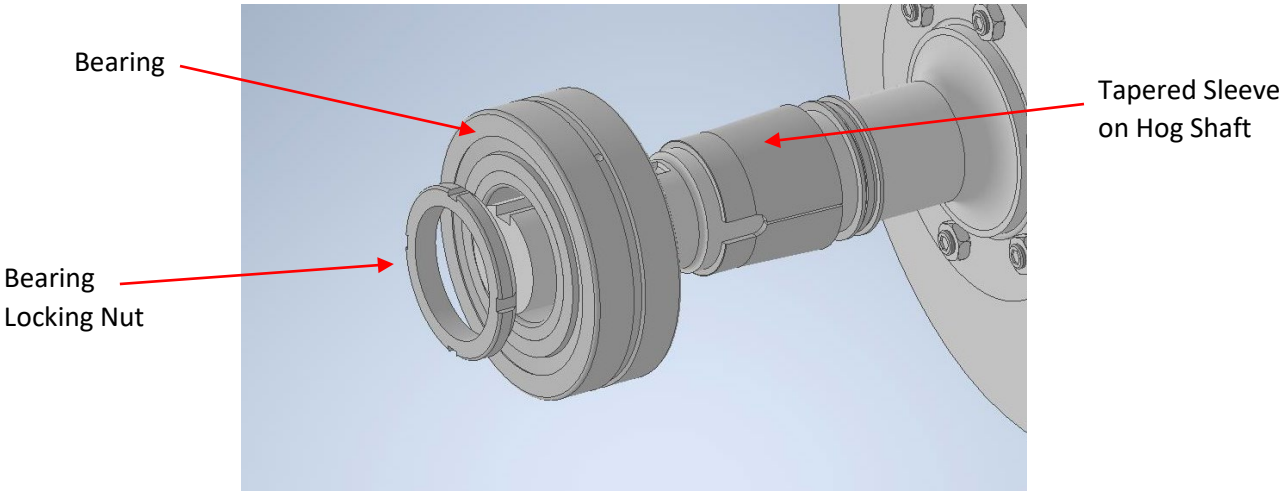
6. Wipe the preservative from the bore of the bearing and then oil the surface lightly. Use a thin mineral oil.



7. Place the bearing on the sleeve. Screw on the nut with its chamfer facing the bearing, but do not mount the locking washer. Do not push the inner ring up on the taper.



8. The bearing unit is secured on the shaft by tightening the lock nut with a spanner wrench or with a blunt chisel and hammer. Turn the nut sufficiently to ensure that the shaft makes proper contact (self-locking) with the sleeve, but do not drive the bearing any further up onto the sleeve until you begin checking the mounted clearance.

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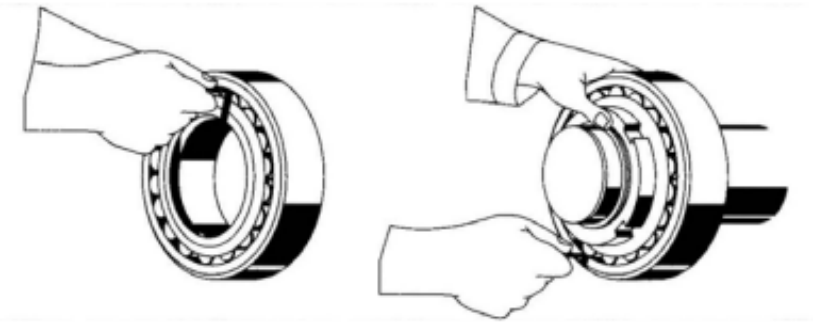
9. While continuing to tighten the nut, keep checking the clearance between the top roller and outer race with a feeler gauge until the proper clearance is reached. Refer to the table below for clearance requirements, based on the bearing manufacturer's recommendations.

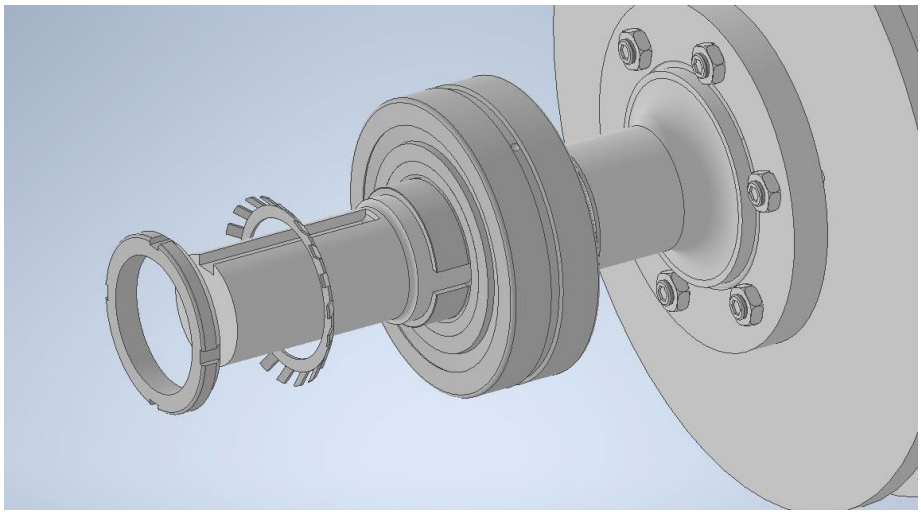


Clearance Requirements for SKF Bearings

Shaft Journal	Bearing	Bore (mm)	Unmounted Clearance	Reduction in Internal Clearance	Mounted Clearance
2.9375	22217 CCK/C3W33	85	0.0043-0.0055	0.0018-0.0025	0.0025-0.0030
3.9375	22222 CCK/C3W33	110	0.0053-0.0067	0.0020-0.0028	0.0033-0.0039
4.4375	22226 CCK/C3W33	130	0.0063-0.0079	0.0025-0.0035	0.0038-0.0044
4.9375	22328 CCK/C3W33	140	0.0063-0.0079	0.0025-0.0035	0.0038-0.0044
5.4375	22232 CCK/C3W33	160	0.0071-0.0091	0.0030-0.0040	0.0041-0.0051

**Note: Values are in inches unless noted. The above clearances are based on a Class-3 fit.*

10. Once the proper mounted clearance is achieved, unscrew the nut, place the locking washer in position, and tighten the nut firmly again.



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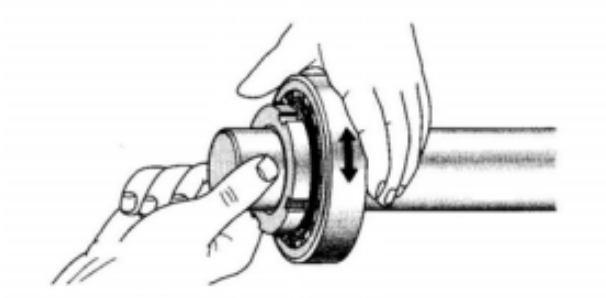
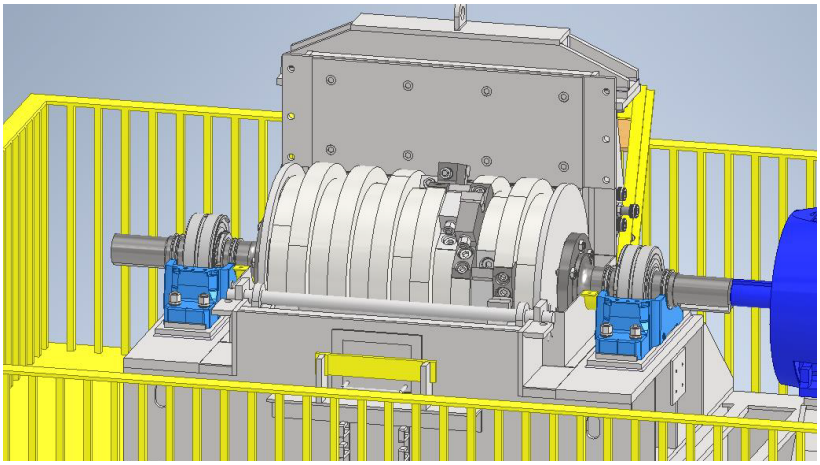
11. Check that the shaft or outer ring can be easily rotated by hand.

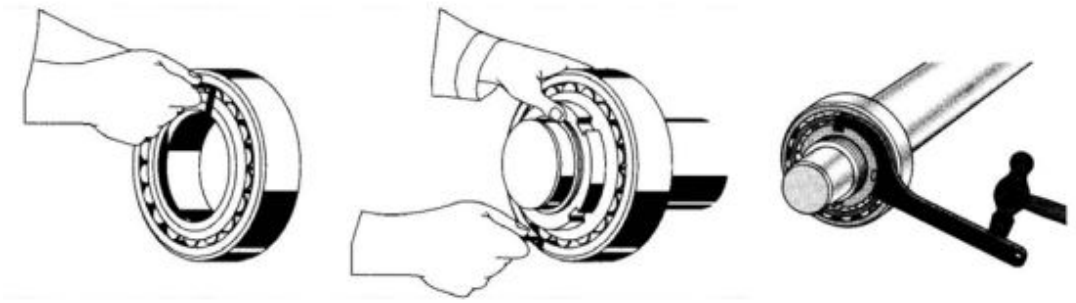


CAUTION: A loose adapter sleeve can lead to the inner ring turning on the adapter sleeve and/or the adapter sleeve turning on the shaft. To ensure that the nut is not excessively tight, make certain the outer ring of the bearing rotates freely. For a Class-3 fit bearing, the outer ring will swivel freely.

12. Allow rotor and bearing unit to rest in the bottom half of the housing for final tightening. An example is given below of a KC Model Hog, but the actual housing will vary based on the user's hog model.



13. Verify mounted clearance and tighten further as needed. Refer to the table above for clearance requirements, based on the bearing manufacturer's recommendations.



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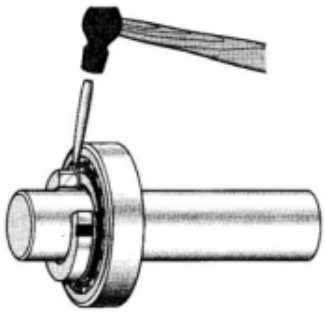
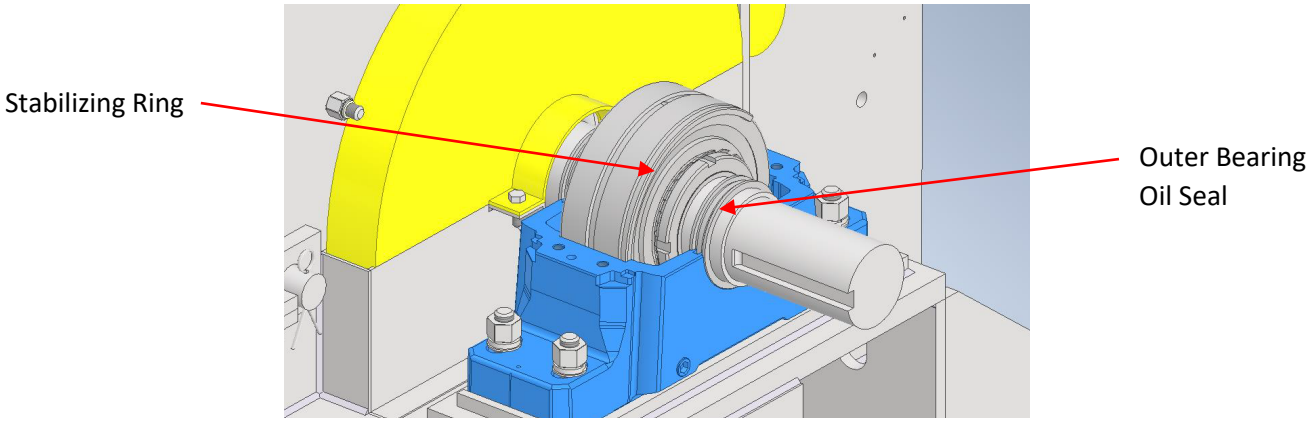
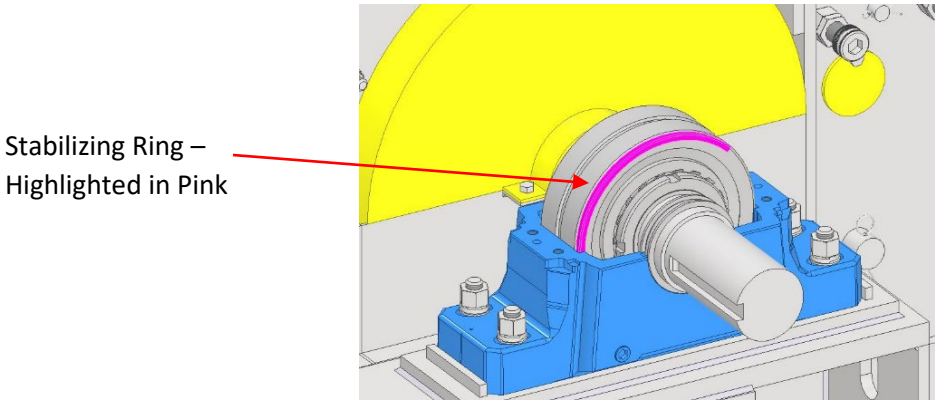
14. Lock the locking nut in place by bending one of the locking washer's tabs down into one of the slots in the nut. Do not bend it to the bottom of the slot.



15. Apply lubrication. Refer to the maintenance manual for your specific hog model for more information.
16. Slide the outer bearing housing oil seal onto the shaft and insert the stabilizing ring, if applicable.



The hog uses only one stabilizing ring per set of bearings, customarily installed on the drive end. The stabilizing ring is a partial ring that can be installed around the shaft and located inside the bearing housing after the bearing has been attached.



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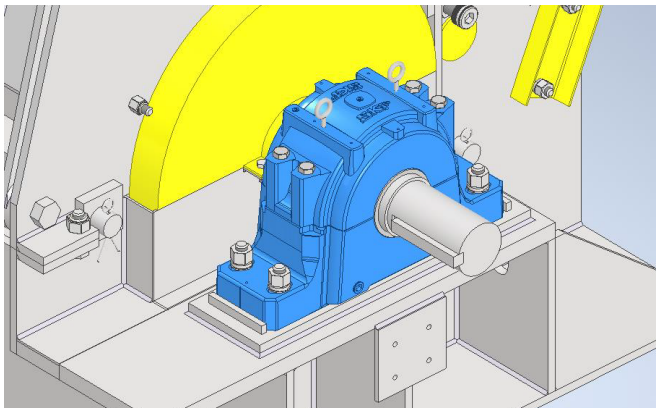
17. Install the upper housing of the bearing.



ENSURE ALL GUARD COVERS HAVE BEEN REINSTALLED BEFORE RUNNING THE HOG.

DO NOT RUN THE HOG WITH BEARING CAP BOLTS OR ANCHOR BOLTS LOOSE.

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Recommended Torque

It is the responsibility of the user to make sure fastenings are properly tightened

Recommended Torque

T3 Tooth	**350 ft-lbs**	Threaded Shank	7/8" Heavy Hex Nut	Lock Washer
T3 2-Part Tooth	**350 ft-lbs**	Threaded Shoulder	7/8" Hex Bolt (Grade-5)	Lock Washer
Anvils (Gravity Models)	**250 ft-lbs**	7/8" Square Head	7/8" Nylock Nut	
		7/8" Anvil Stud	7/8" Heavy Hex Nut	Flat Washer
Anvils (HZF Models)	**250 ft-lbs**	7/8" Socket Head		Lock Washer
Anvil Tie Rod	**250 ft-lbs**	Threaded Ends	7/8" Heavy Hex Nut	Flat Washer
KC Tooth	**450 ft-lbs**	Threaded Shank	1" Heavy Hex Nut	Lock Washer
KC 2-Part Tooth	**450 ft-lbs**	Threaded Shoulder	1" Hex Bolt (Grade-5)	Lock Washer
KC Lug Inserts	**450 ft-lbs**	1-1/4" Socket Head	1" Socket Head	
KC Anvil Points	**450 ft-lbs**	1-1/4" Socket Head		Lock Washer
LRW Tooth Insert	**100 ft-lbs**	1/2" Socket Head		Lock Washer

Important Notes / Recommended Procedures

⚠ **NORMAL OPERATION MAY CAUSE FASTENINGS TO LOOSEN OVER TIME.**

⚠ **TIGHTENING BEYOND THE ELASTIC REGION OF THE STEEL CAN CAUSE THREADS TO STRETCH AND/OR THE LOCK WASHER TO PERMANENTLY FLATTEN OR DEFORM - ANY OF WHICH WILL UNDERMINE THE CONNECTION.**

⚠ **A LOOSE TOOTH CAN HIT THE ANVILS AND/OR THE SCREEN, CAUSING DAMAGE TO THE UNIT AND POSSIBLY CAUSING SEVERE INJURY TO PERSONNEL IN THE AREA.**

√ Use a wire brush to clean threads and remove debris from metal surfaces before installing and tightening parts. Debris between mating surfaces can work loose during operation and allow previously secured parts to move.

√ Initially check fastenings daily to make certain they are tight. The time over which fastenings may loosen varies with each application, depending on the type of material processed, the quantity of material processed, the hours per day of operation, the integrity and fit of the parts, and the level of vibration/imbalance during operation.

Due to the wide variation in applications, there is no standard interval between checks that would be applicable to all installations. Actual operating experience will allow each customer to determine the maximum time interval between checks for the particular installation.

√ Be careful when installing new parts as fingers are easily smashed.

√ All new and factory repaired teeth are shipped with a Heavy Duty Hex Nut and Lock Washer, which should be replaced each time parts are changed to ensure the integrity of the fastener.