User Manual for FS, HD, & PM Model Hogs – Gravity Infeed

Operating, Maintenance, Lubrication, and Safety Instructions

Bulletin 23-10-23

2017 Thelma Street | P.O. Box 3687
Jacksonville, Florida 32206 U.S.A.
Phone: (904) 355-5671
www.montgomeryindustries.com

TABLE OF CONTENTS

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

TABLE OF FIGURES

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

TABLE OF TABLES

**Indicates duplicate table*

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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 may 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 the 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.**

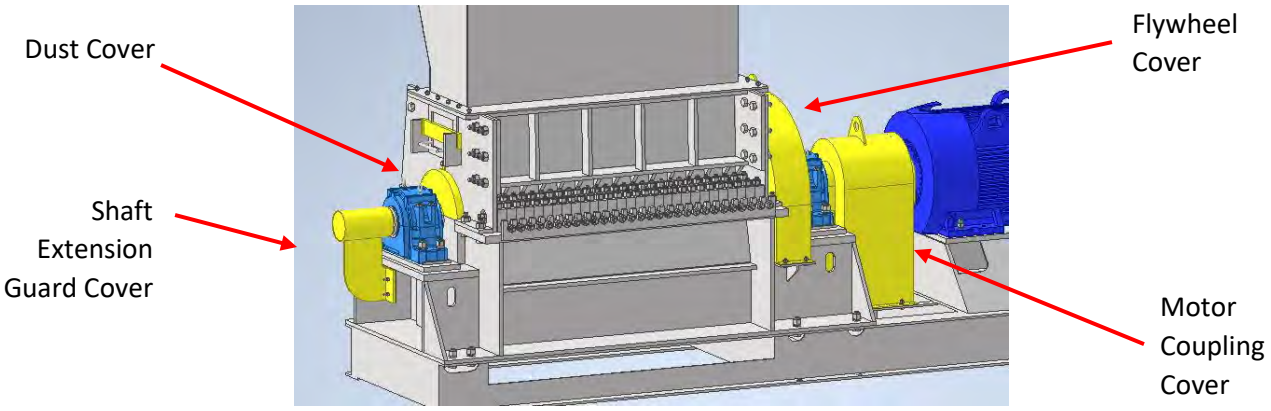


Figure 1.1: Guard Covers

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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

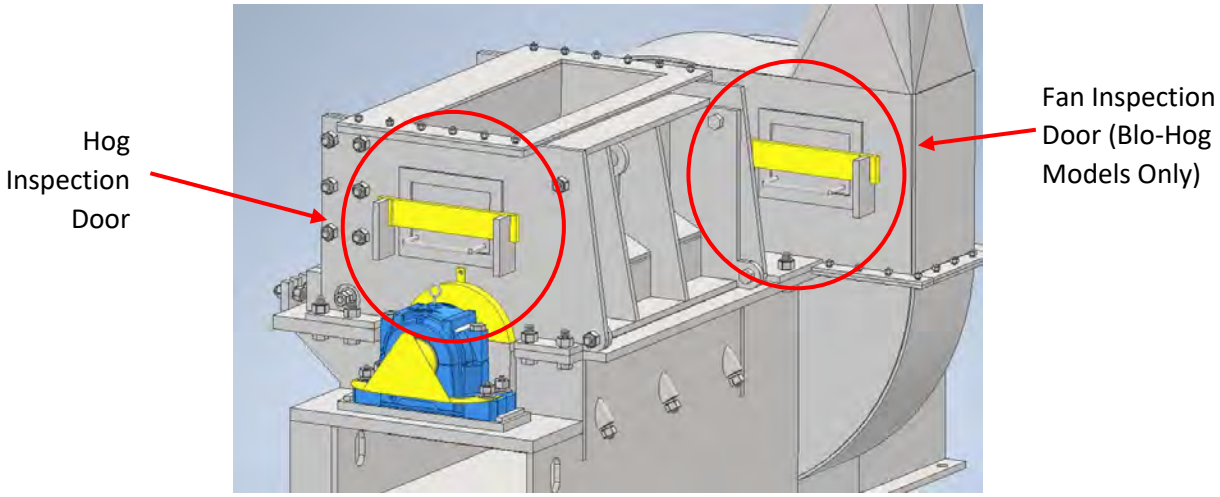


Figure 1.2: Inspection Doors

✓ **Do not turn the rotor over by hand or power with any part of the body between the teeth and anvils.** 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.

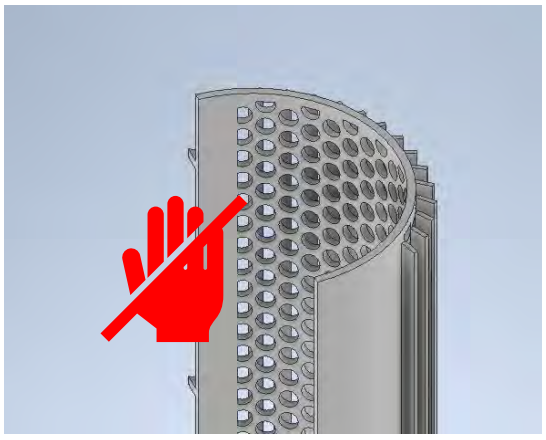


Figure 1.3: Screen

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

✓ 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.

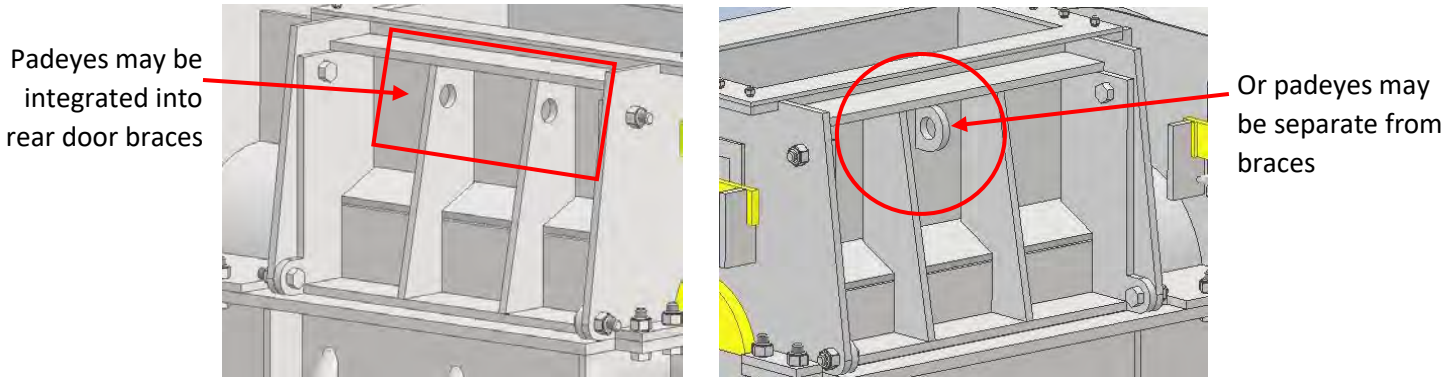


Figure 1.4: Different Styles of Rear Door Lifting Padeyes

✓ 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

INSTALLATION

➤ FOUNDATION PREPARATION

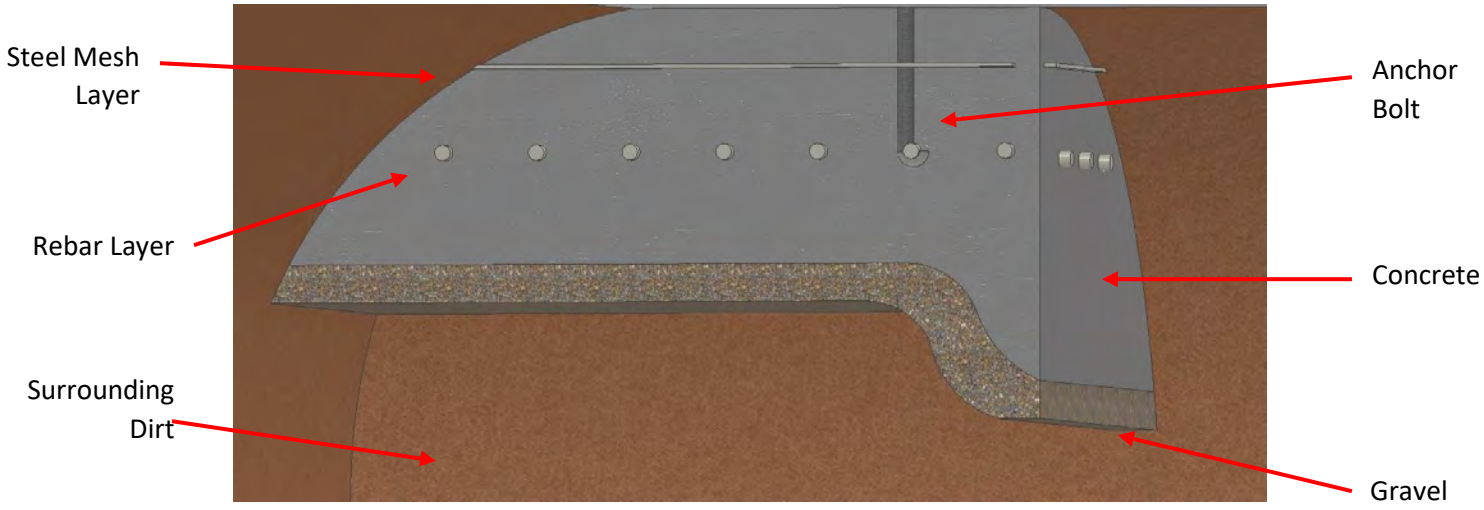


Figure 2.1: Slab-On-Grade Foundation (3D Cutaway View)

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.

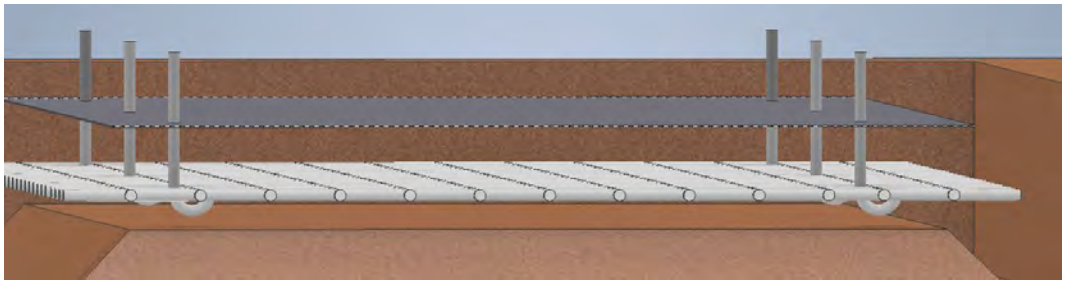


Figure 2.2: Rebar, Steel Mesh, and Anchor Bolt Placement

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

- ✓ #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.

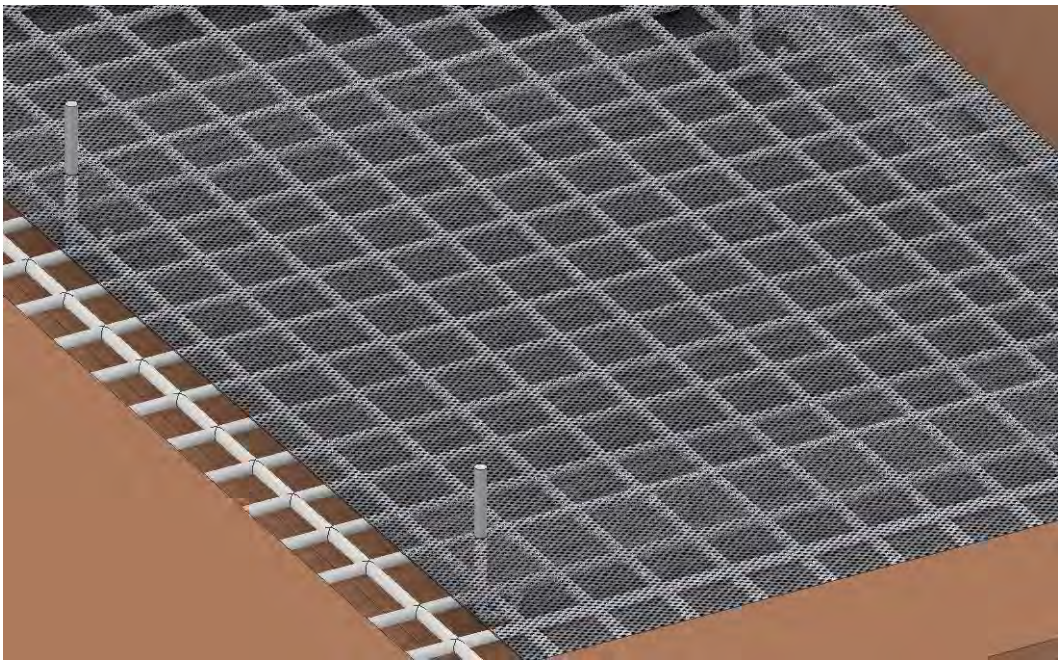


Figure 2.3: Reinforcements Prior to Concrete Pour

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

➤ SHIM AND GROUT BASE PLATE

The hog housing is a fabricated weldment. The base plate is not machined flat. Shims may be required to prevent distortions to the housing or binding on the bearings when an uneven base plate is tightened to a foundation.

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 the correct size and thickness to fill any gaps between the foundation and the bottom of the hog base plate.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Grout is preferred, but not required. A grouted base can help dampen vibration from normal operation.

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.

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

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

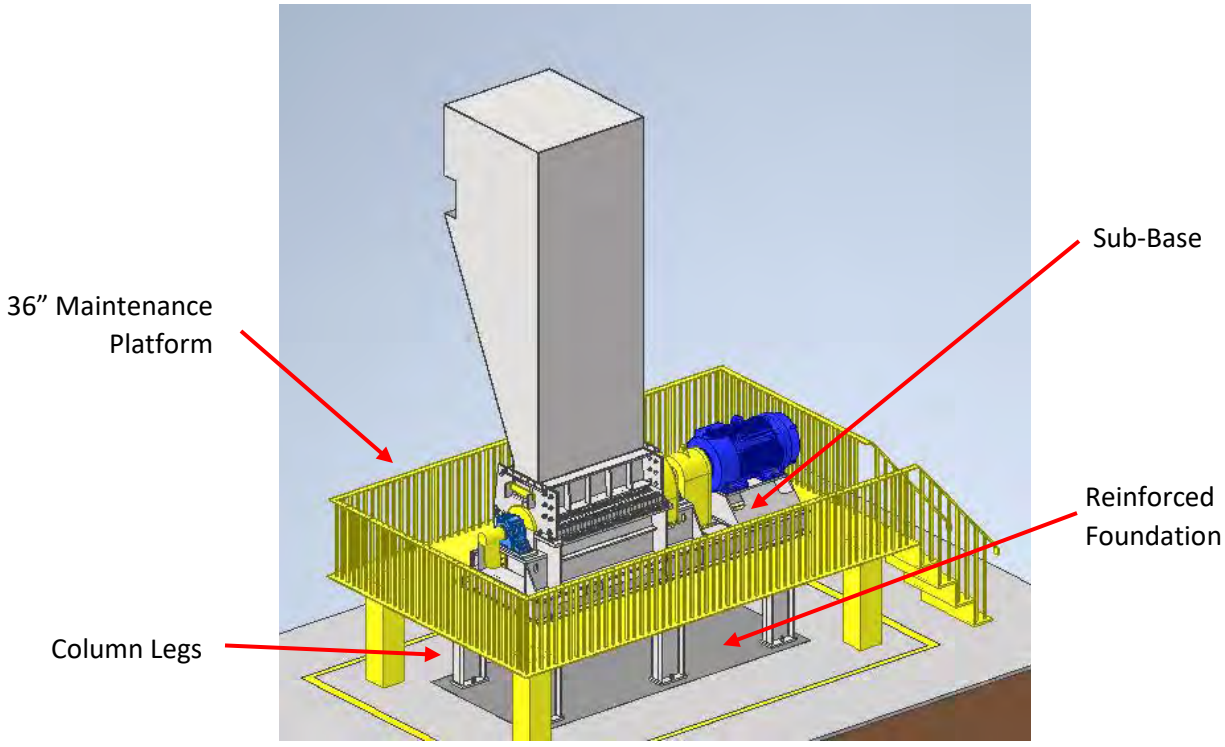


Figure 2.4: Hog Unit Mounted on Sub-Base with Column Legs

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

The structure should incorporate rigid connections, supports, 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.

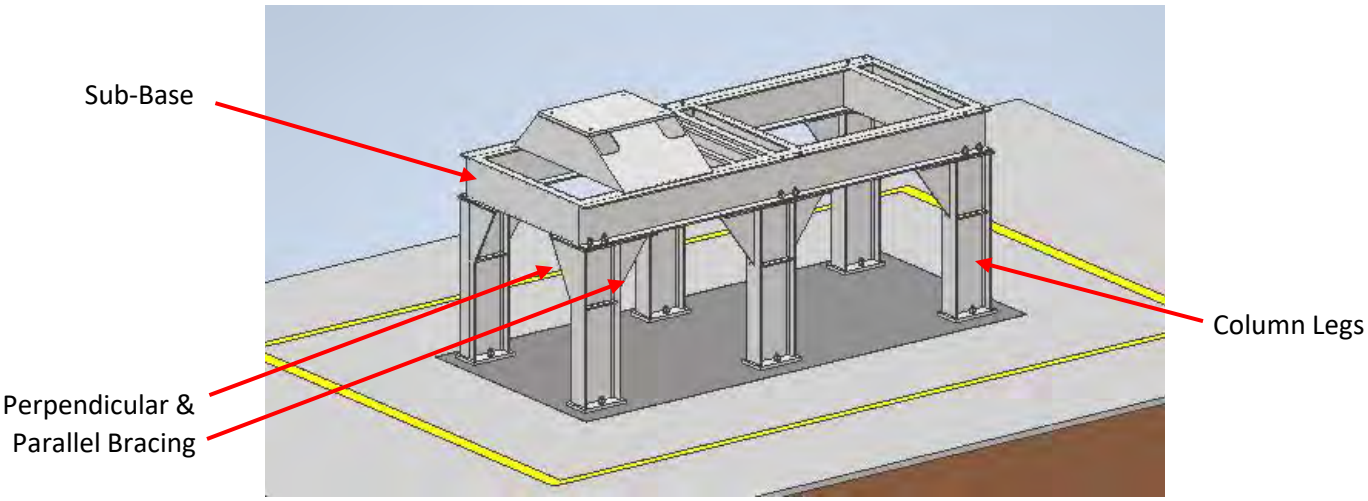


Figure 2.5: Supporting Columns & Structural Sub-Base

➤ 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 into 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 hopper should be approximately 25° off vertical. Any larger and the material will be subjected to friction on the hopper throat. This may prevent the material from sliding down the throat, or may result in material hitting the back wall before the rotor can engage it and pull it into the anvils.
- The hopper should be large enough that the infeed material can freely fall down the hopper chute. There should be enough room above the head pulley so that infeed material can rotate about the head pulley of 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 head pulley of the infeed conveyor should extend 5 feet above the companion flange of the hog housing.**
- The infeed belts should be at an angle of 15° to 20° off horizontal. Any steeper and material may slide back down the conveyor belt instead of entering the hog.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

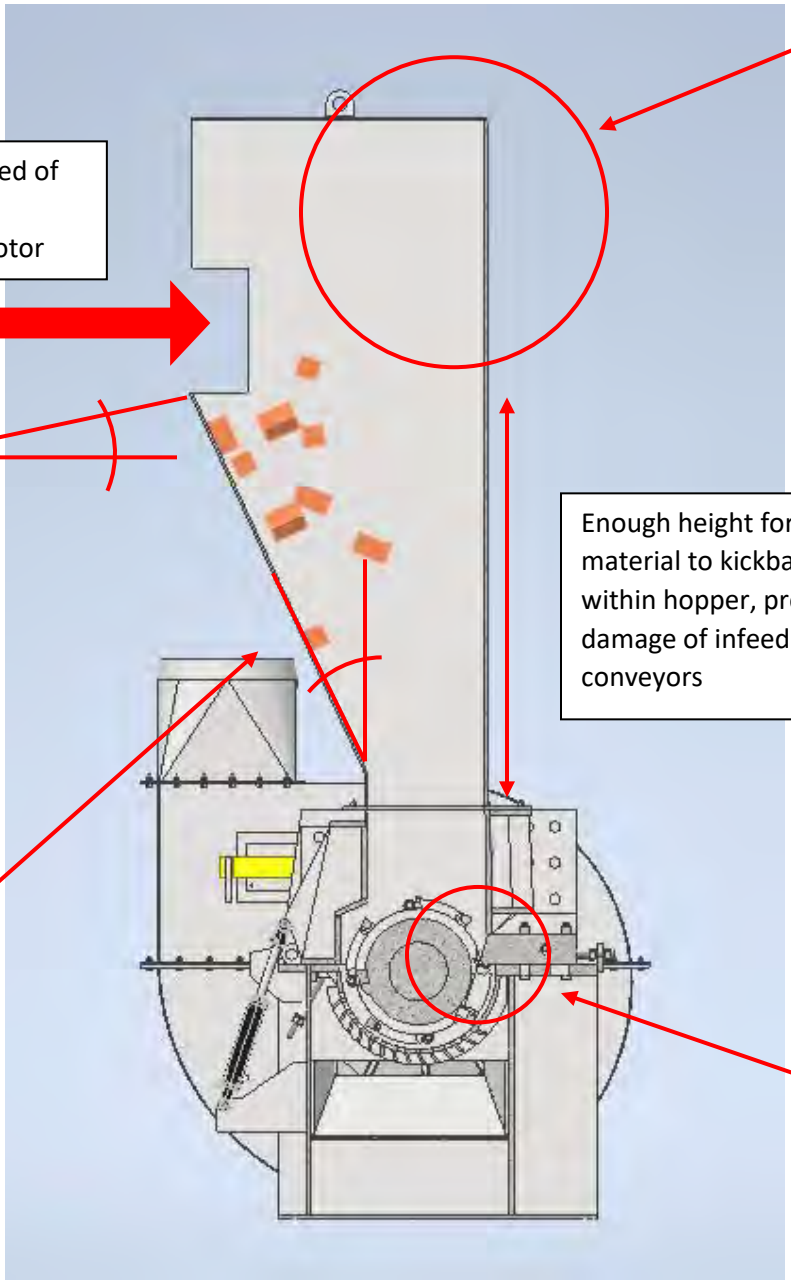


Figure 2.6: Feed Hopper Design

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

➤ START-UP PROCEDURES

There are 12 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.

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 section on *Maintenance Procedures: Bearing Lubrication* for more information.) Additionally, the rolling elements should have grease worked in between them so the bearing itself is 100% full.

Figure 2.7: Bearing Unit and Housing Properly Packed with Grease

Static Oil Bearings

USE ONLY OIL WITH SPECIFICATIONS AS LISTED IN MAINTENANCE PROCEDURES.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

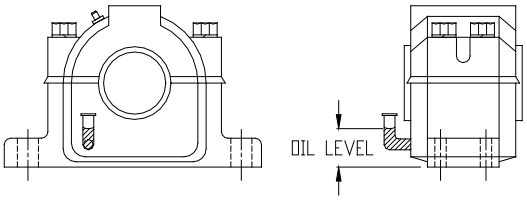


Figure 2.8: Oil Level for Static Oil Bearings

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	2-15/16”	1-3/8”
	3-15/16”	1-25/32”
	4-7/16”	2-11/32”
	5-7/16”	2-1/16”

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Table 2: Oil Flow Rates for Circulating Oil Bearings

Bearing Series	Bearing Size	Flow Rate*
USAF 500	2-15/16”	0.06 GPM
	3-15/16”	0.11 GPM
	4-7/16”	0.12 GPM
	5-7/16”	0.25 GPM

These flow rates are the minimum required to keep the surfaces in the bearing lubricated.* ***They are meant to be a starting point, not a “one size fits all” answer.* *Flow rates may need to be increased depending on the contamination in the environment, ambient conditions, and external heat sources.*

d) To measure the 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.

2. Check alignment of flexible coupling (direct drive) or V-belt drive pulley.

Misalignment is a common source of machine vibration.

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

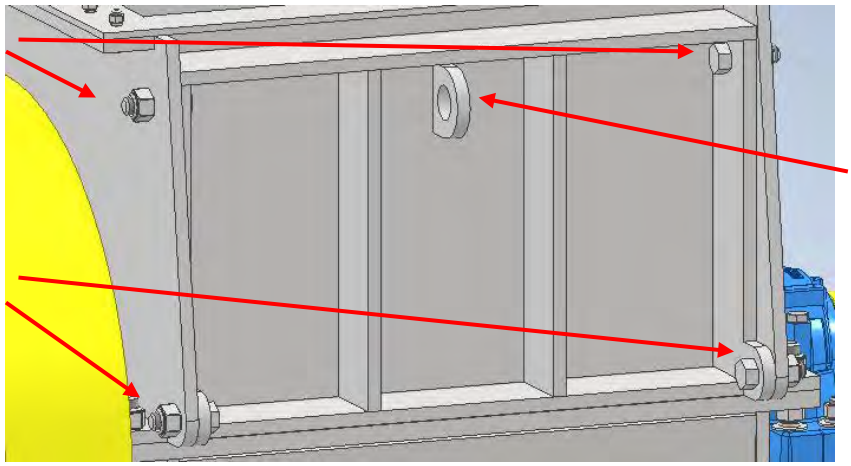


Figure 2.9: Rear Door Bolts (No Hydraulic Rear Door)

Even with a hydraulic rear door opener, the top bolts must be removed, and the bottom bolts must be loosened. Failure to remove the top bolts prevents the door from being opened and may cause damage to hydraulic components.

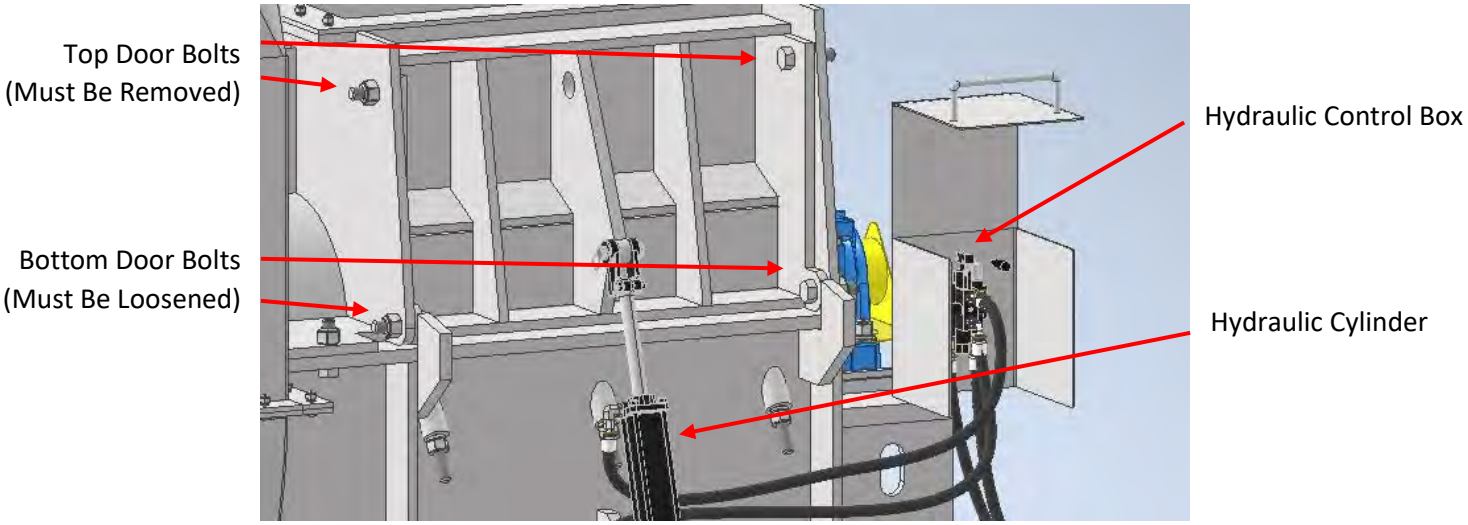


Figure 2.10: Rear Door Bolts (Hydraulic Rear Door)

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

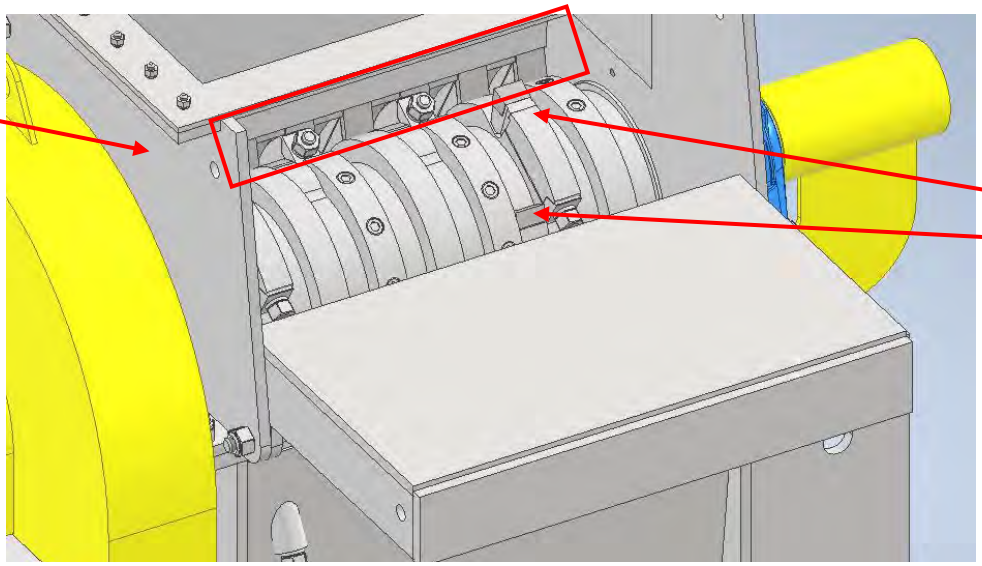


Figure 2.11: Teeth and Anvils

Anvils have been set at the factory prior to shipment. There is no need to adjust the anvil rack upon receipt of a new or factory repaired hog. **If the anvil rack is improperly adjusted, there is a risk for catastrophic failure. Ensure all anvils are properly tightened and clear the teeth before starting the hog.**

4. Make certain all teeth are tight.

The recommended torques for T3 teeth are given below.

Table 3: Recommended Torques for T3 Teeth

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	250 ft-lbs
2-Part Teeth	350 ft-lbs
Manufactured Teeth	350 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 – either of which can 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 the rotor by hand (or by pulling on the drive belt) for a few rotations to check for binding.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

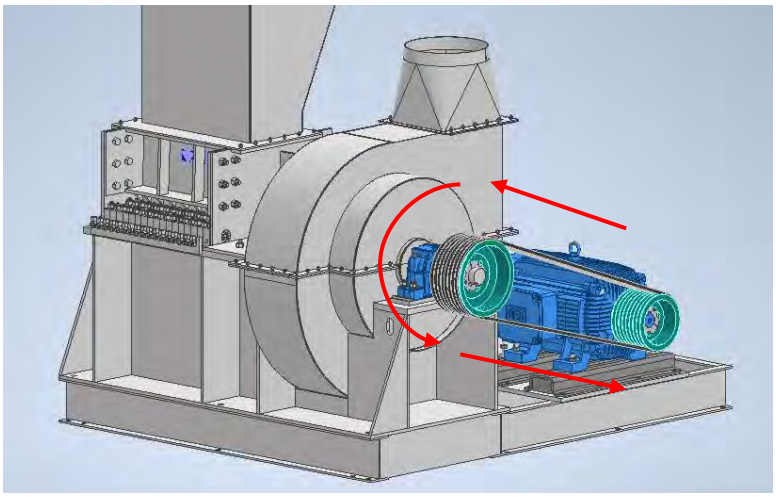


Figure 2.12: Checking for Binding

Make sure the hog is properly mounted on a level, horizontal surface before turning the rotor. An uneven surface can make the rotor appear that it is out of balance, even if it is not. The rotor should turn easily with no heavy spots or rollback.

6. Jog motor to verify correct shaft rotation under power.

The rotor should rotate so that the teeth cut down into the anvils.

7. Make certain that all guards are in place and secure.

This includes dust covers, flywheel covers, shaft extension covers, and inspection doors. Additionally, all rotating elements on drive components need to be covered. This includes V-belt drive covers and direct drive motor coupling covers.

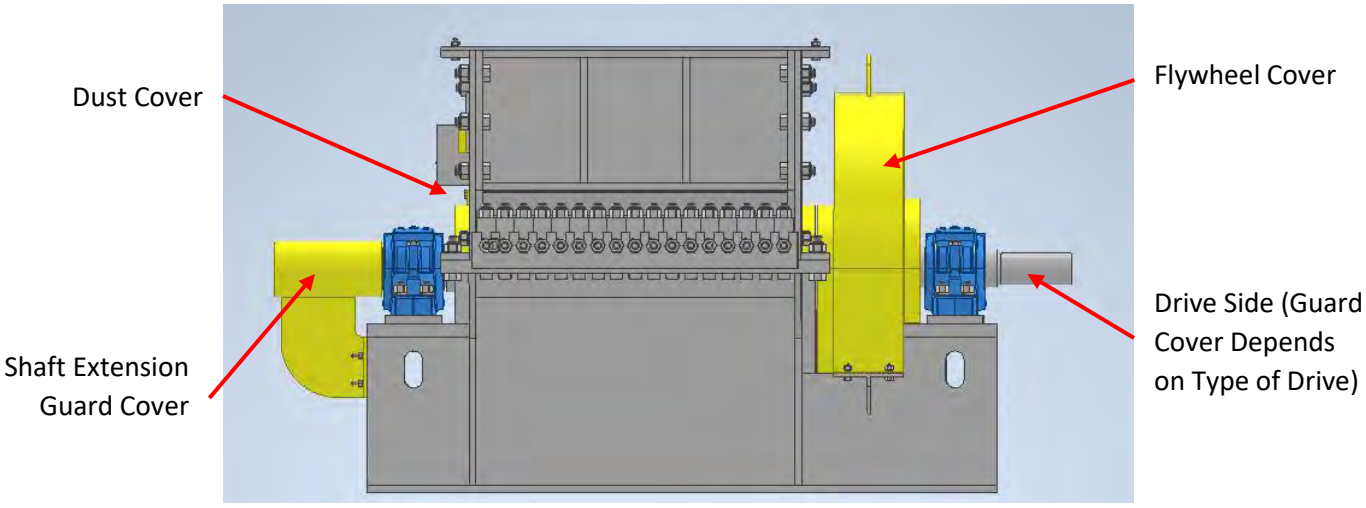


Figure 2.13: Guard Covers in Place – ER

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

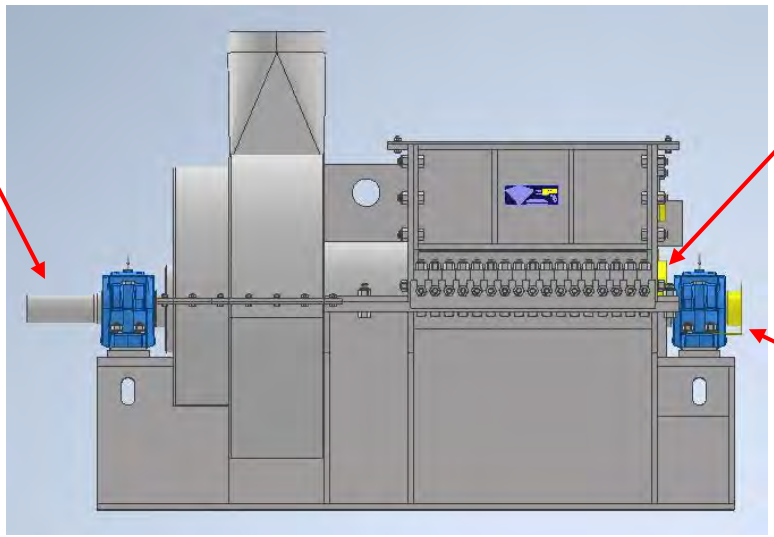


Figure 2.14: Guard Covers in Place – BH

8. If a blowpipe 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.

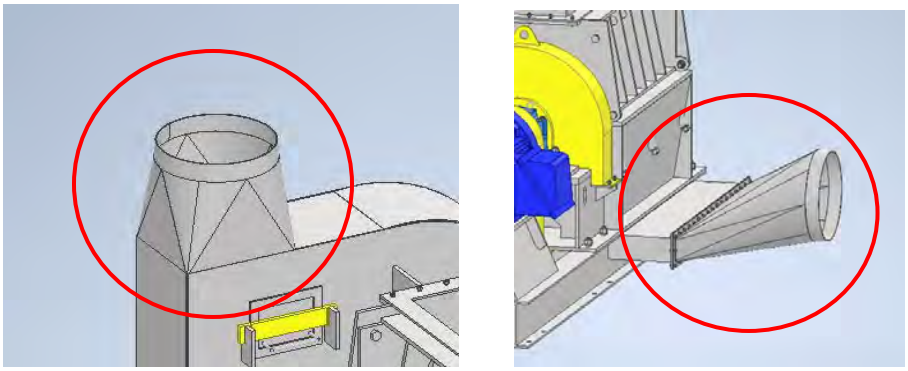


Figure 2.15: Blowpipe Connections

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.

Additionally, ensure all conveyor belts are tight and at the proper angles to prevent slipping of infeed material.

Verify that the hopper does NOT feed against rotation. It should be directed so material falls onto the anvil side of the hog.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

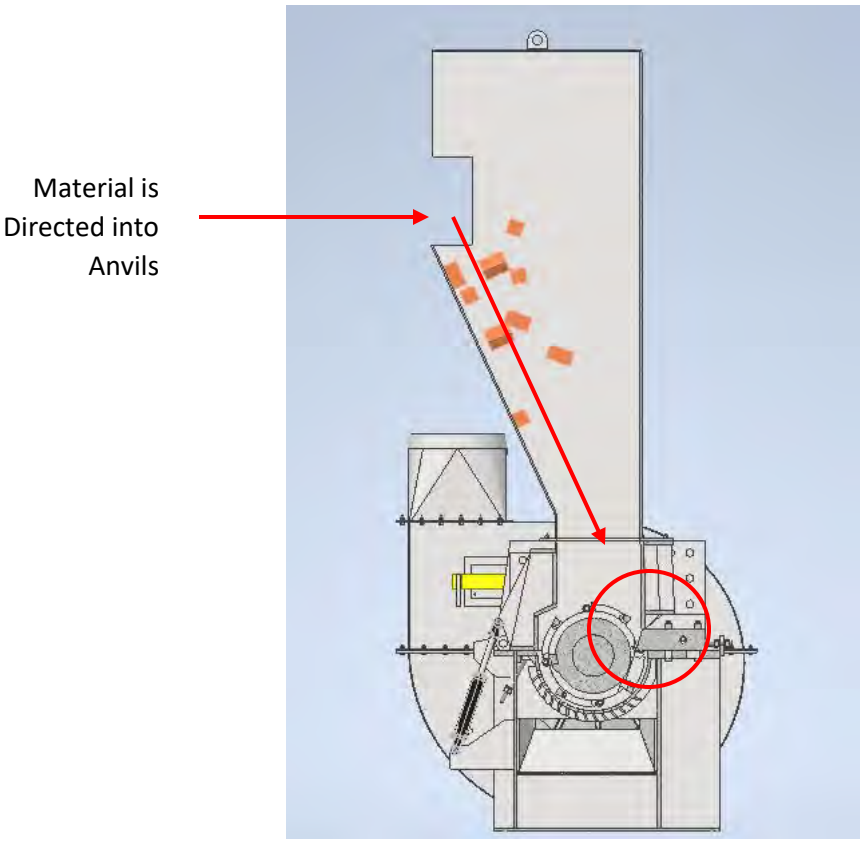


Figure 2.16: Correct Feed Direction

11. Check air make-up openings and remove any obstructions to the air flow.

There must be a minimum of 12” clearance between the air opening and any obstructions (e.g. a wall).

Blo-Hog Models: The air makeup opening is on the side of the hog opposite the fan.

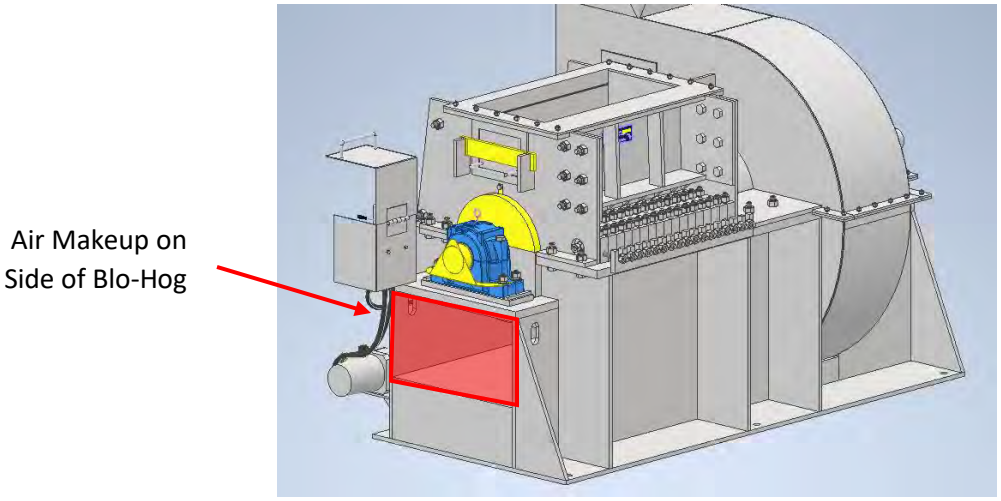


Figure 2.17: Blo-Hog Air Makeup

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Gravity Discharge Models: If a blowpipe connection is included in the sub-base, the air makeup opening will also be on the sub-base. If material is simply gravity discharged onto a conveyor underneath the hog, there will not be an air makeup opening.

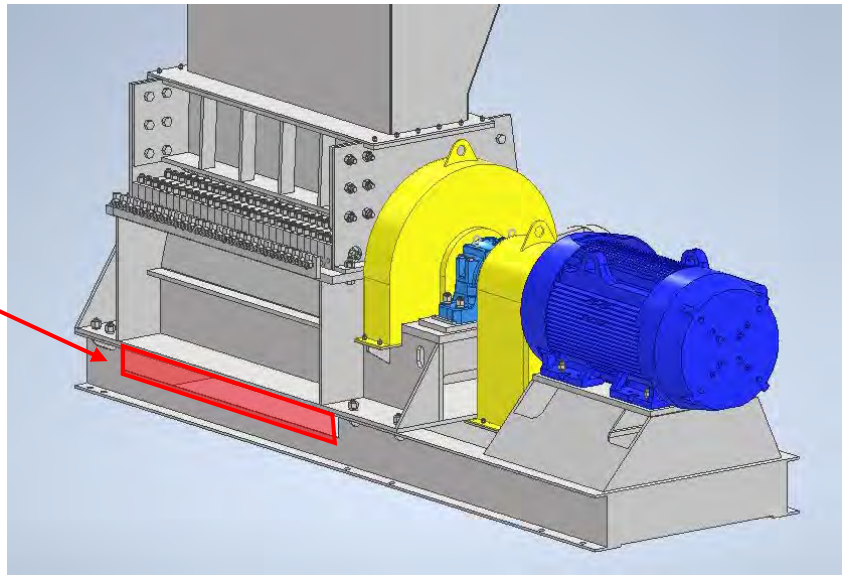


Figure 2.18: Eat Rite Air Makeup

12. Verify proper hog shaft speed.

Direct Drive: Check drive motor RPM.

V-Belt Drive: Check pulley diameters on hog and motor shafts. Verify that the drive motor RPM and the pulley ratio will result in the proper hog RPM.

Additionally, check drive belts for proper tension. Operating a Blo-Hog with loose V-Belts or a worn fanwheel can result in pipe stoppage from inadequate air flow.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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	
(11) Check air make-up openings and remove any obstructions to air flow	
(12) Verify proper hog shaft speed	

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

➤ ANVILS

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

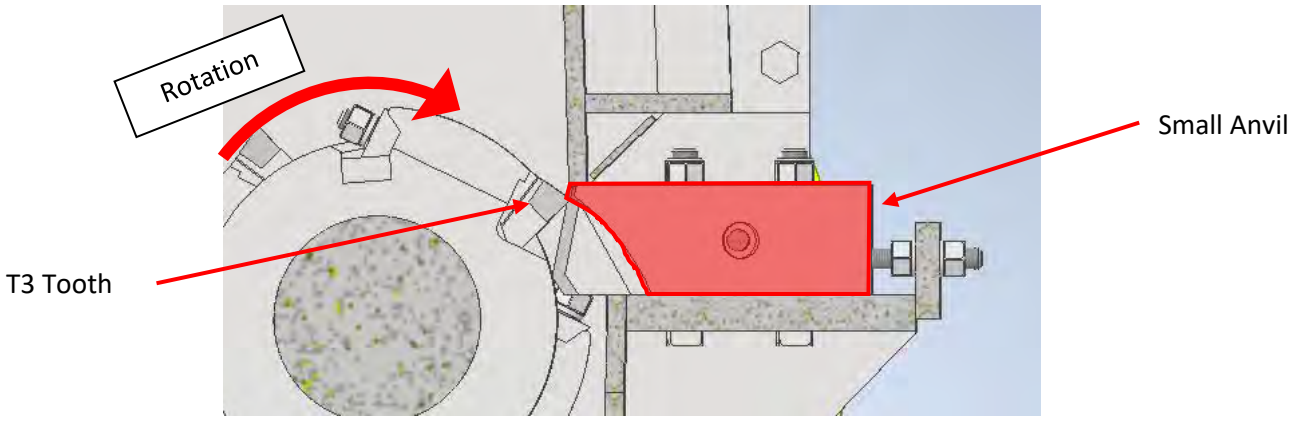


Figure 3.1: Small Anvil Cutting Action

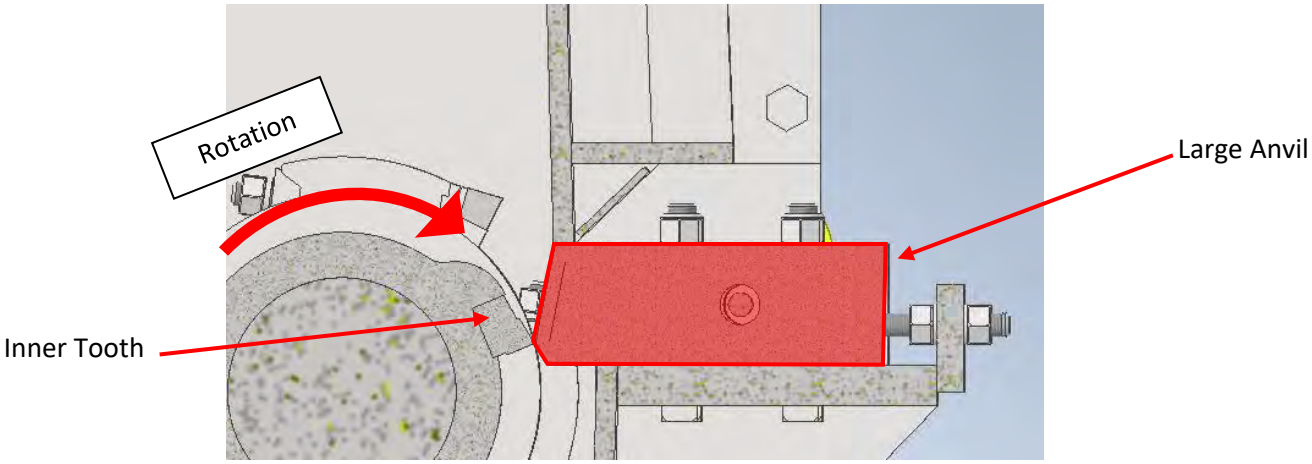


Figure 3.2: Large Anvil Cutting Action

The anvils are adjustable to maintain the proper tooth-anvil clearance for efficient hogging. If the customer needs to move the anvils closer for a tighter grind, there is roughly 1/32” gap to do so. If the customer needs to move the anvils further from the teeth, there is roughly 1/4” to do so.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Anvils have been set at the factory prior to shipment. There is no need to adjust the anvil rack upon receipt of a new or factory repaired hog. **If the anvil rack is improperly adjusted, there is a risk for catastrophic failure. Ensure all anvils are properly tightened and clear the teeth before starting the hog.**

BRINGING THE ANVILS CLOSER TO THE TEETH THAN THEY HAVE BEEN SET AT THE FACTORY MAY ENDANGER THE SAFETY OF PERSONNEL. DO SO AT YOUR OWN RISK.

Anvils are hardsurfaced on all wearing surfaces.

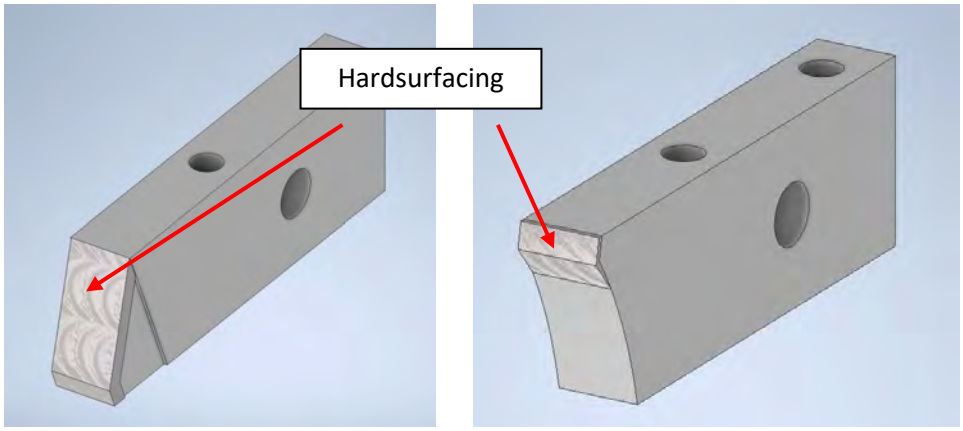


Figure 3.3: Anvil Hardsurfacing, Large (Left) & Small (Right)

Anvils are available in either Standard or Cutaway models. **Cutaway Anvils should be used in conjunction with Overlapping Cut T3 Teeth**. The overlapping cut created from combining cutaway anvils with overlapping teeth allows for successful processing of soft, spongy, or stringy materials.

Because of the different coefficients of thermal expansion between the mild steel and the hardening alloys, hairline cracks 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.

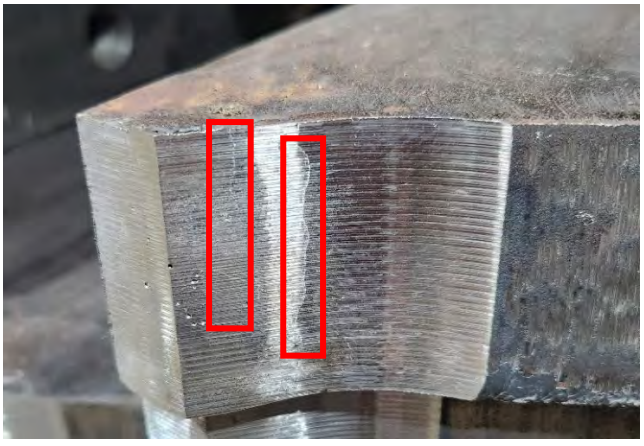


Figure 3.4: Crosschecking on Small Anvil Hardsurfacing

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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 anvils should be shipped to the factory and exchanged for parts rebuilt to factory standards. **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.**

USING AFTERMARKET ANVILS IN YOUR HOG MAY ENDANGER THE SAFETY OF PERSONNEL AND VOIDS ALL WARRANTIES

Anvils are fastened in place in all three planes. Square head machine bolts run vertically through the anvil plate to secure the anvils top-to-bottom. Anvil studs run horizontally through the back of each anvil to secure them front-to-back.

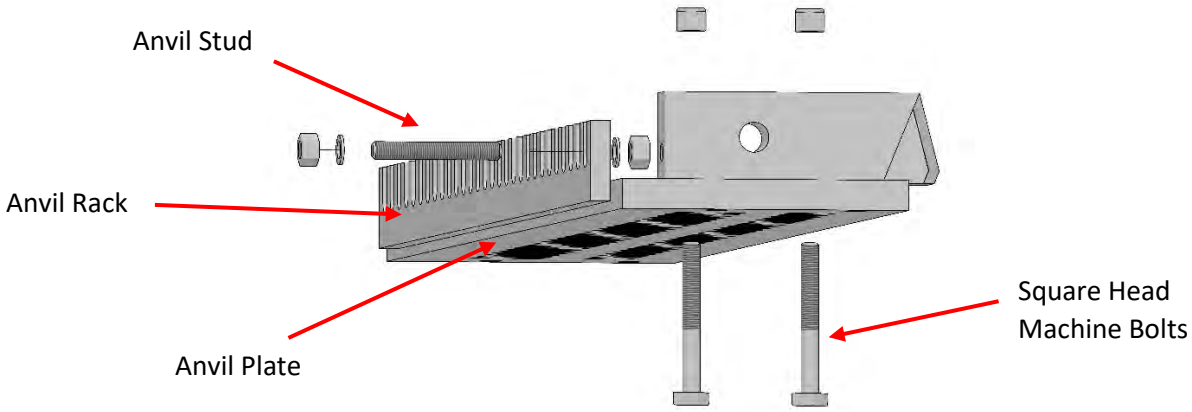


Figure 3.5: Anvil Fasteners – Exploded View

An anvil tie rod runs through the center of each anvil. This secures the anvils side-to-side and squeezes the entire assembly together. The anvil tie rod must be loosened and removed before any anvils can be removed for maintenance.

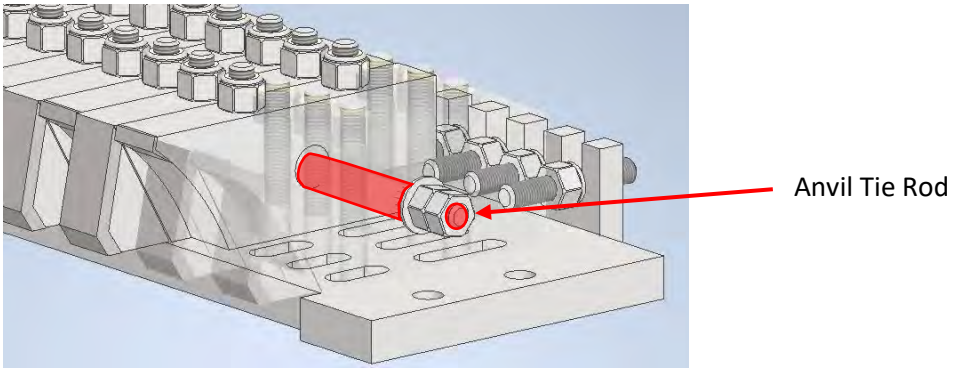


Figure 3.6: Anvil Tie Rod Running Through Anvils

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

FEED OPENINGS & HOPPERS

Gravity-Fed FS, HD, and PM hogs have multiple available options for feed openings. The specific values vary, but the principles of operation remain constant across the different models.

Table 4: Feed Opening Dimensions

Model	Small Feed Opening	Medium Feed Opening	Large Feed Opening
FS-ER & FS-BH	11-3/8”	13-3/8”	17-3/8”
HD-ER & HD-BH	11-3/8”	13-3/8”	17-3/8”
PM-ER & PM-BH	17”	---	21”

The smallest 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.

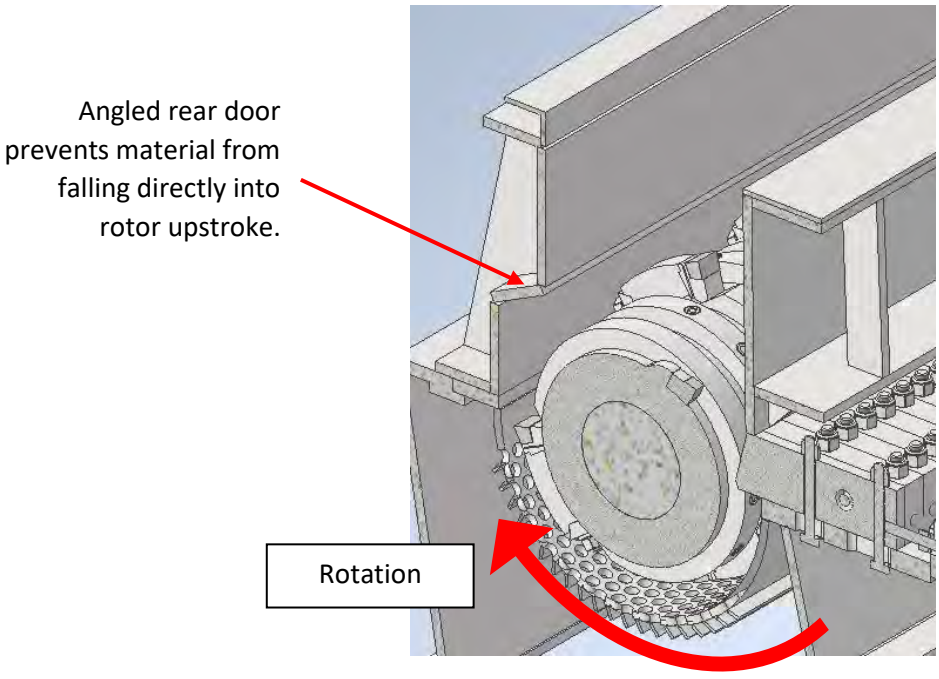


Figure 3.7: Angled Rear Door

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Material is blocked from shooting straight up into the air.

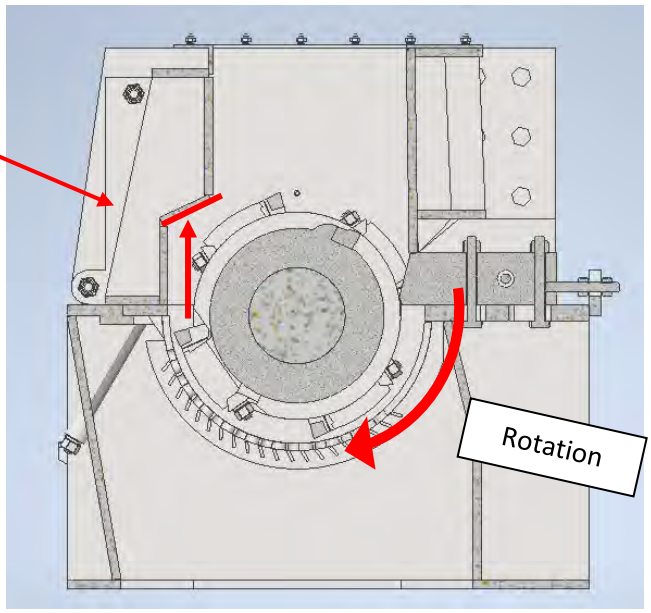
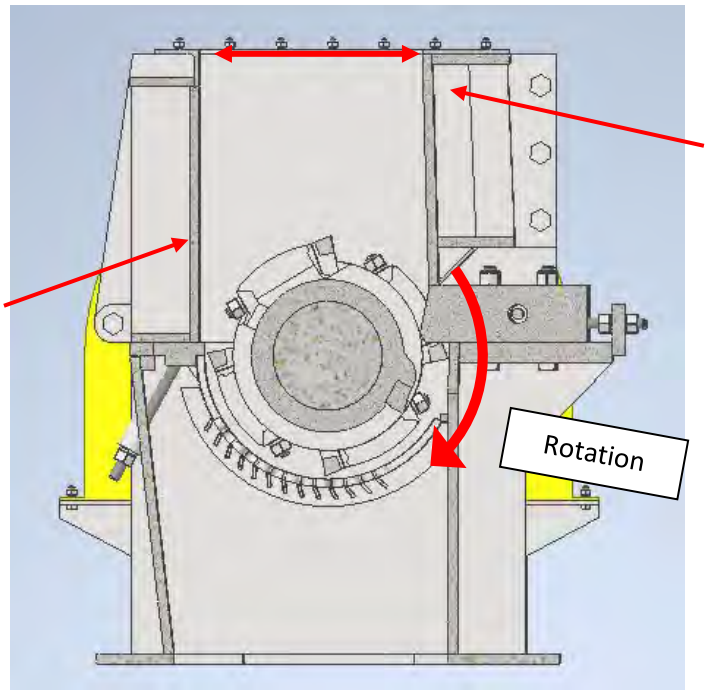


Figure 3.8: Deflecting Recirculation

The largest 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 is not an issue, the largest feed opening option prevents the hopper from getting bogged down with infeed material.

Vertical rear door allows more material to drop into the hog and not clog the hopper.



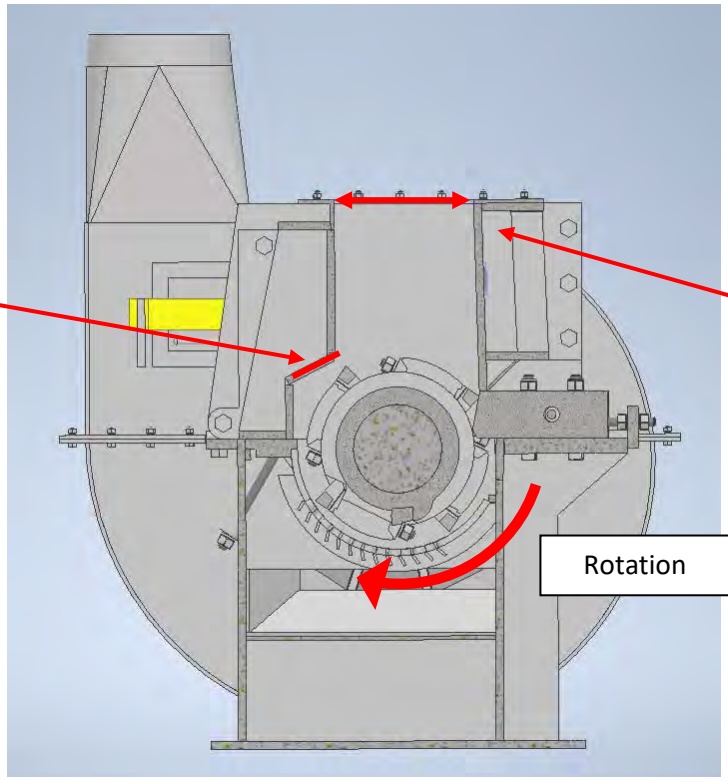
More space for infeed material – best suited for bark or other small chunks where recirculation will not excessively wear the components.

Figure 3.9: Larger Infeed

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

The medium feed opening option is available for the FS and HD series hogs. It aims to balance the benefits of both the smallest and largest feed openings. There is slightly more space within the hog housing for infeed material, but also an angled door to help mitigate recirculation.

Angled rear door prevents material from falling directly into rotor upstroke.



Slightly more space for infeed material than with smallest feed opening option.

Figure 3.10: Medium Feed Opening

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.

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 to reduce the likelihood of turbulent material reaching back up to the infeed conveyors. **All turbulence should be contained within the hopper to minimize kickback. Doing so prevents damaging of infeed belts or creating projectile hazards.**

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

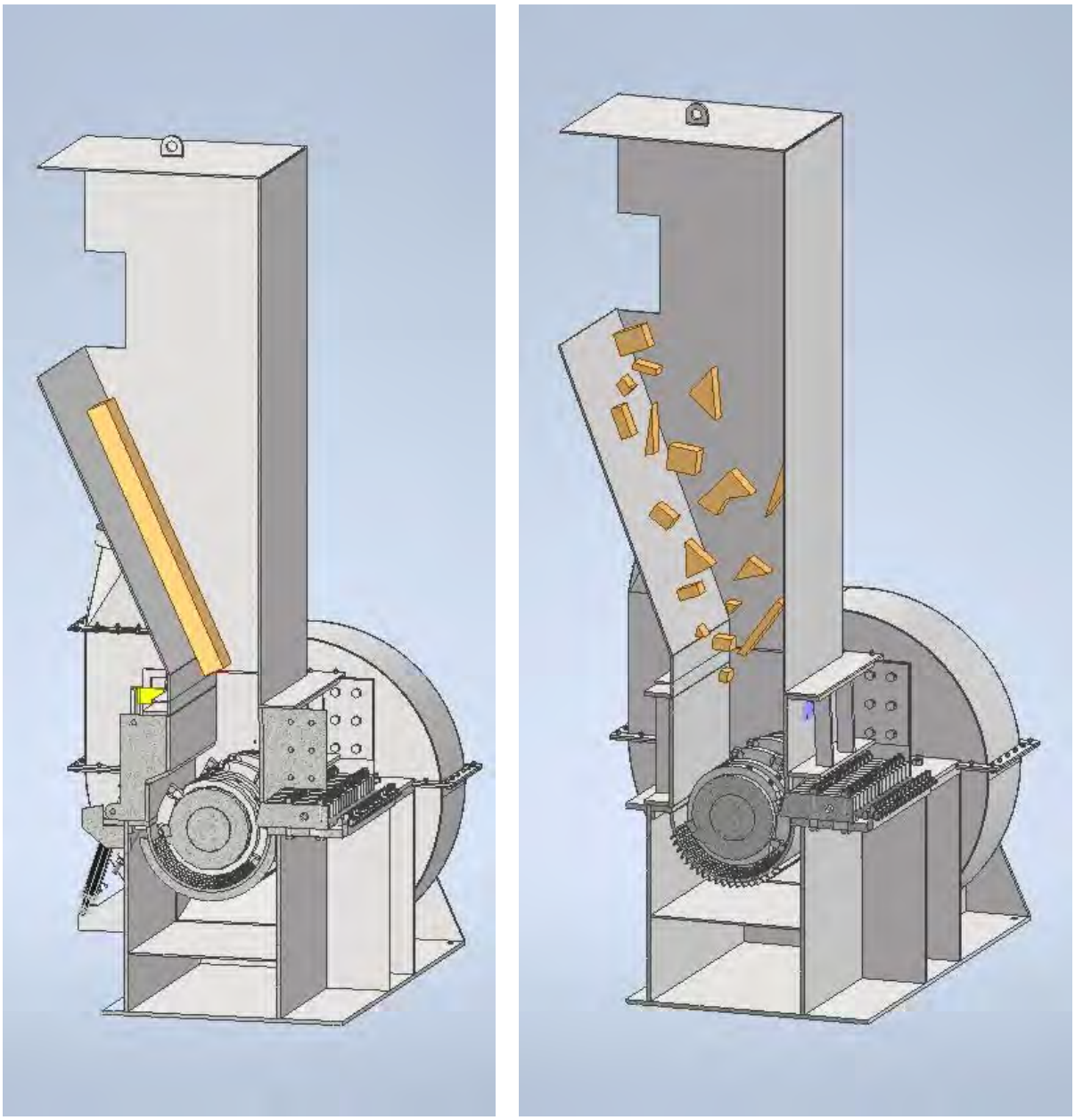


Figure 3.11: Feed Hoppers for Small Feed Opening (Left) & Large Feed Opening (Right)

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 head pulley of 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

PUNCH AND DIE CUTTING

All FS, HD, and PM model hogs employ a unique cutting action involving stationary anvils positioned on the front of the machine with rotating teeth (hammers) that pass through rectangular pockets formed by these anvils.

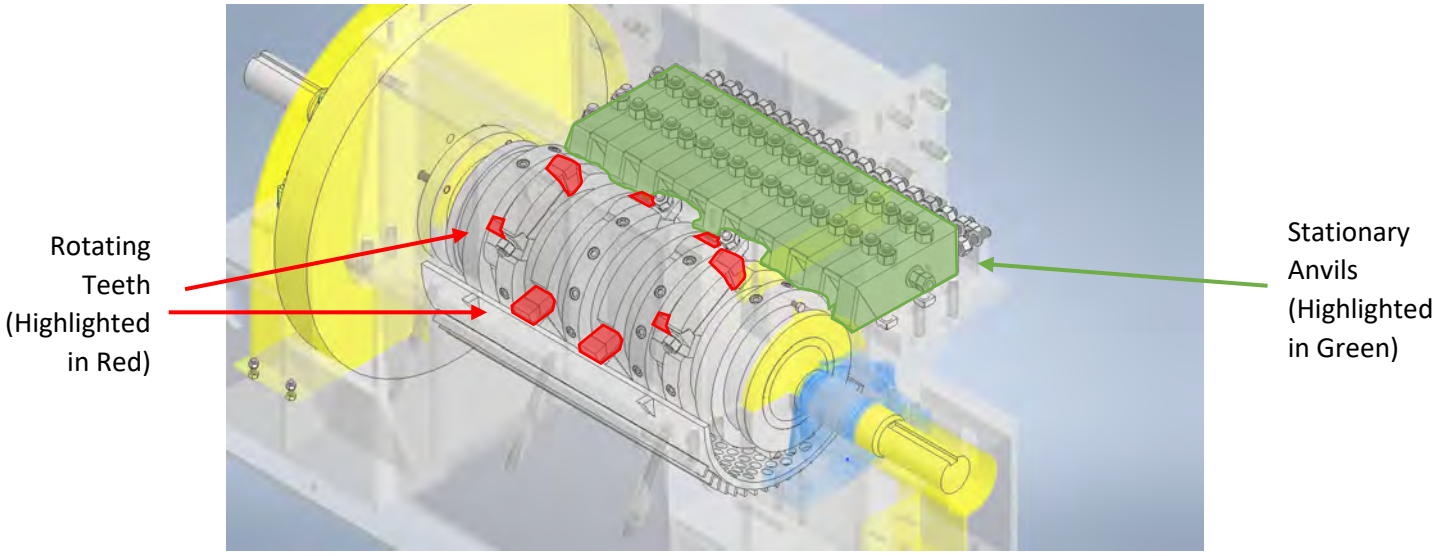


Figure 3.12: Cutting Teeth & Anvils

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

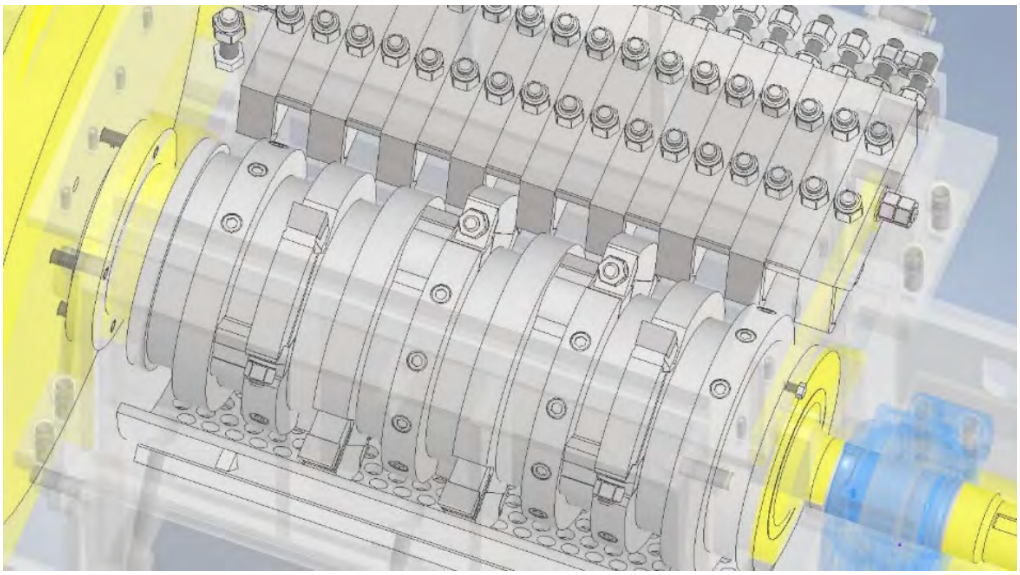


Figure 3.13: Teeth Passing Through Rectangular Pockets

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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

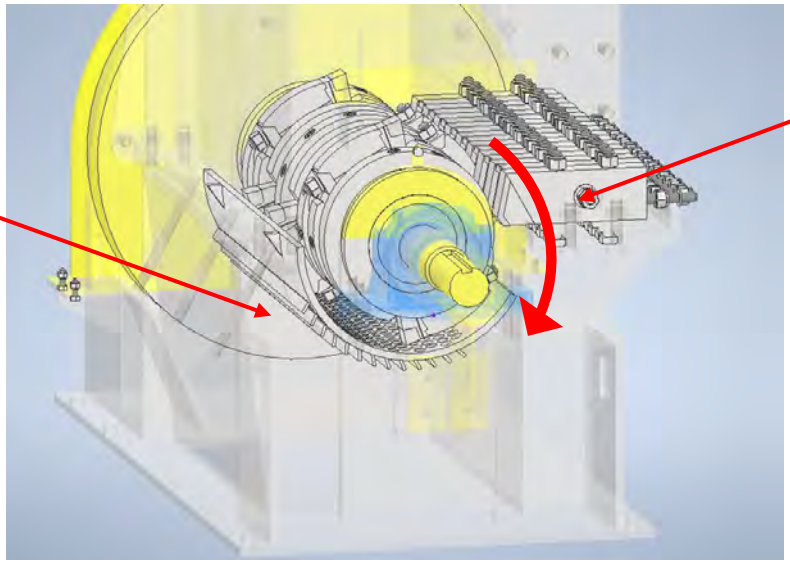


Figure 3.14: Particle Sizing Screen

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

➤ RECHIPPER MODELS

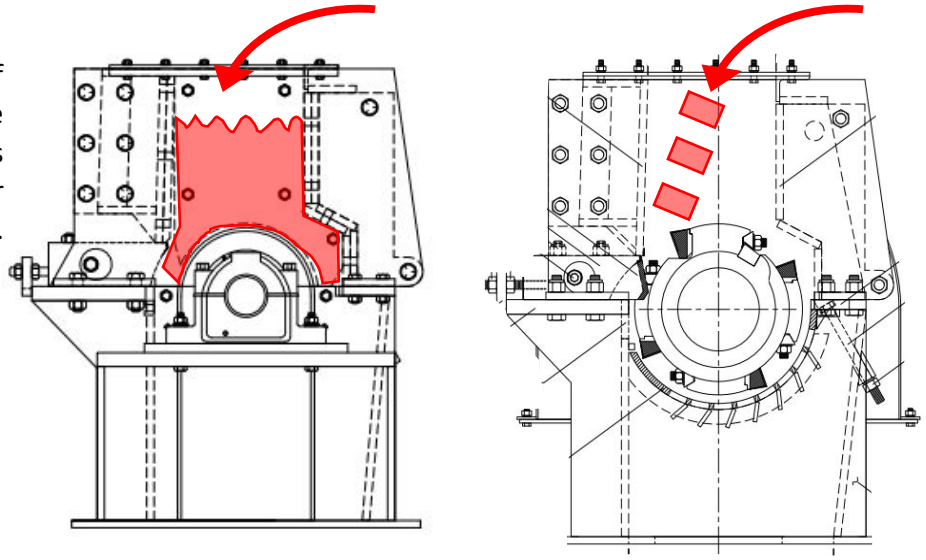
Figure 3.15: Rechipper Hog

Rechipper series Montgomery hogs are modified HD series hogs for specialized use in secondary grinding. Typically, the material entering the hog is pre-ground sticks and chips from a chipper.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

The modifications to the traditional HD series hog allow the Rechipper series to handle batches of flaky material, rather than the standard steady feed of material from a conveyor.

Large quantities of chip overs are dumped at once as they are brought over from the chipper.



Steady stream of material as it moves through processes and arrives via conveyor.

Figure 3.16: Rechipper Feeding (Left) vs. HD Feeding (Right)

The rotors of Rechipper hogs use “HD” rings instead of “HD-GM” rings. These modified rings have smaller diameters, allowing for more material to enter the cutting chamber at once. For standard applications, when large blocks are being dropped into the hog, this extra space creates a pinch point that could potentially lead to jams. However, when pre-ground material is being dumped into the hog in batches, this allows the material to move through the hog faster instead of piling up.

HD rings also expose the teeth to the infeed material more than standard HD-GM rings. In normal applications, this could potentially expose the teeth to excessive wear and decrease the life of the teeth. However, when small, flaky material is being dumped in batches, this allows the hog to work through the material faster.

HD-GM Rings take up more space in the cutting chamber (difference in size highlighted in red). HD Rings for Rechippers are able to make a more aggressive cut.

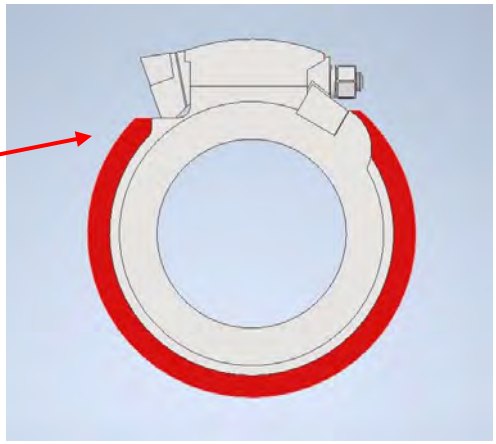


Figure 3.17: HD vs HD-GM Rings

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

All Rechipper hogs also include abrasion resistant wear plates in the cutting chamber. These can be removed from the hog and replaced as needed.

In rechipping applications, the expectation is that chipped material is dumped in large quantities at sporadic intervals. This leads to material buildup in the upper cutting chamber as the hog takes time to process the chips. With increased churning, there is a higher risk for wear in the upper housing. The abrasion resistant wear plates allow for this churning while protecting the housing of the hog.

Figure 3.18: Rechipper Wear Plates

The Bull Screen Rechipper (BS-RC) is designed for when the secondary grinding involves bull screen rejects in the harsh papermaking environment. In addition to the aggressive cut and wear liners in the cutting chamber, the bearings are sealed, hose bibs are provided for flushing, stainless steel is welded to the rings, and the housing is coated in a special anti-corrosion epoxy.

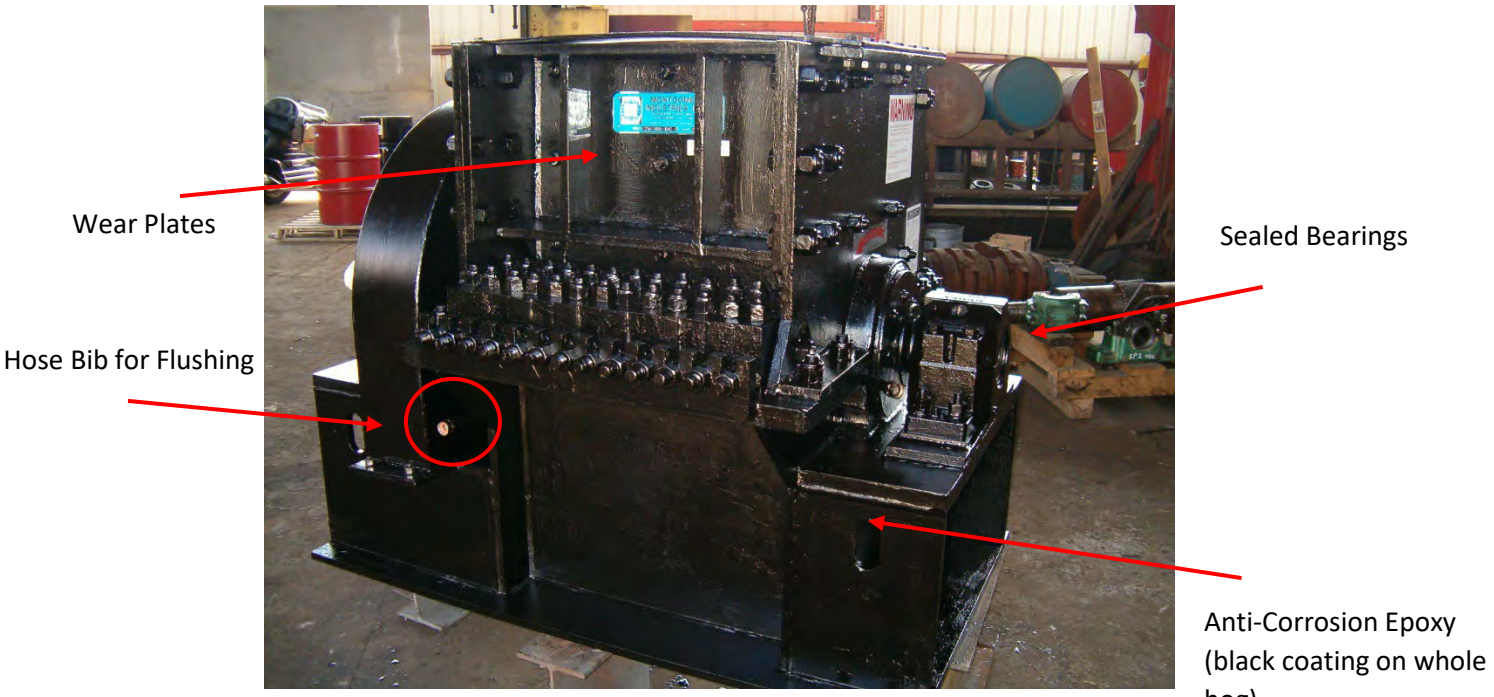


Figure 3.19: Bull Screen Rechipper

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

ROTOR

The rotor assembly consists of a solid steel shaft, a series of steel rings that are fixed to the shaft with shear pins (used for tramp metal protection), and hardsurfaced teeth that are bolted to the rings.

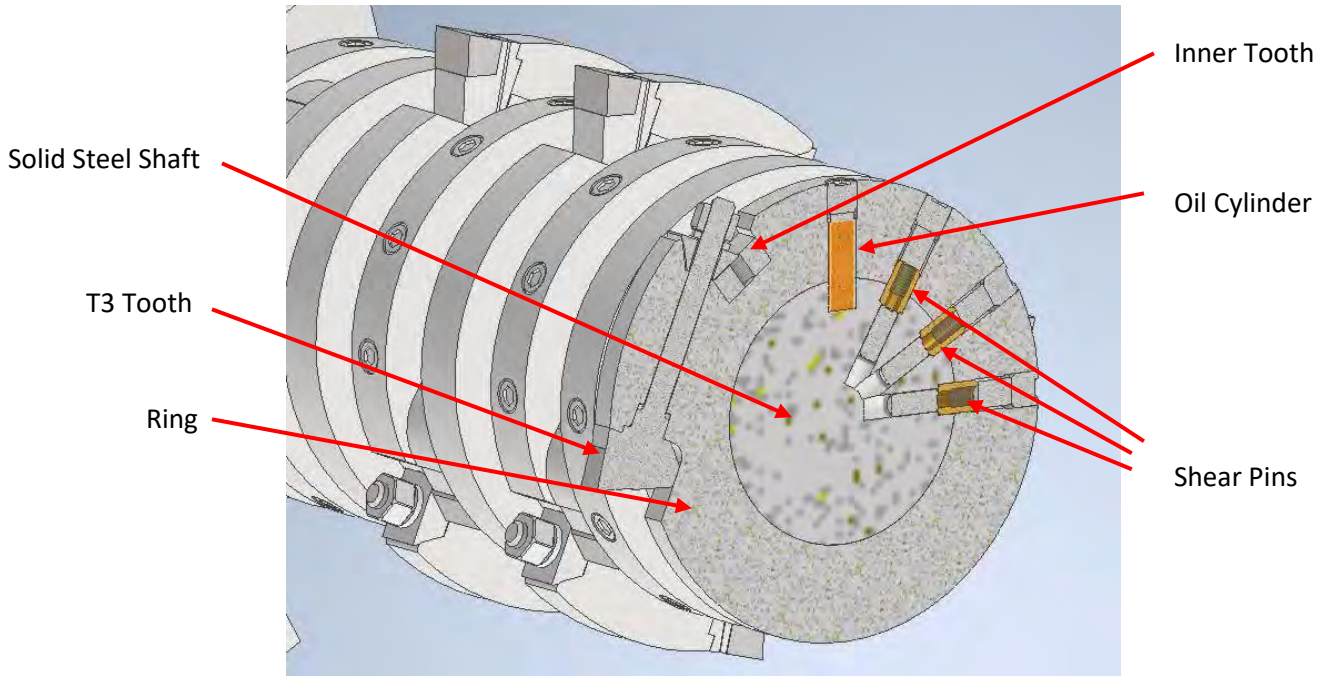


Figure 3.20: HD-GM Rotor, Cutaway View

All HD and PM series hogs include a steel flywheel for added momentum to power through momentary surge loads. FS series hogs use the same rotor components as HD series hogs, but do not include the steel flywheel. Since FS hogs are used in light applications, the flywheel is unnecessary and is omitted for additional value engineering. *(FS model hogs with a Serial Number under 1735 may or may not include a flywheel.)*

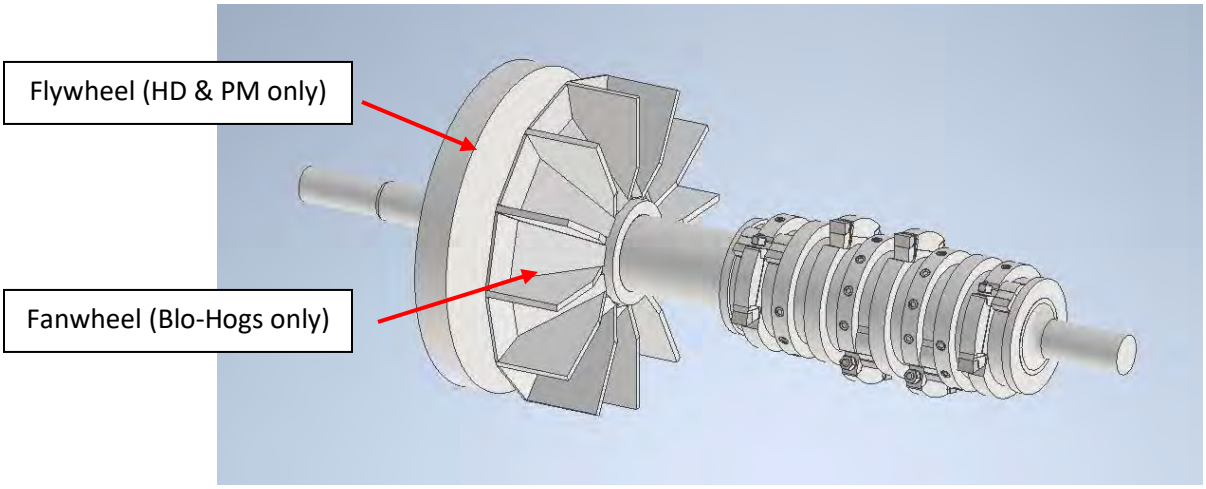


Figure 3.21: Blo-Hog Rotor

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

All Blo-Hog models have an Integral Fan on the same shaft as the rotor. They include a steel fanwheel that can be hardsurfaced to extend economic life in abrasive applications. FS Blo-Hogs typically use a #30 Integral Fan. HD and PM Blo-Hogs typically use a #40, #50, or #60 Integral Fan. For further information on fan sizes and performances, see Appendix B: *Montgomery Industries Fan Performance Curves*.

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.

Rotors are dynamically balanced at Montgomery Industries prior to shipment. Dynamic balancing minimizes vibration and offsets any variations in the rings.

Figure 3.22: Dynamic Balancing

End flanges on either end of the rotor provide a location for balance weights to be welded that protects them from the cutting chamber. **Do not remove these balance weights. This will drastically increase the wear on the bearings and decrease the life of parts.** Additionally, the increased vibration can lead to catastrophic failure and puts personnel at risk.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Figure 3.23: Balance Weights

DO NOT REMOVE THE BALANCE WEIGHTS. OPERATING A HOG OUT OF BALANCE CAN DRASTICALLY INCREASE WEAR AND PUTS PERSONNEL AT RISK.

➤ 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.

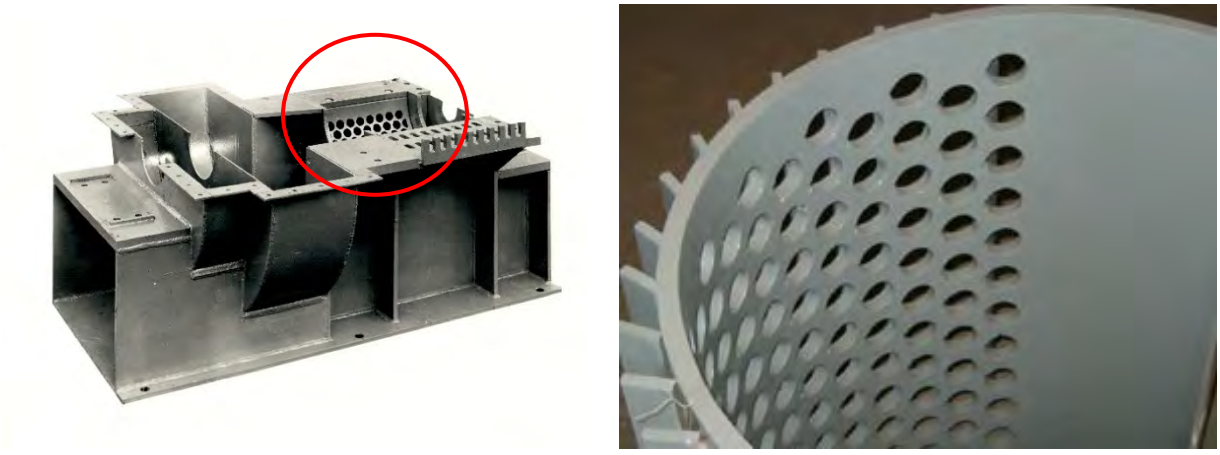


Figure 3.24: Particle Sizing Screens

For Blo-Hogs, material exits the hog through the Integral Fan. For Eat Rite hogs, material exits the hog through a hole in the base plate.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

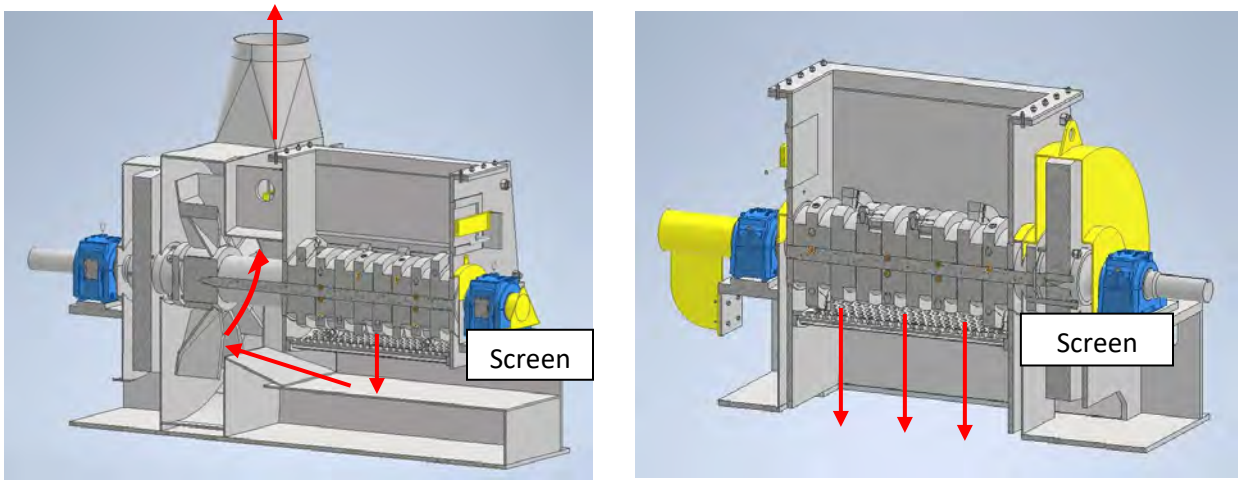


Figure 3.25: Path of Discharge Material - Blo-Hog (left) vs. Eat Rite (right)

The smaller the hole size in the screen, the smaller the end product will be. However, with smaller screens, hog capacity will be reduced compared to larger openings.

The smaller openings mean it will take longer to process a given amount of scrap. More power will be consumed due to the longer grinding time, as material must circulate multiple times before it is small enough to exit through the screen holes. 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.

➤ TEETH

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

Positive cutting action between the teeth and anvils 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

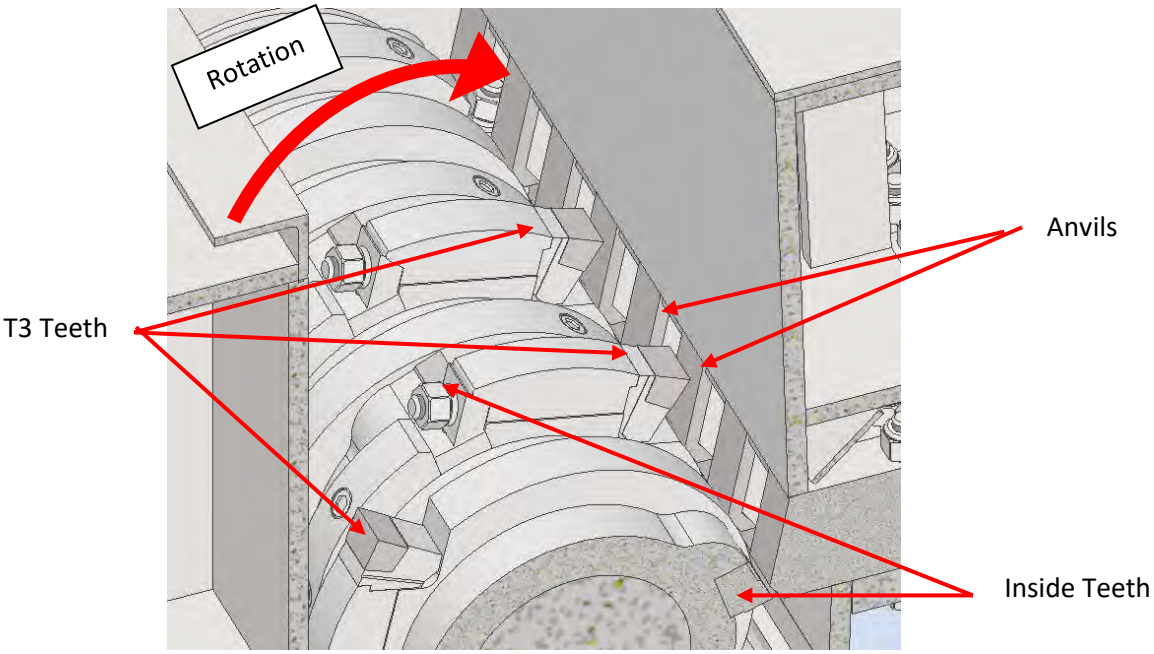


Figure 3.26: Positive Cutting Action

T3 teeth are hardsurfaced on the sides, face, and top.

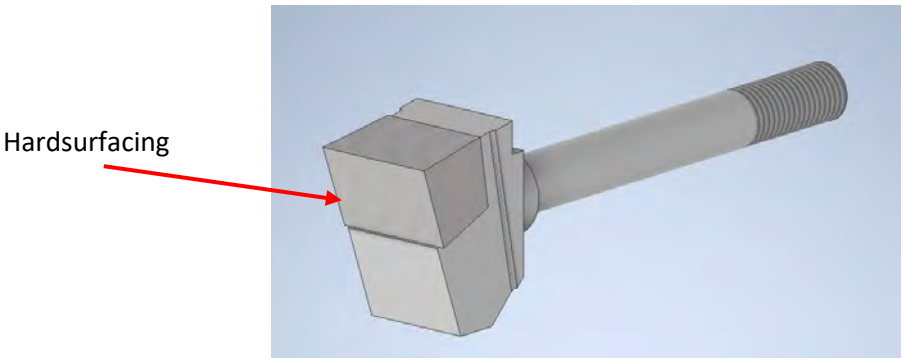


Figure 3.27: T3 Tooth

1-1/2” X 4” and 1-1/2” X 6” Inner teeth are hardsurfaced on the face and top.

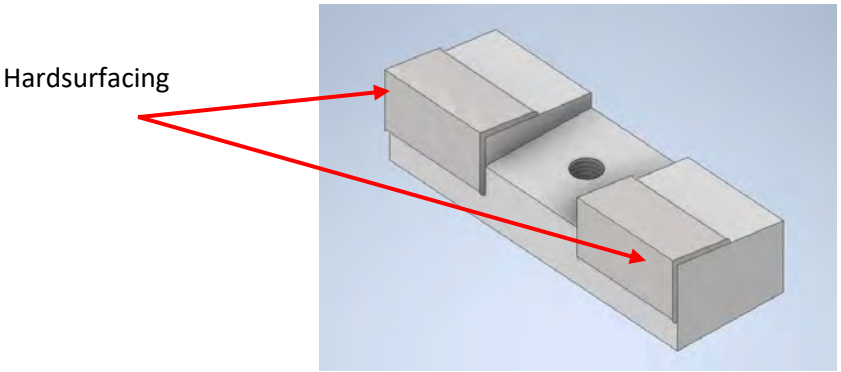


Figure 3.28: 1-1/2" x 6" Inner Tooth

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

T3 Teeth are available in either Standard Cut or Overlapping Cut models. **Overlapping Cut T3 Teeth must be used in conjunction with Cutaway Anvils. If overlapping teeth are used with standard anvils, the teeth will hit and may cause catastrophic damage.** The overlapping cut created by combining Overlapping T3 Teeth with Cutaway Anvils allows for successful processing of soft, spongy, or stringy materials.

Because of the different coefficients of thermal expansion between the mild steel and the hardening alloys, hairline cracks 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 3.29: Crosschecking on T3 Tooth

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 should be shipped to the factory and exchanged for parts rebuilt to factory standards. **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.**

USING AFTERMARKET TEETH IN YOUR HOG MAY ENDANGER THE SAFETY OF PERSONNEL AND VOIDS ALL WARRANTIES

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

TRAMP METAL PROTECTION

Shear pins within the rings are used to protect FS, HD, and PM model hogs from tramp steel. Each breaker ring is secured and held in position on the shaft by three shear pins.

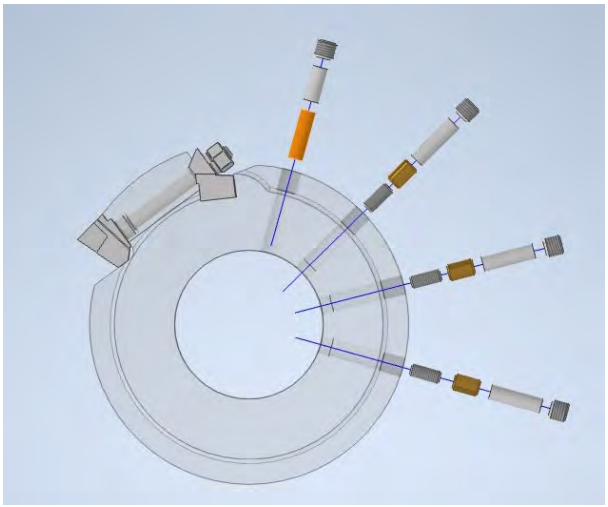


Figure 3.30: Shear Pins in PM-GM Ring (Exploded View)

The shearing strength of these pins is sufficient to carry loads encountered in normal operation of the hog but will shear when heavy tramp steel enters the hog. This configuration lets the sheared ring(s) stop while the shaft continues to turn.

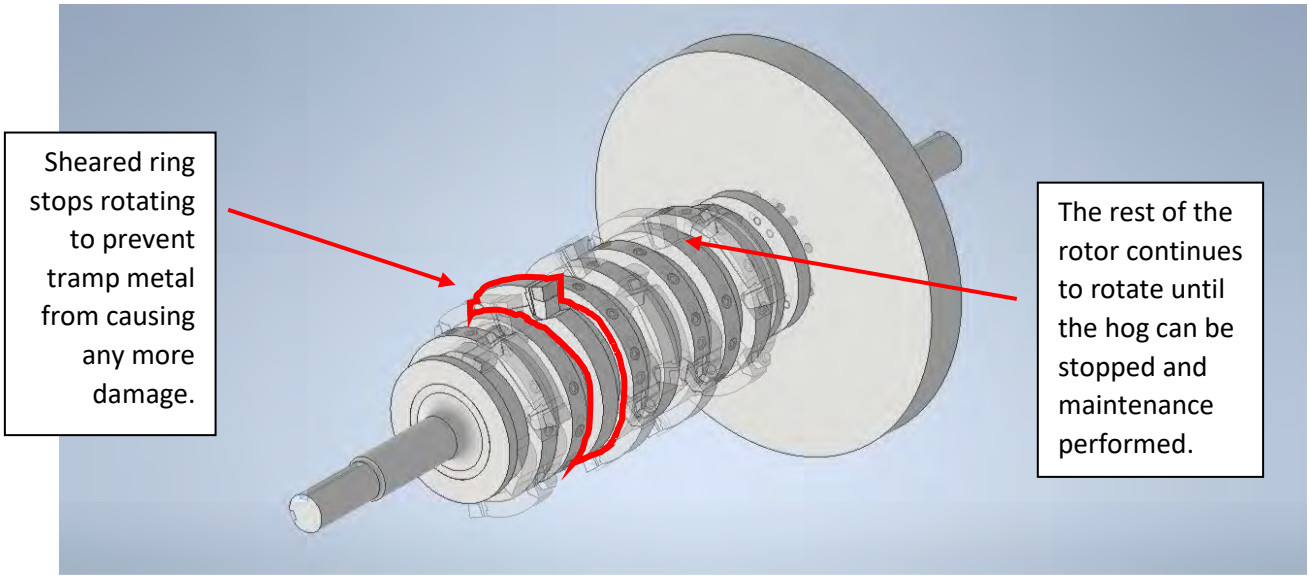


Figure 3.31: Sheared Ring

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

A plastic cylinder of oil is inserted in each ring in the first hole behind the tooth to provide lubrication should these shear pins shear. A new oil cylinder must be installed when new shear pins are installed in the rings. Occasionally, damage will result in spite of this protection, but under normal operating conditions the shear pin protection is effective.

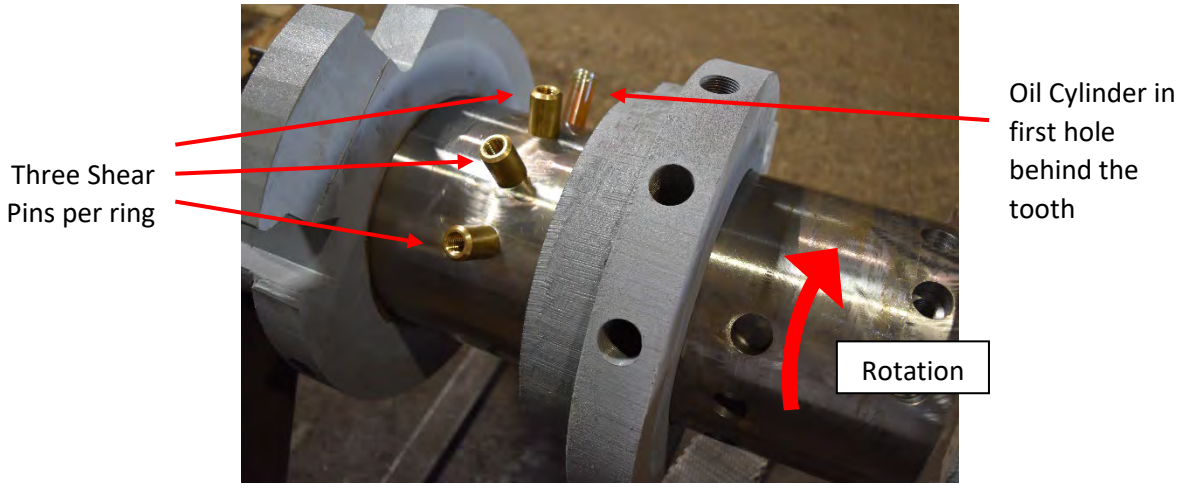


Figure 3.33: Oil Cylinder & Shear Pins

On occasion, and in special instances, the three shear pins in a ring may shear from wood alone. In this case, adjacent rings should be stitch-welded in pairs to provide the additional strength of three extra pins. This makes it necessary for tramp metal to shear six pins at once instead of just three. This configuration is normally done at the factory for applications where the need is anticipated.

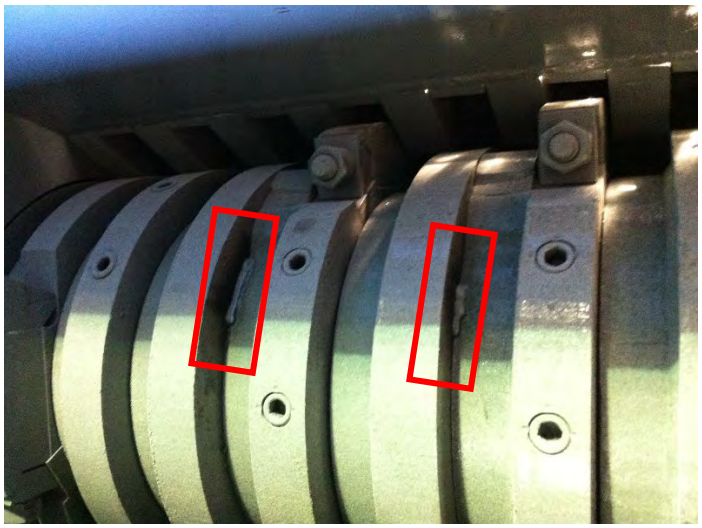


Figure 3.34: Rings Stitch-Welded in Pairs

The operators should familiarize themselves with the tooth pattern of the breaker rings on their hog. This will allow the user to detect, at a glance, any changes in the spacing which would indicate sheared pins.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

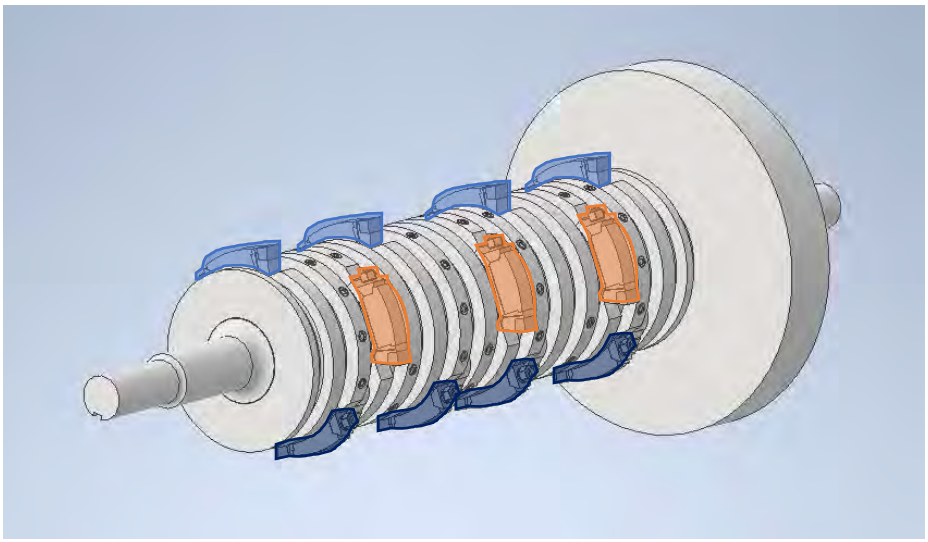


Figure 3.35: Breaker Ring Tooth Pattern

Normally, a sheared pin will be accompanied by rotation of the ring out of position. A ring out of position will result in excessive vibration which should immediately be recognized, and the hog should immediately be shut down and the shear pins replaced.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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 ANVILS

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 anvils.

Teeth and anvils 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 anvils every second or third time the teeth are rebuilt or changed.

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.

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 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 23-78-14 Hardsurface Wear Zones on T3 Teeth*.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

➤ ANVIL REPLACEMENT

STOP THE HOG BEFORE PERFORMING MAINTENANCE.

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

Replacing anvils requires a high level of precision. To aid in checking tooth-anvil clearances, it is helpful to remove the front door. (The front door is the door over the anvils.) This provides maintenance technicians with the visibility required to adjust the anvils.

BEFORE REMOVING THE FRONT DOOR, FIRST SECURE A LIFTING DEVICE TO THE DOOR BRACES. USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS. DO NOT PUT FINGERS IN BOLT HOLES. KEEP CLEAR WHEN REMOVING OR REPLACING.

Front doors are secured to the hog housing on all gravity-fed FS, HD, and PM models with six 1” diameter bolts on each side. Secure a lifting device to the front door, and then remove all twelve bolts. Use the lifting device to remove the door from the hog housing.

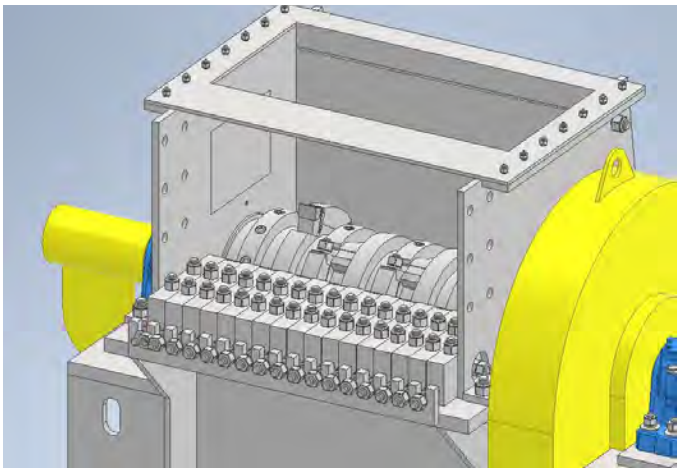


Figure 4.1: Front Door Removed for Anvil Replacement

If it is not practical to remove the front door, the tooth-anvil clearance can be checked by opening or removing the rear door.

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

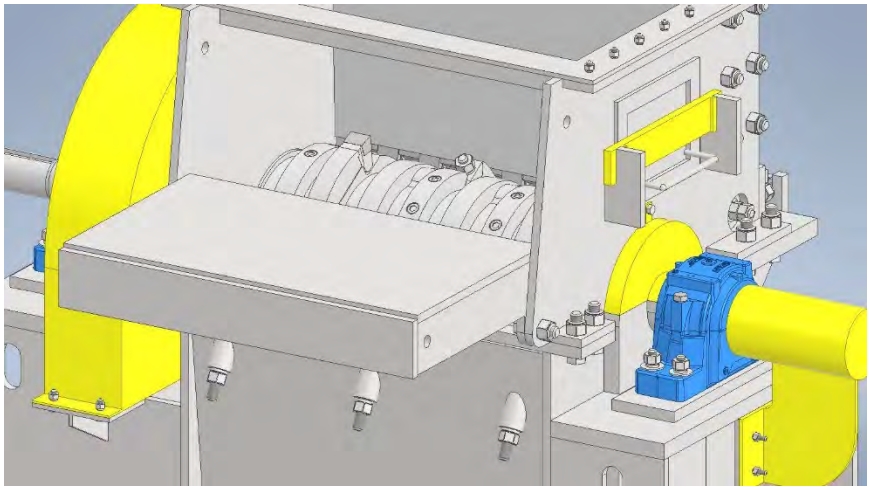


Figure 4.2: Rear Door Open for Anvil Replacement

Anvils are fastened in place in all three planes. Square head machine bolts run vertically through the anvil plate to secure the anvils top-to-bottom. Anvil studs run horizontally through the back of each anvil to secure them front-to-back. An anvil tie rod runs through the center of each anvil. This secures the anvils side-to-side and squeezes the entire assembly together.

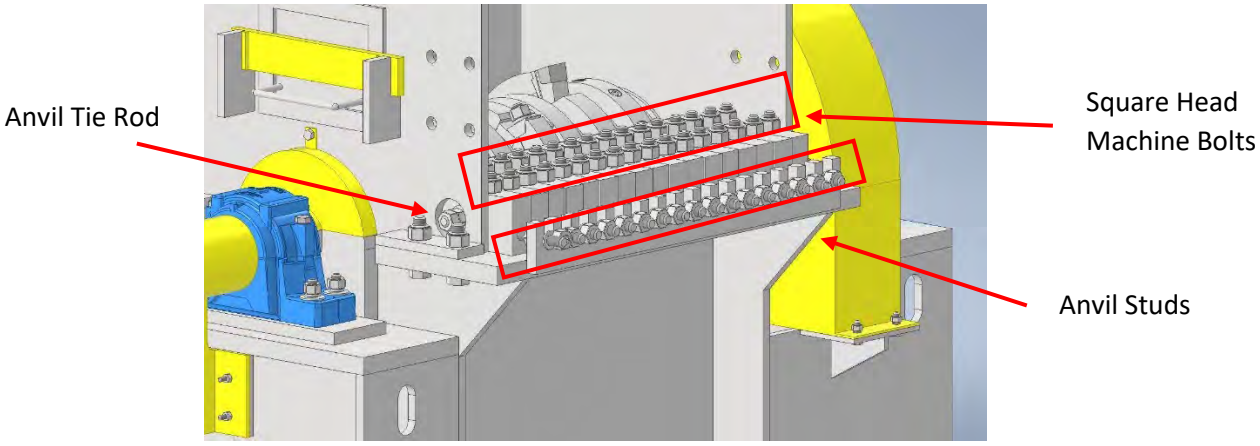


Figure 4.3: Anvil Fasteners

<u>Replacing a Single Anvil</u>

If heavy tramp metal gets in the hog, some anvils may show signs of damage while others may be fine. In this situation, it is most cost-effective to only replace the affected anvils. **If only a few anvils need to be replaced, the anvil rack assembly does NOT need to be completely disassembled.** Completely disassembling the anvil rack assembly is a time- and labor-intensive process.

1. Remove the anvil tie rod. Remove the fasteners from each side of the tie rod, then slide it out one side.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

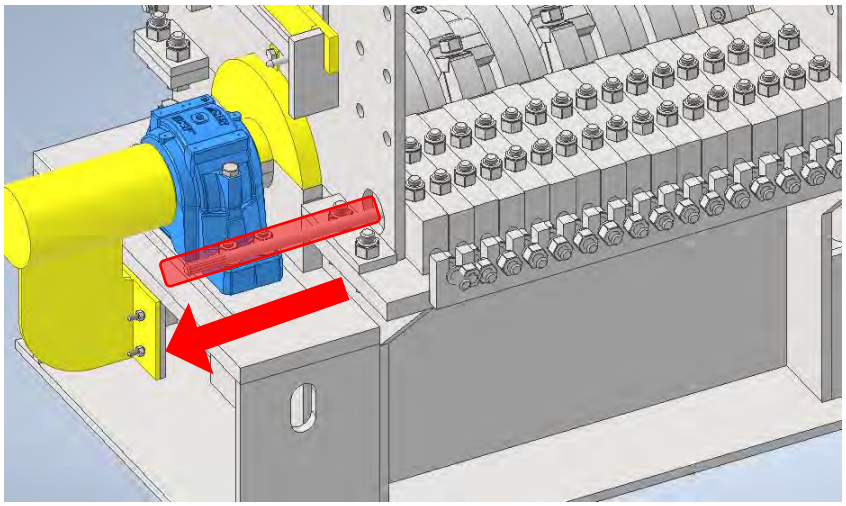


Figure 4.4: Removing Anvil Tie Rod

2. Loosen the locking nuts that secure the anvil stud to the anvil rack. Back out the anvil stud from the affected anvil. The stud is a threaded rod and should be unscrewed until it clears the back end of the anvil.

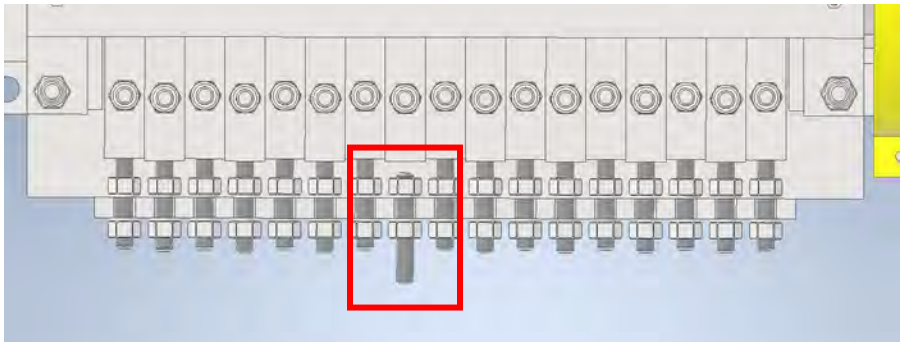


Figure 4.5: Backed Out Anvil Stud (Overhead View)

The anvil stud and its fasteners do not need to be completely removed from the anvil rack. The anvil stud just needs to be loosened enough that the anvil can be lifted out of the way without hitting.

3. Remove the square head machine bolts from the affected anvil.

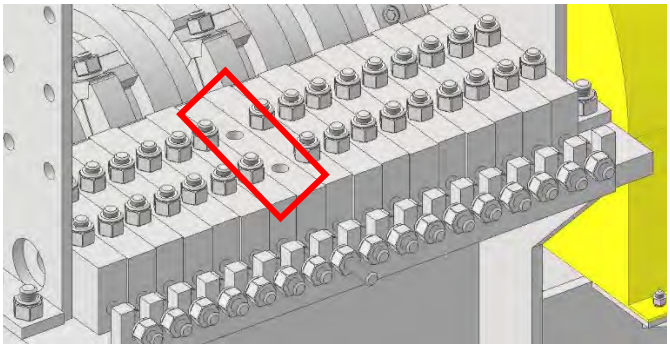


Figure 4.6: Square Head Machine Bolts Removed

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

4. Once the fasteners in all three planes have been removed, the anvil can be removed from the anvil rack assembly.

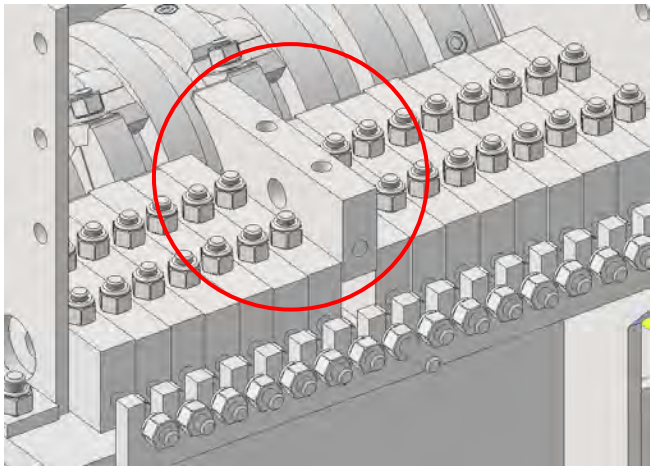


Figure 4.7: Removing Affected Anvil

5. Use a wire brush to clean out the pocket created by the missing anvil. Any debris that gets stuck between anvils can vibrate out once the hog starts running and cause looseness. Once all surfaces are clean, set the replacement anvil down in the pocket formed by the missing anvil.

DO NOT INSERT A REPLACEMENT ANVIL UNTIL THE POCKET HAS BEEN THOROUGHLY CLEANED AND IS FREE OF DEBRIS.

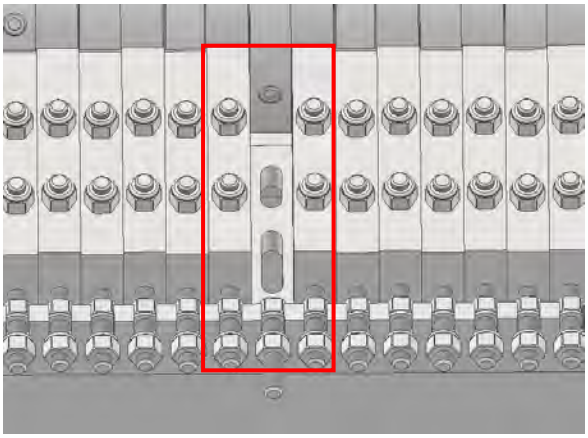


Figure 4.8: Pocket for Replacement Anvil

6. Rotate the rotor so the corresponding tooth lines up to the replacement anvil.

SECURE THE ROTOR SO IT CANNOT SHIFT WHILE CLEARANCES ARE BEING VERIFIED.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

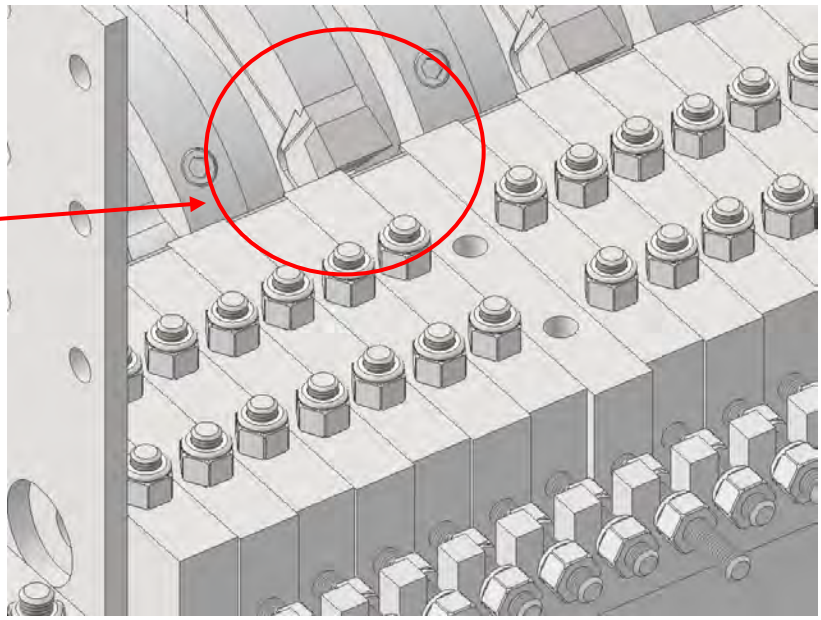


Figure 4.9: Rotor Rotated so Corresponding Tooth Lines Up with Anvil

7. If only a single anvil is being replaced, there should be no room for side-to-side movement. However, it is still important to ensure the anvil is centered on the tooth. Verify that the tooth and anvil line up properly, then soft-tighten the square head machine bolts. The clearances between the sides of the tooth and the sides of the anvil should be 1/32” to 3/32”.

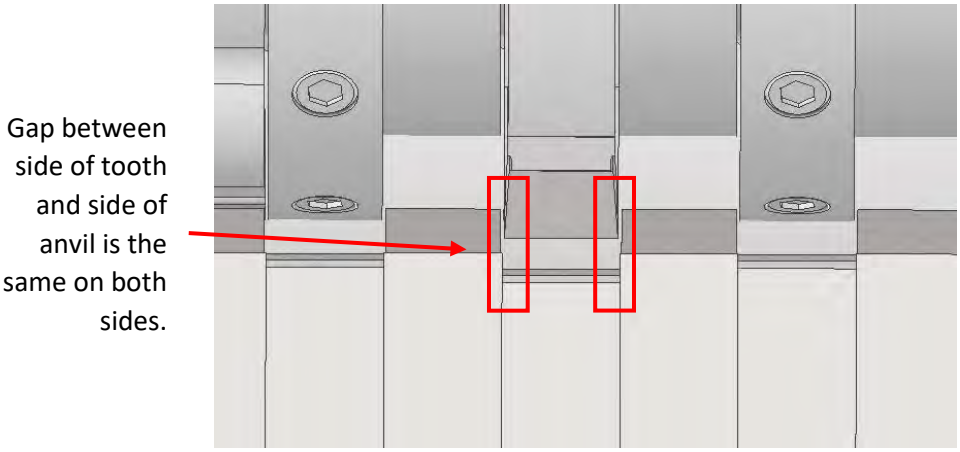


Figure 4.10: Tooth is Centered on Anvil (Overhead View)

8. Set the tooth-anvil clearance. Carefully push the anvil closer to or further away from the rotor to achieve the proper spacing between the leading edge of the tooth and the tip of the anvil. The radial clearance between the tooth and its corresponding anvil should be 1/32” to 1/16”.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

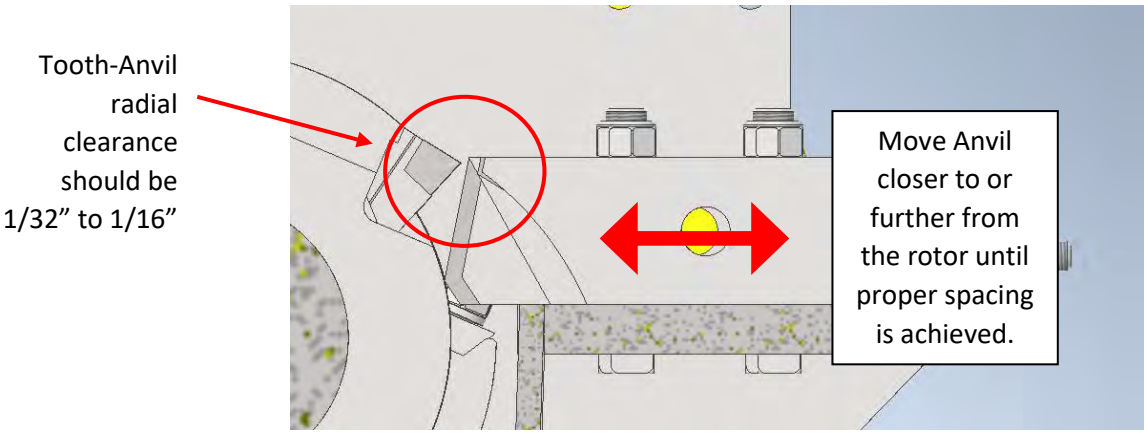


Figure 4.11: Set Tooth-Anvil Clearance

The only way to ensure proper tooth-anvil clearance is by verifying the distance between the leading edge of the tooth and the tip of the anvil. **Lining up the back ends of the anvils is NOT an acceptable method for determining clearances.** There may be slight variations in anvil length due to tolerances in the machining processes. Even if the backs of the anvils do not line up, the critical measurement is that of the tooth-anvil clearance within the cutting chamber.

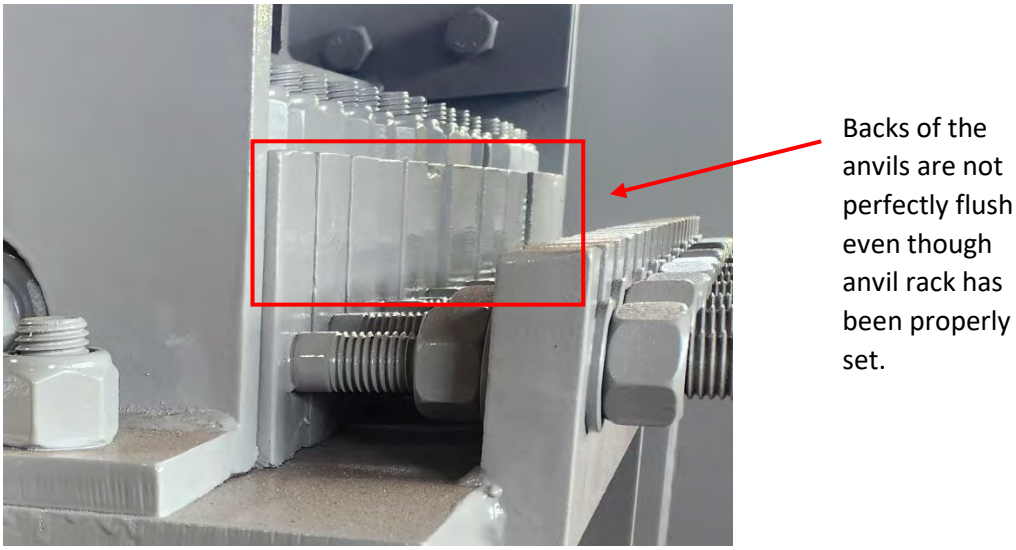


Figure 4.12: Slight Variations in Anvil Length

THE TOOTH-ANVIL CLEARANCE CANNOT BE MEASURED BY LINING UP THE BACK ENDS OF THE ANVILS. THE ONLY WAY TO ENSURE PROPER CLEARANCE IS BY MEASURING THE DISTANCE BETWEEN THE TOOTH CUTTING SURFACE AND THE ANVIL CUTTING SURFACE.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

It may be helpful to use shim-stock and feeler gauges to verify proper tooth-anvil clearance. Especially if viewed through the rear door opening, it may appear that the anvils are touching the teeth when they really are not. Each anvil aligns to the cutting circle of a tooth edge that is sloped. It can form an optical illusion, making clearance difficult to judge visually.

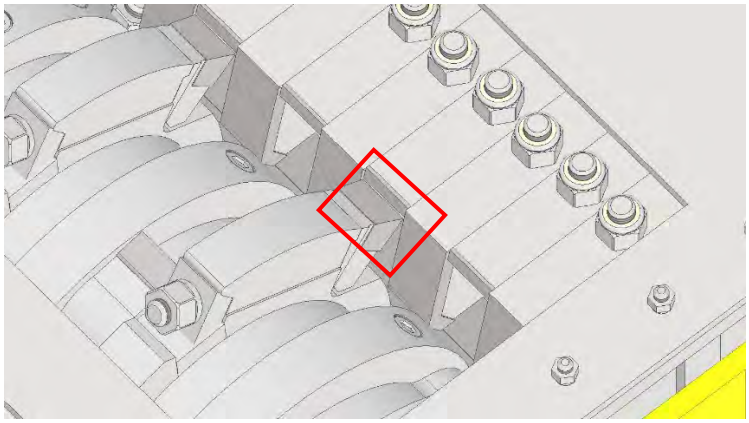


Figure 4.13: Proper Tooth-Anvil Clearance

Once tooth-anvil clearance has been verified to be 1/32” to 1/16”, the anvil stud can be soft-tightened.

9. Being careful to not let the anvil shift, final tighten the square head machine bolts through the anvil. Additionally, tighten the anvil stud into the anvil. Verify clearances side-to-side and front-to-back once everything is secure.
10. Replace the anvil tie rod by running it through all the anvils. Squeeze the anvil rack together by tightening the fasteners on both sides of the anvil tie rod.
11. Turn the rotor over by hand for a few rotations to verify all teeth properly clear the anvils. **Start by rotating the rotor away from the anvils, so that if there is interference, you do not chip a tooth when it hits.**

Figure 4.14: Verifying Clearance

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

BEFORE RESTARTING THE HOG, BE SURE ALL MAINTENANCE EQUIPMENT HAS BEEN REMOVED FROM THE CUTTING CHAMBER. VERIFY THAT THE FRONT AND REAR DOORS ARE IN PLACE AND PROPERLY SECURED.

Replacing All Anvils

Completely disassembling the anvil rack assembly is a time- and labor-intensive process. As such, it is general practice to only replace all anvils every second or third time the teeth are changed. To minimize down time, an entire set of new or repaired anvils should be on standby to swap out with the worn anvils. Once the worn anvils have been removed, they can be shipped to Montgomery Industries to be rebuilt to factory tolerances.

1. Remove the anvil tie rod. Remove the fasteners from each side of the tie rod, then slide it out one side.

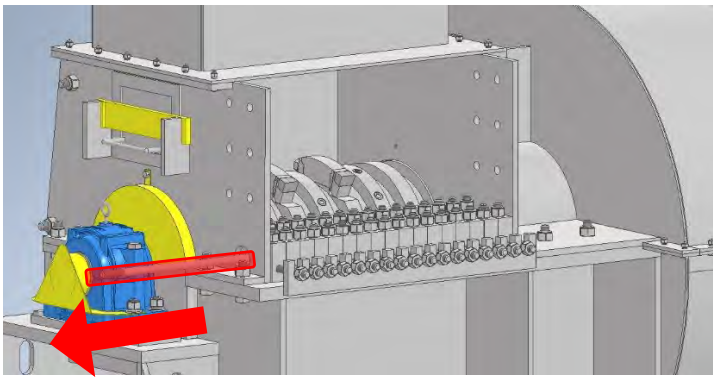


Figure 4.15: Removing Anvil Tie Rod

2. Loosen the locking nuts holding the anvil studs to the anvil rack. Back out the anvil stud from each anvil. The stud is a threaded rod and should be unscrewed until it clears the back end of the anvil.

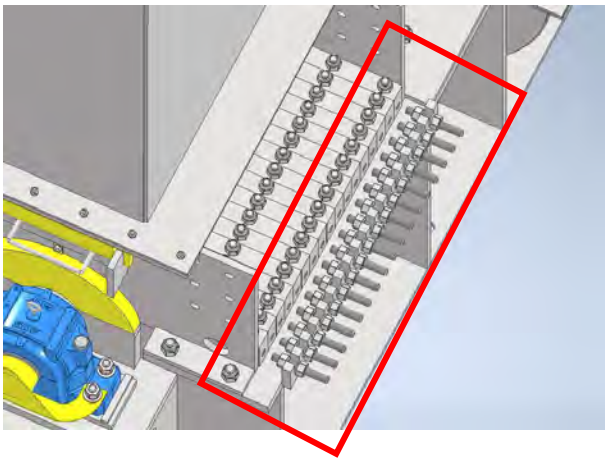


Figure 4.16: All Anvil Studs Loosened

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

The anvil studs and their fasteners do not need to be completely removed from the anvil rack. The anvil studs just need to be loosened enough that the anvils can be lifted out of the way without hitting.

3. Remove the square head machine bolts from each anvil.

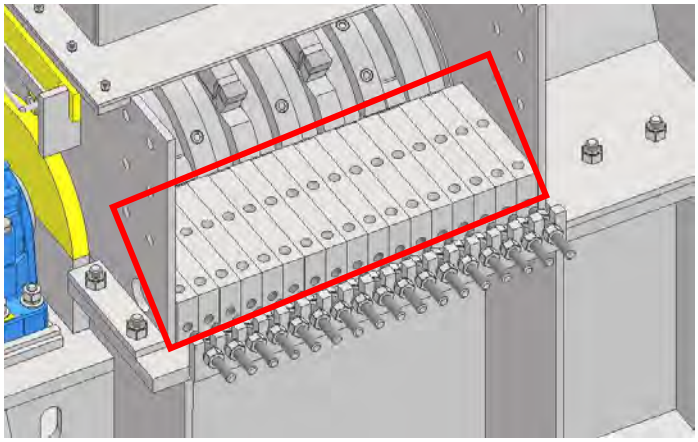


Figure 4.17: All Square Head Machine Bolts Removed

4. Once the fasteners in all three planes have been removed, the anvils can be removed from the anvil rack assembly.

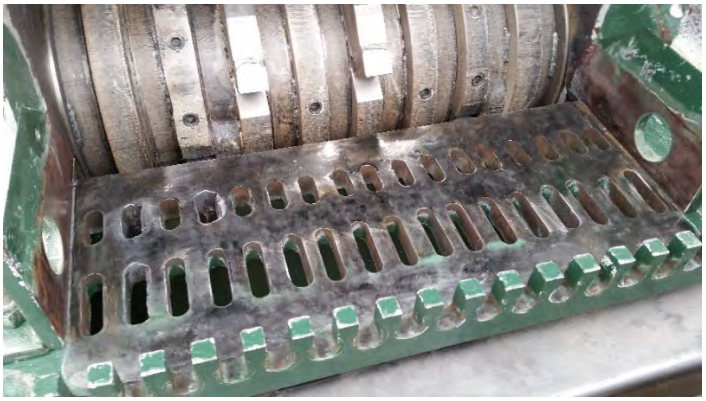


Figure 4.18: All Anvils Removed

5. Use a wire brush to clean out the anvil plate. Any debris that gets stuck in the anvil rack assembly can vibrate out once the hog starts running and cause looseness.

   Anvils are constructed using 2” finished stock to maintain a precise 2” spacing across the anvil rack. There is very little room for error, with only 1/32” clearance between the side of each anvil and the corresponding tooth. **To mitigate tolerance stacking, especially on wider machines, it is critical that anvils are aligned starting in the center and working out.** By starting in the center, you divide any tolerance stacking in half and reduce the potential for propagating alignment errors.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

ANVILS MUST BE REPLACED STARTING IN THE CENTER AND WORKING OUT IN ORDER FOR EVERYTHING TO CLEAR PROPERLY. WORKING FROM ONE SIDE TO THE OTHER CAN RESULT IN IMPROPER SPACING AND CATASTROPHIC FAILURE.

6. Place the first anvil so it matches up to the **middle tooth on the rotor**.

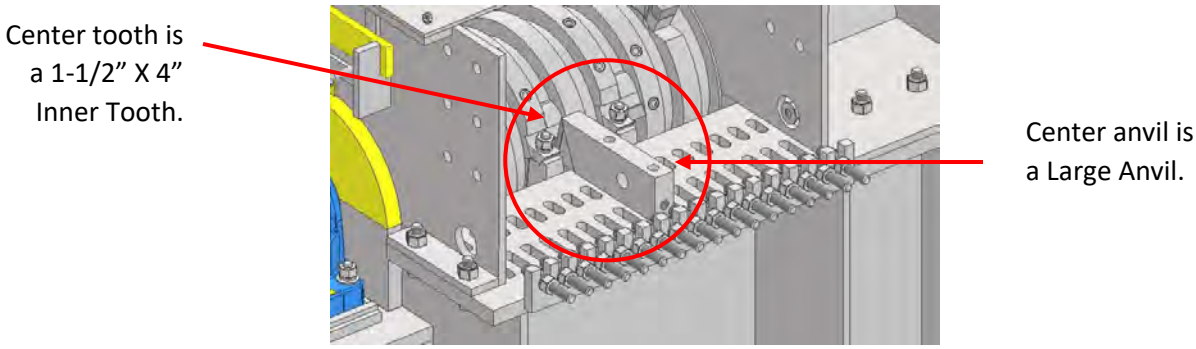


Figure 4.19: First Anvil Placed

Rotate the rotor so the center tooth is roughly level with the cutting surface of the center anvil.

SECURE THE ROTOR SO IT CANNOT SHIFT WHILE CLEARANCES ARE BEING VERIFIED.

Verify that the anvil is centered side-to-side on the tooth. The clearances between the sides of the tooth and the sides of the anvil should be 1/32" to 3/32".

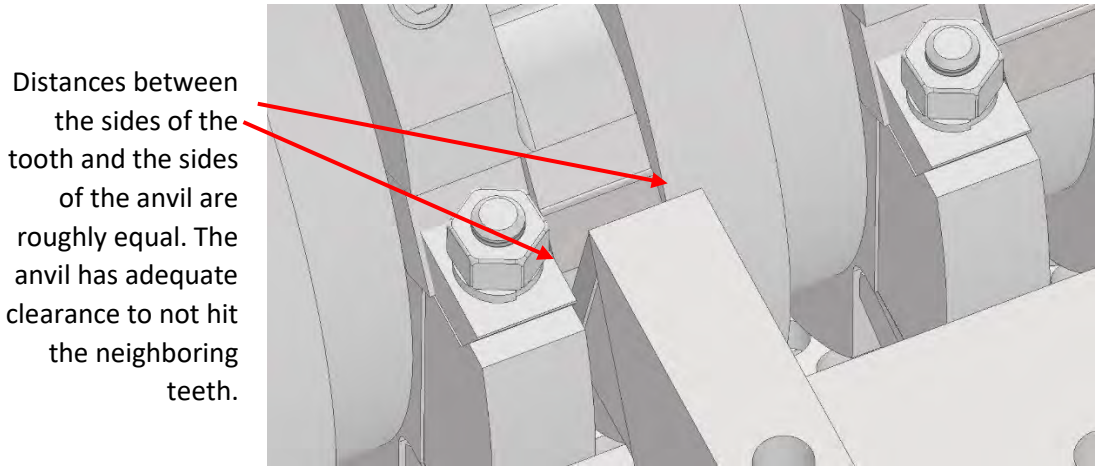


Figure 4.20: Anvil is Centered on Tooth

7. Soft-tighten the square head machine bolts to prevent side-to-side movement of the anvil once it is verified to be in the correct position.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

8. Set the tooth-anvil clearance. Carefully push the anvil closer to or further away from the rotor to achieve the proper spacing between the leading edge of the tooth and the tip of the anvil. The radial clearance between the tooth and its corresponding anvil should be 1/32” to 1/16”.

   It may be helpful to use shim-stock and feeler gauges to verify proper tooth-anvil clearance. Especially if viewed through the rear door opening, it may appear that the anvils are touching the teeth when they really are not. Each anvil aligns to the cutting circle of a tooth edge that is sloped. It can form an optical illusion, making clearance difficult to judge visually.

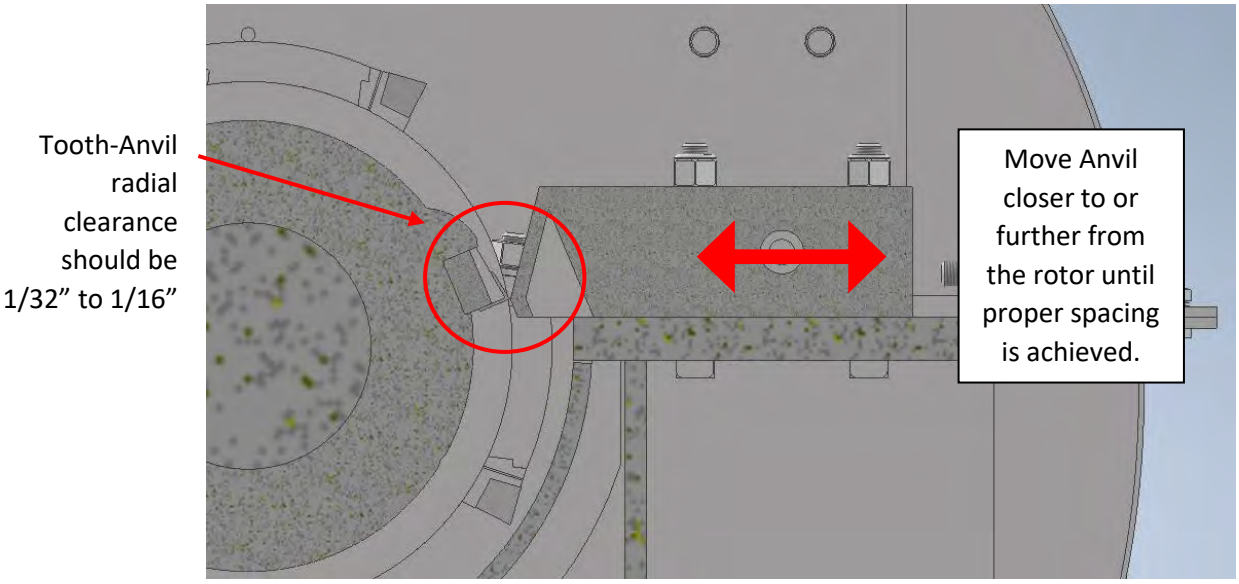


Figure 4.21: Verifying Proper Tooth-Anvil Clearance

   Once tooth-anvil clearance has been verified to be 1/32” to 1/16”, the anvil stud can be soft-tightened.

9. Repeat this process for the rest of the anvils. **Stack outward from the center.** Any slight setting errors or part variations will propagate as you work outward. By working from the center, you divide part variations and setting errors in half, decreasing the risk of the anvils not fitting.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

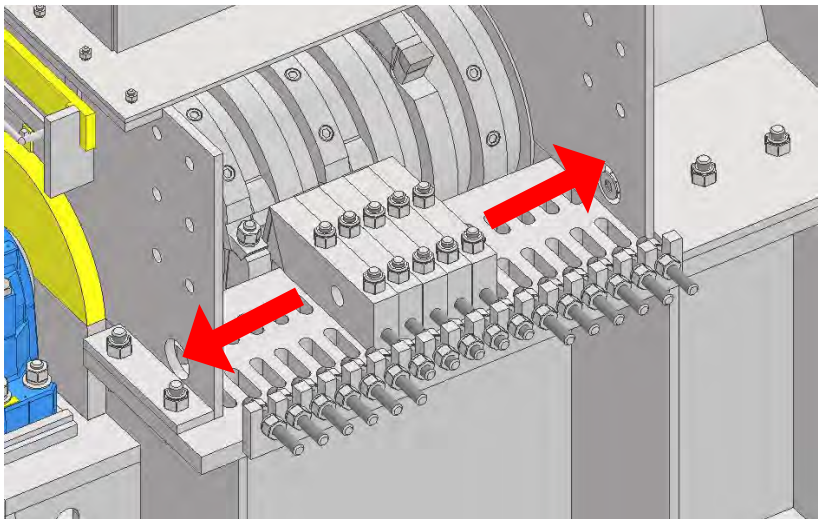


Figure 4.22: Setting Anvils from the Center Outward

Ensure that no debris gets caught in the anvil rack assembly as the anvils are being adjusted. Keep the wire brush on hand and clean all surfaces before placing each anvil into position.

This process requires patience. If the anvils start to not fit, go back and re-verify spacing, starting from the center anvil. **Do not shim between the anvils to try and force the anvils to fit.** Anything that is left between the anvils can vibrate out once the hog has started and create a gap. This gap, in turn, can cause looseness that may allow the anvil to shift during operation and result in catastrophic failure.

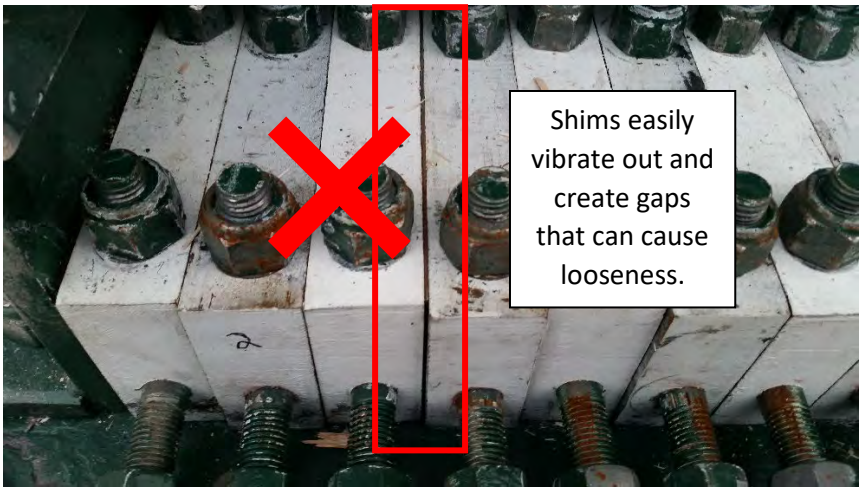


Figure 4.23: Do NOT Shim Between Anvils

10. With each anvil, verify the spacing side-to-side and front-to-back.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

The only way to ensure proper tooth-anvil clearance is by verifying the distance between the leading edge of the tooth and the tip of the anvil. **Lining up the back ends of the anvils is NOT an acceptable method for determining clearances.** There may be slight variations in anvil length due to the machining processes. Even if the backs of the anvils do not line up, the critical measurement is that of the tooth-anvil clearance within the cutting chamber.

Backs of the anvils are not perfectly flush even though anvil rack has been properly set.

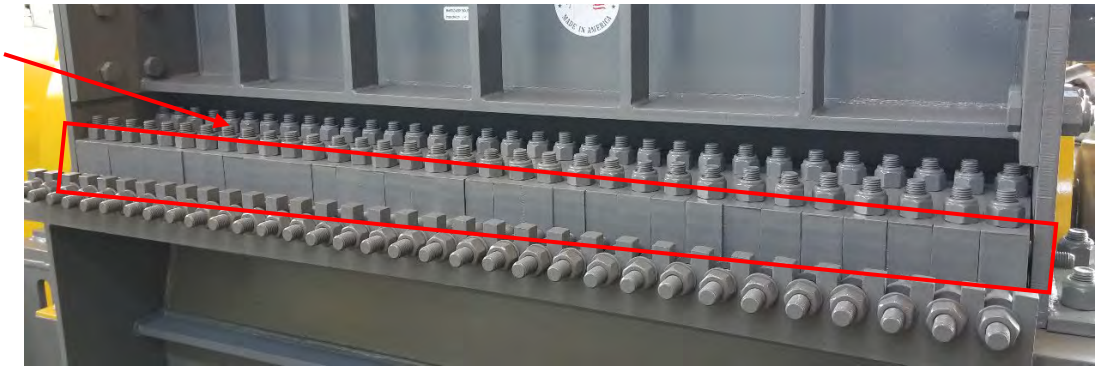


Figure 4.24: Variations in Anvil Length

THE TOOTH-ANVIL CLEARANCE CANNOT BE MEASURED BY LINING UP THE BACK ENDS OF THE ANVILS. THE ONLY WAY TO ENSURE PROPER CLEARANCE IS BY MEASURING THE DISTANCE BETWEEN THE TOOTH CUTTING SURFACE AND THE ANVIL CUTTING SURFACE.

Use extreme caution when rotating the rotor to verify the clearance of each anvil. Fingers can be easily smashed. **This process can be tedious, but it is critical to not skip over safety steps.** The nature of this process creates pinch points that can cause serious damage to technicians' hands and arms if caution is not taken.

SECURE THE ROTOR SO IT CANNOT SHIFT WHILE CLEARANCES ARE BEING VERIFIED.

11. Being careful to not let the anvils shift, final tighten the square head machine bolts through the anvils. Additionally, tighten the anvil studs into the anvils and to the anvil rack. Progressively tighten the nuts and bolts to prevent shifting during the tightening process. Verify clearances side-to-side and front-to-back on each anvil once everything is secure.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

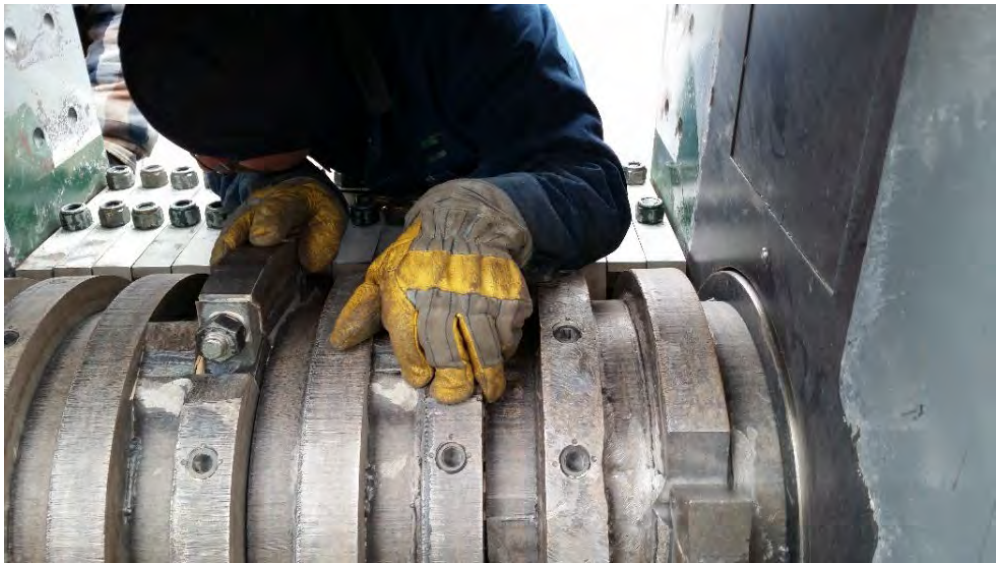


Figure 4.25: Verifying Tooth-Anvil Clearances

12. Replace the anvil tie rod by running it through all the anvils. Squeeze the anvil rack together by tightening the fasteners on both sides of the anvil tie rod.

13. Turn the rotor several rotations by hand to ensure the teeth properly clear the anvils. Start by rotating the rotor away from the anvils, so that if there is interference, you do not chip a tooth when it hits.

Figure 4.26: Turning Rotor by Hand to Ensure Clearances

BEFORE RESTARTING THE HOG, BE SURE ALL MAINTENANCE EQUIPMENT HAS BEEN REMOVED FROM THE CUTTING CHAMBER. VERIFY THAT THE FRONT AND REAR DOORS ARE IN PLACE AND PROPERLY SECURED.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

➤ 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 5: Types of Grease for Grease Bearing Lubrication

Preferred Option	Acceptable Options
Chevron Duralith EP #2 - Viscosity at 210°F (98.9°C): 80 SUS - Drop Point: 370°F (187.8°C)	**Shell Alvania EP #2** - Viscosity at 210°F (98.9°C): 80 SUS - Drop Point: 365°F (185°C)
	Gulf Crown EP #2 - Viscosity at 210°F (98.9°C): 82.5 SUS - Drop Point: 348°F (175.6°C)

3. Any equivalent grease should have the following characteristics:
   - Usable temperature range up to 200°F (93.3°C) operating temperature
   - The viscosity of the oil in the grease should not be less than 100 SUS at the operating temperature
   - The drop point of the grease must be more than 300°F (148.9°C)
   - 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 re-lubrication 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).

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

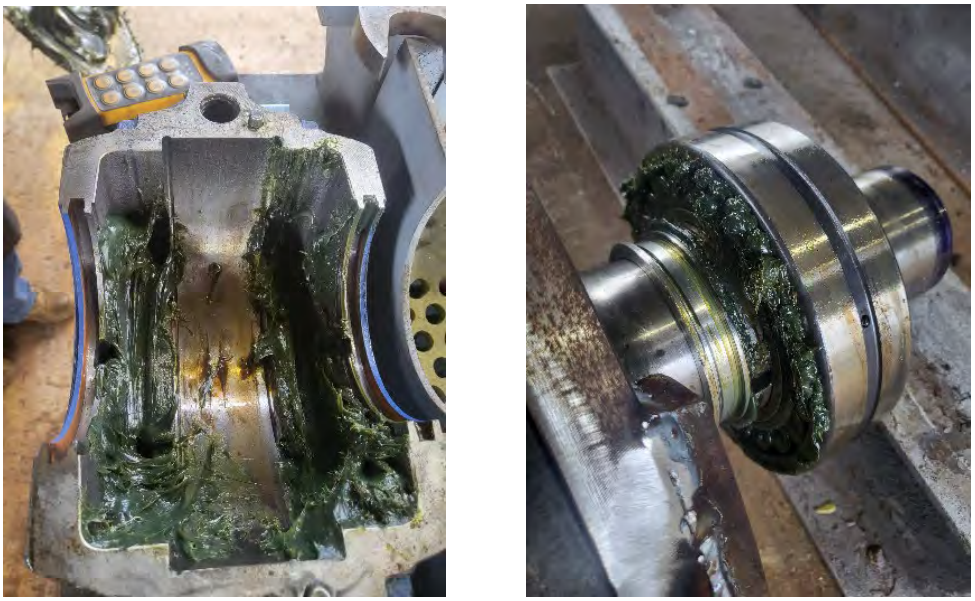


Figure 4.27: Completely Replacing Old Grease with New

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 should 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 before 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

They should be cleaned thoroughly because if they are plugged, the oil will not return and may soon empty the bearing.

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

Table 6: Types of Oil for Oil Bearing Lubrication

Preferred Option	Acceptable Options
Mobile DTE Oil AA - API Gravity: 0.897 - Minimum Flash Temperature: 460°F (237.8°C) - Viscosity: 120-130 SUS at 210°F (98.9°C) - Viscosity Index: 95	**Mobile DTE Oil HH** - API Gravity: 0.9 - Minimum Flash Temperature: 520°F (271.1°C) - Viscosity: 140-155 SUS at 210°F (98.9°C) - Viscosity Index: 95
	Shell Tellus Oil 976 - API Gravity: 27.6 - Minimum Flash Temperature: 495°F (257.2°C) - Viscosity: 126 SUS at 210°F (98.9°C) - Viscosity Index: 97

3. Any equivalent oil should have the following characteristics:
   - Usable temperature range up to 200°F (93.3°C) operating temperature
   - Minimum flash temperature of 460°F (237.8°C)
   - Viscosity at 210° F (98.9°C) must be a minimum of 100 SUS

4. Static Oil Systems: Check sight gauge for proper oil level.

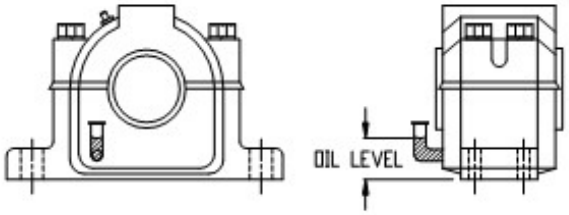


Figure 4.28: Static Oil Level Measurement

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Table 7: Static Oil Levels for Different Bearing Sizes*

Bearing Series	Bearing Size	Static Oil Level
USAF 500	2-15/16”	1-3/8”
	3-15/16”	1-25/32”
	4-7/16”	2-11/32”
	5-7/16”	2-1/16”

5. Circulating Oil Systems: Check sight gauge on oil reservoir for proper oil level.

   Bearings using a Circulating Oil Lubrication System cannot also have a static oil level maintained inside the bearing. Therefore, the oil level sight gauge is located on the Oil Reservoir instead of on the individual bearings.

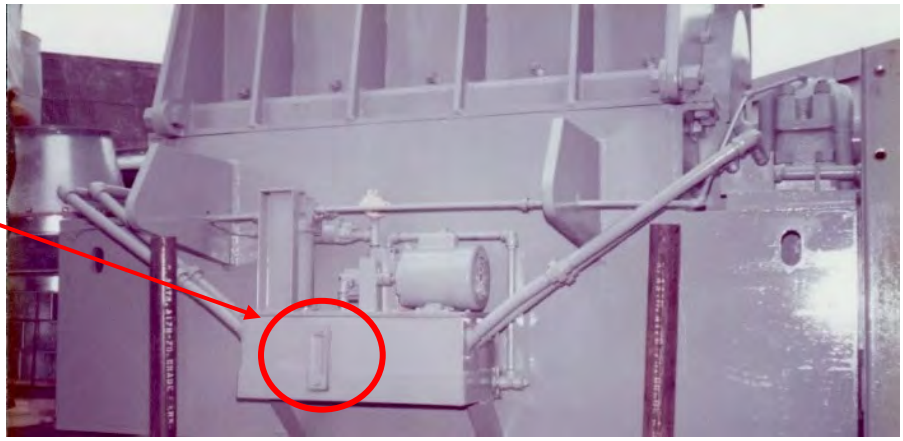


Figure 4.29: Oil Circulating System Reservoir

Minimum flow rates for each bearing size are tabulated below. For applications where there is excessive environmental contamination or extreme operating temperatures, these values may need to be increased.

Table 8: Oil Flow Rates for Circulating Oil Bearings*

Bearing Series	Bearing Size	Flow Rate*
USAF 500	2-15/16”	0.06 GPM
	3-15/16”	0.11 GPM
	4-7/16”	0.12 GPM
	5-7/16”	0.25 GPM

Flow rates can be increased by adjusting the needle valve on the oil circulating pump. Turn the needle valve clockwise to get less flow, or counterclockwise to get more flow.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

BEARING REPLACEMENT

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

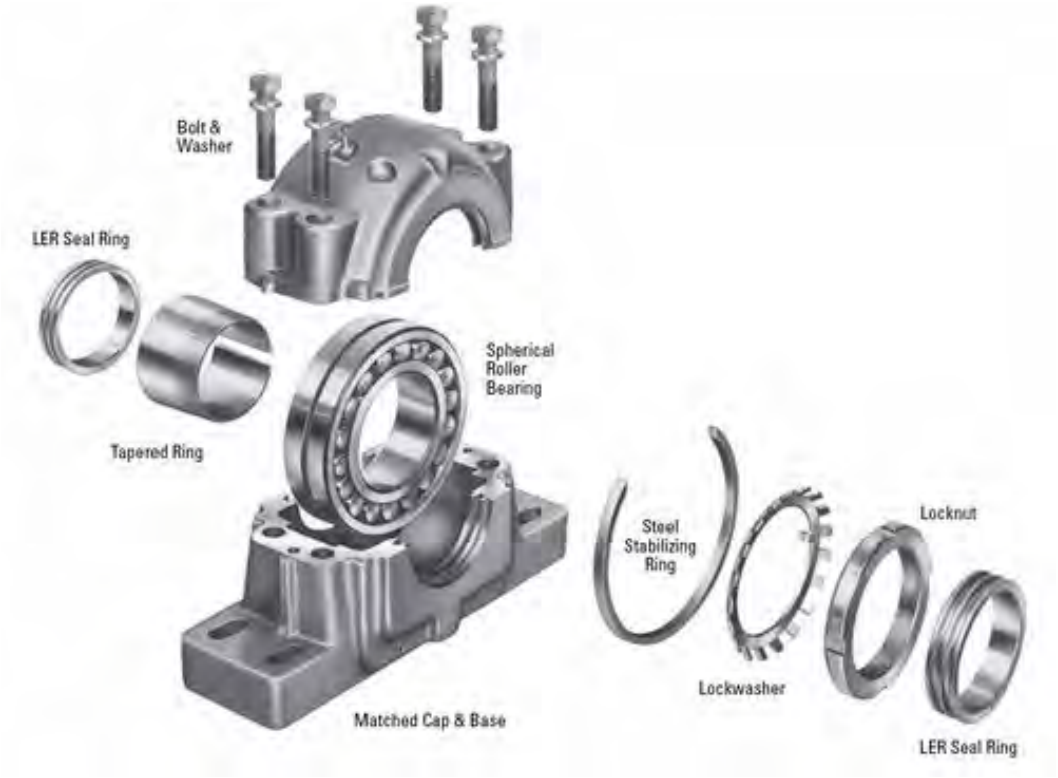


Figure 4.30: Bearing Components[1]

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 the bearings. See *Maintenance Procedures: Rotor Removal* for more information.

STOP THE HOG BEFORE PERFORMING MAINTENANCE.

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

<u>Removing an Old Bearing</u>

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.

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

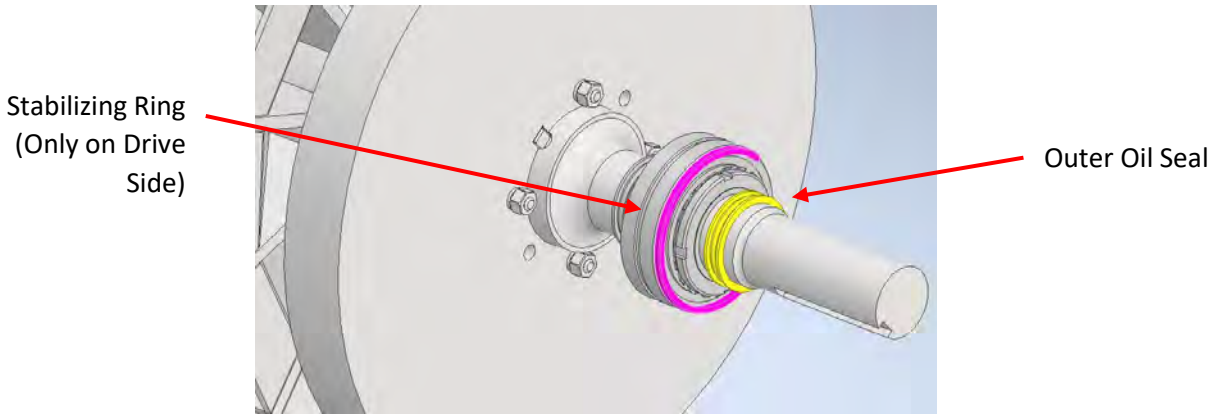


Figure 4.31: Bearing Oil Seal (Yellow) and Stabilizing Ring (Pink)

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

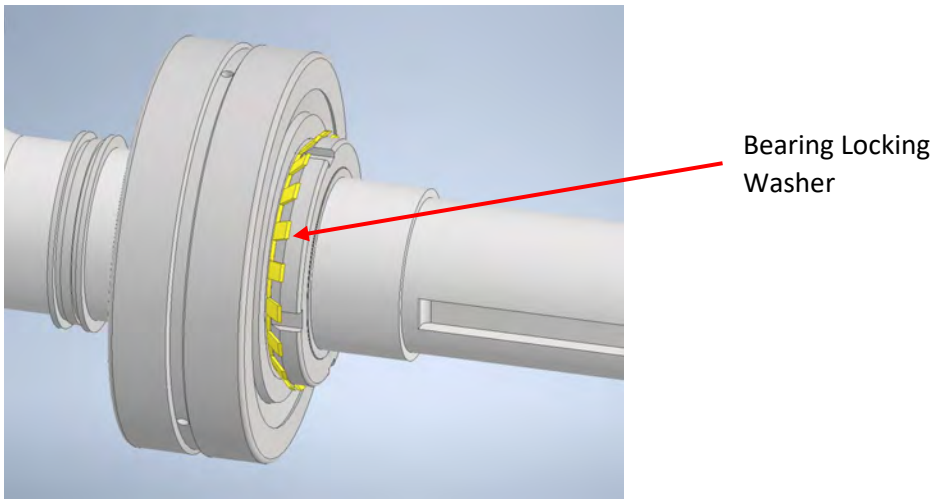


Figure 4.32: Bearing Locking Washer (Yellow)

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 hammer to hit the spanner wrench or bar counterclockwise 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

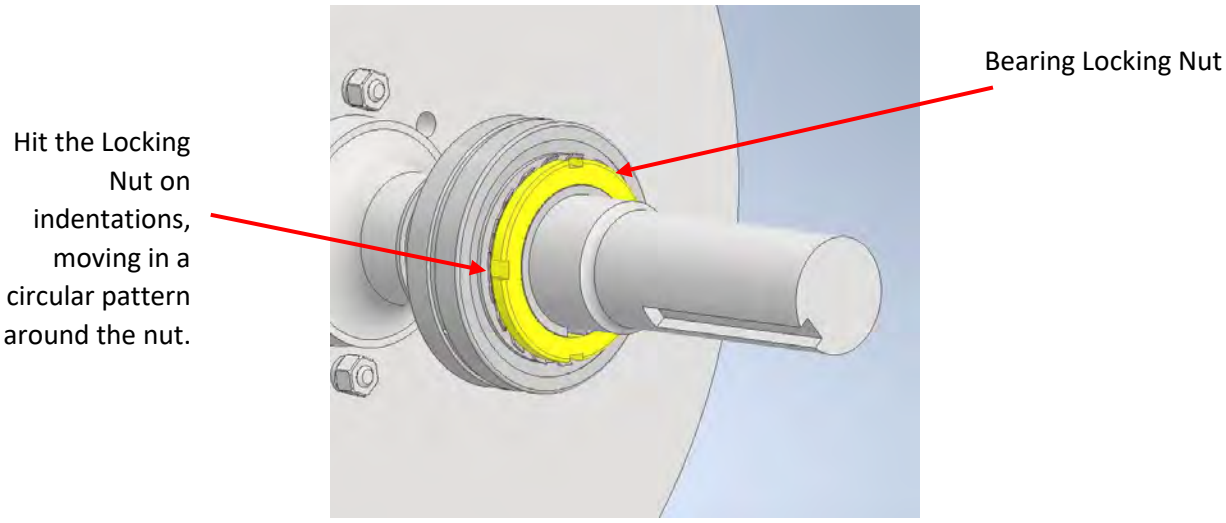


Figure 4.33: Bearing Locking Nut (Yellow)

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 4.34: 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

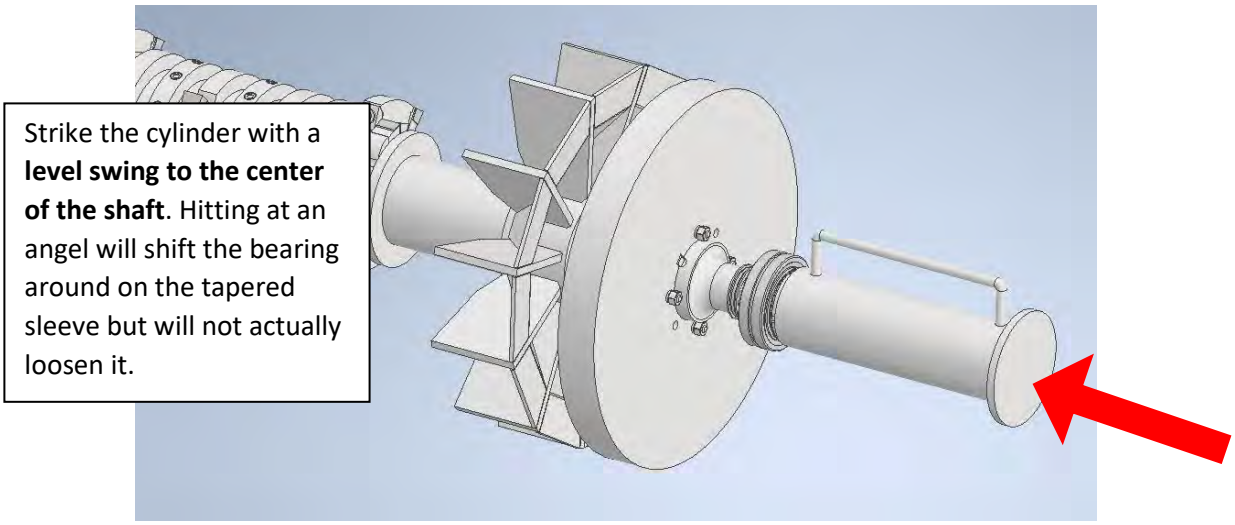


Figure 4.35: Dislodging Bearing Unit from Tapered Sleeve

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.

<u>Installing a New Bearing</u>

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.

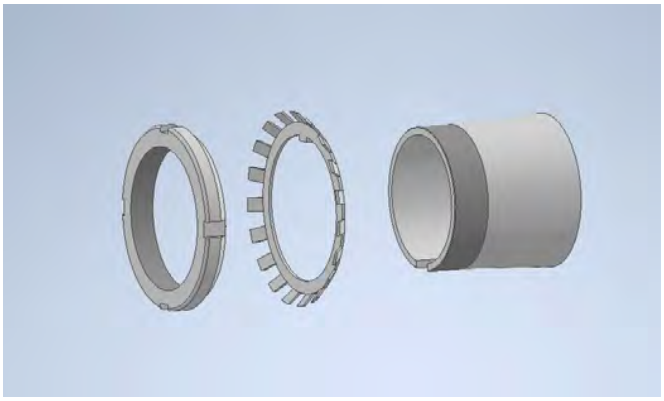


Figure 4.36: (Left to Right) Bearing Nut, Locking Washer, and Tapered Sleeve

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

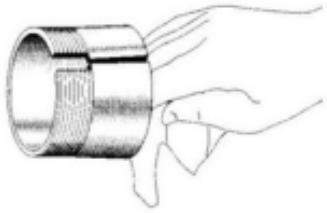


Figure 4.37: Wiping Sleeve with Thin Mineral Oil

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

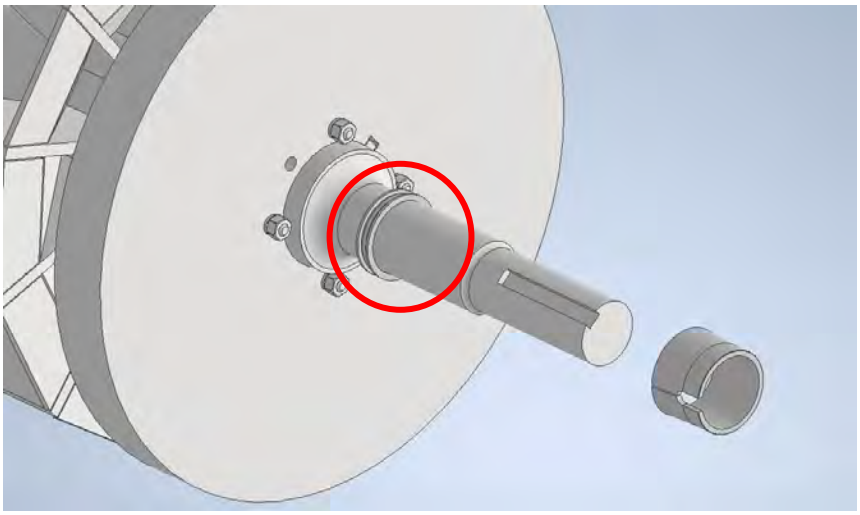


Figure 4.38: Inner Bearing Oil Seal

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

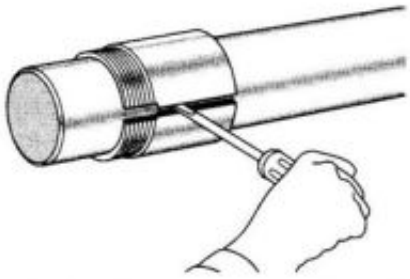


Figure 4.39: Sliding Sleeve onto Shaft

The sleeves should be positioned so that the drive side (non-expansion) bearing accommodates the stabilizing ring on the outer end of the bearing housing, and the bearing opposite the drive (expansion bearing) is centered in the bearing housing.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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

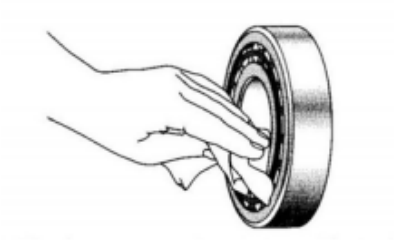


Figure 4.40: Wiping Bearing with Thin Mineral Oil

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

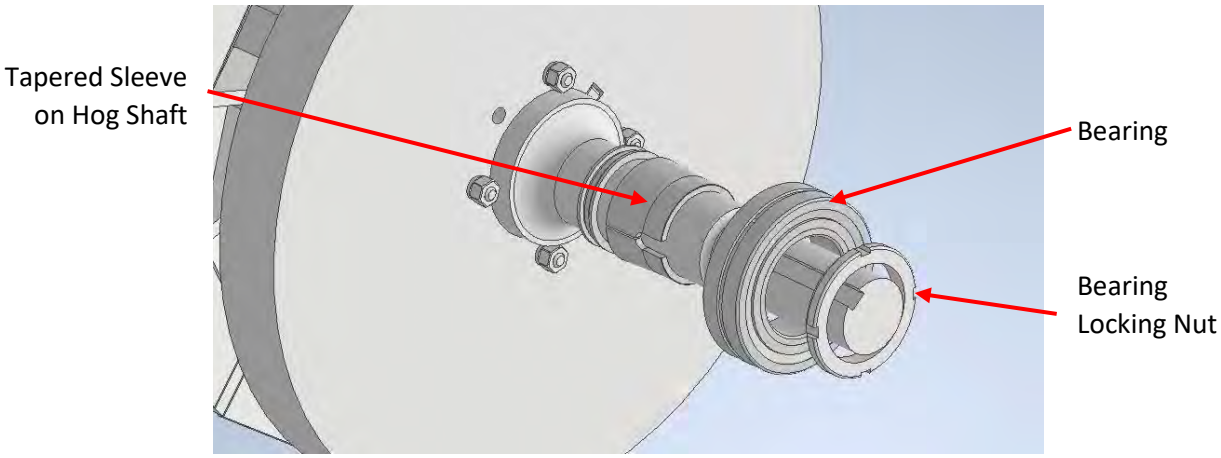


Figure 4.41: Bearing Nut, Bearing, and Tapered Sleeve

8. The bearing unit is secured on the shaft by tightening the lock nut with a spanner wrench (recommended) 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 4.42: Securing Bearing Unit on Shaft

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

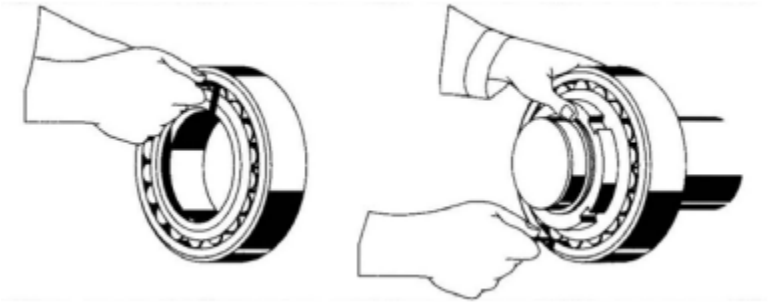


Figure 4.43: Checking Clearance Against Table Values

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
5.4375	22232 CCK/C3W33	160	0.0071-0.0091	0.0030-0.0045	0.0041-0.0046

**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.

Do not install locking washer until after clearance requirements have been met.

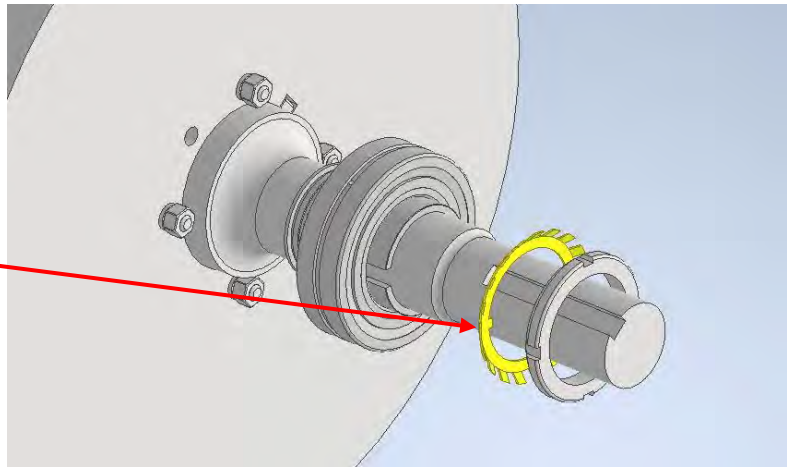


Figure 4.44: Installing Locking Washer and Locking Nut

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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

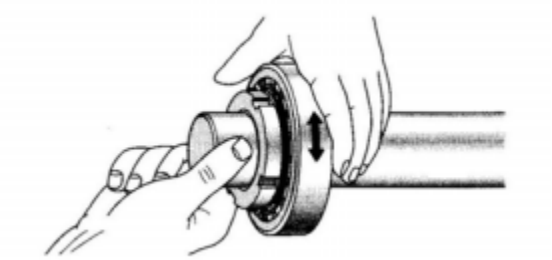


Figure 4.45: Checking Outer Ring Rotation

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, 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.

    Verify that the bearings are positioned so that the drive side (non-expansion) bearing accommodates the stabilizing ring on the outer end of the bearing housing, and the bearing opposite the drive (expansion bearing) is centered in the bearing housing

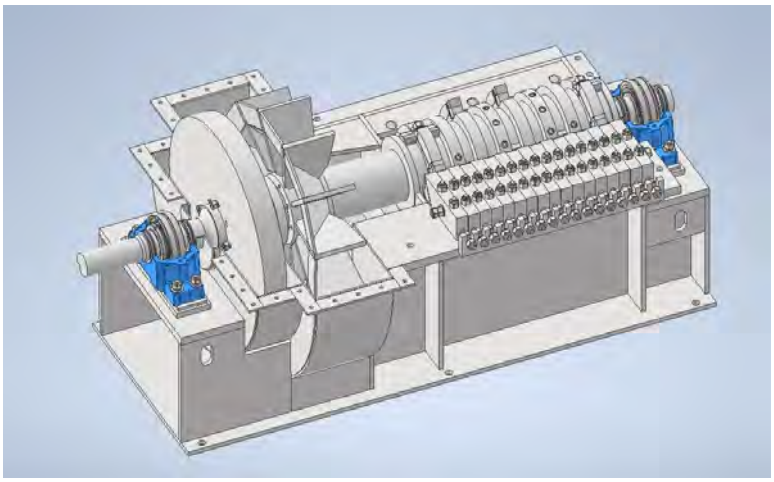


Figure 4.46: Rotor and Bearing Units Resting in Lower Housing

13. Verify mounted clearance and tighten further as needed. Refer to Table 9 for clearance requirements, based on the bearing manufacturer's recommendations.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

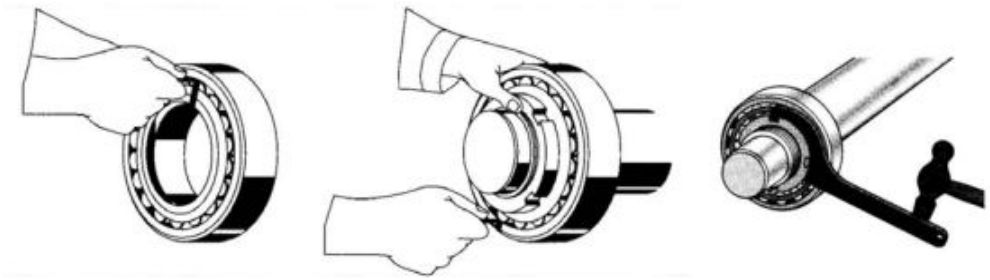


Figure 4.47: Verifying Mounted Clearance

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.

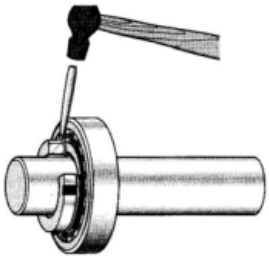


Figure 4.48: Locking the Locking Nut and Locking Washer

15. Apply lubrication. See *Maintenance Procedures: Bearing Lubrication* for more information.
16. Slide the outer bearing housing oil seal onto the shaft and insert the stabilizing ring, if applicable.

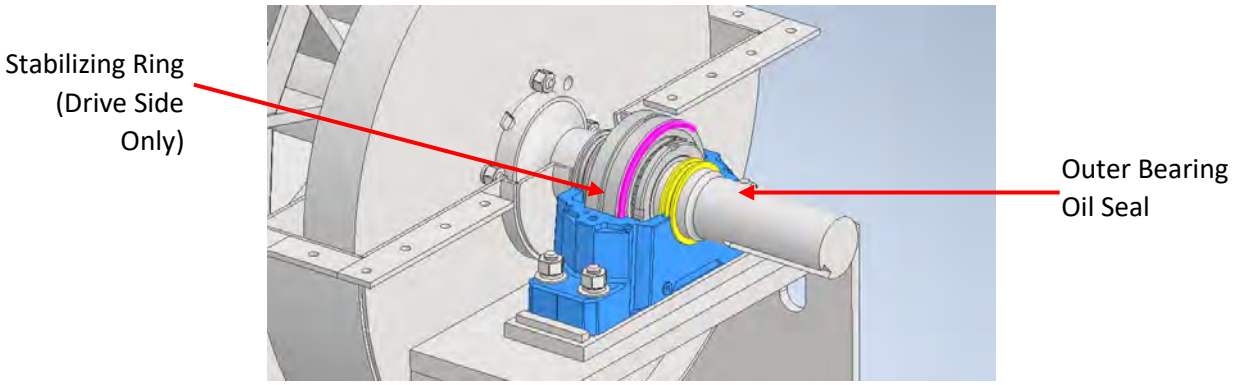


Figure 4.49: Stabilizing Ring (Pink) and Outer Oil Seal (Yellow)

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

stabilizing ring prevents the bearing unit from moving in the bearing housing, which prevents the rotor from shifting during operation.

17. Replace the upper housing of the bearing. **Do this before reassembling the hog to minimize potential for contaminants to enter the bearing.**

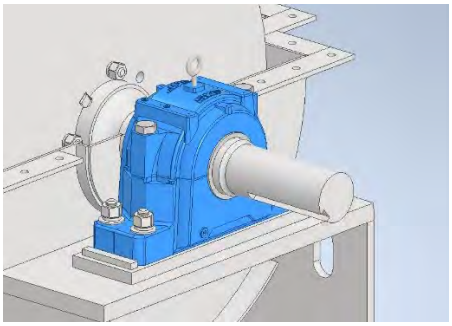


Figure 4.50: Bearing Cap Replaced

18. Replace the hog upper housing, fan upper housing (Blo-Hog models), front and rear doors, and all guard covers.

BEFORE RESTARTING THE HOG, BE SURE ALL MAINTENANCE EQUIPMENT HAS BEEN REMOVED FROM THE CUTTING CHAMBER. ENSURE THAT ALL HOUSING COMPONENTS ARE IN PLACE AND ALL BOLTS ARE PROPERLY TIGHTENED. VERIFY THAT THE BEARINGS HAVE BEEN PROPERLY LUBRICATED.

➤ ROTOR REMOVAL

For certain maintenance procedures (such as replacing bearings) it is strongly encouraged that the rotor be removed from the hog housing. The upper fan housing (for Blo-Hogs) and hog upper housing must be removed, as well as the hopper, the bearing upper housings, and all 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

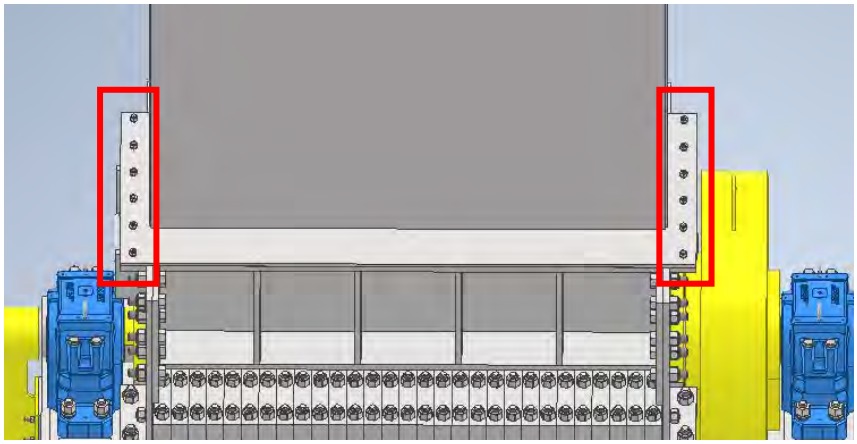


Figure 4.51: Companion Flange Bolts

The companion flange is secured with 1/2" diameter bolts on both sides of the hog housing.

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.

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

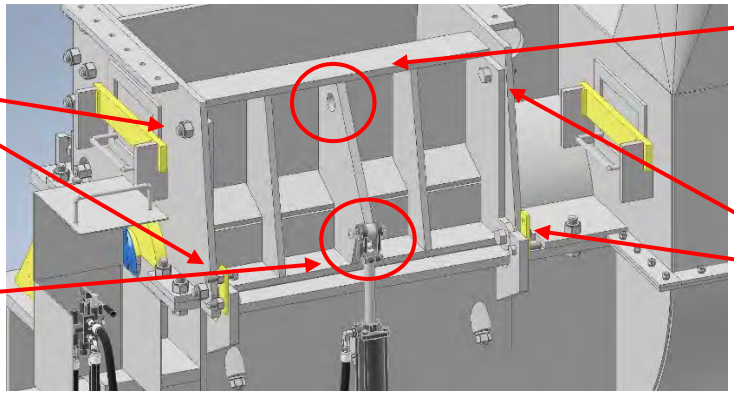


Figure 4.52: Rear Door Removal (Hydraulics)

The rear door is attached to the housing with four 1" diameter bolts (two on each side). All four bolts must be removed before the door can be lifted out of place.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

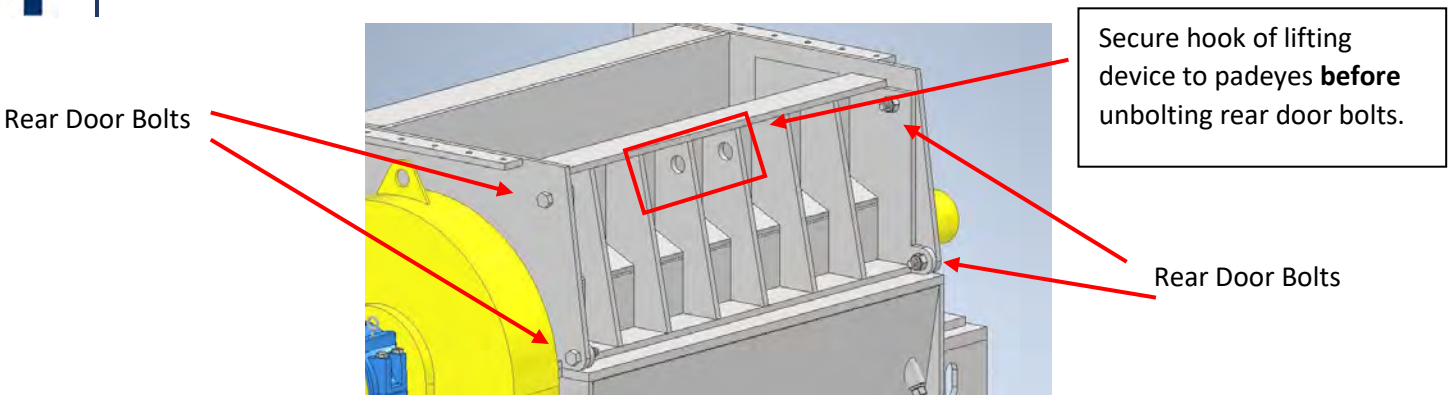


Figure 4.53: Rear Door Removal (No Hydraulics)

3. Remove the flywheel guard cover, if applicable. HD and PM hogs with gravity discharge have flywheel covers separate from the fan upper housing.

   Note: FS Model hogs with a Serial Number under 1735 may or may not include a flywheel.

   The flywheel cover is secured to the hog housing with four 1/2" diameter bolts (two on each side). They must be removed before the flywheel cover can be lifted out of place.

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

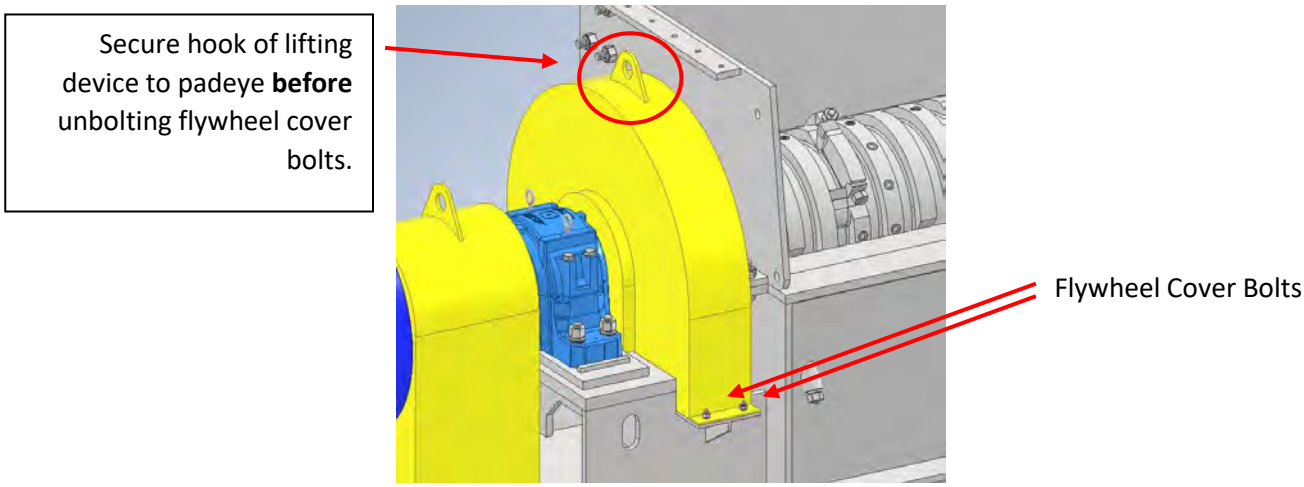


Figure 4.54: Flywheel Cover Removal (Gravity Discharge)

Newer models include extra finger guards between the flywheel cover and the bearing housing, and the flywheel cover and the hog housing. If these are bolted on, ensure the bolts have been removed before attempting to lift the flywheel cover.

The clearances between the flywheel cover, the bearing housing, and the hog housing are tight. The cover may need to be lifted out at an angle to ensure it clears.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

4. Remove the front door.

BEFORE REMOVING THE FRONT DOOR, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO THE FRONT DOOR BRACES. IT IS TOO HEAVY TO HANDLE WITHOUT PROPER MATERIAL HANDLING EQUIPMENT.

The front door is secured to the hog upper housing with twelve 1" diameter bolts (six on each side). These must be removed before the front door can be lifted out of place.

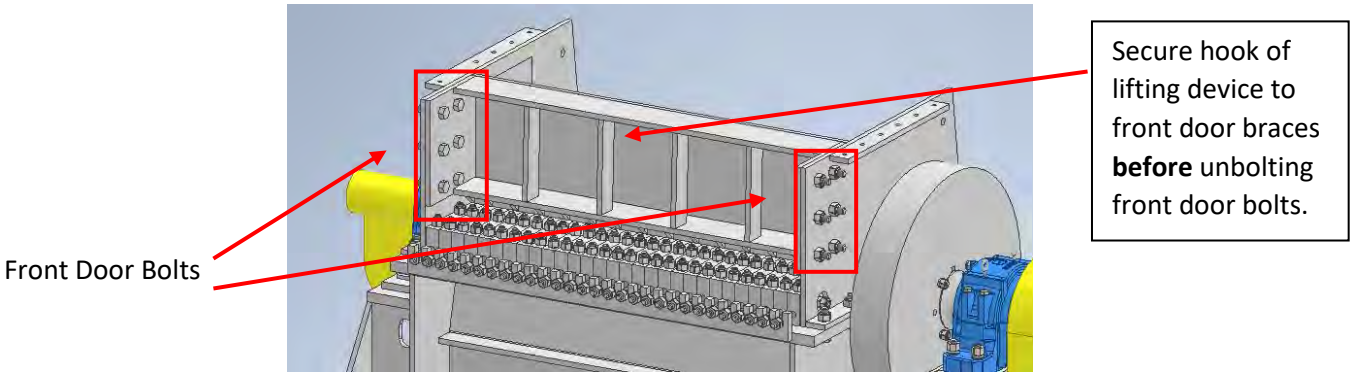


Figure 4.55: Front Door Removal

Figure 4.56: Lifting Device Secured to Front Door

5. Remove the hog upper housing(s).

BEFORE REMOVING THE UPPER HOUSING, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO THE UPPER HOUSING SIDE PLATE. IT IS TOO HEAVY TO HANDLE WITHOUT PROPER MATERIAL HANDLING EQUIPMENT.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

For Eat Rite models, there is an upper housing on each side of the hog. For Blo-Hog models, there is an upper housing on the side of the hog opposite the fan.

Each upper housing is secured to the lower housing with four 1" diameter bolts. **These bolts are longer than the other housing bolts to accommodate for the thickness of the anvil plate. Ensure these bolts are put back in the right spots at reassembly.** There should be a minimum of two bolt threads visible over the top of each fastened locknut.

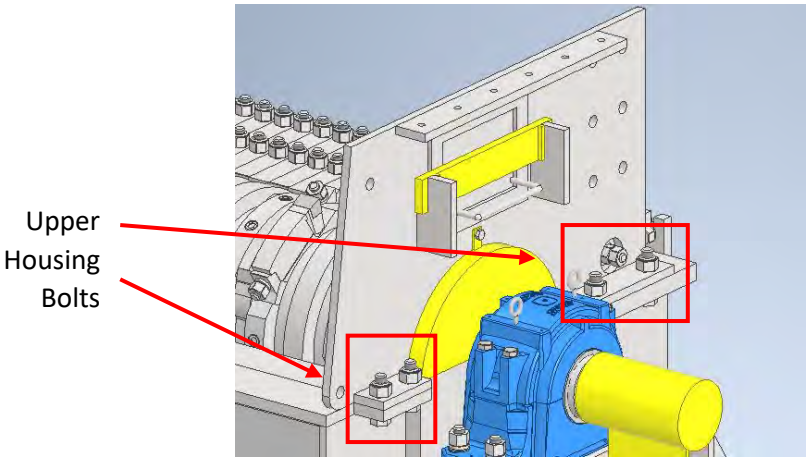


Figure 4.57: Upper Housing Removal

The upper housings may need to be lifted out at an angle to clear the fasteners on the anvil tie rod.

6. Remove the upper fan housing, if applicable. All Blo-Hog models have an upper fan housing to cover the integral fan.

BEFORE REMOVING THE UPPER FAN HOUSING, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO LIFTING HOLE IN THE COWL BRACE. IT IS TOO HEAVY TO HANDLE WITHOUT PROPER MATERIAL HANDLING EQUIPMENT.

The upper fan housing is secured to the lower housing with a series of 1" diameter bolts and 1/2" diameter bolts. The exact quantities vary based on hog model and fan size. The 1" diameter bolts are located between the hog and the fan. The 1/2" diameter bolts are located around the fan housing and flywheel cover.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

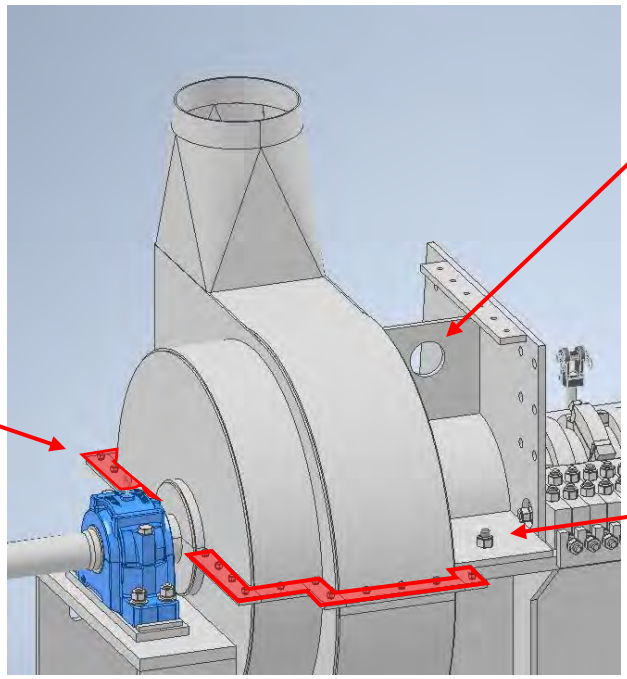


Figure 4.58: Upper Fan Housing Removal

7. Remove any remaining guard covers. This includes the shaft extension guard cover and any drive covers.

BEFORE REMOVING THE DRIVE GUARD COVER, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO THE PROVIDED PADEYE. IT IS TOO HEAVY TO HANDLE WITHOUT PROPER MATERIAL HANDLING EQUIPMENT.

Ensure all bolts have been removed before attempting to lift the guard covers.

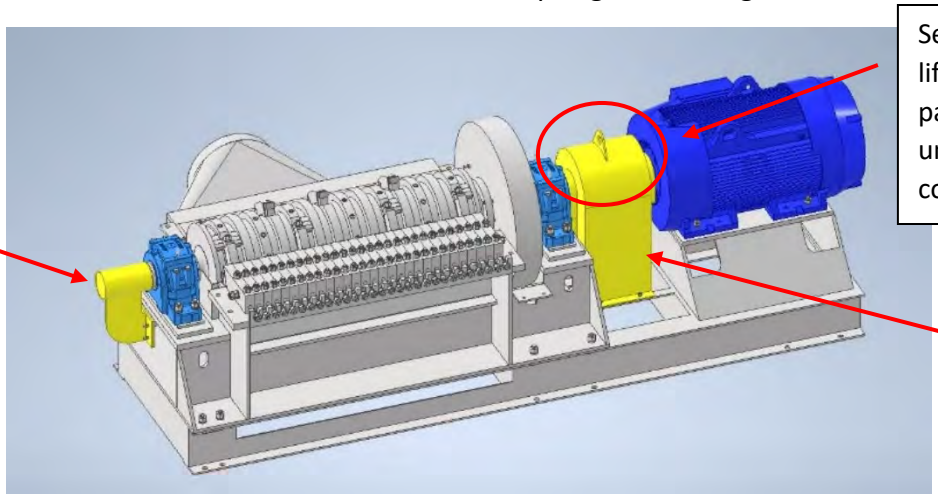


Figure 4.59: Guard Cover Removal – Direct Drive, Eat Rite

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

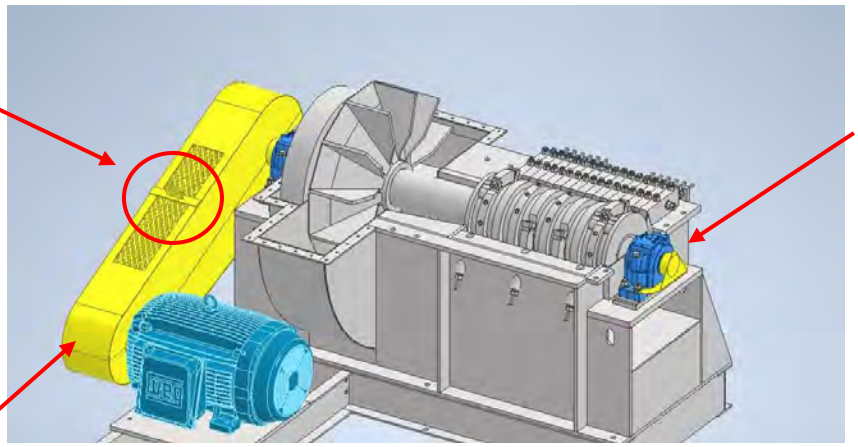


Figure 4.60: Guard Cover Removal – V-Belt Drive, Blo-Hog

8. Disconnect the motor from the hog shaft.

   Direct Drive: Remove the coupling cover to expose the metal grid.

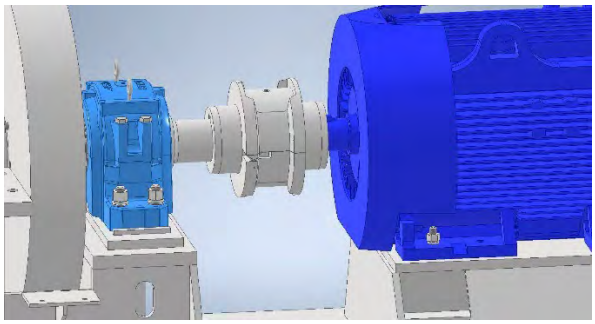


Figure 4.61: Motor Coupling Cover

Remove the metal grid from between the two hubs. Insert a screwdriver into the loop ends, beginning at the open end of the grid section. **Pry the grid out radially in even, gradual stages, proceeding alternately from side to side.** Do not use excessive force, and be careful to not distort the grid as it is removed.

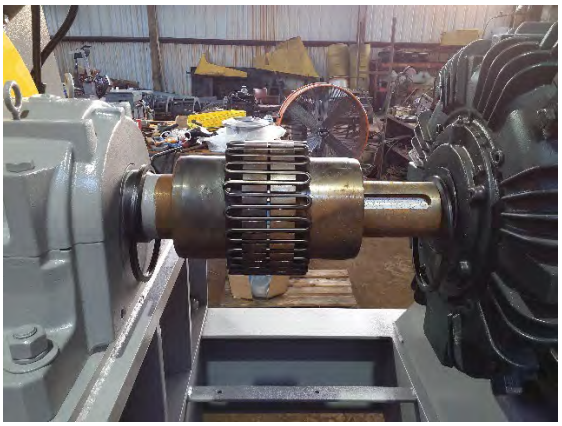


Figure 4.62: Motor Coupling Grid

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

V-Belt Drive: Using the adjustable slide base, move the motor closer to the hog to create slack in the V-Belts. Once the V-Belts have been loosened, they can be removed from the sheaves.

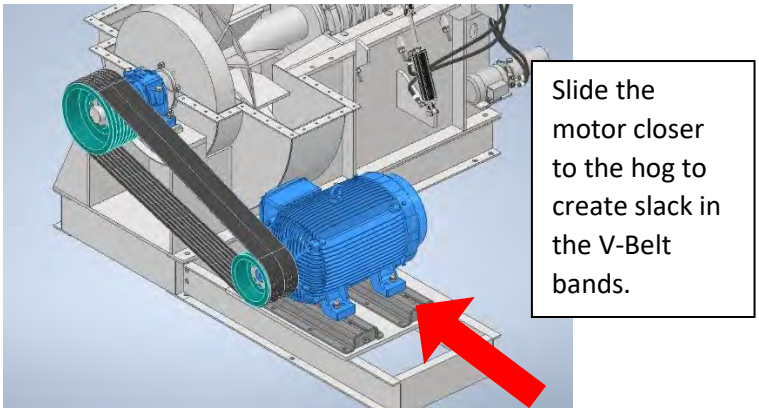


Figure 4.63: V-Belt Removal

9. Remove the bearing housings.

   If the rotor is being removed for bearing replacement or on-site maintenance, the upper housings can be unbolted from the lower housings. **Use extreme caution when taking bearings apart. Ensure that no contaminants have entered the bearing units or bearing housings before restarting the hog.**

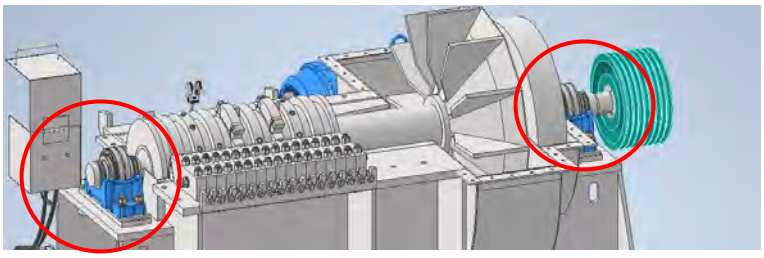


Figure 4.64: Bearing Upper Housings Removed

   If the rotor is being removed to be shipped to Montgomery Industries for repairs, the entire bearing units can be unbolted from the hog housing.

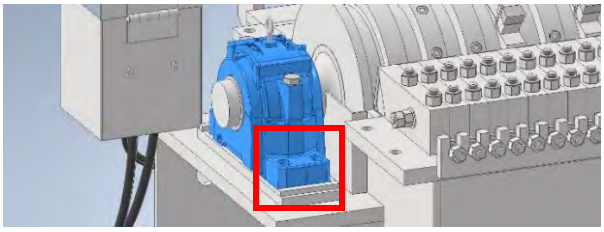


Figure 4.65: Bearing Units Unbolted from Hog Housing

10. The rotor is now ready for removal.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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 lower parts of the rings to prevent slipping or twisting.

Figure 4.66: Lifting a Rotor Out of the Lower Housing

➤ ROTOR DISASSEMBLY

To perform certain maintenance procedures, it may be necessary to disassemble the hog rotor. To install a new fanwheel, replace rings, or replace the drive side bearing, the rotor must be partially disassembled. **Disassembling the rotor is a time and labor-intensive process. If possible, worn rotors should be shipped to Montgomery Industries for rebuilding to factory standards.** It is much more difficult to perform these maintenance tasks in the field without the proper equipment and infrastructure that is available at the factory.

Rotor disassembly must be performed with the rotor outside the hog housing. See *Maintenance Procedures: Rotor Removal* for the steps required to remove the rotor.

There are several companies that sell aftermarket rotor components for Montgomery hogs. Aftermarket rings, teeth, and other parts are **NOT** endorsed by Montgomery Industries. They are not certified to Montgomery design and manufacturing standards, and their performance can be unpredictable. The use of aftermarket parts puts operators at risk and increases the potential for catastrophic failure. As such, using aftermarket parts voids all warranties.

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

The rotor flywheel is extremely heavy and should not be removed unless necessary. To access the fanwheel, flywheel removal is required. For ring replacement, however, you should access the rings from the side opposite the flywheel.

If the maintenance being performed is **NOT** on the drive side, accessing the rotor components only requires removing the bearing. See *Maintenance Procedures: Bearing Replacement* for more information. If the maintenance being performed **IS** on the drive side, the drive components must first be removed.

1. Drive Component Removal:

   Direct Drive:

   If maintenance is being performed from the drive side, the hub on the hog side of the coupling must be removed. The hub is keyed and temperature (interference) fit, so the unit must be heated for removal.

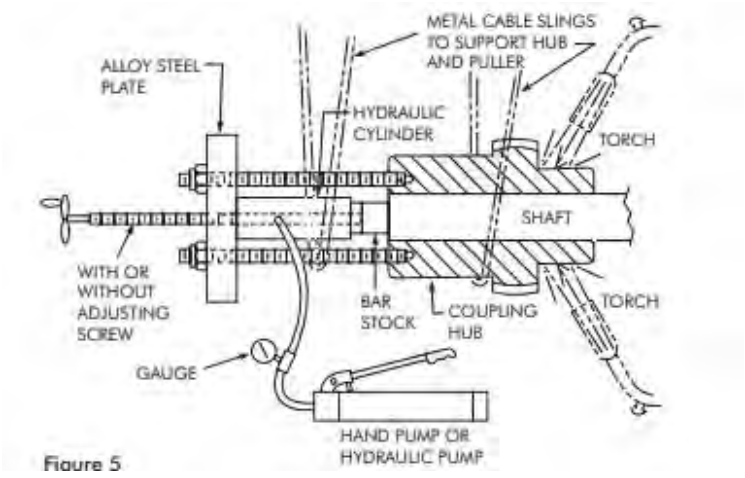


Figure 4.67: Hub Removal Diagram[2]

Using a torch, heat the hub to roughly 275°F (135°C). Direct the flame of the torch to the outside of the hub and keep in motion while heating. Use caution to not overheat an area, and do not apply heat directly to the hub teeth. Do not heat the hub beyond a maximum temperature of 400°F (205°C) to prevent damage to seals. Once the hub has expanded enough, use a puller to remove it from the hog shaft.

DO NOT CUT THE HUB OFF THE SHAFT. This could easily gouge the shaft, preventing a new hub from being installed. If the shaft is gouged from improper hub removal, a new shaft will have to be purchased before the hub can be reinstalled. **This incurs unnecessary costs and drastically increases down-time.**

(2) Falk 458-830 Removal of Interference Fit Hubs

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Figure 4.68: Gouged Shaft from Improper Component Removal

V-Belt Drive:

If maintenance is being performed from the drive side, the V-Belt sheave must be removed. The V-Belt sheave is secured to the shaft with a taper-lock bushing. To remove the bushing, first back out all screws entirely. The exact number varies based on the bushing size. See the figure below for the locations of screws for each bushing size.

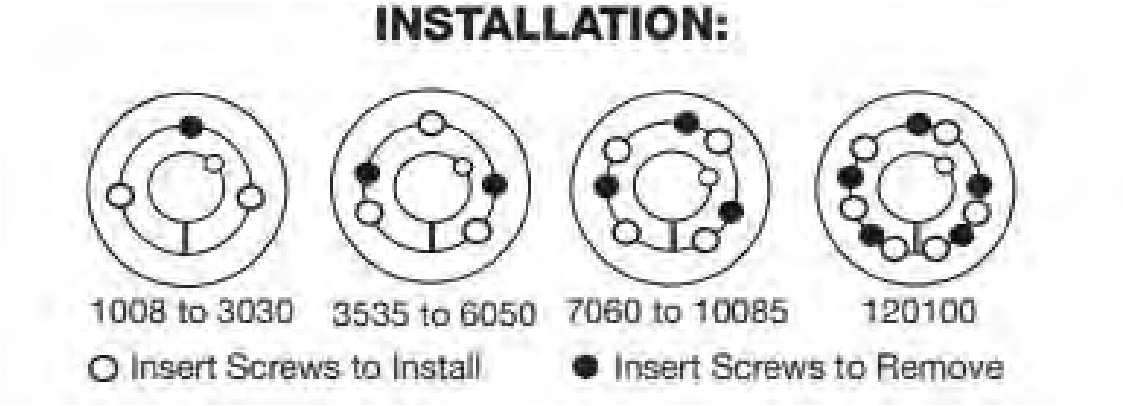


Figure 4.69: Taper-Lock Bushing Fasteners[3]

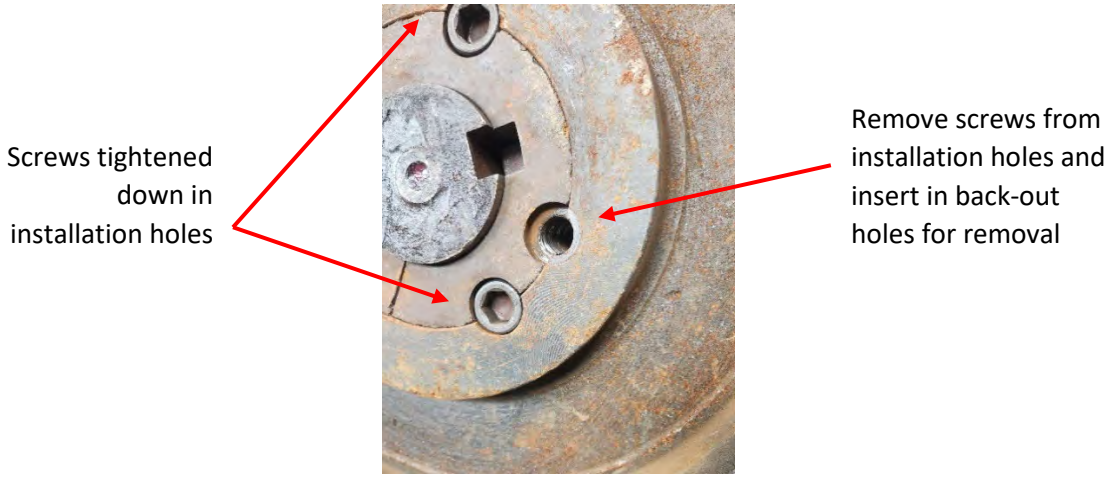


Figure 4.70: Screws on a Taper-Lock Bushing

(3) Dodge MN4044 Taper-Lock Bushing Installation/Removal

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Back the screws completely out, and then insert them in the back-out holes. Loosen the bushing by alternately tightening the screws into the back-out holes.

Figure 4.71: Tightening Screws into Back-Out Holes

Push the bushing up the taper (closer to the hog) to jog it loose.

Figure 4.72: Jogging Loose from Taper

Once the bushing has been pushed off the taper, the inner piece can be slid off the hog shaft. **The outer part of the bushing is too heavy for one person to lift.** Use mechanical advantage to lift it and slide it off the hog shaft.

BEFORE REMOVING THE OUTER BUSHING, FIRST SECURE THE HOOK OF A LIFTING DEVICE TO BOTH SIDES. IT IS TOO HEAVY TO HANDLE WITHOUT PROPER MATERIAL HANDLING EQUIPMENT.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Figure 4.73: Lifting Outer Bushing Off Hog Shaft

Once the drive components have been removed, the drive side bearing can be accessed for removal. For more information on removing the bearing, see *Maintenance Procedures: Bearing Replacement.*

2. Ring Replacement

SECURE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK. RINGS ARE TOO HEAVY TO LIFT WITHOUT MECHANICAL ADVANTAGE. USE A LIFTING DEVICE.

DO NOT STICK YOUR FINGERS INTO THE SHEAR PIN HOLES. FINGERS CAN EASILY GET STUCK, CRUSHED, OR BROKEN.

On each end of the rotor, an end flange has been stitch-welded to the outermost ring. **This flange should remain welded to the ring**. The end flange provides a spot for balance weights to be welded where they will be protected from the cutting chamber.

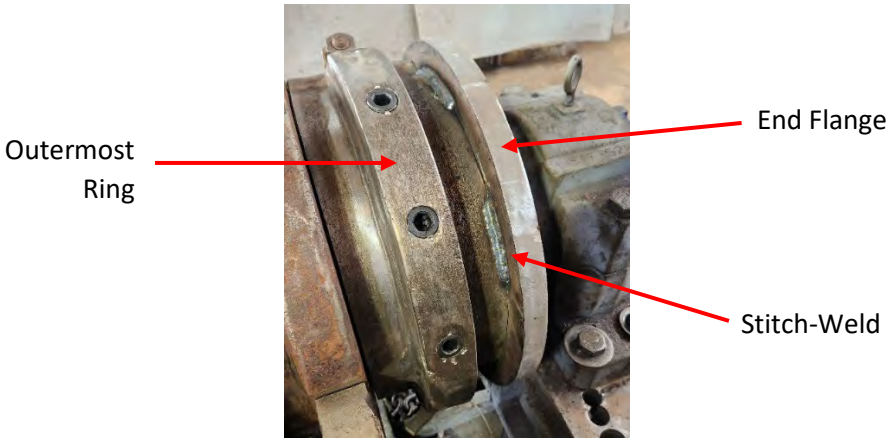


Figure 4.74: End Flange Stitch-Welded to Neighboring Ring

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Do not remove the balance weights from the rotor end flanges. This will put the hog out of balance, causing excessive vibration and potentially catastrophic failure.

Before the rings can be slid off the shaft, the shear pins must be backed out.

Remove the top setscrews to access the shear pins and the oil cylinder. Rotate the rotor until the spacers on top of the shear pins fall out. Keep rotating the rotor until the spacer and oil cylinder drop out.

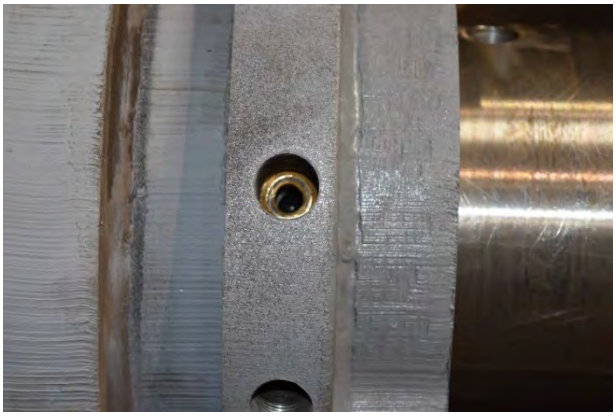


Figure 4.75: Shear Pins Accessible for Removable

Next, use a shear pin extractor to remove the shear pins. Screw the shear pin extractor into the threaded shear pin. Tug on the extractor to pull the shear pin out of the hole.

Figure 4.76: Shear Pin Extractor

The ring can then be slid off the hog shaft.

Work across the shaft, removing each ring until the ring to be replaced is accessible. Once the replacement ring has been installed, reinstall the other rings **in their original order**. It may be helpful to number the rings as they are slid off to maintain the proper order.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

It is possible to slide the rings on backward, so ensure the seat for the tooth head is facing into rotation.

The rotor was dynamically balanced at Montgomery Industries prior to shipment. **It is critical that the rings are reinstalled in their original locations to ensure the rotor stays in balance.**

If an entire set of new rings has been purchased, it is **STRONGLY RECOMMENDED** that the customer elects to have them assembled and balanced at the factory prior to shipment. **If the customer has opted not to include dynamic balancing, it is the responsibility of the customer to balance the rotor in the field.**

For further information on reinstalling new rings, see Appendix F: *Bulletin 57-08-22 Replacing Rings*.

3. Flywheel Removal (Eat Rite Models):

For gravity discharge hogs (no integral fan), there is generally no need to remove the flywheel to conduct routine maintenance. Ring replacement and bearing replacement can be done without flywheel removal. However, in the event of a major hog wreck, the hog shaft may get bent. In this situation, the most cost-effective solution is to move the existing flywheel to a new hog shaft.

SECURE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK. THE FLYWHEEL IS TOO HEAVY TO LIFT WITHOUT MECHANICAL ADVANTAGE. USE A LIFTING DEVICE.

First, remove the four 3/4” diameter flywheel studs that secure the flywheel in position.

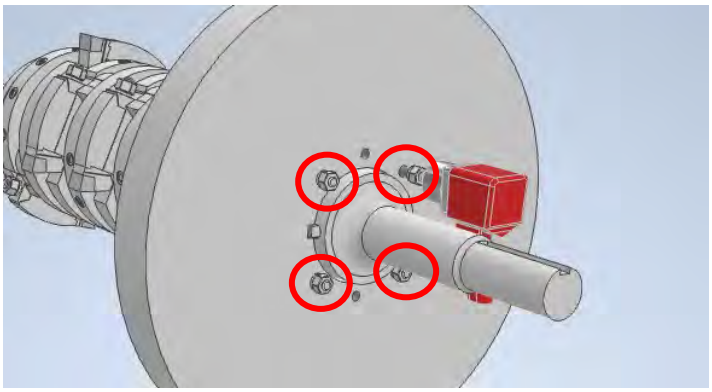


Figure 4.77: Removing Flywheel Studs (ER)

Once the retaining flange is no longer secure to the flywheel, it can be pushed back up the rotor to expose the split retaining ring. Remove the split retaining ring from its groove on the hog shaft.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

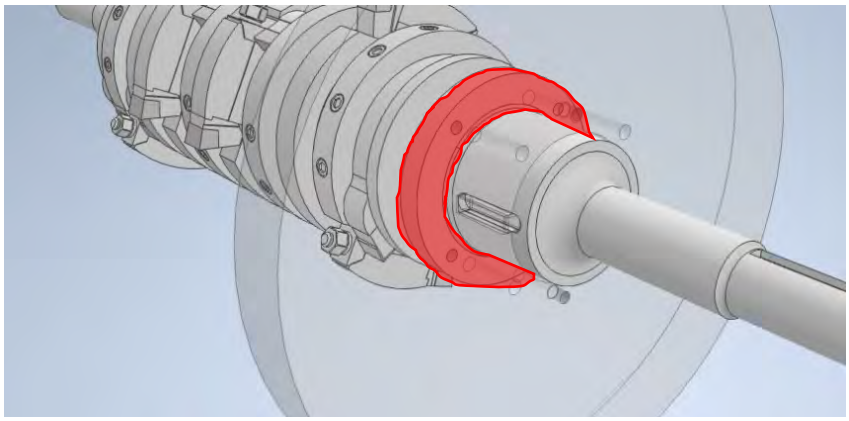


Figure 4.78: Flywheel Retaining Flange (ER)

Push the flywheel retaining flange back down the shaft until it is flush against the back of the flywheel. Wedge a piece of steel between the back of the flywheel retaining flange and the rotor end flange to prevent the retaining flange from slipping. Ensure that the holes on the retaining flange do **NOT** line up to the tapped holes on the flywheel. The back-out bolts need a solid surface behind the flywheel to press against.

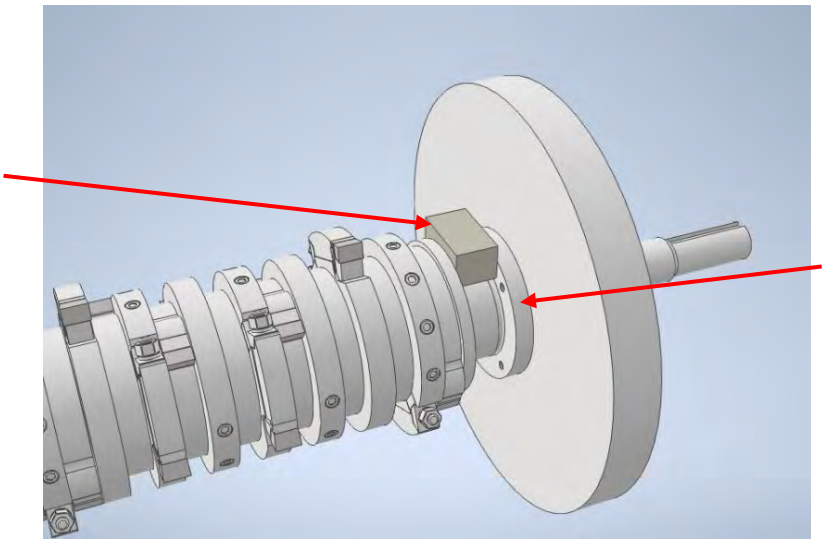


Figure 4.79: Flywheel Retaining Flange Pressed Against Flywheel (ER)

Insert two 7/8” NC-9 bolts into the tapped holes on the flywheel. Tighten them down until they press against the flywheel retaining flange.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

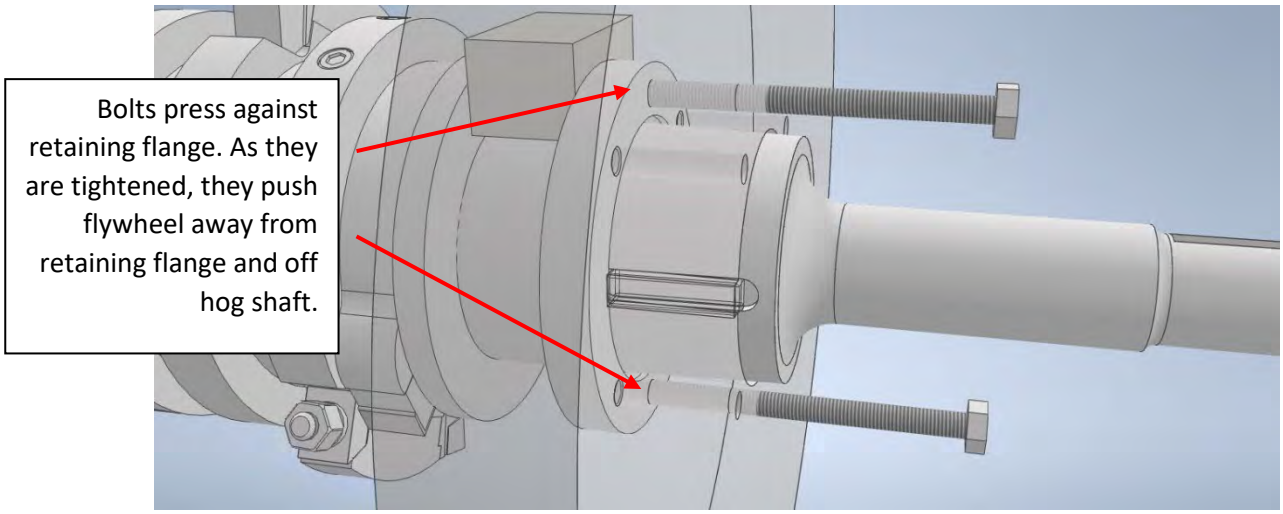


Figure 4.80: Tightening Bolts to Remove Flywheel (ER)

Tighten the bolts to push the flywheel off the hog shaft. Be sure to tighten in an alternating pattern to evenly drive the flywheel off the taper.

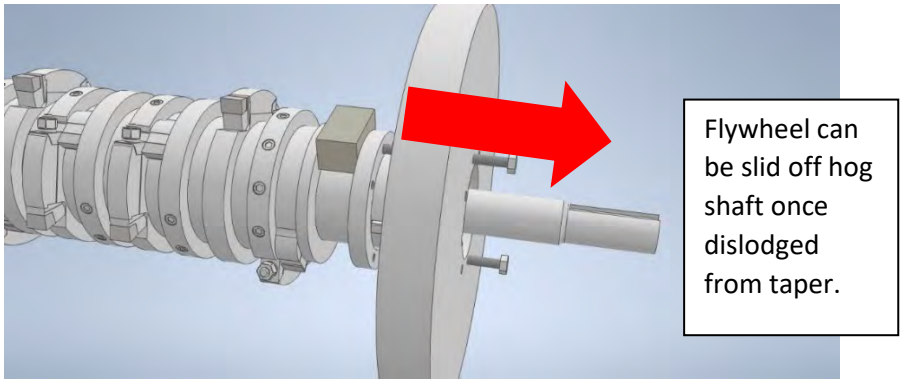


Figure 4.81: Flywheel Free of Taper (ER)

Once the flywheel is free of the taper, it can be lifted off the hog shaft **using a lifting device**.

In some instances, the flywheel may be on so tight that pressure on the bolts will fail to move it. This is generally the case in older units where the flywheel has been exposed to the elements. In this case, heat can be applied to the flywheel to expand it as you tighten the bolts.

If the flywheel still cannot be removed from the hog shaft, it must be sent to the factory for proper removal. Jerry-rigged solutions to remove the flywheel in the field are extremely dangerous and put the safety of personnel at risk. Montgomery Industries has specially designed equipment to remove stuck flywheels and fanwheels without endangering surrounding personnel.

DO NOT ATTEMPT TO REMOVE A STUCK FLYWHEEL IN THE FIELD. DOING SO CAN PUT PERSONNEL AT RISK OF SEVERE INJURIES.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

4. Flywheel and Fanwheel Removal (Blo-Hog Models):

Blo-Hogs may occasionally need to have their fanwheels replaced if the discharge material starts to wear through the fan blades. The frequency with which this must be done is dependent on each individual application and the abrasiveness of the discharge material. If fanwheel wear becomes an issue, replacement fanwheels can be hardsurfaced at the factory to add longevity.

Additionally, in the event of a major hog wreck, the hog shaft may get bent. In this situation, the most cost-effective solution is to move the existing flywheel and fanwheel to a new hog shaft.

SECURE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK. THE FLYWHEEL AND FANWHEEL ARE TOO HEAVY TO LIFT WITHOUT MECHANICAL ADVANTAGE. USE A LIFTING DEVICE.

First, the flywheel must be removed. Remove the four 3/4” diameter flywheel studs that secure the flywheel in position.

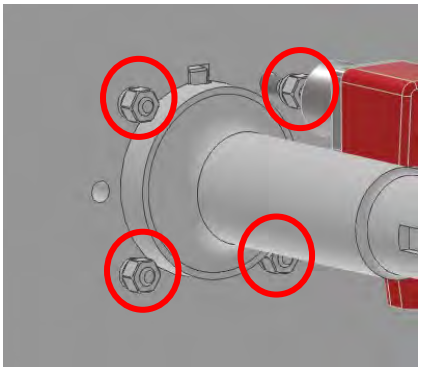


Figure 4.82: Removing Flywheel Studs (BH)

Remove the four 5/8” square head cap screws from the flywheel retaining flange.

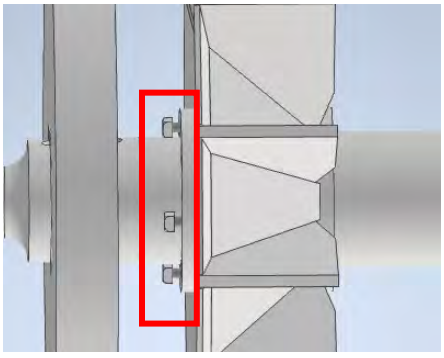


Figure 4.83: Removing Square Head Cap Screws (BH)

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Once the retaining flange is no longer secure to the flywheel or the fanwheel, it can be pushed back up the rotor to expose the split retaining ring. Remove the split retaining ring from its groove on the hog shaft.

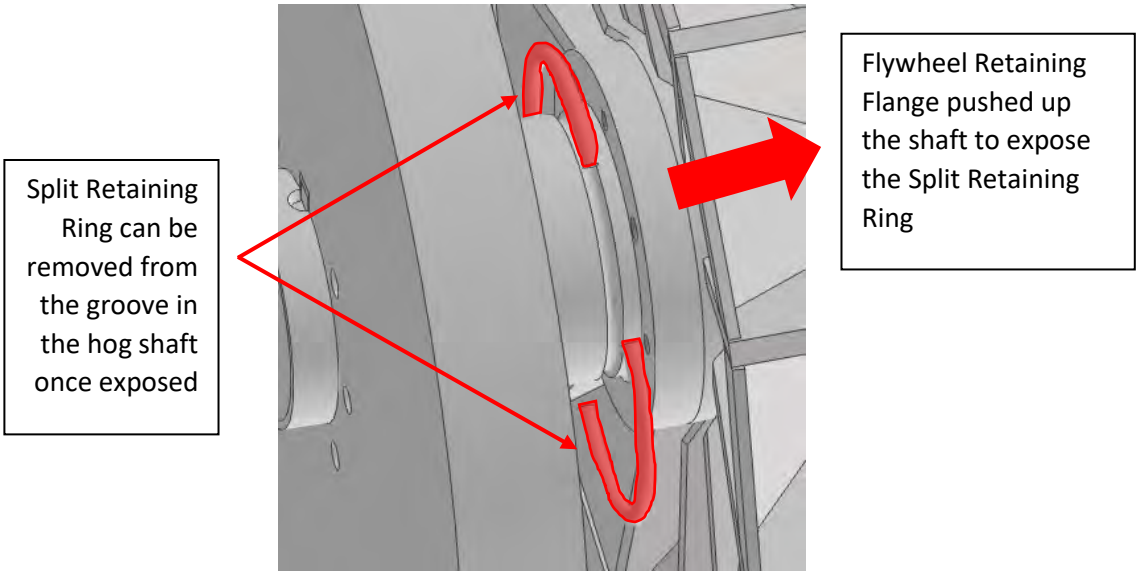


Figure 4.84: Split Retaining Ring (BH)

Push the flywheel retaining flange back down the shaft until it is flush against the back of the flywheel. Wedge a piece of steel between the back of the flywheel retaining flange and the fanwheel hub to prevent the retaining flange from slipping. Ensure that the holes on the retaining flange do **NOT** line up to the tapped holes on the flywheel. The back-out bolts need a solid surface behind the flywheel to press against.

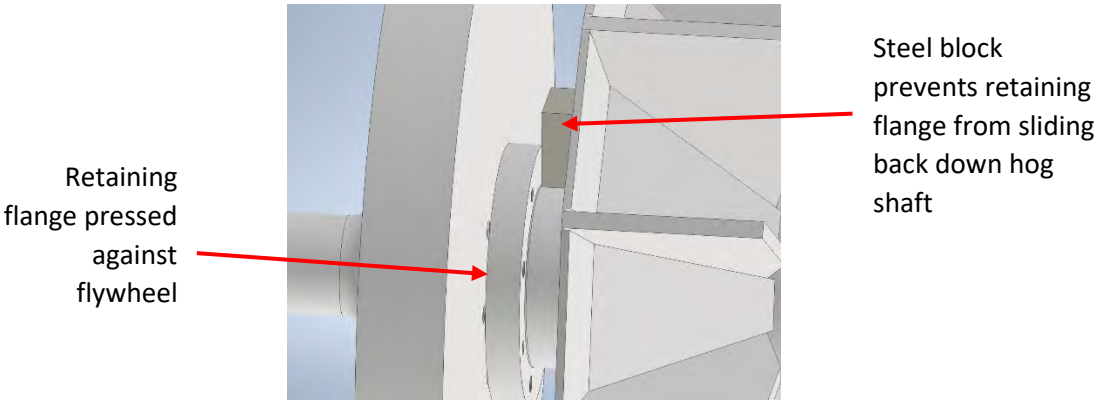


Figure 4.85: Retaining Flange Wedged Against Flywheel (BH)

Insert two 7/8” NC-9 bolts into the tapped holes on the flywheel. Tighten them down until they press against the flywheel retaining flange.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

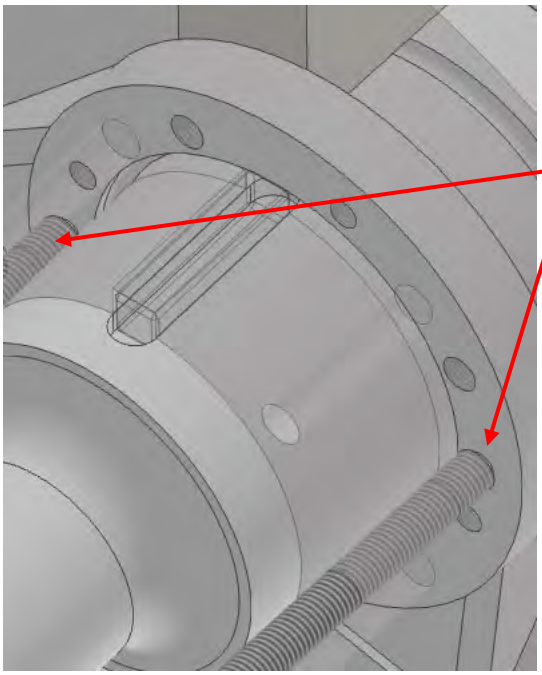


Figure 4.86: Back-Out Bolts Pressed Against Flywheel Retaining Flange (BH)

Tighten the bolts to push the flywheel off the hog shaft. Be sure to tighten in an alternating pattern to evenly drive the flywheel off the taper.

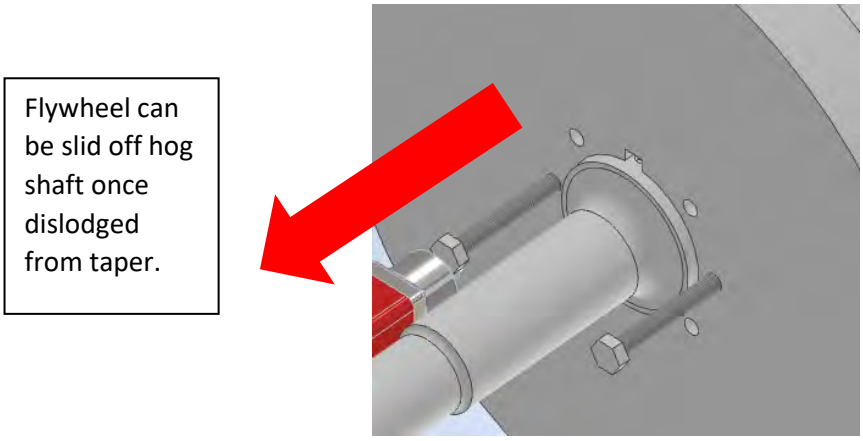


Figure 4.87: Tightening Bolts to Remove Flywheel (BH)

Once the flywheel is free of the taper, it can be lifted off the hog shaft **using a lifting device**.

To remove the fanwheel, first reinstall the flywheel retaining flange **backwards**. Insert the split retaining ring into the groove and then slide the flywheel retaining flange on backwards over it.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

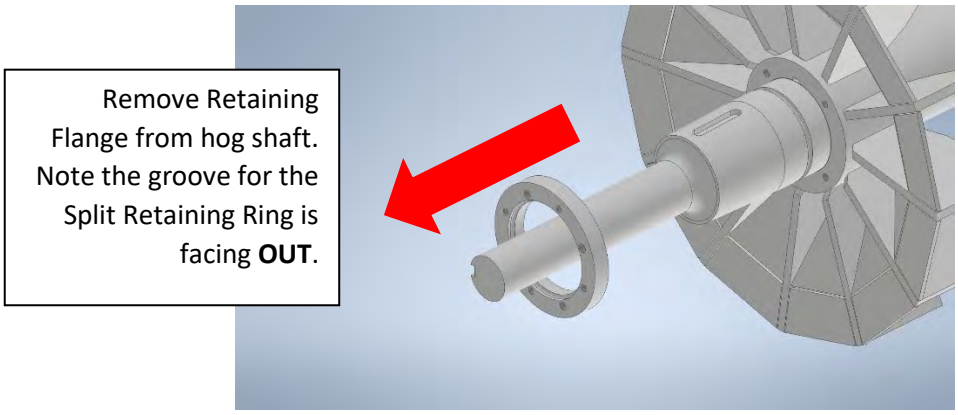


Figure 4.88: Removing Flywheel Retaining Flange (BH)

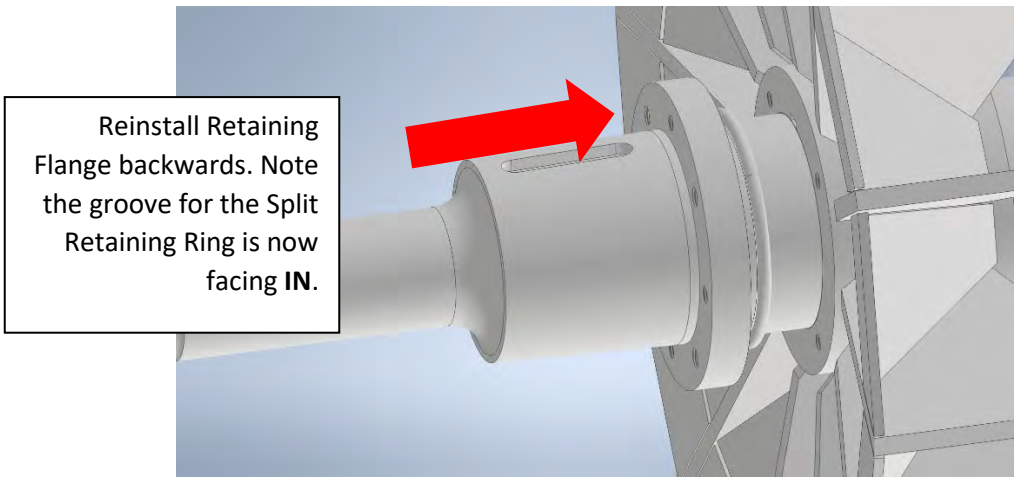


Figure 4.89: Reinstalling Flywheel Retaining Flange Backwards (BH)

When reinstalling the flywheel retaining flange, ensure the 3/4” bolt holes (the larger set of holes) line up to the 5/8” bolt holes on the fanwheel hub.

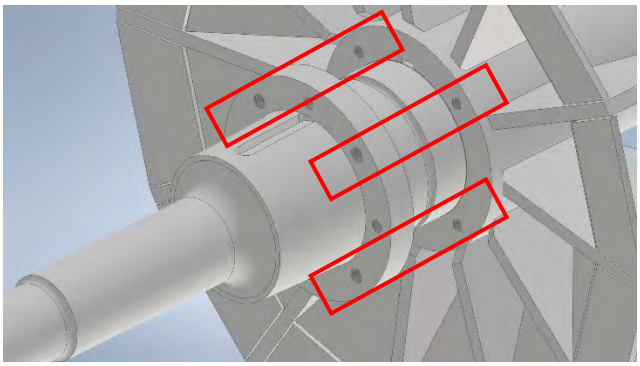
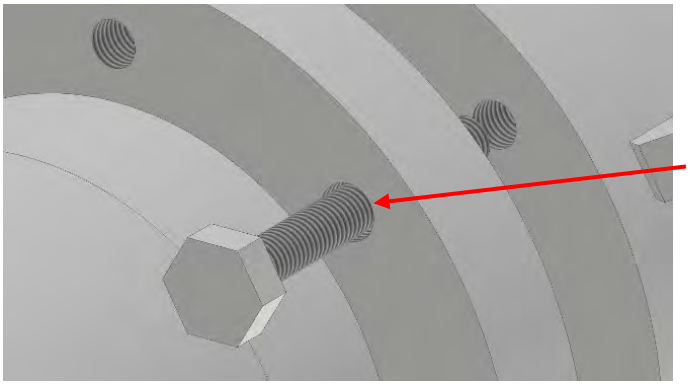


Figure 4.90: 3/4" Bolts Line Up to Back-Out Holes on Fanwheel Hub (BHH)

Insert four 5/8” NC-11 bolts through the 3/4" bolt holes on the flywheel retaining flange and into the threaded holes on the fanwheel hub. **They will not engage the threads on the 3/4"**

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

flywheel retaining flange holes. This is an intentional measure to prevent the bolts from stripping the threads.



Insert bolts through larger set of holes on Flywheel Retaining Flange to prevent damaging the threads.

Figure 4.91: Hole Oversized to Protect Threads (BH)

Tighten the bolts to squeeze the fanwheel to the retaining flange and pull the fanwheel off the tapered hog shaft.

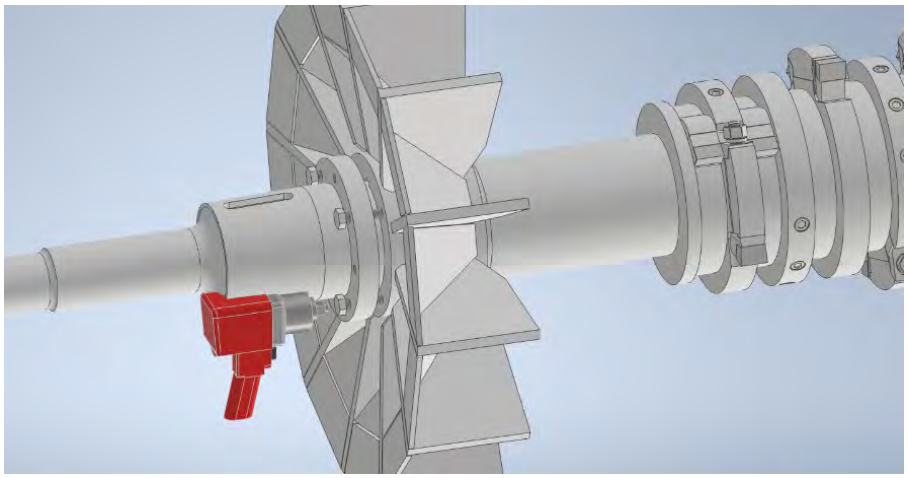


Figure 4.92: Tightening Bolts to Remove Fanwheel (BH)

Once the fanwheel is dislodged from the taper, it can be removed from the hog shaft. First, remove the bolts, flywheel retaining flange, and split retaining ring. Then, **use a lifting device** to remove the fanwheel from the hog shaft.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

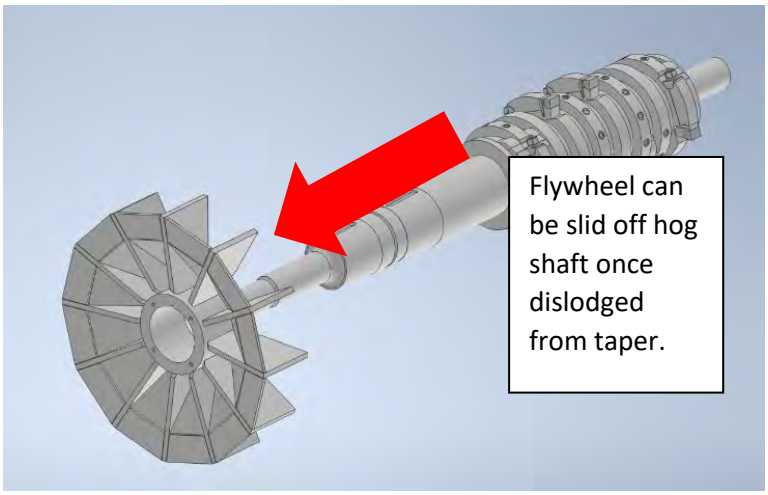


Figure 4.93: Sliding Fanwheel off Hog Shaft

In some instances, the flywheel or the fanwheel may be on so tight that pressure on the bolts will fail to move it. This is generally the case in older units where the rotor has been exposed to the elements. In this case, heat can be applied to the flywheel or fanwheel to expand it as you tighten the bolts.

If the flywheel or fanwheel still cannot be removed from the hog shaft, it must be sent to the factory for proper removal. Jerry-rigged solutions to remove the flywheel or fanwheel in the field are extremely dangerous and put the safety of personnel at risk. Montgomery Industries has specially designed equipment to remove stuck flywheels and fanwheels without endangering surrounding personnel.

DO NOT ATTEMPT TO REMOVE A STUCK FLYWHEEL OR FANWHEEL IN THE FIELD. DOING SO CAN PUT PERSONNEL AT RISK OF SEVERE INJURIES.

➤ ROUTINE MAINTENANCE

ROUTINE MAINTENANCE IS CRITICAL TO MAINTAIN THE PROPER OPERATING CONDITIONS FOR YOUR HOG. FAILURE TO MAINTAIN YOU HOG CAN RESULT IN CATASTROPHIC FAILURE OR INJURY TO PERSONNEL.

The following maintenance tasks should be performed on a frequent basis. **Operators should familiarize themselves with these tasks and closely monitor their hog.** Each application is different, so it is critical for the customer to develop a maintenance schedule tailored to their specific situation.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

This list is not all inclusive. There are other maintenance tasks equally as critical (such as re-greasing bearings, replacing screens, and repairing rotors) that should not be ignored. These have been detailed further in other sections.

1. Check the temperature of the bearings.

   Temperature monitor decals are attached to the top of the bearings to aid in determining if the operating temperature of the bearings is above normal.

Figure 4.94: TempiLabel Temperature Monitoring 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 catastrophic damage to the bearing and the hog.

2. Check the tightness of teeth daily.

   Normal operation may cause the teeth to loosen over time. The frequency 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.

   The recommended torques for T3 teeth are given below.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Table 10: Recommended Torques for T3 Teeth*

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	250 ft-lbs
2-Part Teeth	350 ft-lbs
Manufactured Teeth	350 ft-lbs

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

Alternatively, not tightening the teeth to the specified torque may also compromise the connection.

If a tooth becomes loose from overtightening or under-tightening, catastrophic failure can occur. A loose tooth can become a projectile that hits the anvils and/or the screen, causing damage to the unit. Loose teeth create the possibly of causing severe injury to personnel in the area.

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 4.95: New VS Worn Tooth

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 before teeth and anvils need replacement.

For further information on teeth wear, see Appendix C: *Bulletin 23-78-14 Hardsurface Wear Zones on T3 Teeth*.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

4. Check V-Belt drive (if applicable).

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

➤ SCREEN REMOVAL & INSTALLATION

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.

The screens in gravity-fed FS, HD, & PM Hogs are held in place by the screen clamping bar.

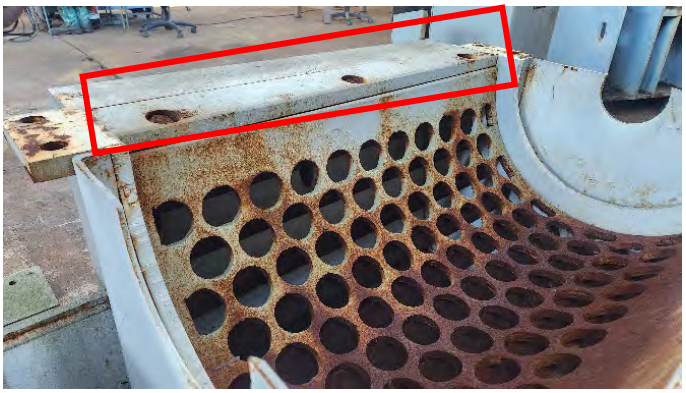


Figure 4.96: Screen Clamping Bar

The screen clamping bar secures the screen in place. It is fastened with either two or three screen hold down bolts, depending on the hog size. The bolts run through the hog housing. When they are tightened, they squeeze the screen in place.

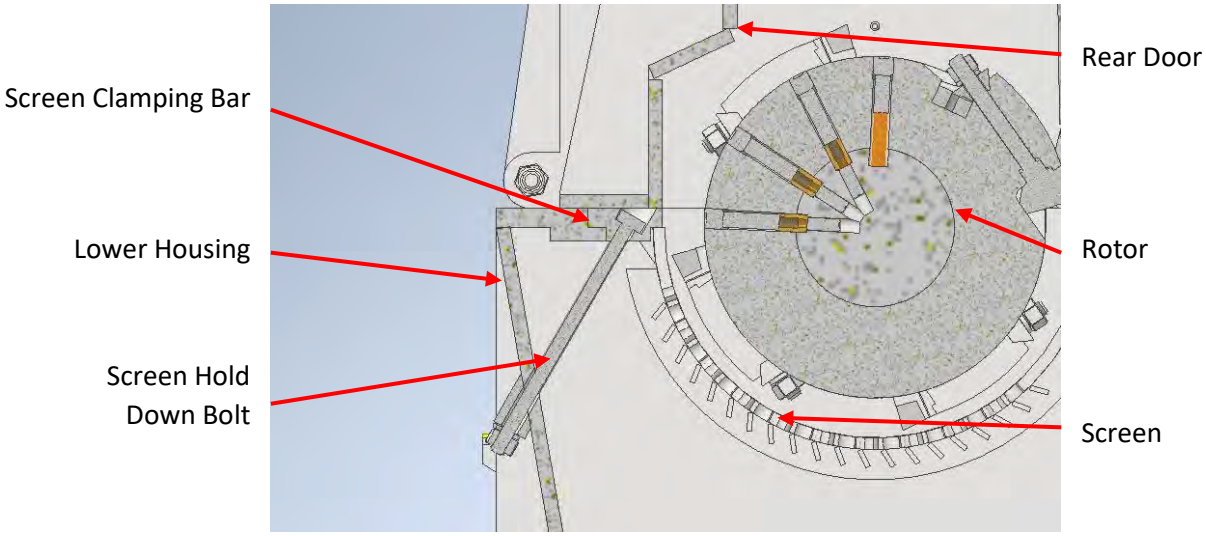


Figure 4.97: Screen Hold Down Bolts

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

To remove the screen, first loosen the screen clamping bar by removing the fasteners on the hold down bolts outside of the hog housing. Depending on when the machine was built, it may have nylock nuts, lock nuts, or a combination of nuts and lock washers.

Figure 4.98: Removing Screen Hold Down Bolt Fasteners

Open the rear door to access the screen clamping bar.

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.

Remove the screen hold down bolts and the screen clamping bar. If they are stuck in place, a mallet may be used to jog the bolts and clamping bar loose.

Figure 4.99: Removing Screen Clamping Bar

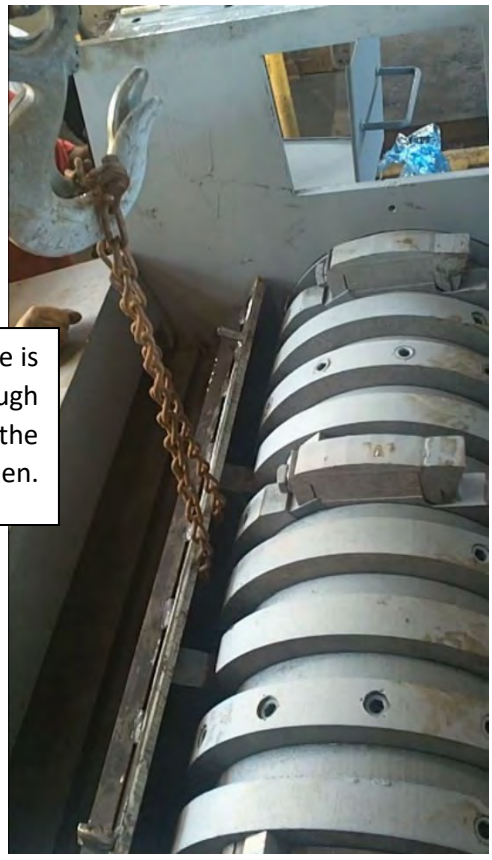
2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

DO NOT PUT FINGERS IN BOLT HOLES OR HOLES IN SCREEN.

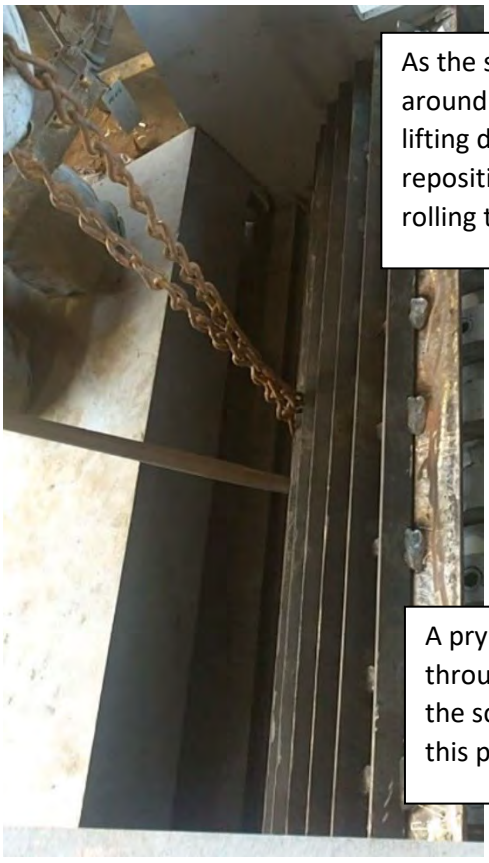
BE SURE THAT ALL PERSONNEL ARE CLEAR OF SCREEN FALLING AREA.

BEFORE LIFTING THE SCREEN, SECURE A LIFTING DEVICE THROUGH THE SCREEN HOLES. THE SCREEN IS TOO HEAVY TO LIFT WITHOUT MECHANICAL ADVANTAGE.

Roll the screen up and forward around the rotor until the back of the screen hits the front of the hog housing. A pry bar inserted through holes in the screen may be helpful for rolling the screen around the rotor.



A lifting device is secured through holes in the screen.



As the screen moves around the rotor, the lifting device can be repositioned to continue rolling the screen.

A prybar inserted through holes in the screen aids in this process.

Figure 4.100: Rolling Screen Around Rotor

Continue to maneuver the screen until the front of the screen clears the rear door.

If removing the screen with the hopper in place, clearances will be extremely tight. The rear door may need to be removed to provide enough room for the screen to be slid out without hitting the hopper.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

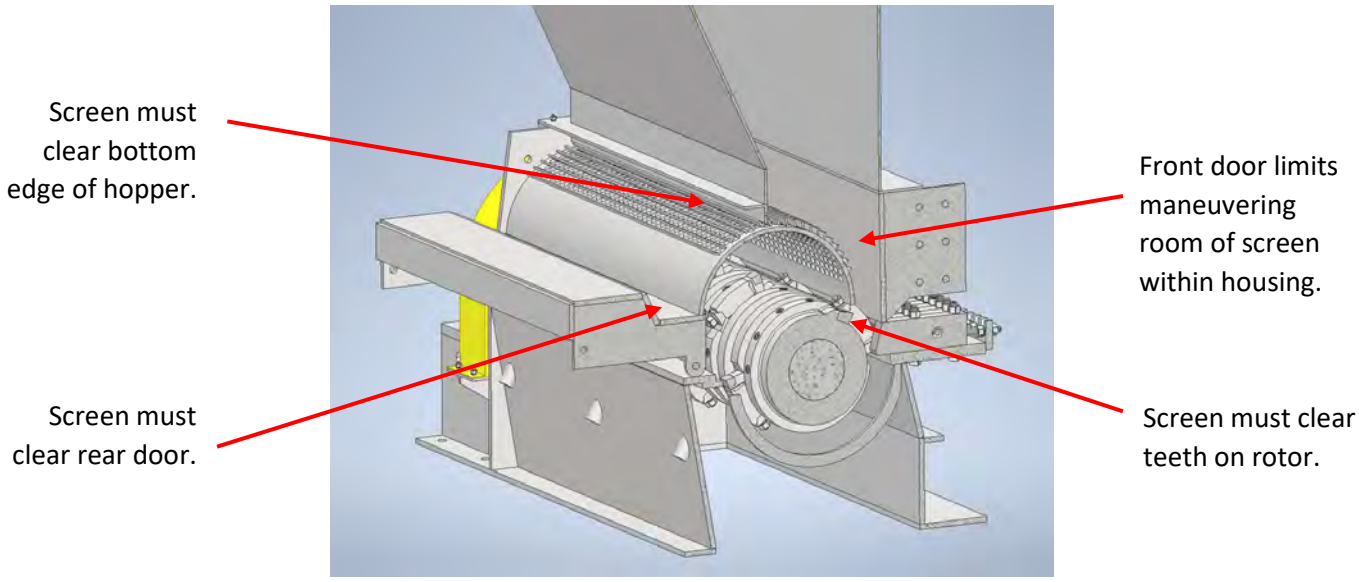


Figure 4.101: Tight Clearances While Removing Screen

Lift the screen up and out of the hog. **Use extreme caution when lowering the screen onto the ground. Ensure all personnel are clear of the screen lowering area.** The screen can easily swing while suspended, injuring surrounding personnel.

Figure 4.102: Lowering Screen onto Ground

To install a new screen, this procedure is reversed. Use a lifting device to position the screen over the rotor.

Figure 4.103: Using Lifting Device to Maneuver Screen

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

It is possible to reinstall the screen backwards. Ensure the screen is in the correct orientation before lowering it into the hog. The leading blank (large section without holes) should be lowered into the hog first.

IT IS POSSIBLE TO INSTALL THE SCREEN BACKWARDS. ENSURE THE SCREEN IS INSTALLED IN THE CORRECT ORIENTATION.

As the screen is lowered down into the hog housing, guide the screen so the front edge wraps around and underneath the back of the rotor.

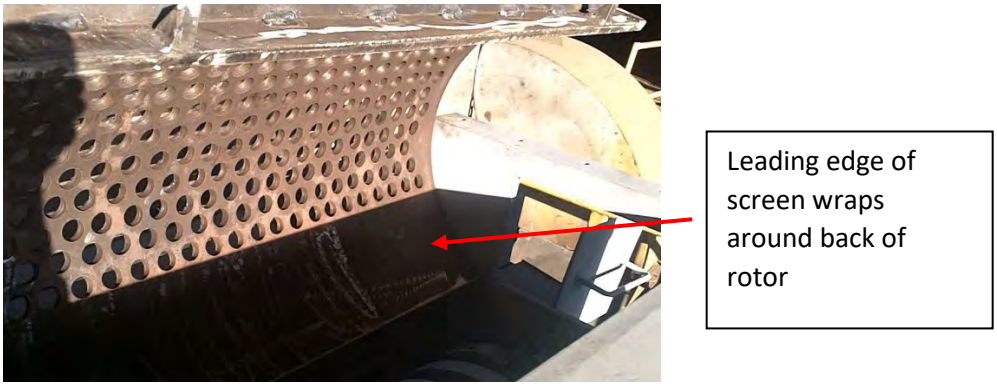


Figure 4.104: Guide Screen so Front Edge Wraps Around Rotor

Continue to roll the screen around the rotor until the leading edge of the screen hits the screen stop. For FS and HD model hogs, this is a piece of barstock welded in the hog housing under the anvil plate. For PM hogs, the bottom of the anvil plate serves as the screen stop.

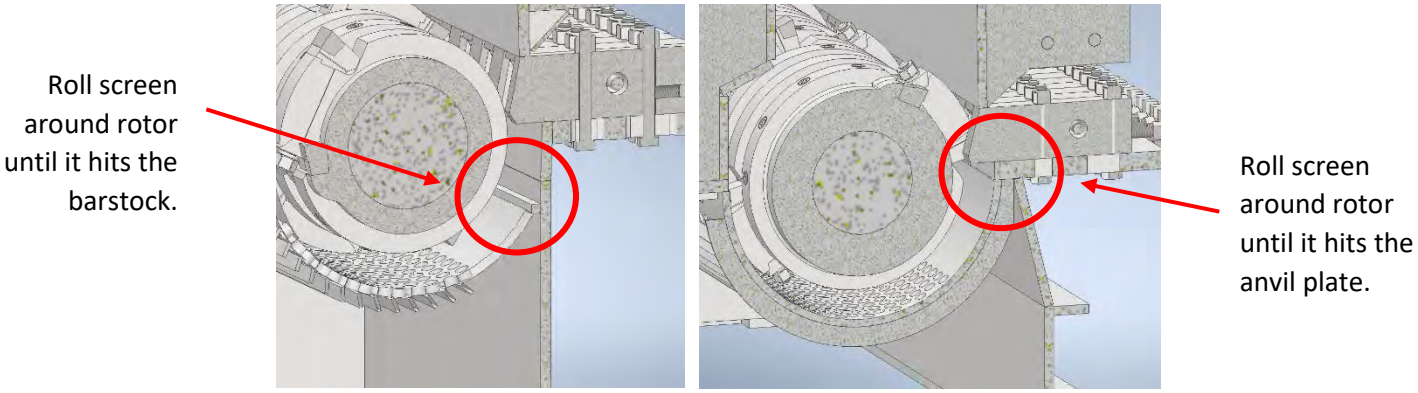


Figure 4.105: Screen Stop - FS/HD (Left) & PM (Right)

Reinstall the screen clamping bar. If the screen clamping bar won't sit flush within the housing, the screen may not be all the way in place. In this situation, a mallet can be used to drive the screen around the rotor.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Figure 4.106: Reinstall Screen Clamping Bar

Figure 4.107: Driving Screen into Position

Insert the screen hold down bolts through the holes on the screen clamping bar. If the bolts won't sit flush against the countersunk holes, you may need to use a mallet to drive them all the way down.

Figure 4.108: Driving Bolts into Countersunk Holes

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Reinstall the fasteners for the screen hold down bolts on the outside of the hog housing. Depending on when the machine was built, these fasteners may be nylock nuts, lock nuts, or a combination of nuts and lock washers.

Figure 4.109: Tightening Fasteners for Screen Hold Down Bolts

BEFORE RESTARTING THE HOG, BE SURE ALL MAINTENANCE EQUIPMENT HAS BEEN REMOVED FROM THE CUTTING CHAMBER. ENSURE THAT ALL HOUSING COMPONENTS ARE IN PLACE AND ALL BOLTS ARE PROPERLY TIGHTENED.

➤ SHAFT LUBRICATION

Lubrication between the rings and the shaft is required to prevent galling the shaft in the event the shear pins are sheared.

For newer model hogs (Serial Number 472 and higher), this lubrication is supplied by a plastic oil cylinder inserted in each ring. If a shear pin has been sheared, it will be necessary to install a new oil cylinder in the affected ring(s) at the time the shear pins are replaced.

Figure 4.110: Oil Cylinders (Various Styles)

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Older model hogs (Serial Numbers under 472) are equipped with a grease passage through the shaft. On these units, a small amount of grease should be pumped into this passage each time the bearings are greased. This ensures that there is a supply of grease at the internal surface of the breaker rings if shear pins are sheared. For lubrication intervals and specifications, see *Maintenance Procedures: Bearing Lubrication*.

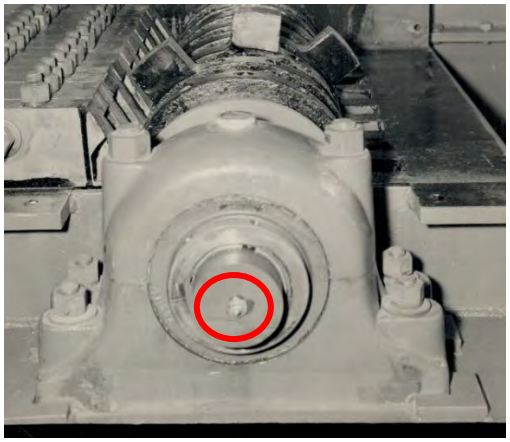


Figure 4.111: Grease Passage (SN < 472)

➤ SHEAR PIN REPLACEMENT

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

USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS.

Check the position of the lugs on the rotor to determine which pins have been sheared. When the shear pins have sheared, the affected rings will either rotate freely on the shaft, or will be rotated out of position. Pay attention to the pattern of teeth locations down the shaft and look for breaks in this pattern.

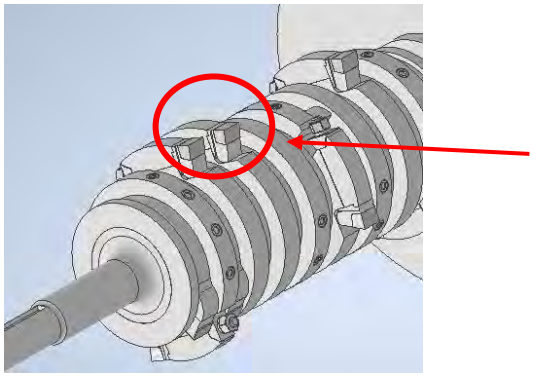


Figure 4.112: Ring Out of Position

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Before removing the old fasteners and shear pins, block up the rotor and breaker ring so they cannot shift.

First, remove all 1-1/8” setscrews from rings in which pins have been sheared. The setscrew threads have been “locked” in place with dimples to prevent them from vibrating loose. In addition, the setscrews are likely worn. It is expected that these will need to be discarded after removal. They will be replaced with fresh setscrews during shear pin reinstallation.

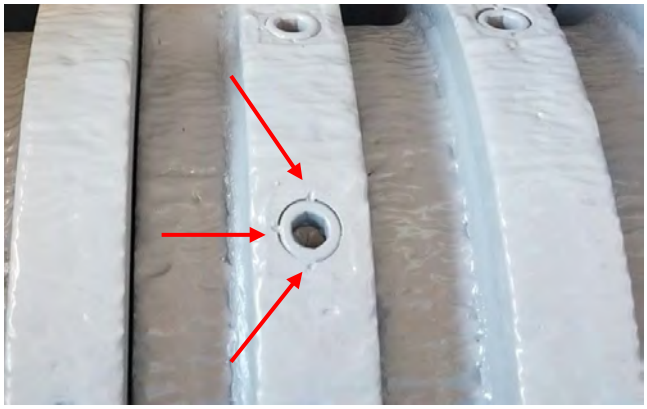


Figure 4.113: Locking Dimples on Setscrews

Once the setscrew has been backed out of its hole, the spacers beneath should pull out with very little resistance. **Use extreme caution to not get fingers stuck in holes while removing the spacers.**

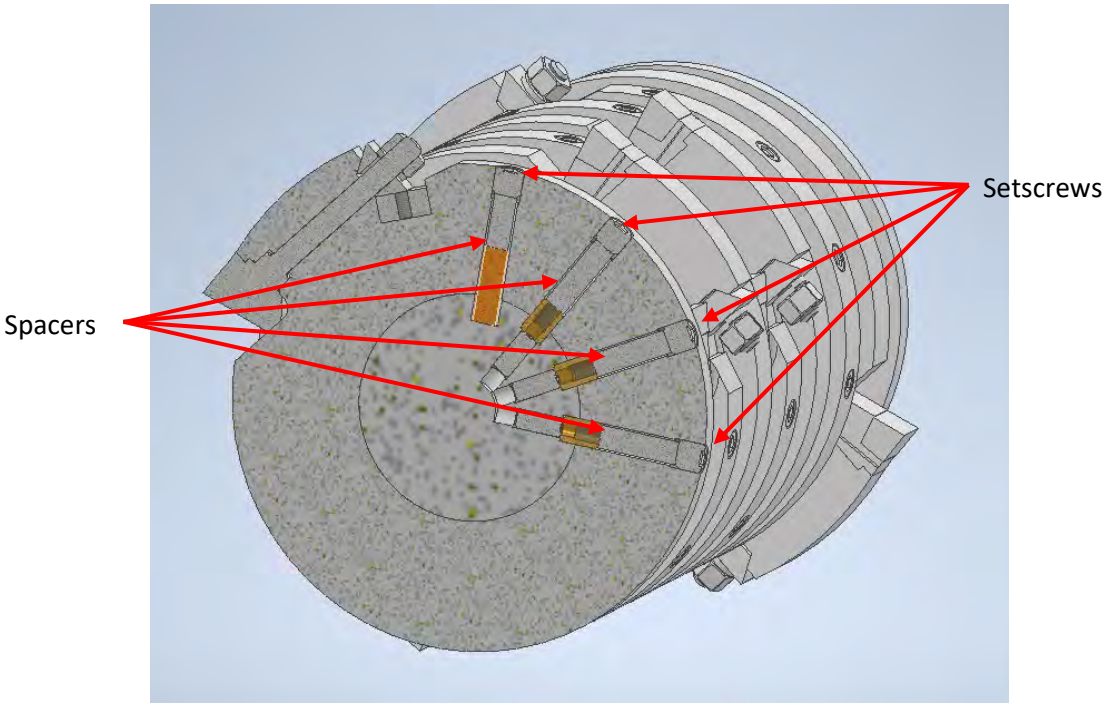


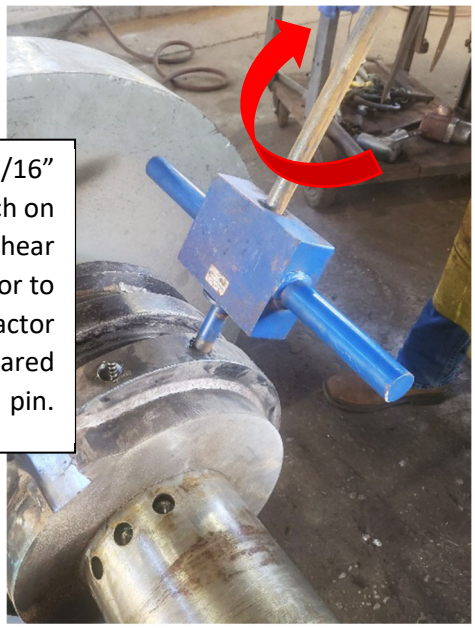
Figure 4.114: Spacers Below Setscrews

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Figure 4.115: Top Half of Sheared Shear Pin

Remove the top halves of sheared shear pins from the ring using a Shear Pin Extractor. Screw the extractor as far into the shear pin as possible using a 1-7/16” socket wrench, then pull the handles up to pull the top half of the shear pin out of the ring.

Use a 1-7/16” socket wrench on the end of the Shear Pin Extractor to screw the extractor into the sheared pin.



Use the handles to pull back on the Shear Pin Extractor, pulling the top half of the sheared pin out of its hole.

Figure 4.116: Shear Pin Extractor Operation

If a Shear Pin Extractor is unavailable, use a 5/8” NC-11 x 6” long cap screw. Run a 5/8” NC nut up on the cap screw until it is next to the head. Place a 5/8” flat washer over the hole and screw the cap screw into the sheared pin in the ring as far down as possible.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

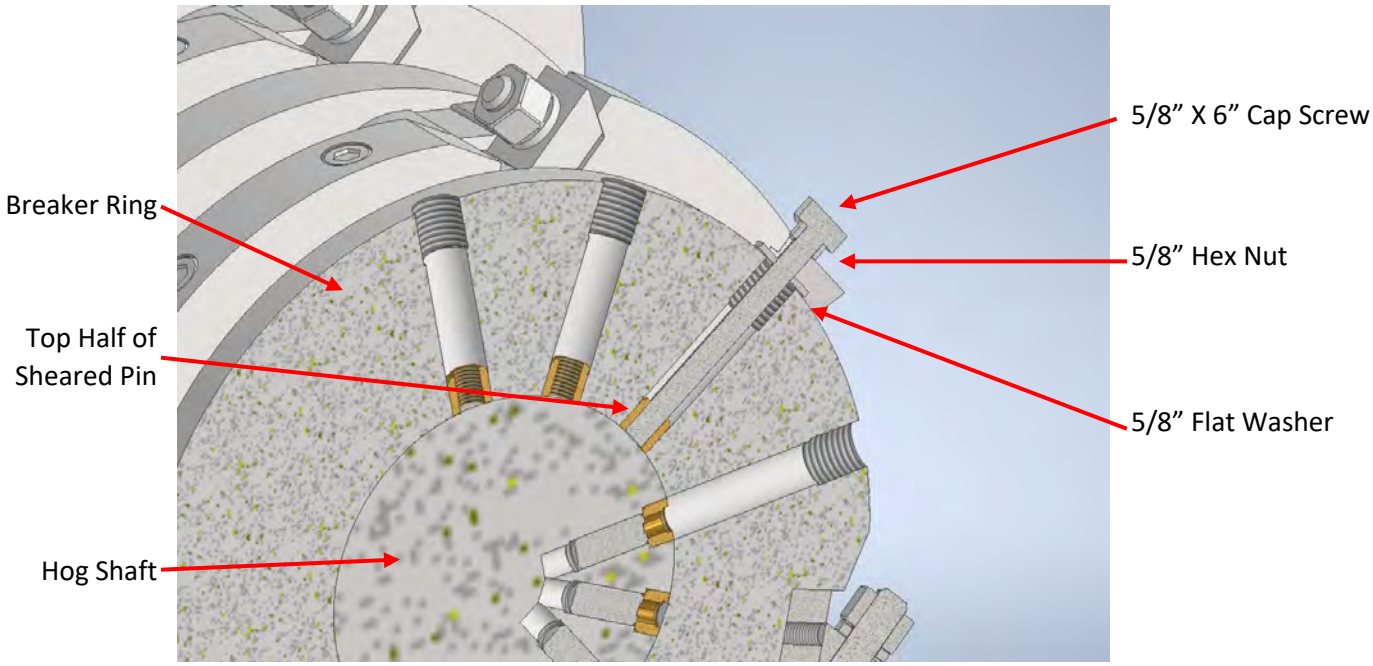


Figure 4.117: Alternative to Shear Pin Extractor

Run down the nut until it touches the flat washer, then continue to tighten the nut. As it is tightened, the sheared pin will be pulled to the top of the hole in the ring. A strong tug on the bolt should extract the top half of the sheared pin from the ring.

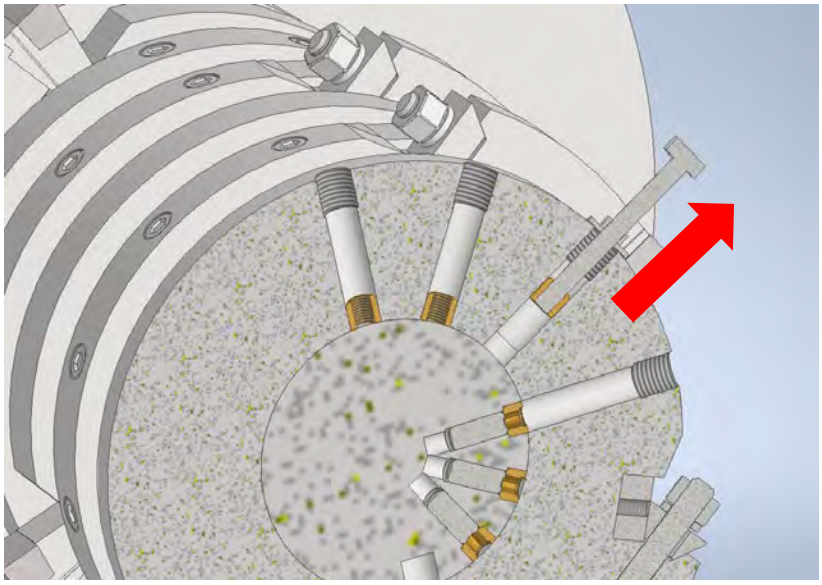


Figure 4.118: Sheared Pin Pulled to Top of Hole

If the pin won’t come out with a tug, you may need to use a hammer on the side of the cap screw to add leverage and pry the pin loose.

Repeat this procedure until the top half of all sheared pins have been removed.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Rotate the breaker ring until the holes on the ring line up to the holes on the hog shaft. A flashlight can be shone through the ring holes as the ring is rotated to help find the hog shaft holes. **Block the rotor and ring up so they cannot move while removing the rest of the shear pins.**

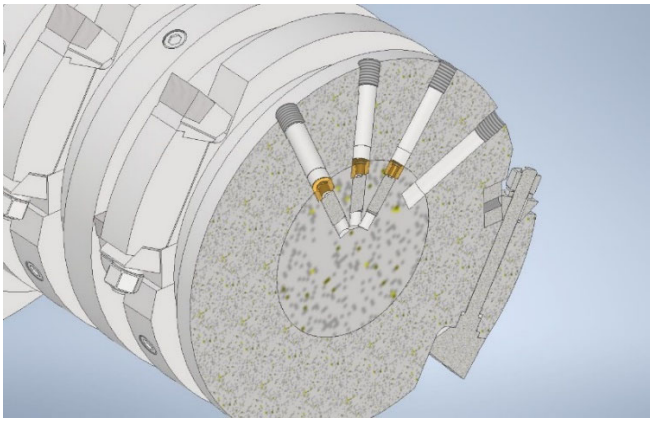


Figure 4.119: Ring Rotated so Holes Align

Remove any refuse from the oil cylinder hole. **Use extreme caution to not get fingers stuck in holes while removing oil cylinder refuse.**

Usually, the force from shearing the shear pin will pinch the hole in the bottom half of the shear pin closed.

Figure 4.120: Pinched Shear Pins

Using a hammer, drive the Shear Pin Punch into the hole in the center of the shear pin. This will help round out the hole enough to allow an Allen wrench to pass through the pin.

Figure 4.121: Shear Pin Punch

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Insert an Allen wrench into the 3/4” x 1-3/4” socket setscrew in the shaft and back this setscrew out. This will force the bottom half of the sheared pin out of the shaft.

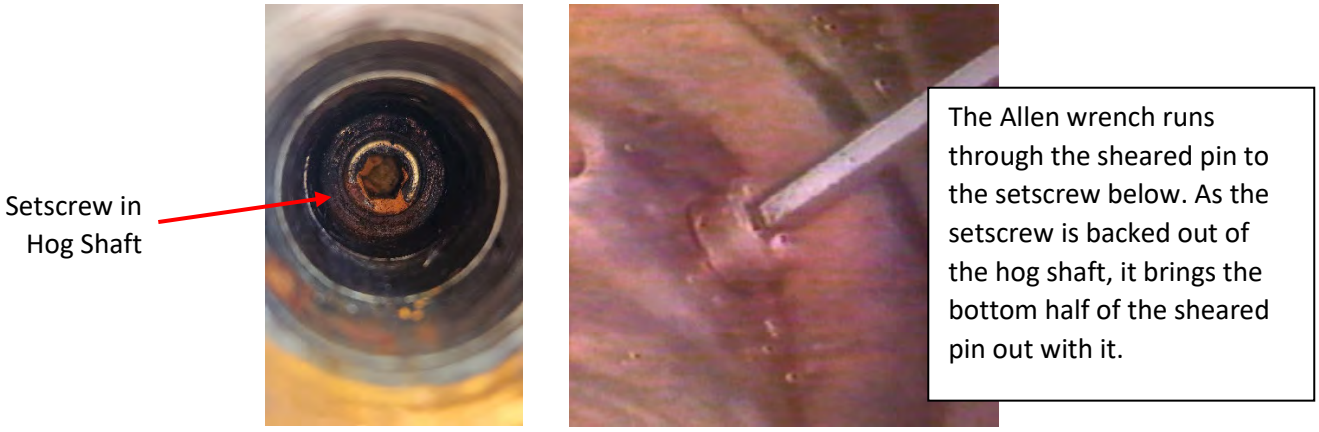


Figure 4.122: Removing Lower Half of Shear Pin

Repeat this procedure for any other sheared pins.

Once all shear pins and debris have been removed, new shear pins can be inserted. **First, be sure that all holes are clear of debris**. This verification can be accomplished with a flashlight.

Run the 3/4” x 1-3/4” socket setscrews back down into the shaft as far as they will go.

Next, drive in new shear pins. **Do not use yellow brass.** Shear pins are made from a stronger material. Yellow brass will cause rings to shear much easier.

Shear pins should be inserted into the three holes furthest from the lug. These have an interference fit, and should be driven into place until they seat on the bottom of the hole. **If a shear pin drops in easily, it is likely in the oil cylinder hole, not in its proper location.**

Figure 4.123: Driving Shear Pin into Position

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

It is possible to install shear pins backwards. Be careful to install them with the threaded half of the shear pin facing outward. The unthreaded half should be in the shaft, and the threaded half should be in the ring. This orientation is important to aid in their removal, should the ring be sheared again.

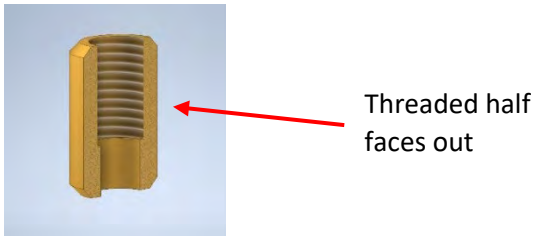


Figure 4.124: Shear Pin Orientation

Next, insert the oil cylinder into the **first** hole after the lug. Drop all spacers into the holes above the shear pins and oil cylinder. The shorter spacer should be inserted above the oil cylinder, and the longer spacers above the shear pins.

Figure 4.125: Inserting Spacers

Once the oil cylinder, all shear pins, and all spacers are in place, new setscrews can be installed. Insert the 1-1/8” set screws into the holes and tighten until they sit just below the surface of the ring. **Take care to not overtighten setscrews, as this can break the oil cylinders.**

Figure 4.126: Fastening Set Screws

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Center punch the edge of the hole in the ring in three places around each setscrew. These will act as "locking" mechanisms that prevent the setscrews from vibrating out.

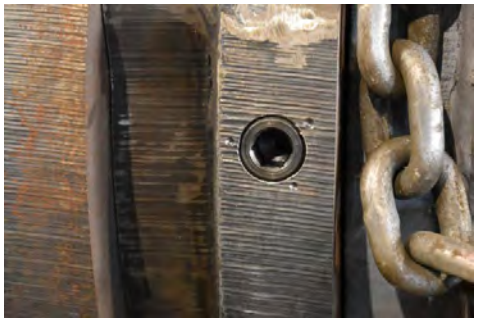


Figure 4.127: Center Punch Setscrews

➤ TEETH – CHANGING

To remove T3 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.

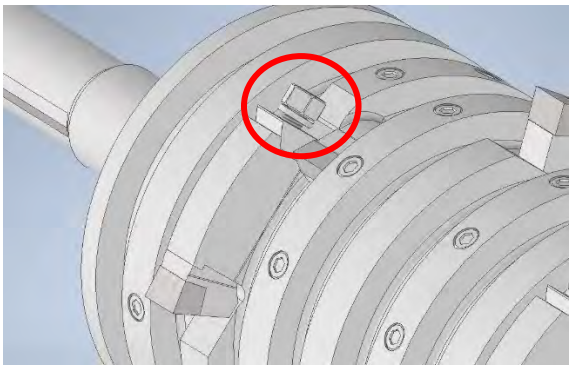


Figure 4.128: Fasteners Protecting End Threads of Tooth Shank

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.

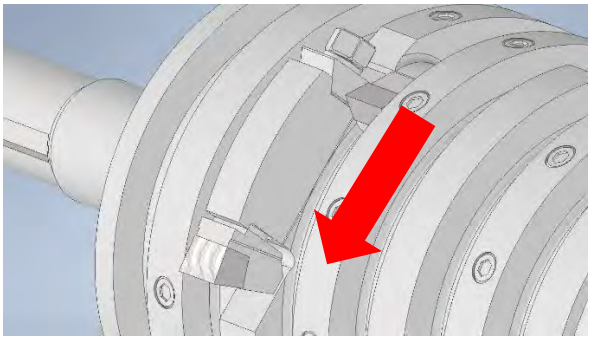


Figure 4.129: Dislodging T3 Tooth

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

To remove 1-1/2” X 4” and 1-1/2” X 6” inner teeth, first remove the wedge. If the wedge is stuck from compacted material, use a mallet to tap on the sides to loosen.

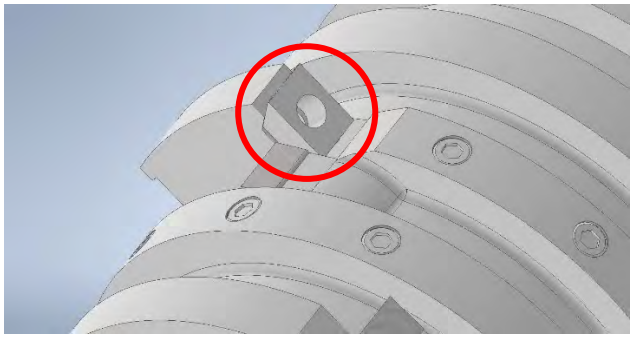


Figure 4.130: Removing Wedge

Screw a 1/2" diameter cap screw into the provided threaded hole to remove the inner tooth. Tap on the sides of the screw to jog the inner tooth loose, then use the screw to pull the tooth out of the seat.

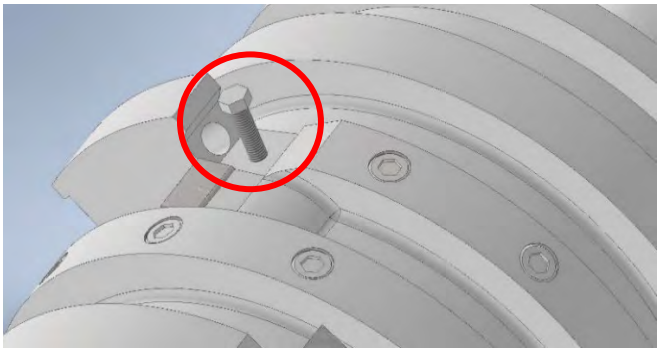


Figure 4.131: Removing Inner Tooth

Before reinstalling T3 teeth or inner teeth, be sure that all surfaces are clean and free of debris. A wire brush should be used to clean all surfaces before new teeth are inserted. This is critical for proper tightening of teeth.

All new and factory repaired T3 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.

When installing T3 2-Part Teeth, use Grade-5 bolts and lock washers.

Figure 4.132: T3 2-Part Tooth

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Make certain all teeth are tight. The recommended torques for T3 teeth are given below.

Table 11: Recommended Torques for T3 Teeth*

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	250 ft-lbs
2-Part Teeth	350 ft-lbs
Manufactured Teeth	350 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 screen, causing damage to the unit and possibly causing severe injury to personnel in the area.

While changing teeth, inspect the anvils for wear and determine if they also need changing. Anvils generally need to be replaced every second or third time teeth are replaced.

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.

USING TEETH NOT MANUFACTURED BY MONTGOMERY INDUSTRIES IN YOUR HOG MAY ENDANGER THE SAFETY OF PERSONNEL AND VOIDS ALL WARRANTIES.

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.

➤ TEETH – CLEARANCE

Every time the teeth or anvils are changed, clearances should be verified to ensure nothing will hit when the hog is put back into operation. Clearances can be checked by accessing the cutting chamber through the front or rear door.

SECURE THE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK. THE FRONT AND REAR DOORS ARE TOO HEAVY TO OPEN OR REMOVE WITHOUT MECHANICAL ADVANTAGE. USE A LIFTING DEVICE.

USE EXTREME CAUTION NOT TO MASH OR CUT OFF FINGERS.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

The clearance between the sides of the teeth and anvils is normally 1/32” to 3/32”.

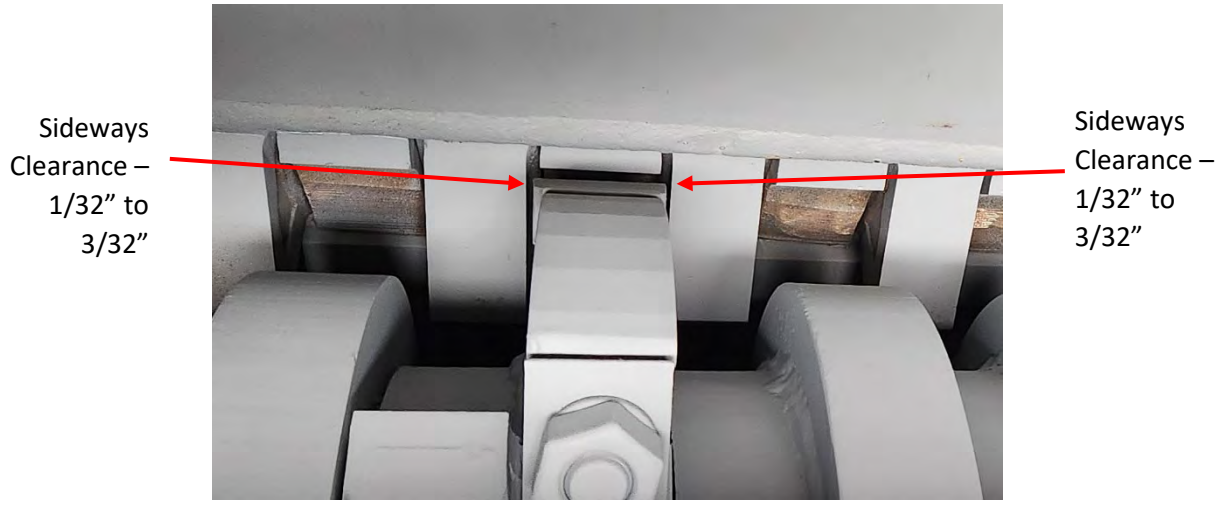


Figure 4.133: Side Clearance (Overlapping Cut Shown)

The radial clearance between the teeth and anvils is normally 1/32” to 1/16”.

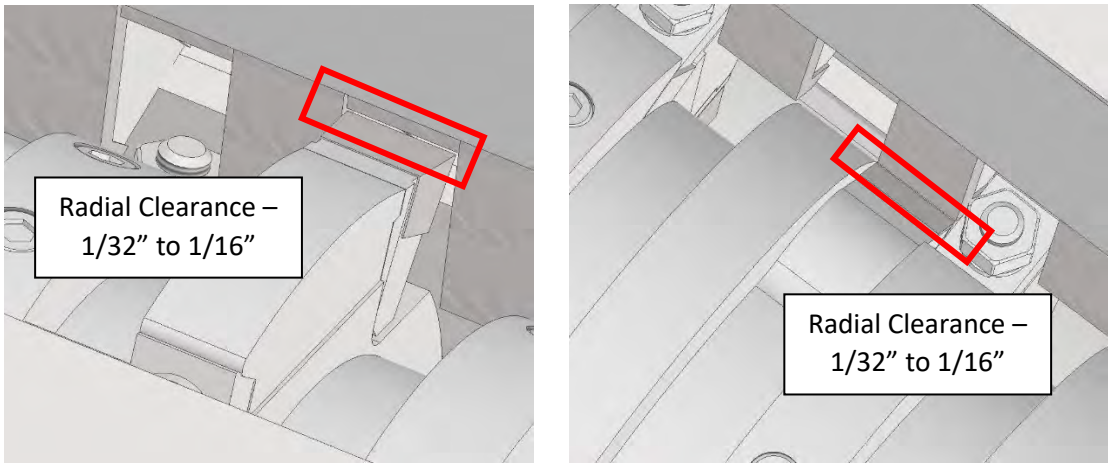


Figure 4.134: Radial Clearance – T3 Teeth/Small Anvils (Left) & Inner Teeth/Large Anvils (Right)

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 anvils 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.

T3 Teeth are available in either Standard Cut or Overlapping Cut models. **Overlapping Cut T3 Teeth must be used in conjunction with Cutaway Anvils**. **If overlapping teeth are used with standard anvils, the teeth will hit and may cause catastrophic damage.** Especially when ordering replacement parts for used/old machines, it is important to verify whether the unit is equipped with standard cut or overlapping cut parts.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

➤ TEETH – TIGHTNESS

Check the tightness of teeth daily.

The recommended torques for T3 teeth are given below.

Table 12: Recommended Torques for T3 Teeth*

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	250 ft-lbs
2-Part Teeth	350 ft-lbs
Manufactured Teeth	350 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.

Normal operation may cause the teeth to loosen over time. 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 their particular installation.

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

TROUBLESHOOTING INFORMATION

➤ BEARINGS ARE OVERHEATING

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

Figure 5.1: 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 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Potential Cause: Bearings are Under-Lubricated

Failure to properly lubricate the bearings at a consistent interval will result in the bearing lubrication being burned off. Without a replenishment of grease, the rollers and inner workings of the bearing will start to rub. This friction causes the unit to heat up. **Operating the hog for an extended period without proper lubrication can result in catastrophic failure.** If the bearings get hot enough, the aluminum bearing housing seals may melt, and the hog shaft may be permanently deformed.

If the bearings get hot enough that they warp the hog shaft, the shaft, bearings, and other affected components will need to be replaced.

Figure 5.2: Overheated Bearing from Extended Use Without Lubrication

Potential Cause: Bearings are Over-Lubricated

Too much grease or oil will cause churning within the bearing, leading to the break-down of the lubricant and the bearing 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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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

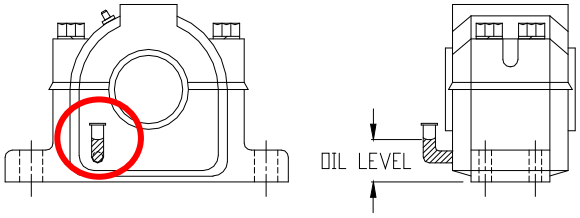


Figure 5.3: Static Oil Bearing Sight Gauge

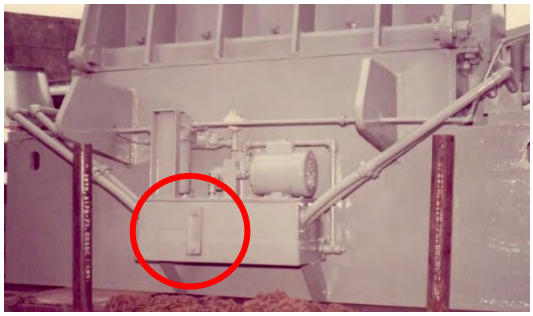


Figure 5.4: Circulating Oil Bearing Sight Gauge

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 after draining excess grease to prevent contaminants from getting into the bearing housing.**

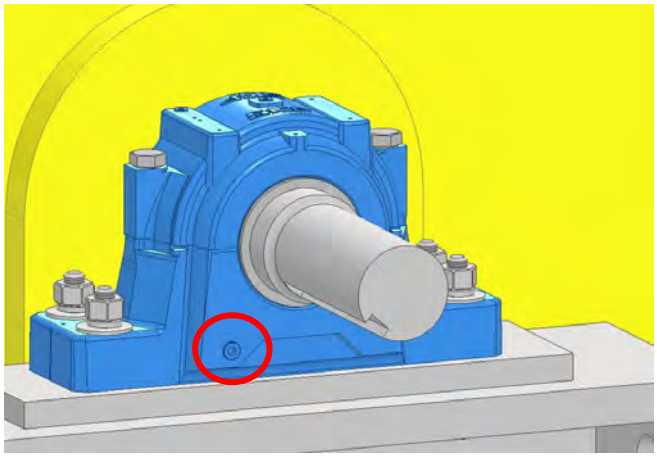


Figure 5.5: Grease Bearing Drain Plug

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

should be followed each time the bearing is lubricated to avoid overheating due to over lubrication.

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.

Used hogs may also have shims underneath the bearings, where previous customers attempted to level the hog following a major wreck. Upon purchasing a used unit, be sure to inspect the bearings for any debris or shims between the bearing housing and 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.

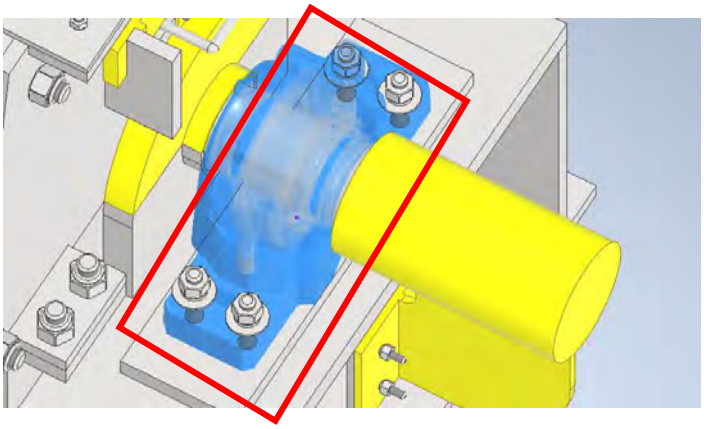


Figure 5.6: Bearing Plate

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.

If dust got between the bearing cap and the bottom housing during maintenance, this could cause an uneven fit. **Any maintenance should be done with the bearing cap in place on the lower bearing housing to prevent exposing the bearings to contaminants.**

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Additionally, used hogs may have shims between the upper and lower bearing housings placed there by previous customers after a major wreck. Upon purchasing a used unit, be sure to inspect the bearing housing for shims that would indicate the bearing housing had previously been compromised.

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

Clean off these surfaces with a wire brush. 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.**

➤ BENT TOOTH SHANKS/TOOTH BREAKAGE

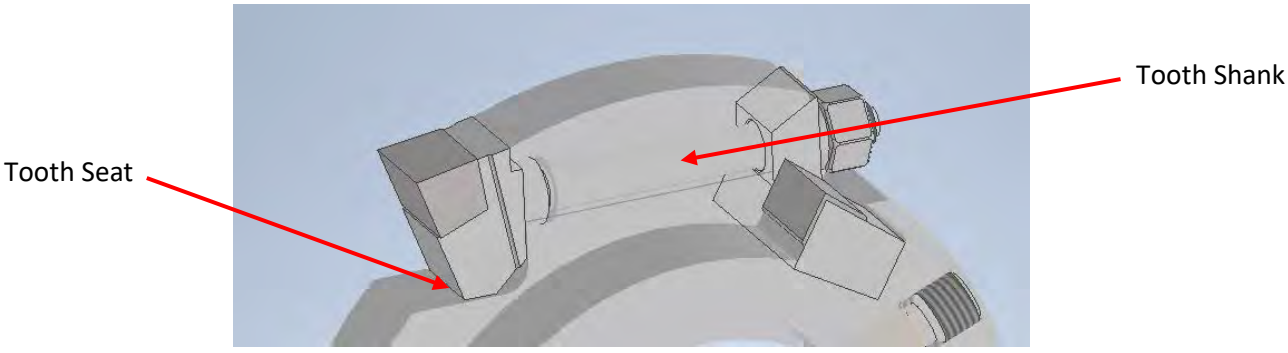


Figure 5.7: Tooth Seat and Shank

Bent shanks on T3 teeth can indicate an improper tooth seat and the need for immediate repair or replacement of the 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.

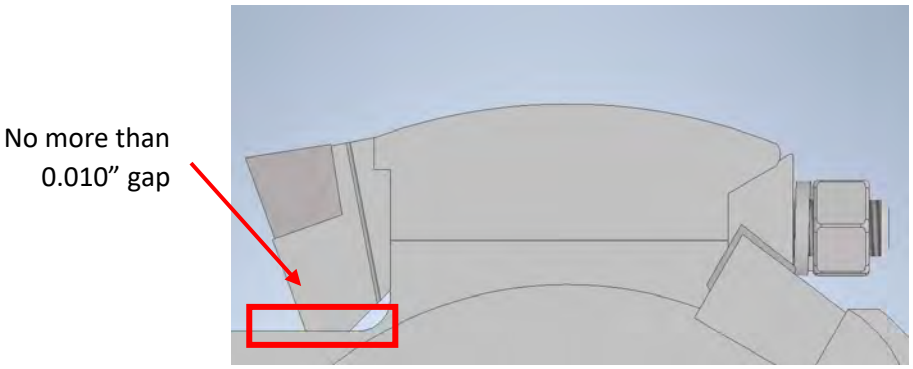


Figure 5.8: Gap on Tooth Seat

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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 ring will need to be replaced.

Hollowed out counterbores are usually a result of torsional forces being applied to the tooth that causes them to twist within the lug. Generally, this is a result of large pieces of tramp metal entering the hog.

Figure 5.9: Egg-shaped Tooth Counterbore

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

Potential Cause: Tramp Steel Damage or Abuse

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

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.

If a tooth head has been broken off, damage is usually sustained to the tooth seat and counterbore before the machine can be stopped. It takes excessive force to break off a tooth head, and the most likely cause in this scenario is tramp metal.

If tramp metal has entered the hog and caused damage to the teeth, it is important to inspect the breaker rings and anvils for damage. The shear pins will also need to be replaced on any damaged/impacted rings.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Figure 5.10: Mangled Tooth After Impact with Large Tramp Metal

Check teeth daily so they can be rebuilt before excessive wear. Excessively worn teeth are more susceptible to damage because the layer of hardsurfacing protection is no longer intact.

Potential Cause: Gap between the T3 Tooth and Breaker Ring

A gap between the bottom of the T3 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.

Figure 5.11: Gaps from Abrasion Wear

These gaps can be caused over time from abrasive material (such as sand, rocks, etc.) entering the cutting chamber and wearing down the parts. 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 lug has been compromised and the ring must be replaced.**

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

WE STRONGLY ADVISE THAT YOU DO NOT WELD THE RING WHILE THE ROTOR IS STILL IN THE HOG. However, if it is absolutely necessary, be sure that you ground the welding lead to the ring.

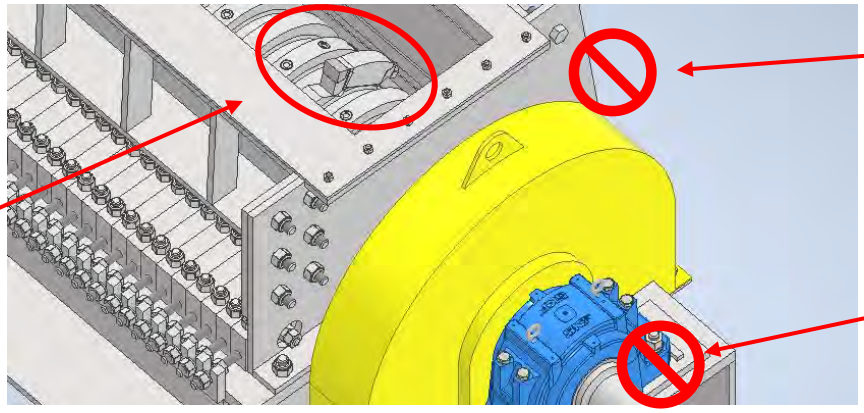


Figure 5.12: Location for Welding Ground

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: Gap between the Inner Tooth and Breaker Ring

Severe abrasion over a long period of time can wear down the diameter of the ring until the outside of the ring is even with or below the bottom of the inner tooth.

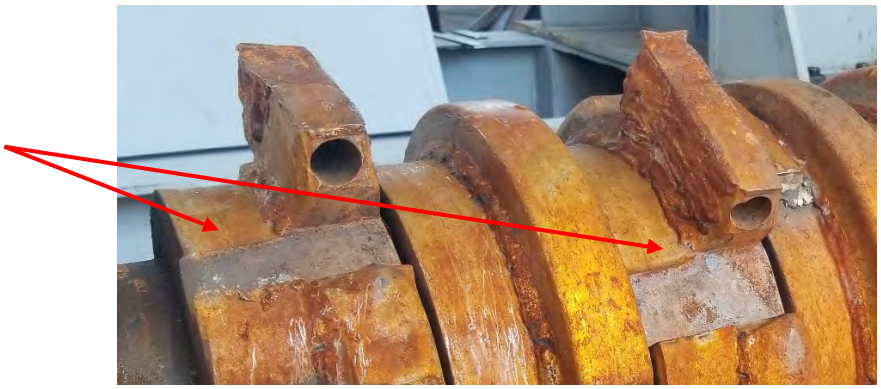


Figure 5.13: Rings Worn Down Below Inner Tooth Seats

This wear allows material to pack under the small tooth, which can force the small tooth up until it eventually strikes the anvil. Such a strike will break the tooth.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Potential Cause: Over-Tightening of the Hex Nut

Over-tightening of the hex nut on the T3 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.

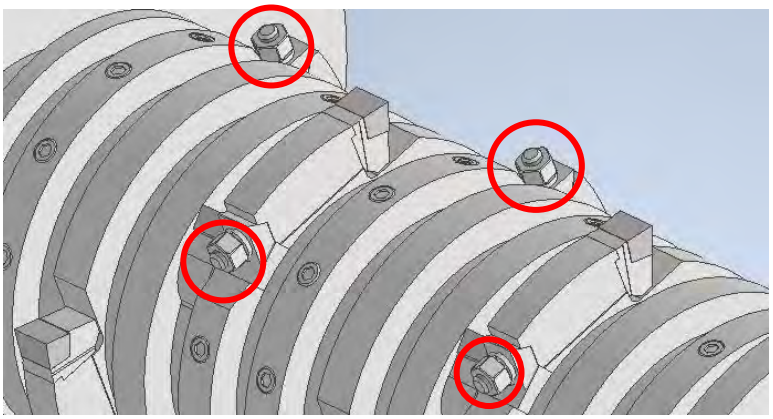


Figure 5.14: Hex Nuts on T3 Teeth

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 T3 Teeth*

Type of Teeth	Recommended Torque
Forged Teeth (Discontinued in 2011)	250 ft-lbs
2-Part Teeth	350 ft-lbs
Manufactured Teeth	350 ft-lbs

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

➤ EXCESSIVE BLO-HOG FAN WEAR

The integral fan on a Blo-Hog should not need to be replaced frequently. Excessive wear on the fan blades or fan housing is generally indicative of other problems. It is important to figure out the root cause of Blo-Hog fan wear, so the larger problem can be addressed.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Potential Cause: Processing Abrasive Material

In applications where infeed material includes sand or other debris, hogs will wear prematurely. Sand or dirt can act as sandpaper, smoothing rings down and dulling the teeth and anvils. Small rocks that pass through the hog may act as projectiles, dinging up the sides of the hog and fan housing.

Rotor is polished smooth and hog housing is dinged up, indicating sand and rocks have been processed through the hog.

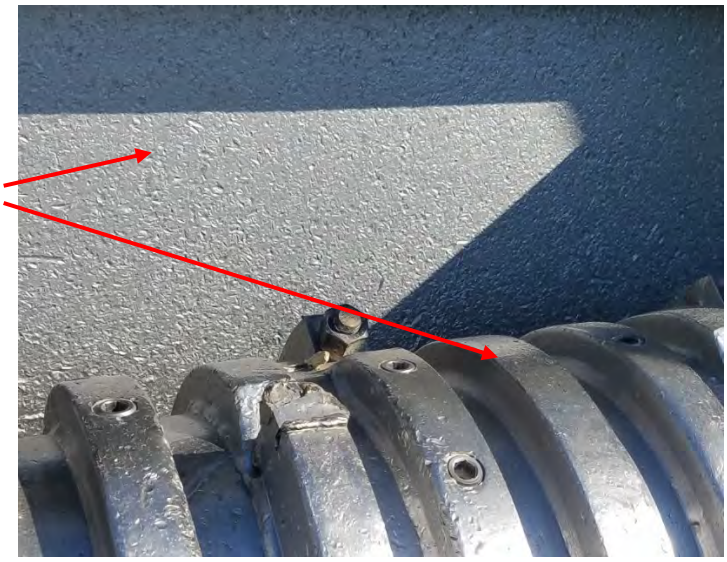


Figure 5.15: Wear on Hog Running Abrasive Material

Even if these contaminants are not enough to shear pins, they can still cause premature wearing of components. It is advised in this situation that the customer installs an external screener to limit the amount of contamination that can enter the hog. Additionally, fanwheels can be hardsurfaced at the factory in anticipation of accelerated wear.

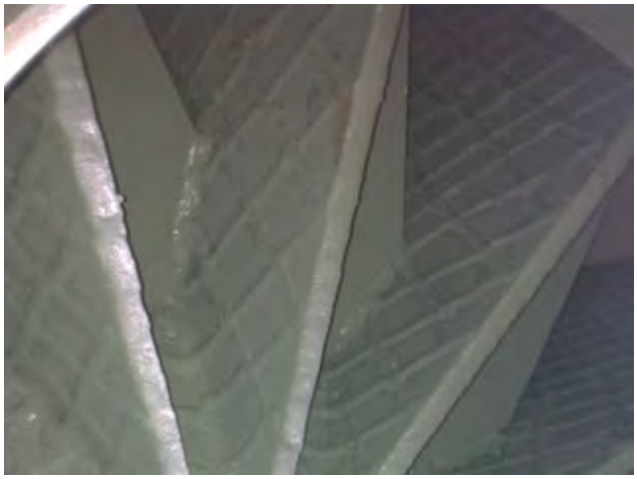


Figure 5.16: Severe Duty Blo-Hog Fanwheel (Hardsurfaced Blades)

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Potential Cause: Inadequate Fan Capacity

Blo-Hog sizing is dependent on a number of factors. The quality of infeed material, desired processing power, and screen size contribute to the sizing of the hog. The hog capacity and existing blowpipe system then determine the size of the integral fan.

Increasing the screen hole size also increases the hog capacity, allowing for faster grinding of the same amount of material. However, the integral fan may not be sized to keep up with the increased hog capacity. This generally results in material gathering at the bottom of the cutting chamber, and more frequent plugging of the screen.

To combat this capacity imbalance, customers may increase the speed of the hog/fan to try and increase fan capacity. While this may provide some relief, the faster speed creates more resistance in the system and can accelerate the wear on the fan.

Potential Cause: Aging Machine

When purchasing a Mongomery hog used, the unit may have already been in service for many years. As such, components may need to be repaired or replaced. Customers can elect to send used machines to Montgomery Industries to be rebuilt, generally at a fraction of the cost of purchasing the hog new.

If reconditioning is not practical or if wear is contained to the fan unit, repairs can be made to extend the life of the fan housing. Holes in the fan scroll can be patched with flatbar or thin plate. The plate is rolled to match the curvature of the fan scroll, then welded to the fan housing.

Figure 5.17: Patches to Worn Fan Scroll

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

However, in some cases the fan housing may be so worn that patching it is ineffective. This is especially the case where the fan scroll is so worn that there is nothing solid to weld repairs to.

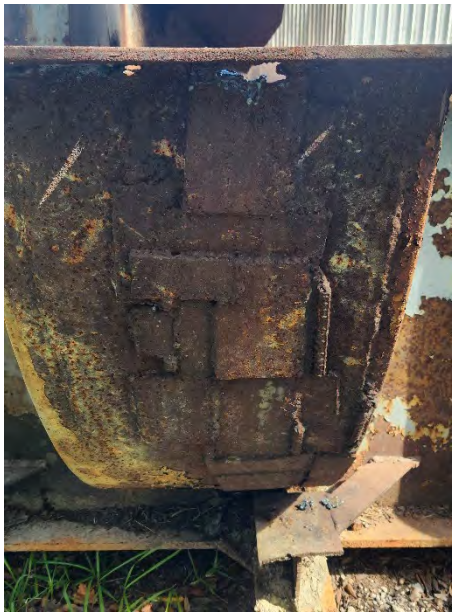


Figure 5.18: Fan Scroll Worn Beyond Repair

In this case, the only option is to replace the fan housing entirely. Montgomery Industries offers replacement upper fan housings and lower hog housings. This allows the customer to mitigate the cost of repairs by only replacing what has been worn.

➤ EXCESSIVE PIN SHEARING

The shear pins in a Montgomery Hog have been engineered to break upon entry of tramp metal into the cutting chamber. If pins begin to shear from regular operation (wood only – no tramp metal), it is considered excessive pin shearing.

Potential Cause: Worn Rings

Shear pins may shear easily if the shear pin holes in the rings have become wallowed out. This generally occurs from damage to the holes during maintenance following pins shearing. In standard applications, this should not be an issue. However, if tramp metal frequently enters the hog and pins are frequently sheared, there is an increased potential for wallowing of shear pin holes.

Additionally, shear pin holes may become wallowed out due to untreated sheared pins. If the hog is allowed to operate with the pins in a sheared condition for an extended period of time, the shear pin debris may start to wear the inside surfaces of the breaker rings. This can cause

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

a looser fit of rings, leading to wallowing of shear pin holes and more frequent shearing of pins.

If rings begin to show signs of wear, it is best to send them to Montgomery Industries to be rebuilt to factory standards. By performing preemptive maintenance, the user can salvage rings before they become excessively worn. If rings become excessively worn, the only option is to replace them with new rings—which is a much more costly option.

Potential Cause: Processing Difficult Material

In some cases, hardwoods such as White Pine, Sugar Maple (commonly referred to as "Rock Maple"), or Hickory may be so hard that pins can shear from normal operation. Slow growth causes these species of wood to have tighter rings, which results in a denser product and a more difficult grind. To help mitigate unnecessary shearing in this situation, the customer can elect to have their rings stitch-welded in pairs. This makes it necessary to shear six pins to spin a ring instead of three.

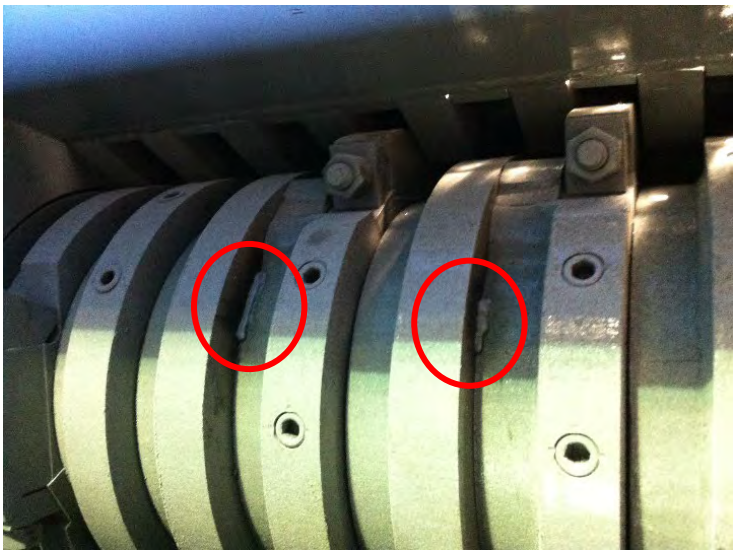


Figure 5.19: Rings Stitch-Welded in Pairs

If the unit was purchased used, the customer may choose to stitch-weld the rings themselves in the field. See Appendix H: *Bulletin 57-03-16 Stitch-Welding Rings in Pairs* for more information.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

EXCESSIVE RING WEAR

Potential Cause: Rings Have Gone Too Long Between Rebuilds

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 Montgomery Industries 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.

Figure 5.20: Excessively Worn Ring

For applications that are particularly abrasive, the outer surfaces of rings can be hardsurfaced to extend their wear life.

Potential Cause: Sheared Pins Have Not Been Reset

The inside surfaces of rings may begin to show signs of wear if pins are sheared frequently, or if the hog is allowed to operate with the pins in a sheared condition. Small amounts of wear on the inside of the rings are usually not detrimental, although it may cause the shear pins to shear prematurely. If sheared pins are left untreated indefinitely, the rings may begin to wallow out on the inside and show signs of excessive wear. In this case, the rings must be replaced.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

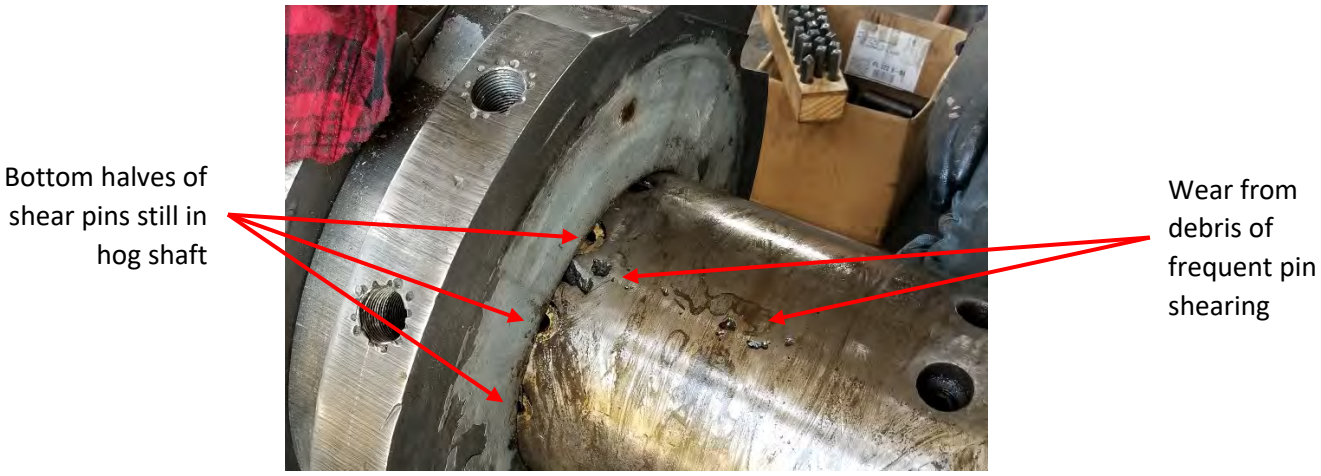


Figure 5.21: Wear to Shaft & Rings from Frequently Sheared Pins

➤ EXCESSIVE VIBRATION

Potential Cause: Mass Imbalance

1. Rings Are Worn: 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. If the rings are excessively worn past the point of being salvageable, they must be replaced.

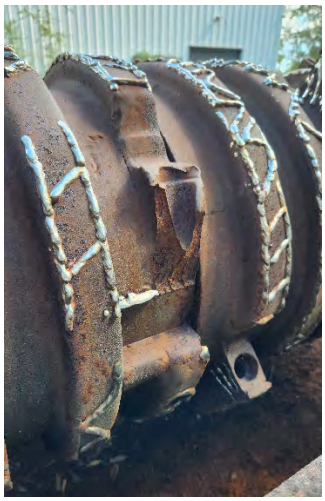


Figure 5.22: Mass Imbalance from Worn & Altered Rings

2. A Pin Has Sheared: Normally, a sheared pin will be accompanied by rotation of the ring out of position. This will result in excessive vibration, which will alert operators that the hog needs to be shut down and the shear pins replaced.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Operators should familiarize themselves with the pattern of breaker ring spacings on the hog. This will allow them to detect, at a glance, any changes in the spacing which would indicate sheared pins.

3. Balance Weights Have Been Altered: If a hog starts to have excess vibration following maintenance, and no other cause may be found, it may be due to balance weights being removed or altered. Ensure maintenance crews are informed of the importance of balance weights and do not cut off the balance weights unintentionally.

Figure 5.23: Balance Weights

Balance weights are welded to the end flanges of the rotor to offset mass imbalance. Cutting them off reverses the dynamic balancing performed by Montgomery Industries before the rotor left the factory. If they have been removed, the rotor will need to be rebalanced, either by a qualified professional in the field or by shipping the rotor to Montgomery Industries.

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

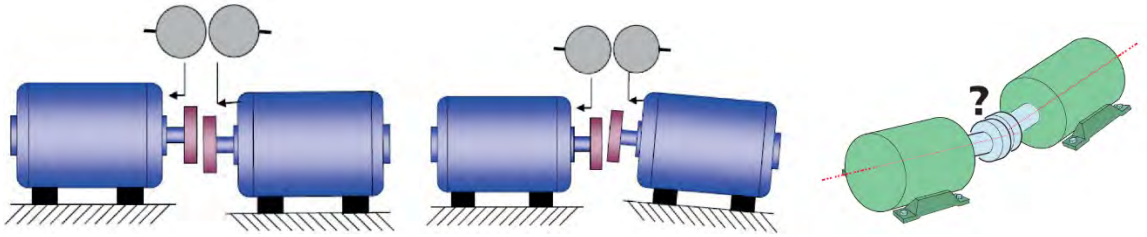


Figure 5.24: Examples of Misalignment

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.*

➤ 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 5.25: Worn Screen

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

Figure 5.26: Screen Plugging from Incompatible Material

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

APPENDIX

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

Appendix B: Montgomery Industries Fan Performance Curves

Appendix C: Bulletin 23-78-14 – Hardsurface Wear Zones on T3 Teeth

Appendix D: SKF Bearing Lubrication Guide

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

Appendix F: Bulletin 57-08-22 – Replacing Rings on FS, HD, & PM Hogs

Appendix G: Montgomery Industries Recommended Torque Values

Appendix H: Bulletin 57-03-16 – Stitch-Welding Rings in Pairs

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671
www.montgomeryindustries.com

Reinforced Concrete Calculations

Supporting Documentation

Bulletin 25-01-22

2017 Thelma Street | P.O. Box 3687
Jacksonville, Florida 32206 U.S.A.
Phone: (904) 355-5671
Fax: (904) 355-0401
www.montgomeryindustries.com

[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.

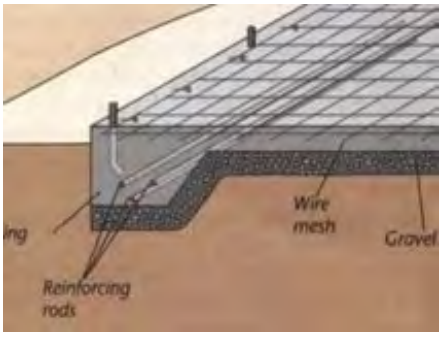


Figure 1: Slab-On-Grade Foundation[1]

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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.

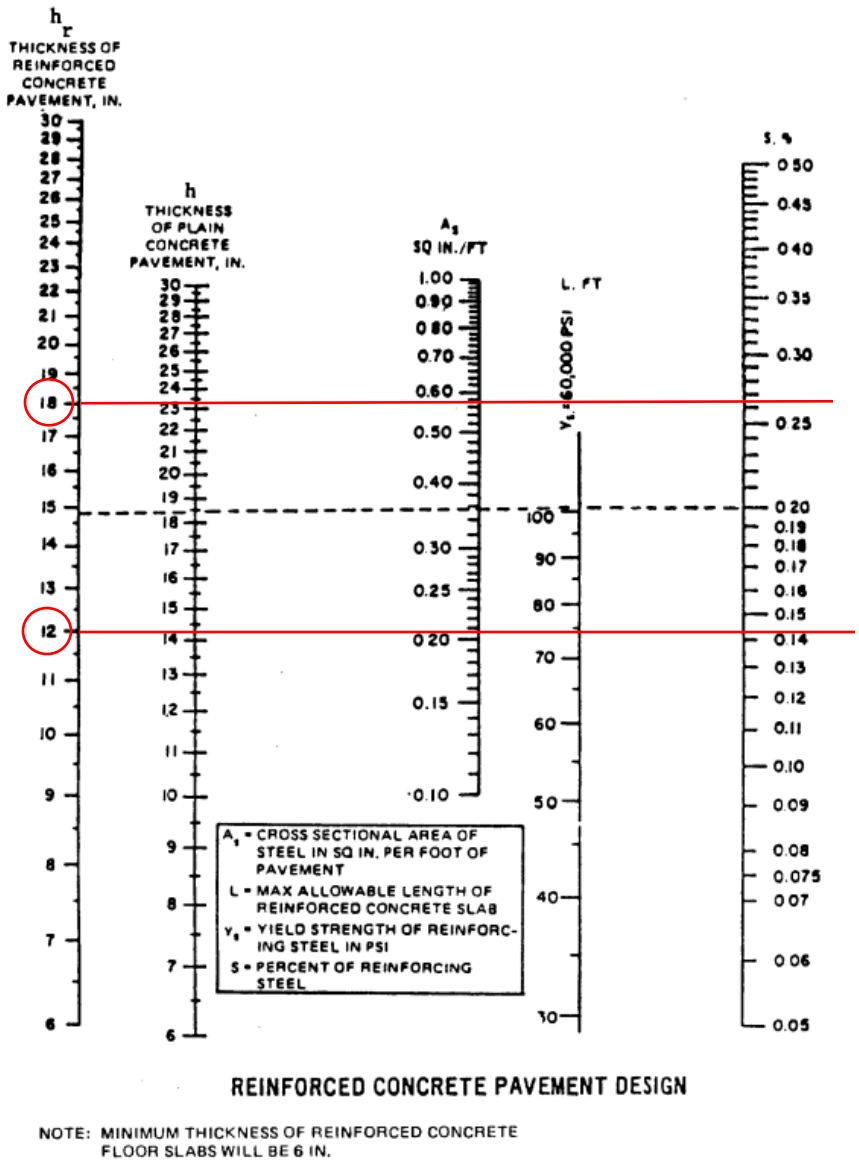


Figure 2: Reinforced Concrete Design Chart[2]

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

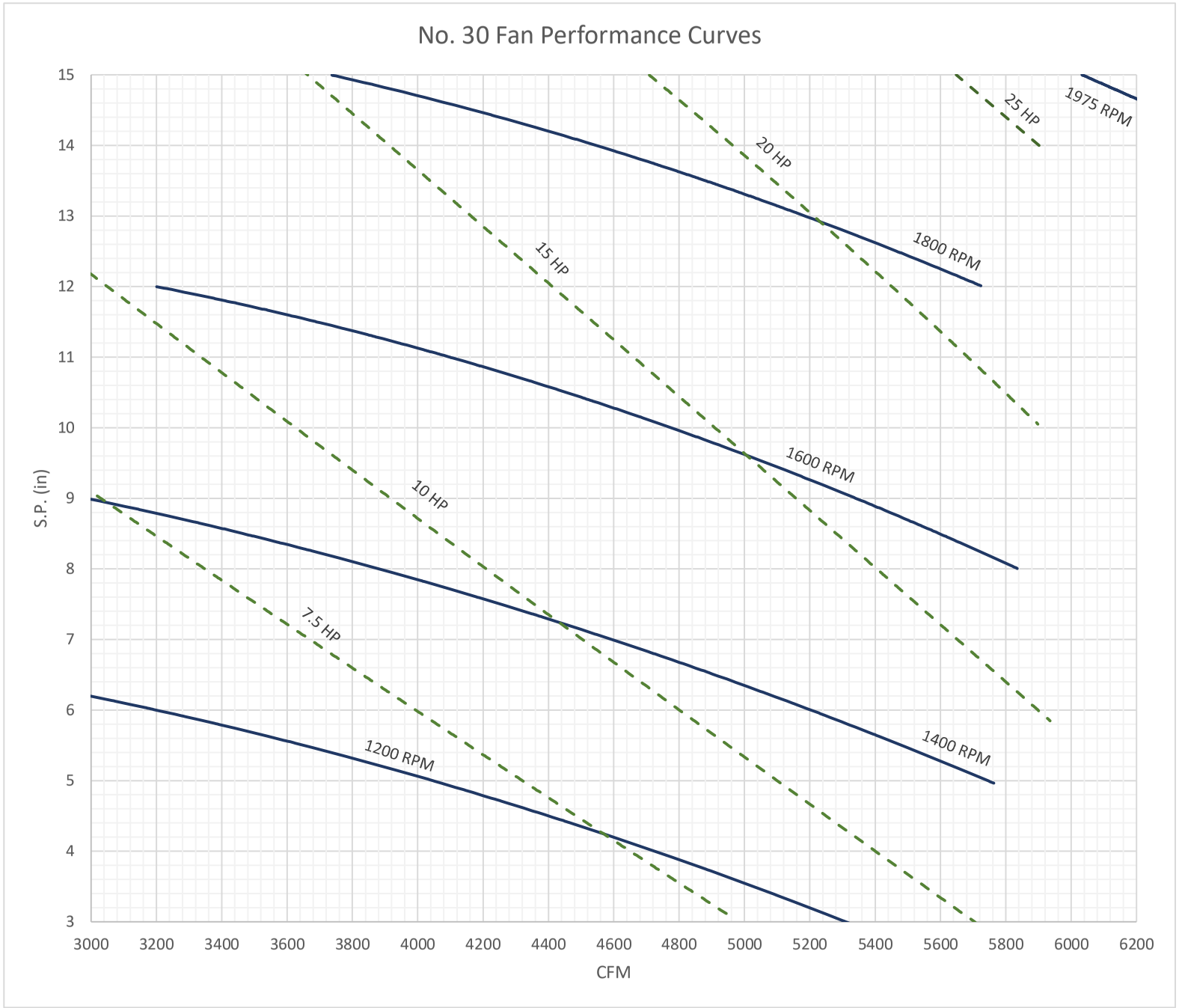
reinforcement.[5] The combination of a structural rebar layer and a crack-preventing steel mesh layer ensures the slab can withstand the dynamic loading of the hog.

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

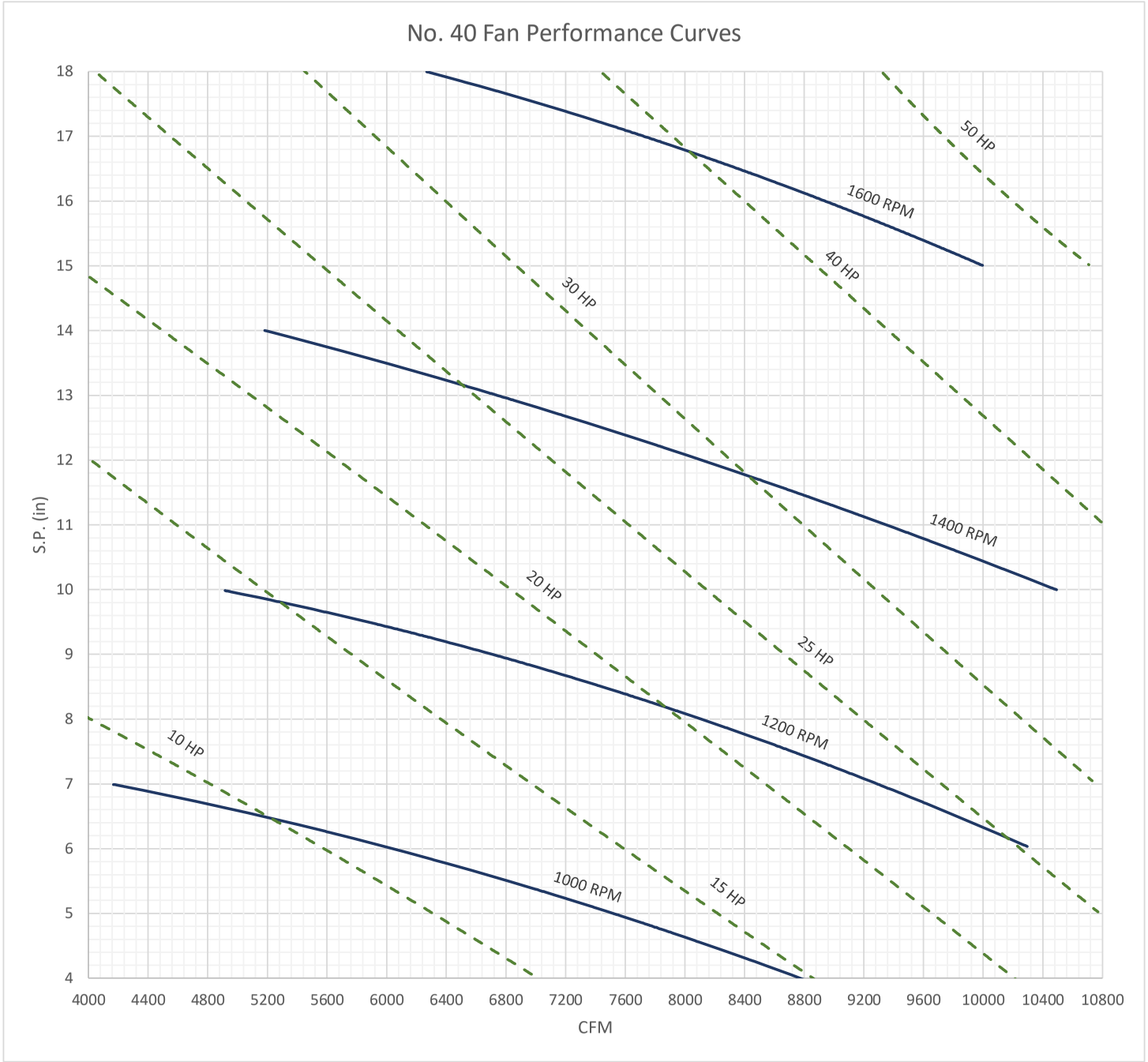
2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com


No. 30 Fan Performance Curves
S.P. (in)
CFM
15
14
13
12
11
10
9
8
7
6
5
4
3
3000
3200
3400
3600
3800
4000
4200
4400
4600
4800
5000
5200
5400
5600
5800
6000
6200
1975 RPM
1800 RPM
1600 RPM
1400 RPM
1200 RPM
25 HP
20 HP
15 HP
10 HP
7.5 HP

No. 30 Material Handling Fan

Wheel Diameter 29" | No. of Blades: 12 | Wheel Circumference 7.594' | Max RPM: 1975 | *outlet velocity based on 13" diameter pipe

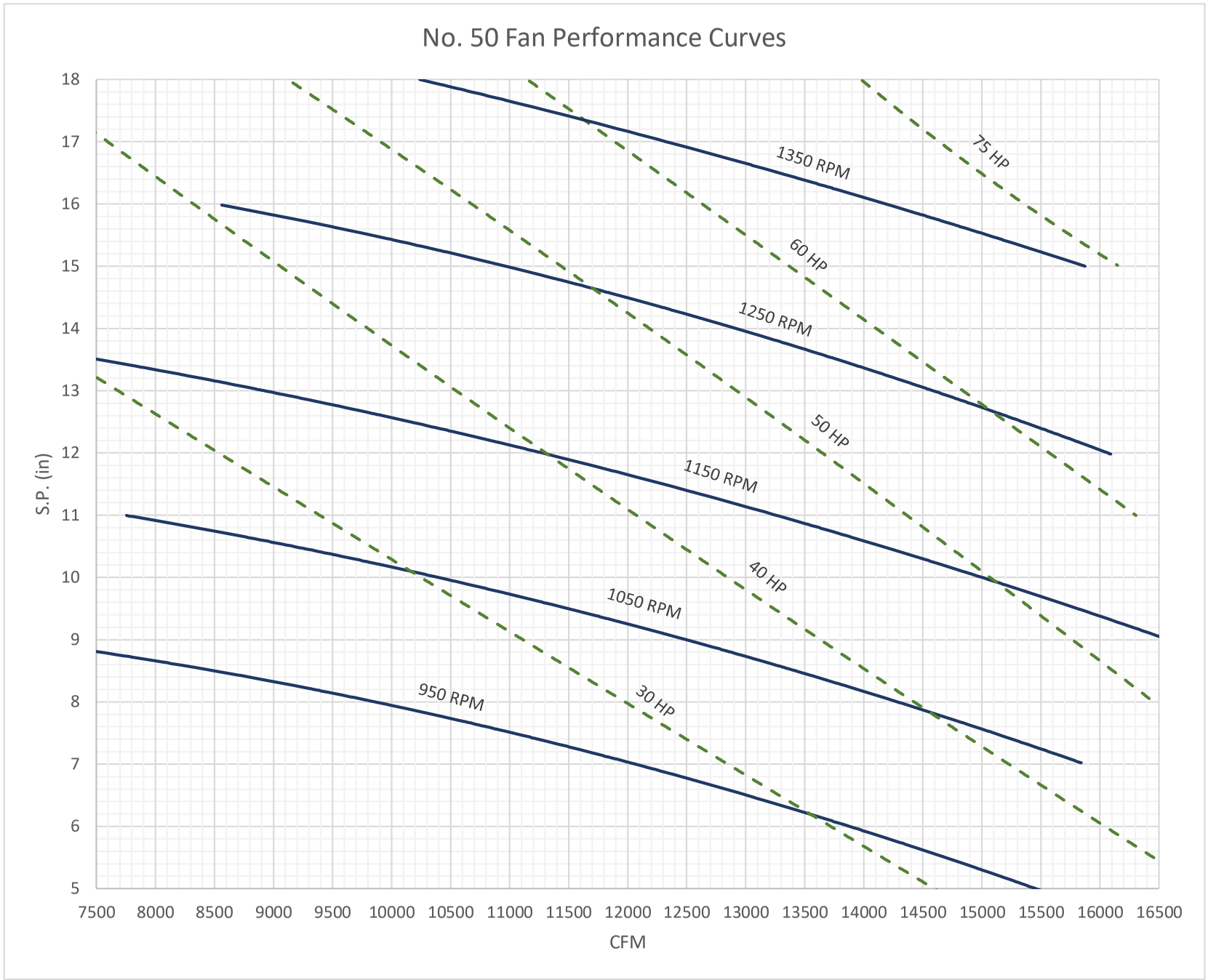
CFM	OUT VEL	3" S.P.		4" S.P.		5" S.P.		6" S.P.		7" S.P.		8" S.P.		9" S.P.		10" S.P.		11" S.P.		12" S.P.		13" S.P.		14" S.P.		15" S.P.	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1844	2000	817	1.62	921	2.16	1022	2.75	1112	3.30	1198	4.13	1276	4.76	1344	5.39	1412	5.92	1480	6.45	1550	7.57	1610	8.16	1670	8.75	1730	9.33
2028	2200	829	1.76	934	2.26	1038	3.07	1121	3.52	1205	4.34	1282	4.97	1350	5.60	1418	6.22	1486	6.75	1555	7.87	1615	8.51	1675	9.15	1735	9.80
2212	2400	844	1.94	946	2.44	1045	3.23	1129	3.72	1211	4.52	1288	5.19	1360	5.76	1432	6.33	1495	6.90	1559	8.08	1619	8.75	1679	9.42	1738	10.08
2397	2600	856	2.08	961	2.67	1058	3.47	1141	4.03	1220	4.81	1297	5.49	1369	6.39	1436	6.87	1503	7.35	1565	8.44	1625	9.15	1685	9.87	1744	10.75
2581	2800	875	2.31	974	2.89	1069	3.71	1155	4.40	1234	5.20	1310	5.94	1378	6.69	1444	7.24	1511	7.79	1570	8.74	1631	9.20	1689	10.18	1749	11.31
2765	3000	894	2.59	988	3.17	1083	3.98	1169	4.74	1246	5.56	1321	6.31	1388	7.02	1455	7.77	1519	8.23	1578	9.21	1636	9.53	1697	10.75	1757	12.17
2950	3200	913	2.86	1007	3.53	1097	4.27	1182	5.09	1257	5.88	1333	6.74	1399	7.41	1465	8.21	1527	8.72	1589	9.79	1648	10.45	1705	11.30	1764	12.73
3134	3400	932	3.15	1026	3.90	1114	4.60	1193	5.39	1267	6.15	1344	7.11	1410	7.83	1475	8.66	1538	9.32	1596	10.17	1654	10.91	1713	11.87	1772	13.31
3318	3600	953	3.47	1047	4.31	1133	4.99	1207	5.76	1282	6.57	1355	7.50	1424	8.34	1487	9.22	1548	9.85	1607	10.79	1665	11.69	1723	12.55	1780	13.88
3503	3800	974	3.89	1067	4.70	1150	5.37	1222	6.15	1297	7.00	1368	7.98	1435	8.80	1500	9.84	1561	10.59	1619	11.41	1674	12.36	1735	13.43	1789	14.52
3687	4000	994	4.20	1084	5.03	1165	5.77	1238	6.56	1313	7.45	1383	8.50	1446	9.25	1510	10.29	1572	11.23	1632	12.11	1684	12.93	1744	14.05	1797	15.15
3872	4200	1016	4.61	1104	5.43	1182	6.20	1257	7.06	1327	7.88	1396	8.96	1461	9.82	1522	10.85	1583	11.83	1643	12.72	1696	13.67	1755	14.86	1808	15.93
4056	4400	1037	5.03	1124	5.79	1201	6.71	1274	7.53	1342	8.40	1412	9.53	1475	10.37	1538	11.59	1597	12.51	1655	13.34	1709	14.44	1767	15.61	1818	16.69
4240	4600	1061	5.52	1147	6.29	1224	7.31	1293	8.05	1364	9.13	1430	10.18	1491	11.02	1552	12.25	1611	13.19	1671	14.19	1723	15.27	1780	16.45	1832	17.65
4425	4800	1084	5.99	1169	6.85	1246	7.90	1318	8.74	1384	9.82	1443	10.68	1509	11.80	1568	12.97	1628	14.01	1683	14.87	1739	16.20	1793	17.29	1844	18.53
4609	5000	1106	6.45	1189	7.37	1264	8.38	1336	9.32	1401	10.37	1467	11.56	1524	12.47	1583	13.67	1642	14.69	1699	15.74	1752	16.98	1805	18.07	1857	19.49
4793	5200	1130	6.95	1212	7.98	1287	9.00	1356	10.01	1423	11.22	1485	12.26	1544	13.38	1602	14.52	1661	15.62	1714	16.53	1767	17.92	1818	18.86	1870	20.43
4978	5400	1155	7.52	1235	8.61	1308	9.57	1380	10.83	1444	12.06	1506	13.14	1563	14.20	1621	15.37	1676	16.37	1730	17.45	1781	18.96	1832	19.80	1883	21.38
5162	5600	1178	8.12	1257	9.22	1329	10.20	1400	11.52	1464	12.89	1525	13.99	1581	15.03	1640	16.19	1694	17.34	1746	18.37	1797	20.18	1849	20.87	1900	22.57
5346	5800	1203	8.75	1276	9.75	1349	10.91	1419	12.25	1483	13.67	1544	14.90	1600	15.90	1658	17.00	1710	18.17	1762	19.26	1812	21.27	1865	21.86	1914	23.59
5531	6000	1227	9.34	1299	10.39	1369	11.62	1439	13.02	1504	14.52	1566	15.91	1621	16.85	1679	17.96	1729	19.13	1779	20.25	1831	22.65	1881	22.88	1929	24.65
5715	6200	1250	10.03	1323	11.12	1394	12.48	1461	13.89	1526	15.43	1587	16.87	1644	14.87	1698	18.99	1748	20.14	1799	21.44	1851	23.99	1898	23.94	1944	25.20
5900	6400	1275	10.74	1347	11.89	1417	13.32	1485	14.89	1542	16.08	1607	17.71	1669	18.97	1717	20.01	1769	21.31	1820	22.69	1868	24.79	1914	24.99	1962	26.48
6084	6600	1300	11.48	1372	12.73	1439	14.23	1504	15.58	1568	17.12	1630	18.67	1687	19.93	1738	21.09	1786	22.30	1840	23.82	1884	25.60	1932	26.11	1980	27.82


No. 40 Fan Performance Curves
S.P. (in)
CFM
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
4000
4400
4800
5200
5600
6000
6400
6800
7200
7600
8000
8400
8800
9200
9600
10000
10400
10800
50 HP
40 HP
30 HP
25 HP
20 HP
15 HP
10 HP
1600 RPM
1400 RPM
1200 RPM
1000 RPM

No. 40 Material Handling Fan

Wheel Diameter 36" | No. of Blades: 12 | Wheel Circumference 9.427' | Max RPM: 1600 | *outlet velocity based on 17" diameter pipe

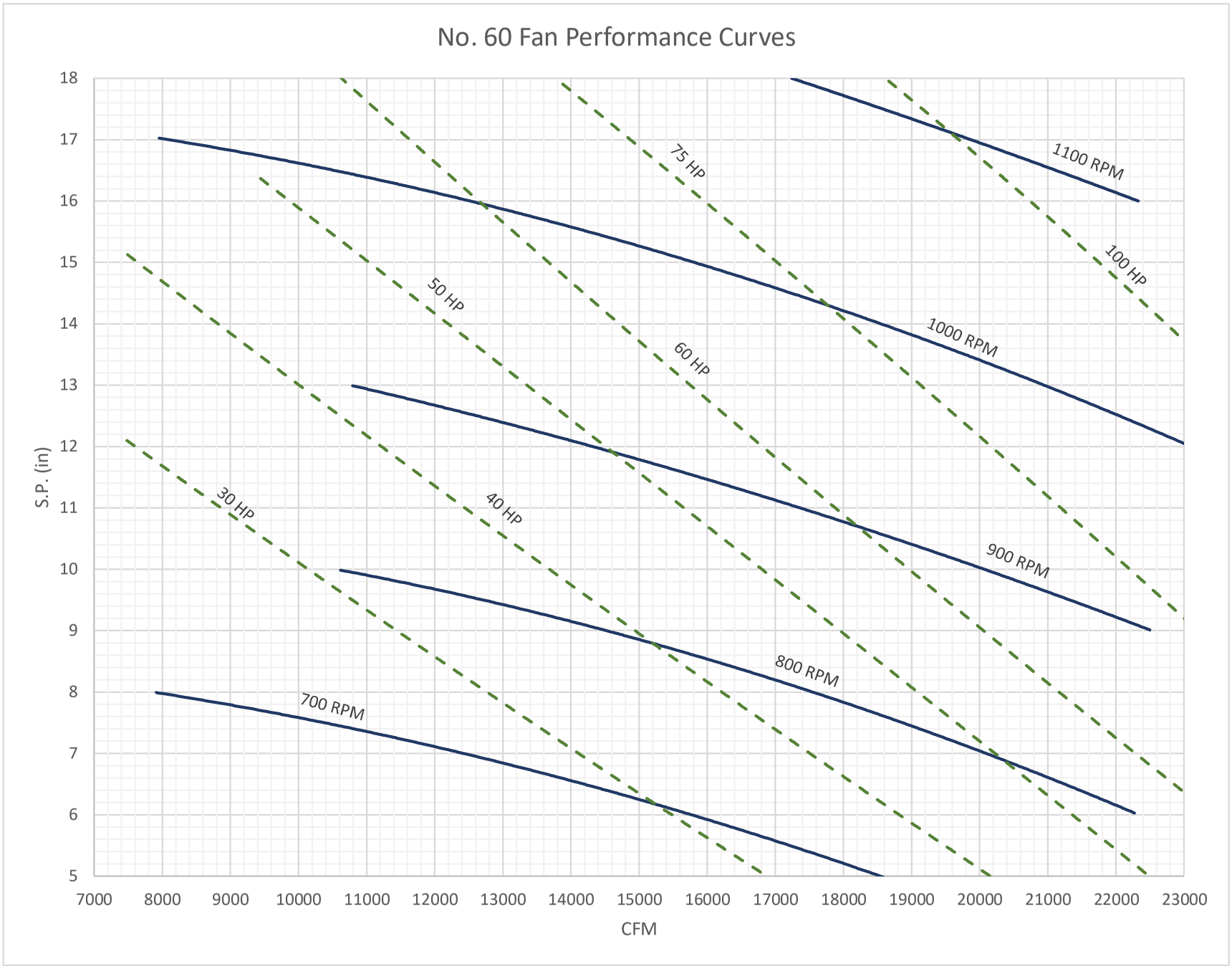
CFM	OUT VEL	3" S.P.		4" S.P.		5" S.P.		6" S.P.		7" S.P.		8" S.P.		9" S.P.		10" S.P.		11" S.P.		12" S.P.		13" S.P.		14" S.P.		15" S.P.		16" S.P.		17" S.P.		18" S.P.	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3152	2000	664	2.66	758	3.72	835	4.97	912	6.06	975	6.53	1038	7.89	1105	9.81	1160	10.66	1214	11.61	1264	13.26	1313	14.08	1360	15.90	1410	17.57	1450	20.00	1496	20.79	1525	23.79
3467	2200	674	2.95	765	4.04	845	5.39	918	6.39	980	6.99	1046	8.51	1111	10.31	1165	11.12	1221	12.42	1269	13.89	1319	14.90	1366	16.74	1416	18.51	1454	20.59	1499	21.32	1532	24.32
3782	2400	686	3.29	777	4.47	855	5.81	925	6.78	988	7.57	1053	9.92	1118	10.88	1171	11.66	1226	12.99	1275	14.65	1325	15.73	1372	17.58	1423	19.61	1458	21.18	1502	21.85	1539	24.85
4098	2600	698	3.64	787	4.83	865	6.23	935	7.33	998	8.30	1063	10.49	1124	11.39	1180	12.48	1232	13.68	1283	15.66	1332	16.68	1378	18.42	1430	20.71	1463	21.92	1505	22.38	1546	25.38
4413	2800	712	4.09	800	5.30	877	6.73	944	7.82	1007	8.92	1073	11.06	1133	12.11	1187	13.12	1238	14.37	1290	16.54	1338	17.51	1383	19.12	1437	21.81	1469	22.81	1510	23.25	1553	26.28
4728	3000	725	4.51	812	5.80	888	7.20	954	8.37	1017	9.60	1081	11.52	1140	12.68	1194	13.75	1245	15.18	1297	17.42	1343	18.19	1389	19.96	1443	22.75	1474	23.55	1517	24.48	1560	27.50
5043	3200	738	4.94	826	6.39	901	7.75	964	8.95	1027	10.27	1091	12.09	1149	13.42	1204	14.71	1253	16.10	1306	18.50	1351	19.29	1396	20.99	1450	23.85	1481	24.59	1523	25.53	1567	28.73
5358	3400	754	5.46	837	6.85	910	8.23	974	9.47	1038	11.02	1102	12.76	1159	14.24	1210	15.30	1263	17.25	1310	18.97	1359	20.38	1405	22.20	1457	24.95	1488	25.62	1531	26.93	1575	30.13
5674	3600	769	5.94	851	7.44	917	8.59	986	10.13	1049	11.76	1111	13.47	1167	14.39	1220	16.34	1273	18.40	1320	20.14	1369	21.74	1412	23.18	1463	25.89	1494	26.51	1539	28.33	1583	31.83
5989	3800	784	6.43	864	7.99	934	9.49	1000	10.90	1062	12.64	1121	14.26	1178	15.80	1230	17.36	1282	19.43	1330	21.31	1378	22.99	1419	24.16	1470	26.99	1503	27.85	1547	29.73	1592	33.10
6304	4000	803	7.08	878	8.58	945	10.06	1012	11.69	1074	13.45	1131	15.05	1192	16.94	1240	18.38	1292	20.58	1339	22.36	1388	24.36	1428	25.42	1477	28.09	1512	29.21	1557	31.48	1601	34.67
6619	4200	815	7.59	891	9.12	959	10.80	1023	12.42	1084	14.12	1142	15.92	1199	17.52	1249	19.30	1302	21.73	1351	23.77	1396	25.45	1437	26.64	1483	29.03	1522	30.72	1567	33.23	1610	36.15
6934	4400	831	8.27	907	9.87	973	11.53	1034	13.14	1095	14.86	1153	16.79	1210	18.59	1258	20.22	1310	22.65	1359	24.70	1406	26.75	1446	27.94	1490	30.13	1533	32.38	1576	34.80	1618	37.47
7250	4600	847	8.95	921	10.61	987	12.27	1048	14.07	1107	15.76	1162	17.50	1220	19.58	1272	21.64	1321	23.92	1367	25.62	1414	27.75	1455	29.20	1497	31.23	1540	33.44	1585	36.30	1627	38.96
7565	4800	862	9.59	936	11.41	1000	12.95	1060	14.86	1119	16.72	1177	18.68	1231	20.67	1283	22.77	1332	25.18	1379	27.04	1424	29.00	1467	30.88	1509	32.79	1551	35.10	1595	38.13	1637	40.61
7880	5000	884	10.52	952	12.26	1016	14.00	1076	15.92	1134	17.92	1191	19.79	1243	21.86	1295	23.99	1343	26.45	1391	28.45	1434	30.25	1476	32.14	1522	34.85	1562	36.76	1606	39.96	1647	42.26
8195	5200	903	11.34	968	13.10	1030	14.92	1090	16.84	1147	18.96	1203	20.79	1255	23.05	1309	25.49	1357	28.06	1403	29.88	1445	31.63	1489	33.96	1534	36.56	1574	38.57	1616	41.56	1657	43.91
8510	5400	920	12.16	984	13.95	1046	15.96	1104	17.81	1160	20.00	1213	21.74	1266	24.13	1320	26.70	1370	29.55	1414	31.25	1457	33.13	1500	35.50	1547	38.42	1585	40.24	1627	43.32	1667	45.56
8826	5600	938	13.02	1004	15.06	1062	17.01	1121	19.13	1176	21.28	1228	23.16	1280	25.52	1333	28.13	1380	30.70	1425	32.63	1469	34.63	1510	36.92	1559	40.14	1595	41.75	1637	44.92	1678	47.37
9141	5800	958	13.98	1020	16.12	1078	18.06	1135	20.21	1189	22.32	1241	24.40	1293	26.81	1344	29.34	1393	32.20	1438	34.25	1481	36.13	1522	38.62	1572	42.00	1607	43.64	1648	46.68	1688	49.02
9456	6000	974	14.75	1036	17.16	1095	19.17	1151	21.45	1206	23.75	1256	25.82	1307	28.25	1356	30.66	1404	32.99	1448	35.50	1493	37.63	1535	40.47	1584	43.71	1618	45.43	1659	48.44	1698	50.67
9771	6200	993	15.66	1054	18.36	1112	20.40	1168	22.77	1221	25.11	1272	27.34	1320	29.64	1369	32.09	1417	34.59	1462	37.25	1505	39.23	1546	42.03	1595	45.29	1629	47.21	1671	50.36	1709	52.67
10086	6400	1013	16.88	1072	19.55	1133	21.98	1188	24.32	1238	26.66	1288	28.86	1335	31.25	1382	33.52	1430	36.19	1476	39.00	1519	41.26	1559	43.88	1602	46.32	1641	49.16	1682	52.12	1720	54.70
10402	6600	1032	18.16	1091	20.81	1152	23.40	1206	25.78	1255	28.21	1305	30.54	1350	32.85	1396	35.06	1442	37.67	1487	40.38	1531	43.00	1571	45.58	1612	47.94	1653	51.11	1694	54.04	1731	56.74
10717	6800	1052	19.51	1114	22.32	1170	24.75	1224	27.35	1274	29.93	1324	32.57	1367	34.67	1410	36.73	1457	39.51	1500	41.75	1544	44.88	1583	47.29	1625	50.05	1664	52.90	1702	55.36	1742	58.77
11032	7000	1075	21.06	1133	23.58	1190	26.25	1243	29.01	1292	31.57	1338	34.07	1384	36.49	1422	38.20	1471	41.23	1515	43.95	1557	46.77	1596	49.13	1636	51.83	1678	55.18	1716	57.88	1753	60.81


No. 50 Fan Performance Curves
S.P. (in)
18
17
16
15
14
13
12
11
10
9
8
7
6
5
7500
8000
8500
9000
9500
10000
10500
11000
11500
12000
12500
13000
13500
14000
14500
15000
15500
16000
16500
CFM
1350 RPM
1250 RPM
1150 RPM
1050 RPM
950 RPM
75 HP
60 HP
50 HP
40 HP
30 HP

No. 50 Material Handling Fan

Wheel Diameter 43" | No. of Blades: 12 | Wheel Circumference 11.255' | Max RPM: 1330 | *outlet velocity based on 21" diameter pipe

CFM	OUT VEL	3" S.P.		4" S.P.		5" S.P.		6" S.P.		7" S.P.		8" S.P.		9" S.P.		10" S.P.		11" S.P.		12" S.P.		13" S.P.		14" S.P.		15" S.P.		16" S.P.		17" S.P.		18" S.P.	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4810	2000	556	4.06	633	5.68	699	7.58	764	9.25	816	10.12	870	13.40	925	14.91	971	16.27	1016	17.72	1058	20.23	1099	21.49	1139	24.26	1180	26.81	1213	30.52	1251	31.54	1276	36.16
5291	2200	564	4.50	640	6.16	707	8.22	769	9.75	820	10.67	875	14.27	930	15.73	975	16.97	1022	18.95	1062	21.20	1104	22.74	1144	25.54	1185	28.25	1217	31.42	1254	32.44	1282	37.06
5772	2400	574	5.02	651	6.82	716	8.87	774	10.35	827	11.55	882	15.14	936	16.60	980	17.79	1026	19.82	1067	22.36	1109	24.00	1149	26.83	1191	29.92	1221	32.32	1257	33.34	1288	37.96
6253	2600	584	5.55	659	7.37	724	9.51	783	11.19	836	12.67	890	16.01	941	17.38	988	19.04	1031	20.87	1074	23.90	1115	25.44	1154	28.11	1197	30.78	1225	33.45	1260	34.15	1294	38.77
6734	2800	596	6.24	670	8.09	734	10.27	790	11.93	843	13.61	898	16.88	949	18.48	994	20.02	1036	21.93	1080	25.24	1120	26.72	1158	29.18	1203	33.28	1230	34.80	1264	35.48	1300	40.10
7215	3000	607	6.88	680	8.85	743	10.99	799	12.77	851	14.65	905	17.58	954	19.35	1000	20.98	1042	23.16	1086	26.58	1124	27.76	1163	30.46	1208	34.72	1234	35.94	1270	37.36	1306	41.96
7696	3200	618	7.54	692	9.75	754	11.83	807	13.66	860	15.67	913	18.45	962	20.48	1008	22.45	1049	24.57	1093	28.23	1131	29.44	1169	32.03	1214	36.39	1240	37.52	1275	38.96	1312	43.84
8177	3400	631	8.33	701	10.45	762	12.56	815	14.45	869	16.82	923	19.47	970	21.73	1013	23.35	1057	26.32	1097	28.95	1138	31.10	1176	33.88	1220	38.07	1246	39.09	1282	41.09	1319	45.98
8658	3600	644	9.06	716	11.35	768	13.11	825	15.46	878	17.94	930	20.55	977	22.72	1021	24.93	1066	28.08	1105	30.73	1146	33.17	1182	35.37	1225	39.51	1251	40.45	1288	43.23	1325	48.57
9139	3800	656	9.81	723	12.19	782	14.48	837	16.63	889	19.29	939	21.76	986	24.11	1030	26.49	1073	29.65	1113	32.52	1154	35.08	1188	36.87	1231	41.19	1258	42.50	1295	45.37	1333	50.51
9620	4000	672	10.80	735	13.09	791	15.35	847	17.84	899	20.52	947	22.97	998	25.85	1038	28.05	1082	31.40	1121	34.12	1162	37.17	1196	38.79	1237	42.88	1266	44.57	1304	48.04	1340	52.90
10101	4200	682	11.58	746	13.92	803	16.48	856	18.95	908	21.55	956	24.29	1004	26.73	1046	29.45	1090	33.16	1131	36.27	1169	38.84	1203	40.65	1242	44.30	1274	46.88	1312	50.71	1348	55.16
10582	4400	696	12.62	759	15.06	815	17.59	866	20.05	917	22.68	964	25.62	1013	28.37	1053	30.85	1097	34.56	1138	37.69	1177	40.82	1211	42.63	1247	45.98	1283	49.41	1319	53.10	1355	57.18
11063	4600	709	13.66	771	16.19	826	18.72	877	21.50	927	24.05	973	26.70	1021	29.88	1065	33.02	1106	36.50	1144	39.09	1184	42.34	1218	44.56	1253	47.66	1289	51.03	1327	55.39	1362	59.45
11544	4800	722	14.63	784	17.41	837	19.76	887	22.68	937	25.51	985	28.50	1031	31.54	1074	34.75	1115	38.42	1155	41.26	1192	44.25	1228	47.12	1263	50.04	1299	53.56	1335	58.18	1371	61.97
12025	5000	740	16.05	797	18.71	851	21.36	901	24.29	949	27.34	997	30.20	1041	33.36	1084	36.61	1124	40.36	1165	43.41	1201	46.16	1236	49.04	1274	53.18	1308	56.09	1345	60.98	1379	64.49
12506	5200	756	17.30	810	19.99	862	22.77	913	25.70	960	28.93	1007	31.72	1051	35.17	1096	68.90	1136	42.86	1175	45.60	1210	48.27	1247	51.82	1284	55.79	1318	58.86	1353	63.42	1387	67.00
12987	5400	770	18.51	824	21.29	876	24.35	924	27.18	971	30.52	1016	33.17	1060	36.82	1105	40.70	1147	45.09	1184	47.69	1220	50.55	1256	54.17	1295	58.63	1327	61.40	1362	66.10	1396	69.52
13468	5600	785	19.87	841	22.98	889	25.96	939	29.19	985	32.47	1028	35.34	1072	38.94	1116	42.92	1155	46.85	1193	49.79	1230	52.84	1264	56.34	1305	61.25	1335	63.71	1371	68.54	1405	72.28
13949	5800	802	21.33	854	24.60	903	27.51	950	30.84	995	34.06	1039	37.23	1083	40.91	1125	44.77	1166	49.14	1204	52.26	1240	55.13	1274	58.93	1316	64.24	1345	66.59	1380	71.23	1414	74.80
14430	6000	815	22.55	867	26.18	917	29.25	964	32.73	1010	36.24	1052	39.40	1094	43.11	1135	46.79	1174	50.34	1212	54.17	1250	57.42	1285	61.75	1326	66.70	1355	69.32	1389	73.92	1422	77.32
14911	6200	831	23.90	882	27.99	931	31.12	978	34.75	1022	38.32	1065	41.72	1105	45.23	1146	48.97	1186	52.78	1224	56.84	1260	59.86	1294	64.14	1335	69.11	1364	72.04	1399	76.85	1431	80.37
15392	6400	848	25.76	897	29.83	949	33.54	995	37.11	1036	40.68	1078	44.04	1118	47.69	1157	51.15	1197	55.22	1236	59.51	1271	62.96	1305	66.96	1341	70.68	1374	75.02	1408	79.53	1440	83.47
15873	6600	864	27.71	913	31.75	964	35.71	1010	39.34	1051	43.05	1093	46.60	1130	50.13	1169	53.50	1207	57.48	1245	61.62	1282	65.62	1315	69.55	1350	73.15	1384	77.99	1418	82.46	1449	86.58
16354	6800	861	29.77	933	34.06	980	37.77	1025	41.73	1069	45.67	1108	49.70	1144	52.90	1180	56.05	1220	60.29	1256	63.71	1293	68.48	1325	72.16	1360	76.37	1393	80.72	1425	84.48	1458	89.68
16835	7000	900	32.14	949	35.98	996	40.06	1041	44.27	1082	48.17	1120	51.99	1159	55.68	1191	58.29	1232	62.91	1268	67.07	1304	71.37	1336	74.97	1370	79.09	1405	84.20	1437	88.32	1468	92.79


No. 60 Fan Performance Curves
S.P. (in)
CFM
18
17
16
15
14
13
12
11
10
9
8
7
6
5
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
21000
22000
23000
75 HP
100 HP
50 HP
60 HP
30 HP
40 HP
1100 RPM
1000 RPM
900 RPM
800 RPM
700 RPM

No. 60 Material Handling Fan

Wheel Diameter 54" | No. of Blades: 12 | Wheel Circumference 14.135' | Max RPM: 1060 | *outlet velocity based on 25" diameter pipe

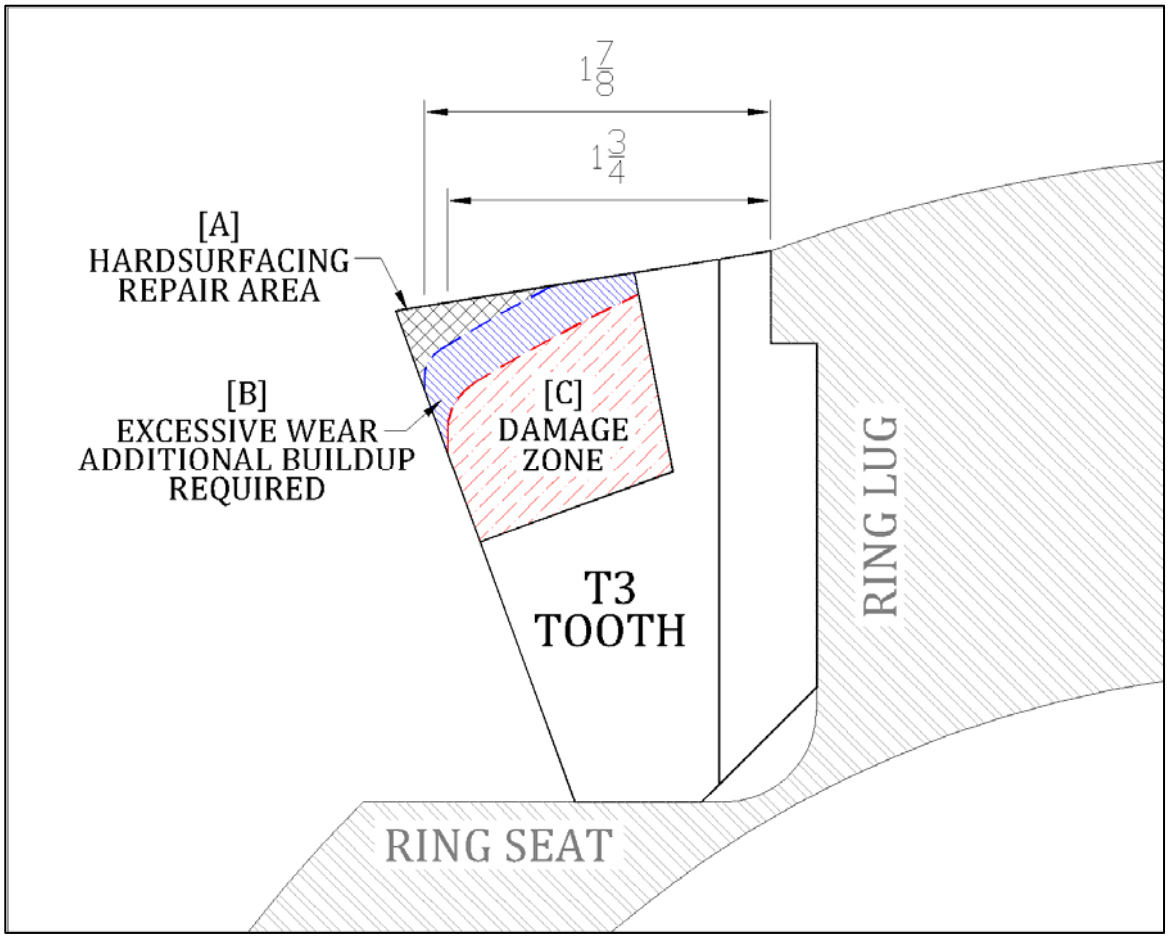
CFM	OUT VEL	3" S.P.		4" S.P.		5" S.P.		6" S.P.		7" S.P.		8" S.P.		9" S.P.		10" S.P.		11" S.P.		12" S.P.		13" S.P.		14" S.P.		15" S.P.		16" S.P.		17" S.P.		18" S.P.	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6818	2000	443	5.75	504	8.04	557	10.75	608	13.11	650	14.34	693	18.97	737	21.22	773	23.05	809	25.11	843	28.68	875	30.45	907	34.39	940	38.00	966	43.43	995	44.88	1015	51.33
7500	2200	449	6.38	510	8.74	564	11.66	612	13.82	653	15.12	697	20.21	741	22.30	777	24.65	814	26.86	846	30.04	879	32.22	911	36.20	944	40.03	969	44.53	998	45.98	1020	52.43
8182	2400	457	7.12	518	9.67	570	12.56	617	14.66	659	16.37	702	21.45	745	23.53	781	25.22	817	28.09	850	31.68	883	34.02	915	38.02	949	42.41	972	45.80	1001	47.25	1025	53.70
8863	2600	465	7.87	525	10.45	577	13.47	623	15.35	665	17.95	709	22.69	749	24.63	787	27.00	821	29.58	855	33.87	888	36.07	919	39.84	953	44.79	975	47.44	1003	48.40	1030	54.85
9545	2800	475	8.85	533	11.46	585	14.55	629	16.91	671	19.29	715	23.92	755	26.18	791	28.37	825	31.08	860	35.77	892	37.87	922	41.35	958	47.17	979	49.33	1007	50.28	1035	56.83
10227	3000	483	9.75	541	12.54	592	15.57	636	18.10	678	20.76	721	24.91	760	27.42	796	29.74	830	32.83	865	37.67	895	39.34	926	43.17	962	49.20	983	50.93	1011	52.94	1040	59.47
10909	3200	492	10.68	551	13.82	601	16.76	643	19.36	685	22.21	727	26.15	766	29.02	803	31.81	835	34.82	871	40.01	901	41.72	931	45.39	967	51.58	987	53.18	1015	55.21	1045	62.13
11591	3400	503	11.81	558	14.81	607	17.80	649	20.48	692	23.63	735	27.60	773	30.80	807	33.09	842	37.31	873	41.03	906	44.07	937	48.01	971	53.96	992	55.41	1021	58.24	1050	65.16
12272	3600	513	12.85	567	16.09	611	18.59	657	21.91	699	25.43	741	29.13	778	32.20	813	35.34	849	39.79	880	43.56	913	47.02	941	50.15	975	55.99	996	57.33	1026	61.27	1055	68.84
12954	3800	523	13.91	576	17.28	623	20.44	667	23.57	708	27.34	747	30.84	785	34.17	820	37.54	855	42.02	887	46.09	919	49.72	946	52.25	980	58.37	1002	60.23	1031	64.29	1061	71.58
13636	4000	535	15.31	585	18.56	630	21.76	675	25.28	716	29.09	754	32.55	795	36.63	827	39.73	861	44.51	892	48.36	925	52.68	952	54.97	985	60.75	1008	63.17	1038	68.08	1067	74.98
14318	4200	543	16.41	594	19.72	639	23.36	682	26.86	723	30.54	761	34.43	799	37.89	833	41.74	868	46.99	901	51.41	931	55.04	958	57.61	989	62.78	1015	66.44	1045	71.86	1073	78.18
15000	4400	554	17.88	605	21.35	649	24.94	689	28.42	730	32.14	769	36.31	807	40.20	839	43.73	873	48.98	906	53.42	937	57.85	964	60.42	993	65.16	1022	70.03	1051	75.26	1078	81.03
15681	4600	565	19.36	614	22.95	658	26.54	699	30.48	738	34.08	775	37.85	813	42.34	848	46.80	881	51.73	911	55.41	943	60.01	970	63.15	998	67.54	1027	72.32	1057	78.50	1085	84.26
16363	4800	575	20.74	624	24.68	667	28.01	707	32.14	746	36.16	785	40.40	821	44.70	855	49.24	888	54.46	919	58.48	949	62.72	978	66.78	1006	70.91	1034	75.91	1063	82.46	1091	87.82
17045	5000	589	22.75	635	26.51	677	30.28	717	34.43	756	38.75	794	42.80	829	47.28	863	51.88	895	57.20	927	61.53	956	65.42	984	69.51	1015	75.37	1041	79.50	1071	86.42	1098	91.39
17727	5200	602	24.52	645	28.33	687	32.27	727	36.43	765	41.00	802	44.97	837	49.85	873	55.13	905	60.68	935	64.62	963	68.40	993	73.44	1023	79.07	1049	83.41	1077	89.88	1105	94.96
18409	5400	613	26.30	656	30.17	697	34.52	736	38.52	773	43.25	809	47.02	844	52.18	880	57.74	913	63.91	943	67.58	971	71.65	1000	76.77	1031	83.09	1056	87.02	1085	93.69	1111	98.53
19090	5600	625	28.16	669	32.57	708	36.79	747	41.37	784	46.02	819	50.09	853	55.19	889	60.83	920	66.39	950	70.57	979	74.89	1007	79.84	1039	86.81	1063	88.13	1091	97.15	1119	102.44
19772	5800	639	30.23	680	34.86	719	39.06	757	43.71	793	48.26	827	52.77	862	57.98	896	63.45	929	69.64	959	74.07	987	78.14	1015	83.57	1048	90.83	1071	94.38	1099	100.95	1125	106.01
20454	6000	649	31.90	691	37.11	730	41.46	767	46.39	804	51.36	837	55.84	871	61.09	904	66.31	936	71.35	965	76.77	995	81.38	1023	87.52	1056	94.53	1079	98.25	1106	104.76	1132	109.58
21136	6200	662	33.87	703	39.71	741	44.12	779	49.24	814	54.30	848	59.13	880	64.10	913	69.40	945	74.81	975	80.56	1003	84.84	1031	90.90	1063	97.95	1086	102.10	1114	108.91	1139	113.91
21818	6400	675	36.51	715	42.28	755	47.53	792	52.60	825	57.66	859	62.41	890	67.58	921	72.49	953	78.27	984	84.34	1013	89.23	1039	94.90	1068	100.17	1094	106.31	1121	112.72	1147	118.30
22499	6600	688	39.27	727	45.00	768	50.61	804	55.75	837	61.01	870	66.05	900	71.04	931	75.82	961	81.47	991	87.11	1021	92.99	1047	98.57	1075	103.70	1102	110.53	1129	116.87	1152	122.71
23181	6800	701	42.19	743	48.27	780	53.53	816	59.15	849	64.73	883	70.44	911	74.98	940	79.43	971	85.45	1000	90.29	1029	97.06	1055	102.27	1083	108.24	1109	114.40	1135	119.72	1161	127.10
23863	7000	717	45.54	755	50.99	793	56.77	829	62.74	861	68.27	892	73.68	923	78.91	948	82.61	981	89.17	1010	95.05	1038	101.15	1064	106.25	1091	112.09	1119	119.33	1144	125.17	1169	131.51

MONTGOMERY INDUSTRIES INTERNATIONAL

Hardsurface Wear Zones – T3 Teeth

√ 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.

√ General practice is to rebuild the anvils 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 anvils 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.

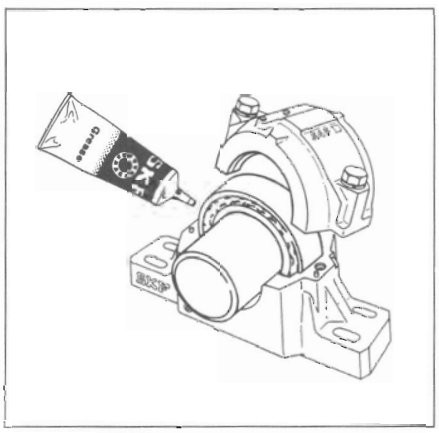
Initial Grease Charge for Split Pillow Block Housings

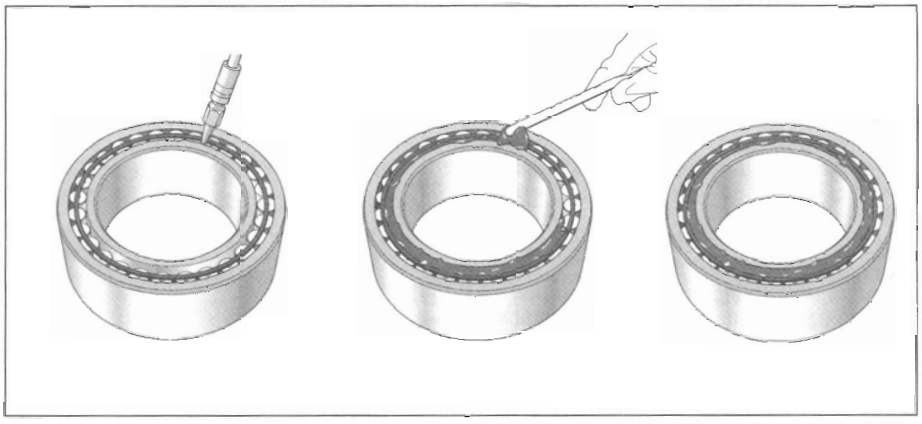
The recommended initial grease charge (weight) for split pillow block and bearing assemblies are listed in the accompanying tables. Values apply for spherical roller bearings, toroidal roller (CARB) bearings and self-aligning ball bearing units. The initial charge is intended to fill approximately ½ 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

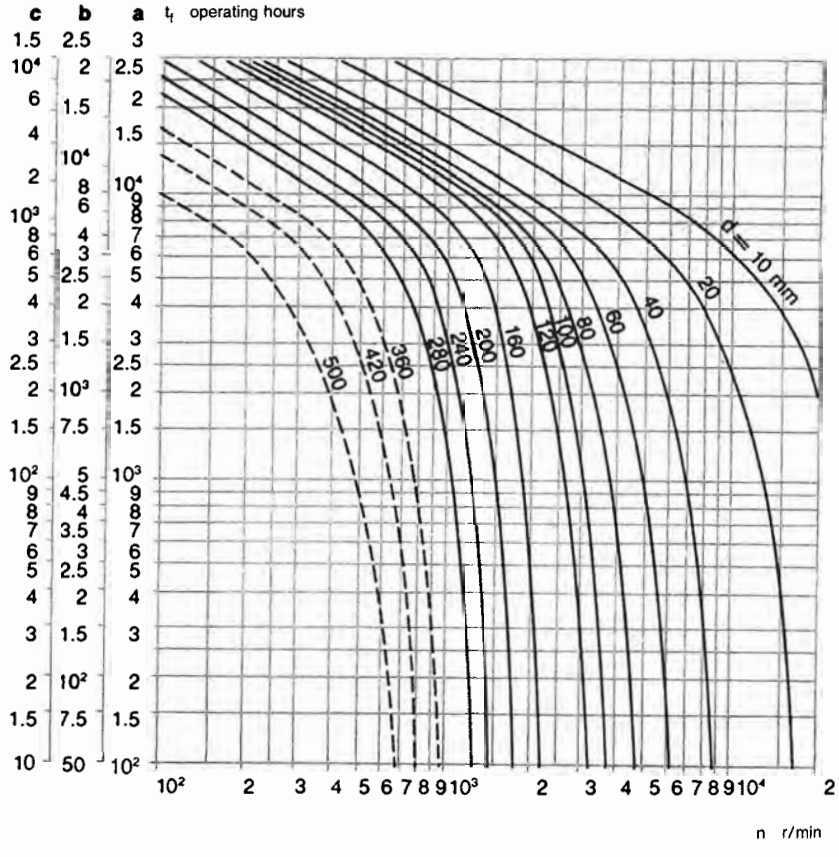
The relubrication intervals t_f for normal operating conditions can be read off as a function of bearing speed n and bore diameter d of a certain bearing type from Diagram 1. The diagram is valid for bearings on horizontal shafts in stationary machines under normal loads. It applies to good quality lithium 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

2017 Thelma Street | P.O. Box 3687
Jacksonville, Florida 32206 U.S.A.
Phone: (904) 355-5671
Fax: (904) 355-0401
www.montgomeryindustries.com

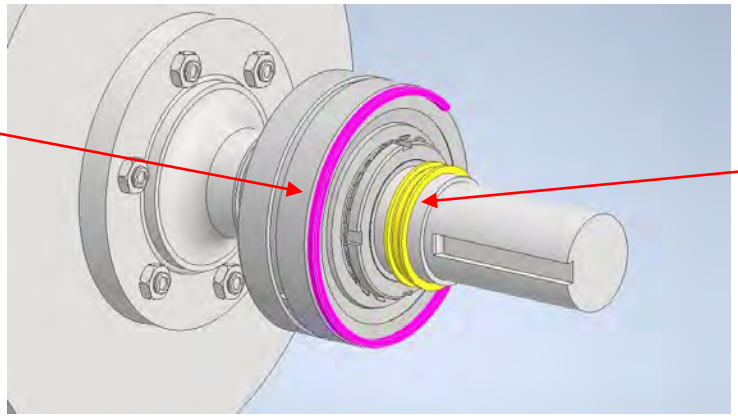
REMOVING AN OLD BEARING

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.

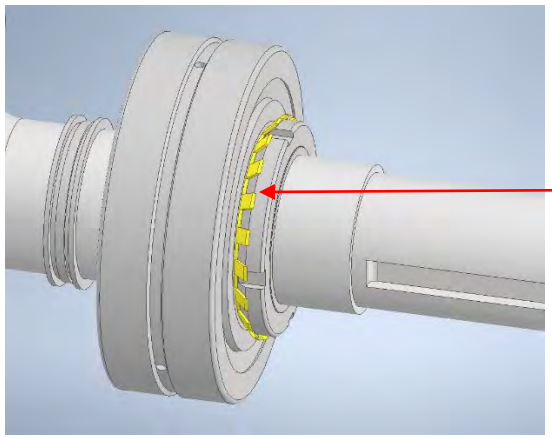
STOP THE HOG BEFORE PERFORMING MAINTENANCE.

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.



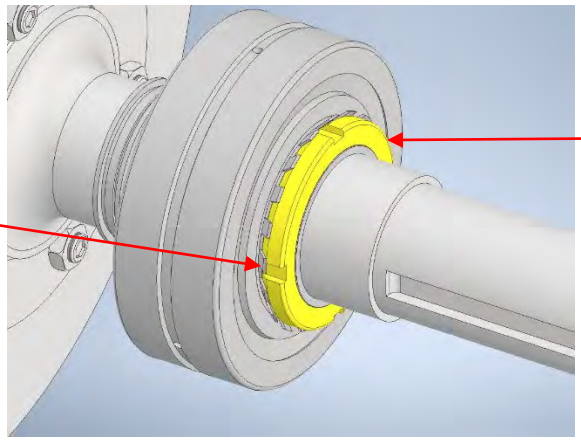
2. Bend out the locking washer on the lock ring to release the nut.



2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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

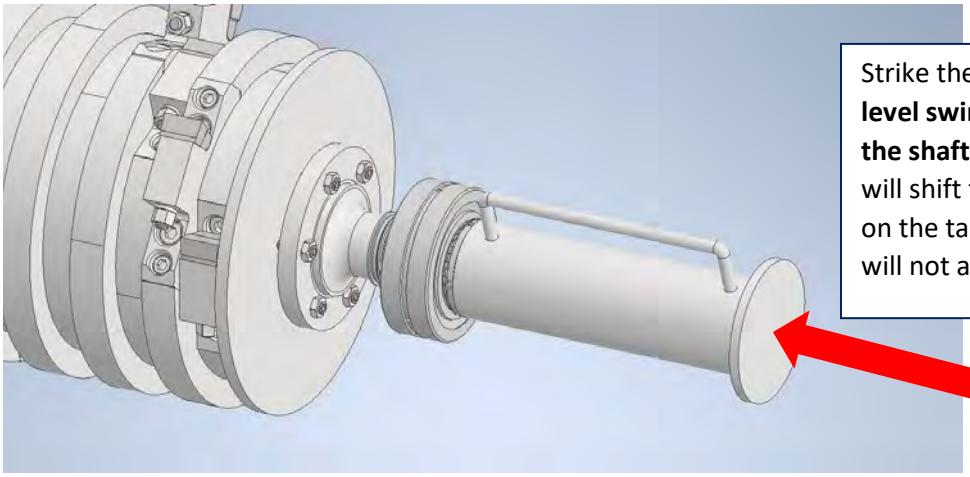
To loosen the nut, place a spanner wrench or heavy bar of brass or bronze against the nut. Use a heavy sledgehammer to hit the wrench or bar and keep moving around the nut with the wrench or bar. **Do not keep pounding in one place** as this will ruin the threads on the sleeve and nut.

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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.

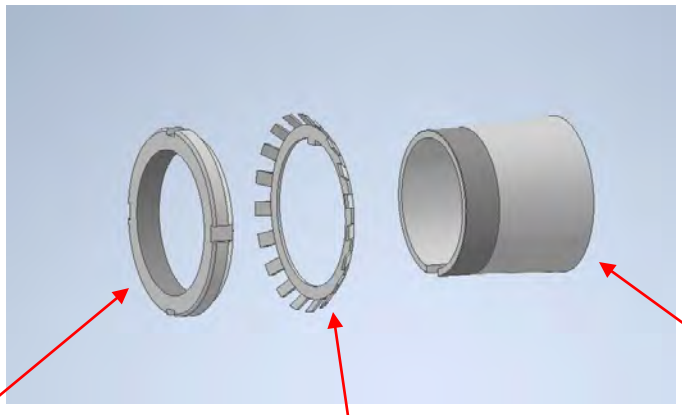


Strike the cylinder with a **level swing to the center of the shaft**. Hitting at an angle will shift the bearing around on the tapered sleeve but will not actually loosen it.

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

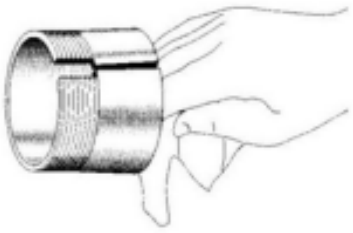
INSTALLING A NEW BEARING

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.

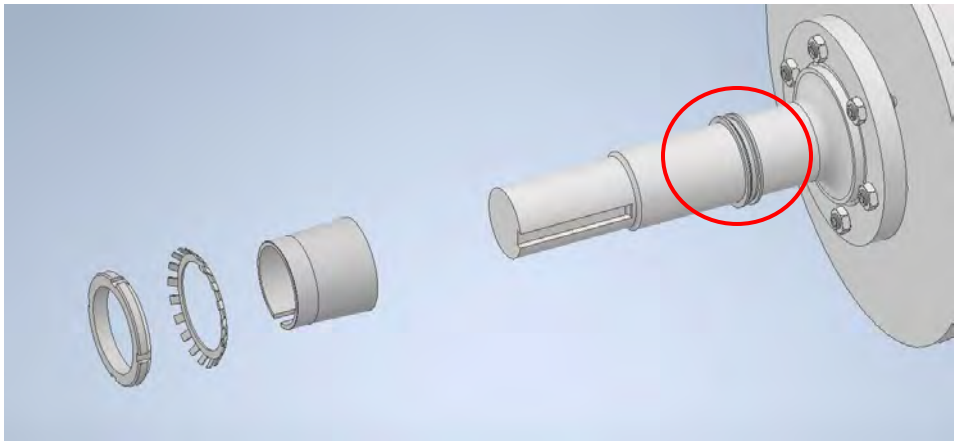


2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

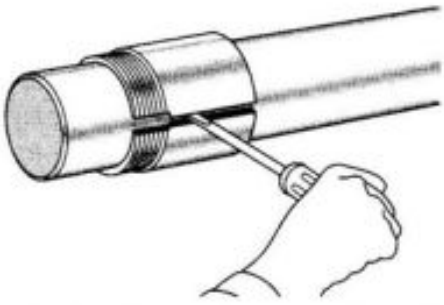
3. Wipe the preservative from the surface of the sleeve and then oil the bore surface lightly. Use a thin mineral oil.



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

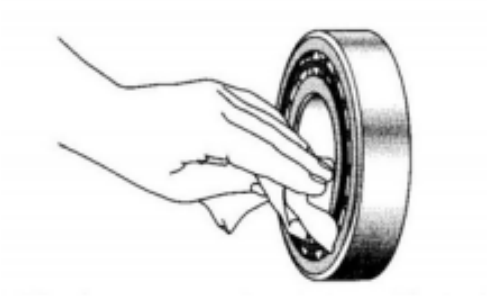


5. Open up the sleeve by inserting a screwdriver into the slit. Then, slide the sleeve along the shaft to the correct position.

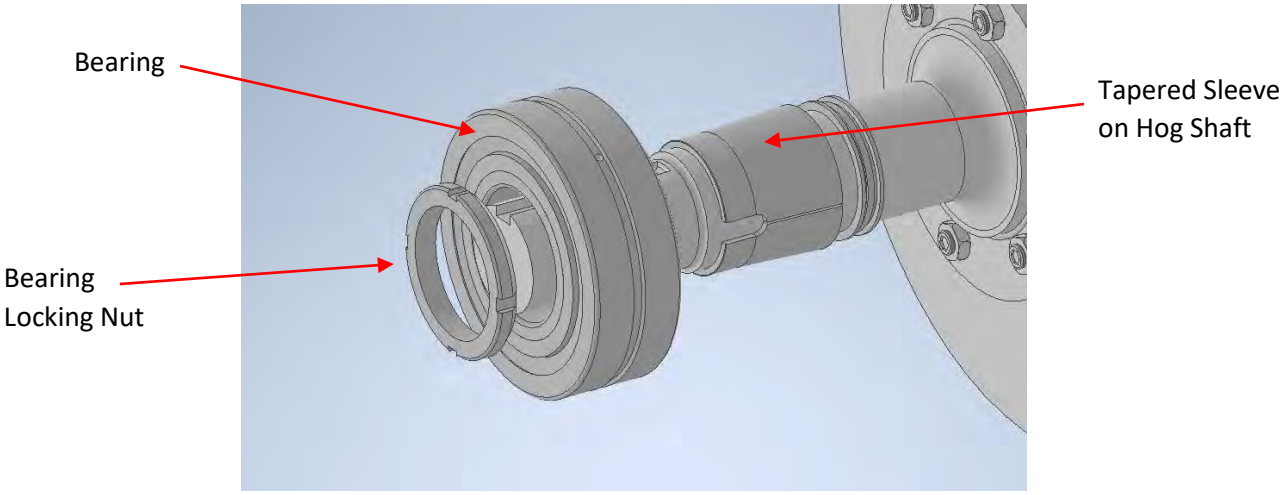


2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

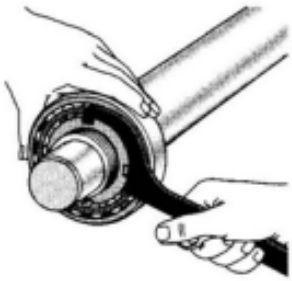
6. Wipe the preservative from the bore of the bearing and then oil the surface lightly. Use a thin mineral oil.



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.

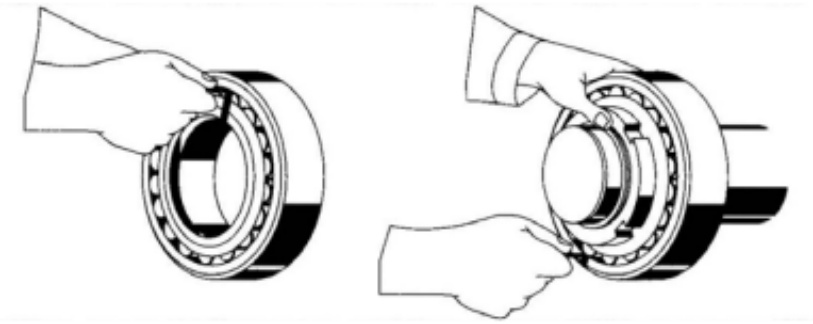


8. The bearing unit is secured on the shaft by tightening the lock nut with a spanner wrench or with a blunt chisel and hammer. Turn the nut sufficiently to ensure that the shaft makes proper contact (self-locking) with the sleeve, but do not drive the bearing any further up onto the sleeve until you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



2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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.

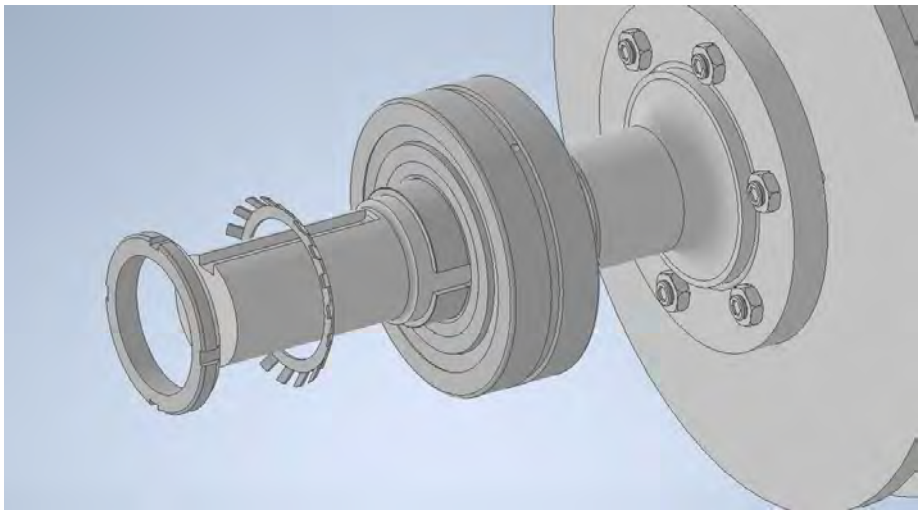


Clearance Requirements for SKF Bearings

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

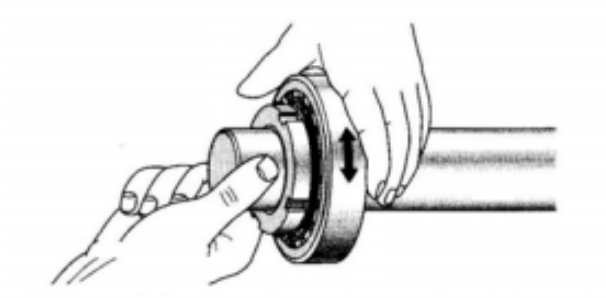
**Note: Values are in inches unless noted. The above clearances are based on a Class-3 fit.*

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



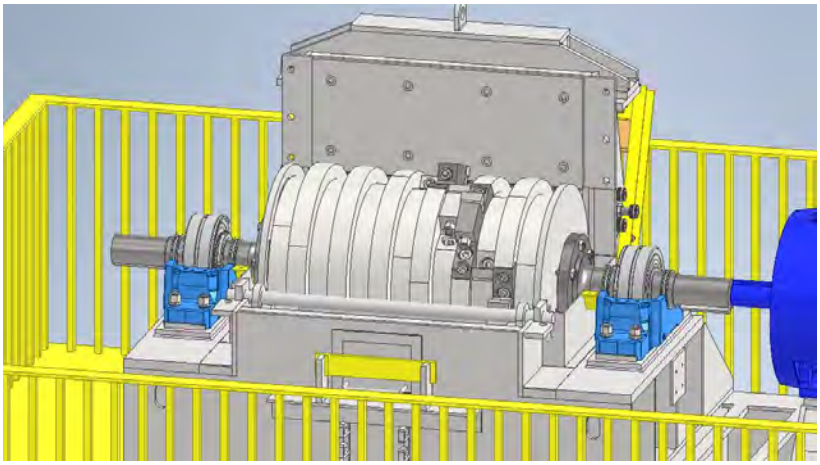
2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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

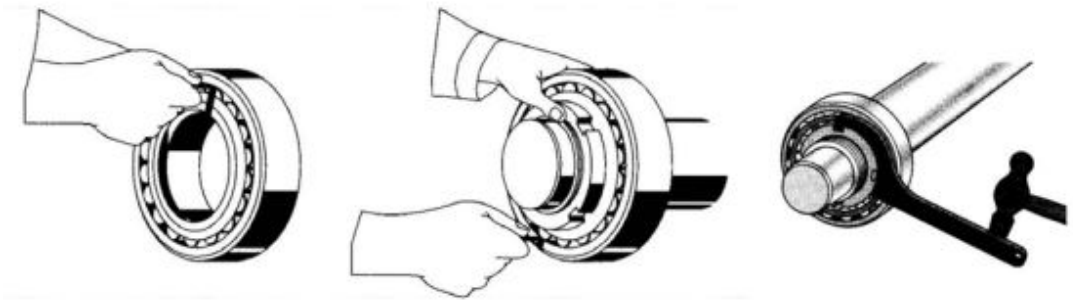


CAUTION: A loose adapter sleeve can lead to the inner ring turning on the adapter sleeve and/or the adapter sleeve turning on the shaft. To ensure that the nut is not excessively tight, make certain the outer ring of the bearing rotates freely. For a Class-3 fit bearing, the outer ring will swivel freely.

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.

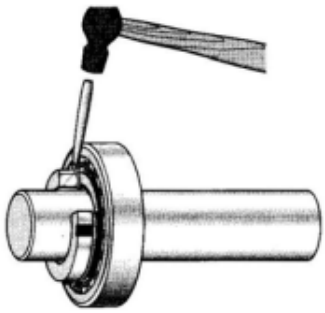


13. Verify mounted clearance and tighten further as needed. Refer to the table above for clearance requirements, based on the bearing manufacturer's recommendations.

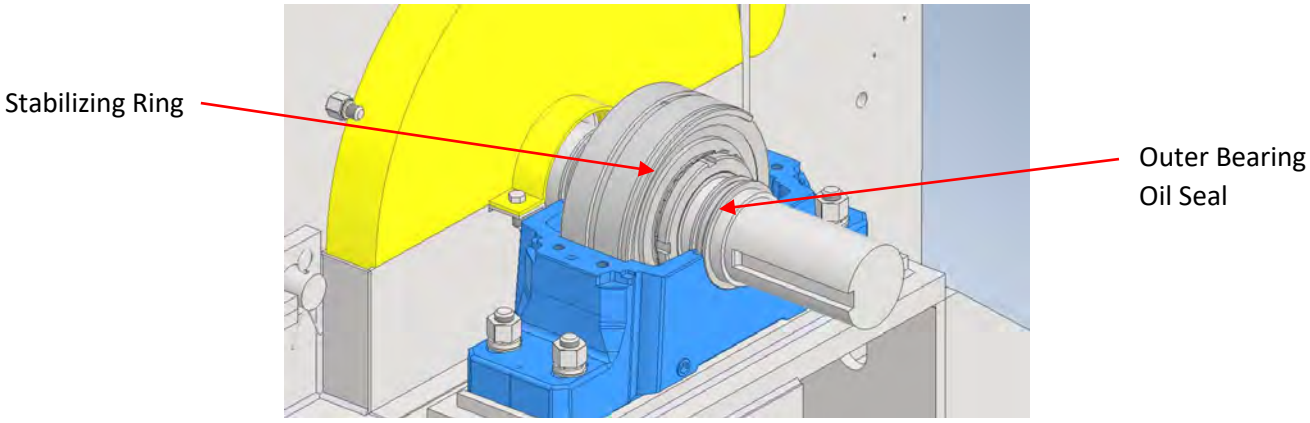


2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

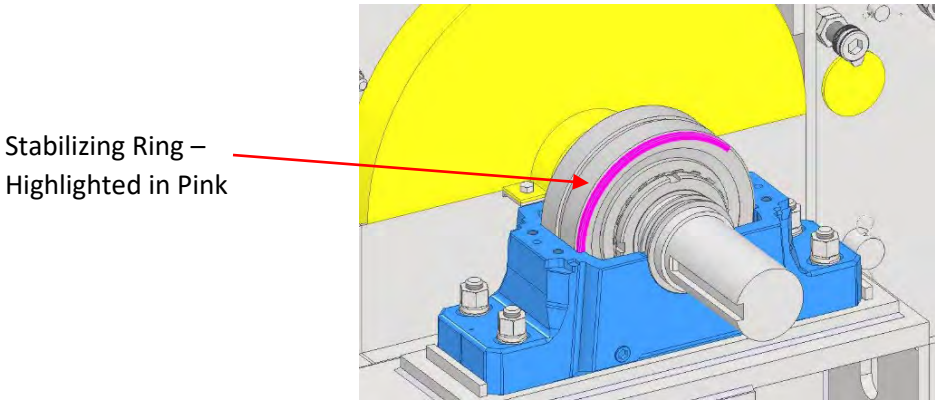
14. Lock the locking nut in place by bending one of the locking washer's tabs down into one of the slots in the nut. Do not bend it to the bottom of the slot.



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.

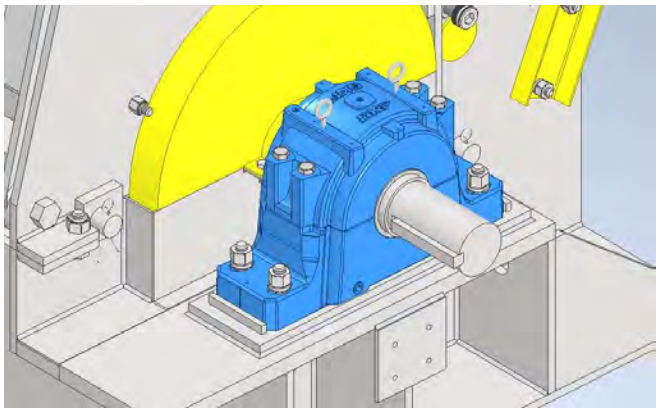


The hog uses only one stabilizing ring per set of bearings, customarily installed on the drive end. The stabilizing ring is a partial ring that can be installed around the shaft and located inside the bearing housing after the bearing has been attached.



2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

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.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

Replacing Rings

HD, HD-GM, & PM-GM

Procedure Notes

Bulletin 57-08-22

2017 Thelma Street | P.O. Box 3687
Jacksonville, Florida 32206 U.S.A.
Phone: (904) 355-5671
Fax: (904) 355-0401
www.montgomeryindustries.com

ROTOR PREPARATION

STOP THE HOG BEFORE PERFORMING MAINTENANCE.

USE PROPER LIFTING EQUIPMENT WHEN HANDLING THE HOG ROTOR AND RINGS. USE EXTREME CAUTION NOT TO CUT OR MASH FINGERS.

DO NOT REMOVE THE ROTOR UNTIL THE FEED HOPPER AND CONVEYOR ARE PROPERLY BLOCKED UP. NEVER INSERT FINGERS OR HANDS THROUGH THE INSPECTION DOOR.

Before replacing the rings on a T3 hog, the rotor must be lifted out of the hog housing. There is not room within the hog housing to properly remove the rings.

On gravity models, the feed hoppers, side housing plates, upper bearing housings, front doors, and rear doors must be removed. Any guard covers that obstruct the rotor from being lifted must also be removed. On Blo-Hogs, the upper fan housing will need to be removed as well.

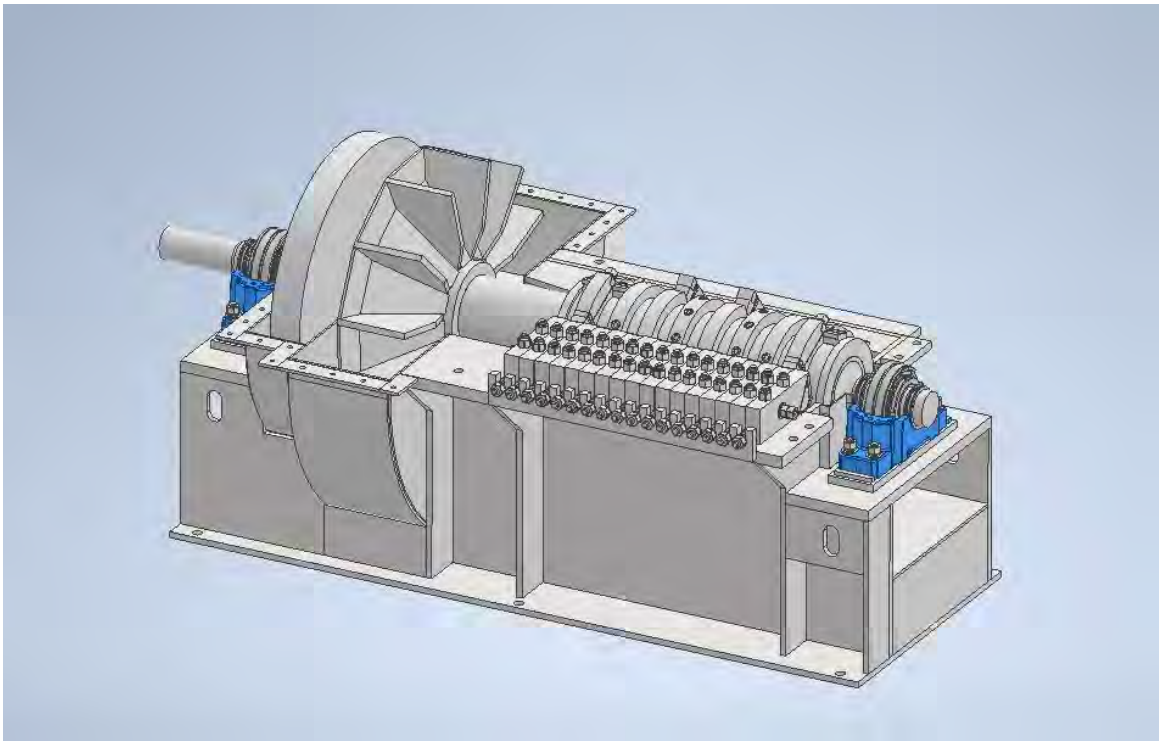


Figure 1: Upper Housing Removed - Gravity Model T3 Blo-Hog

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

On horizontal models, the screen, upper housing, and bearing upper housings must be removed. This includes the fan upper housing for Blo-Hogs. Any guard covers that obstruct the rotor from being lifted must be removed. If a powered feed roll has been installed, it must also be removed. The rear door may remain on the hog, but must be opened so it does not obstruct the rotor. Additionally, the feed chute may remain on the hog.

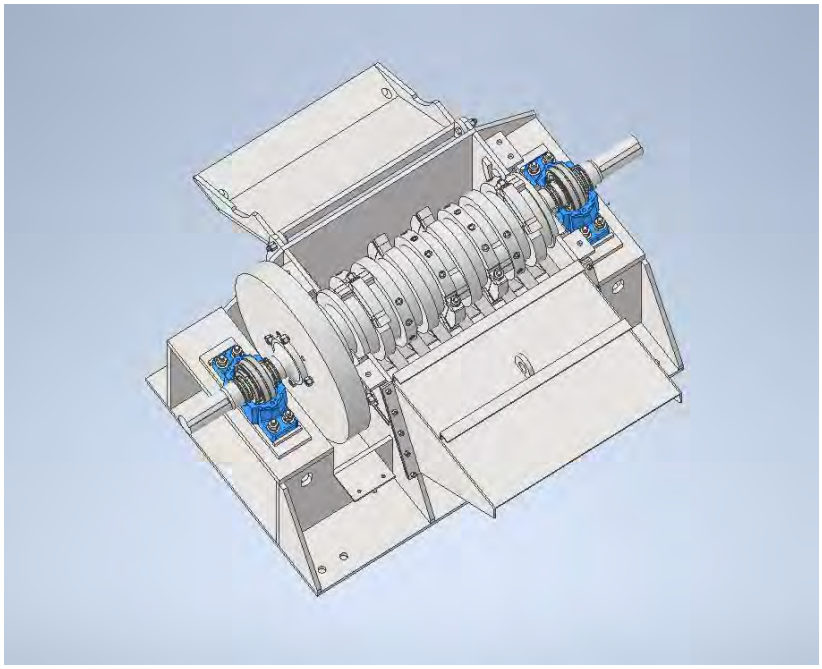


Figure 2: Upper Housing Removed - Horizontal Model T3 Hog

Once it is clear from any obstructions, the rotor can be lifted out of the hog and set down on the floor.

Next, the bearing opposite the flywheel must be removed. The oil seal must be removed, then the locking washer and locking nut. Either a post pole driver or a bearing removal cylinder can be used to dislodge the bearing from the hog shaft. See *Bulletin 57-05-22: Replacing a Bearing* for more information and detailed instructions.

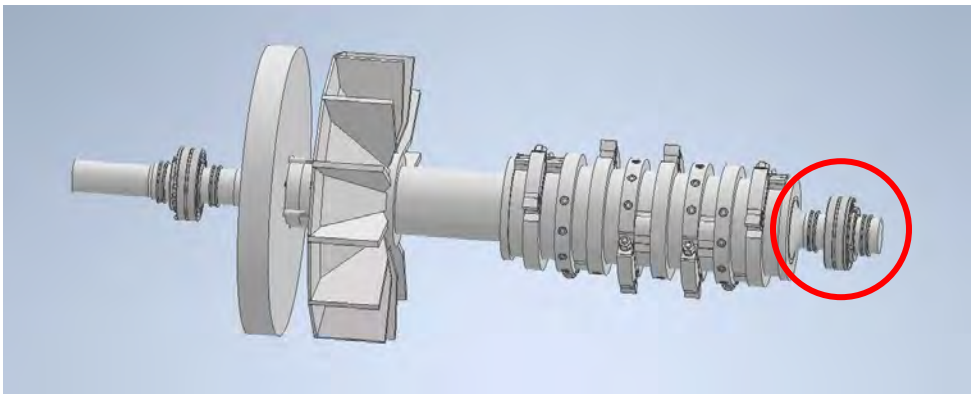


Figure 3: Remove Bearing Opposite Flywheel

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

REMOVING OLD RINGS

SECURE THE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK. THE RINGS ARE TOO HEAVY TO LIFT WITHOUT MECHANICAL ADVANTAGE. USE A LIFTING DEVICE THROUGHOUT THIS ENTIRE PROCESS.

Rings are connected to the hog shaft with a series of shear pins. Before the rings can slide off the shaft, the pins must be removed. This process includes the removal of all setscrews, spacers, oil cylinders, and shear pins.

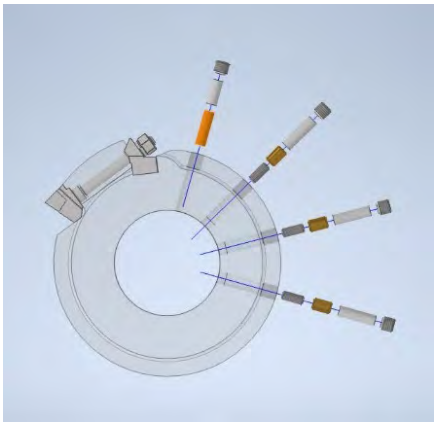


Figure 4: Setscrews, Spacers, Oil Cylinder, Shear Pins

Ideally, the rotor shaft should be mounted where it can be easily turned. However, if this is not possible, the rings can still be removed and replaced with the rotor resting on the floor.

Figure 5: Mounted Rotor Shaft

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

First, remove all setscrews. The setscrew threads have been "locked" in place with dimples to prevent them from vibrating loose. In addition, the setscrews are likely worn. It is expected that they will get discarded after removal. They will be replaced with fresh setscrews during ring reinstallation.

Figure 6: Locking Dimples on Setscrews

Once the setscrew has been backed out of its hole, the spacers and oil cylinders beneath should pull out with very little resistance. If the rotor is able to rotate, turn the shaft so the hole is facing down and allow gravity to drop these out. If the rotor is resting on the floor, the cylinders and spacers can be pulled out. **Use extreme caution to not get fingers stuck in holes while removing the spacers and oil cylinders.**

Next, the shear pins must be removed. A Shear Pin Extractor has been included with the recommended spares for each hog to aid in this process. Screw the extractor as far into the shear pin as possible, then lift up to pull the shear pin out of the ring.

Figure 7: Shear Pin Extractor

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

If a Shear Pin Extractor is unavailable, a 5/8" NC x 6" cap screw can be used to remove the shear pins. See *Bulletin 23-10-15: FS, HD, & PM Hog Maintenance* for further information.

There is a setscrew located underneath each shear pin to aid in removal if the shear pin has sheared. **Unless they have been used to pull out the shear pins, these do not need to be removed.**

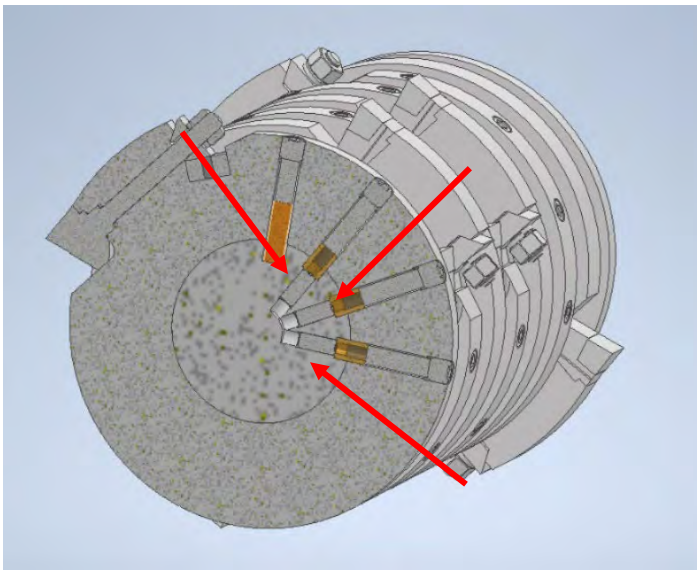


Figure 8: Setscrews Below Shear Pins Do Not Need to be Removed

Once all setscrews, spacers, shear pins, and oil cylinders have been removed, the rings can be removed from the shaft. Rings can be slid off individually or pressed off as one unit.

Figure 9: Sliding Rings off Shaft

In some cases, the rings may be on so tight that pressure will fail to remove them. In such instances, heat may be required to expand the rings enough for removal.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

INSTALLING NEW RINGS

SECURE THE ROTOR SO IT CANNOT SHIFT PRIOR TO BEGINNING WORK. THE RINGS ARE TOO HEAVY TO LIFT WITHOUT MECHANICAL ADVANTAGE. USE A LIFTING DEVICE THROUGHOUT THIS ENTIRE PROCESS.

First, slide the new rings onto the hog shaft. It is possible to slide the rings on backward, so ensure the seat for the tooth head is facing into rotation.

It may be helpful to fully install one ring at a time, rather than attempting to keep them all aligned and secure throughout the installation process.

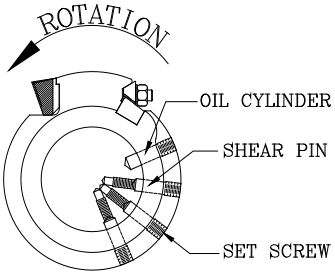


Figure 10: Proper Ring Direction

If an entire set of rings is purchased, it is **STRONGLY RECOMMENDED** that the customer also elects to have them assembled and balanced at the factory prior to shipment. **Each ring will be numbered; be sure to install them in order. This ensures the rotor is properly balanced**. If the customer has opted to not include dynamic balancing, it is the responsibility of the customer to balance the rotor in the field.

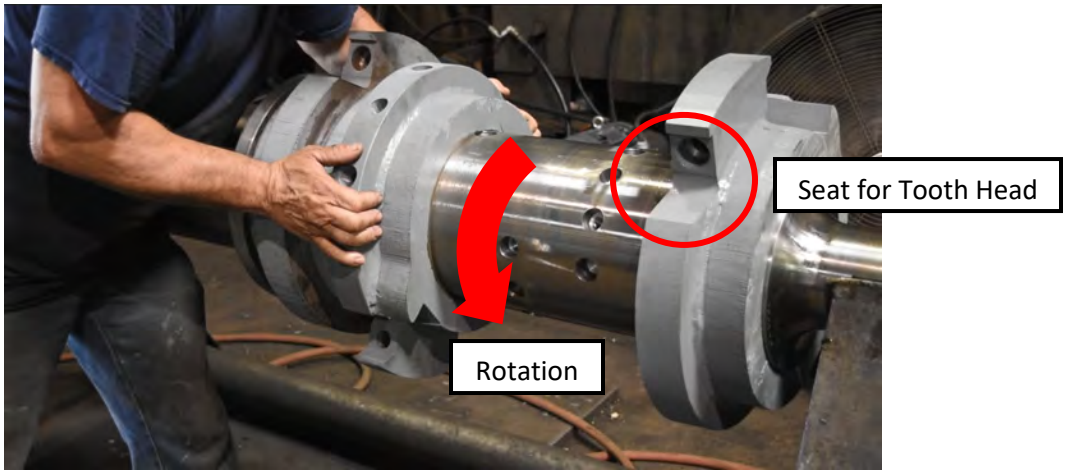


Figure 11: Sliding Rings into Position

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

Once a ring is on the shaft, the holes on the ring must be lined up to the corresponding holes on the hog shaft. A flashlight can be used to see down each hole and ensure it has been properly aligned.

Before securing the ring in position, be sure that all holes are clear of debris. This verification can also be accomplished with a flashlight.

Next, insert the shear pins into the three holes furthest from the lug. These have an interference fit, and should have to be driven into place. **If a shear pin drops in easily, it is likely in the oil cylinder hole, not in its proper location.**

Figure 12: Order of Holes - Oil Cylinder Closest to Lug

Be sure that the shear pins seat on the bottom of the hole. **Be careful to install them with the threaded half of the shear pin facing outward.** The unthreaded half should be in the shaft, and the threaded half should be in the ring.

Figure 13: Driving Shear Pin into Position

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

Next, insert the oil cylinder into the **first** hole after the lug. Drop all spacers into the holes above the shear pins and oil cylinder. The shorter spacer should be inserted above the oil cylinder, and the longer spacers above the shear pins.

Figure 14: Inserting Spacers

Once the oil cylinder, all shear pins, and all spacers are in place, new setscrews can be installed. Setscrews should be tightened until they sit just below the surface of the ring. **Take care to not overtighten setscrews, as this can break the oil cylinders.**

Figure 15: Inserting Setscrews

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

Finally, use a center punch to punch dimples around each setscrew. These will act as “locking” mechanisms that prevent the setscrews from backing out.

Figure 16: "Locking" Dimples

Figure 17: Dimples Around Every Setscrew

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

ROTOR REINSTALLATION

Before reinserting the rotor into the hog, the removed bearing on the side opposite the flywheel must be reinstalled. **Do not tighten the bearing until the rotor has been positioned in the bearing housings.** See *Bulletin 57-05-22: Replacing a Bearing* for more information.

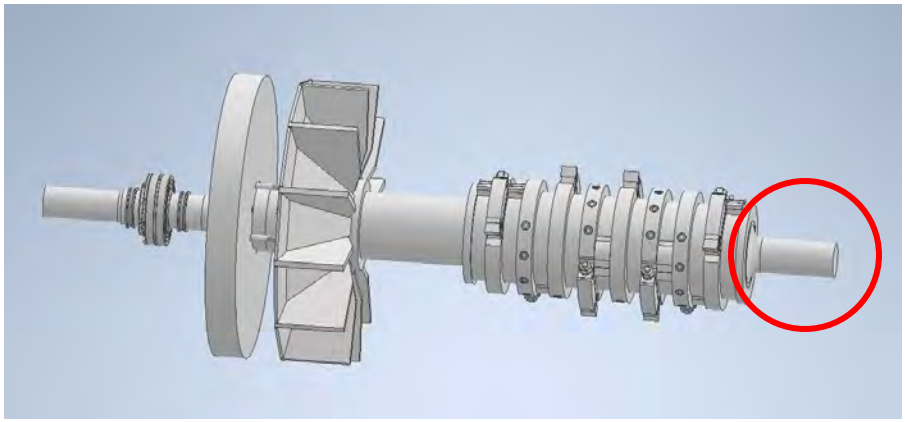


Figure 18: Bearing Must be Reinstalled

Using proper mechanical advantage, the rotor can then be lifted and placed back down into the hog housing.

USE PROPER LIFTING EQUIPMENT WHEN HANDLING THE HOG ROTOR AND HOUSING COMPONENTS. USE EXTREME CAUTION NOT TO CUT OR MASH FINGERS.

Be sure the bearing housings are free of any debris, then reinstall the bearing housing caps. **The bearing caps should be installed first to ensure the bearings do not get damaged during housing reinstallation.**

Finally, reinstall all upper housing pieces. This includes all doors, hoppers, conveyors, feed rolls, and guard covers.

DO NOT OPERATE THE HOG UNLESS ALL HOUSING PIECES AND GUARDS ARE IN PLACE. THIS IS A HIGH-INERTIA ROTOR AND CAN VERY EASILY CAUSE INJURY IF IMPROPERLY INSTALLED.

Before placing the hog back into operation, ensure there are teeth in the new rings. Operating without all teeth can lead to imbalance. Additionally, the tightness of the teeth in the new rings and the tooth-anvil clearance should be confirmed before restarting the hog.

2017 Thelma Street Jacksonville, FL 32206
Phone 904.355.5671 | Fax 904.355.0401
www.montgomeryindustries.com

MONTGOMERY
INDUSTRIES INTERNATIONAL

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.

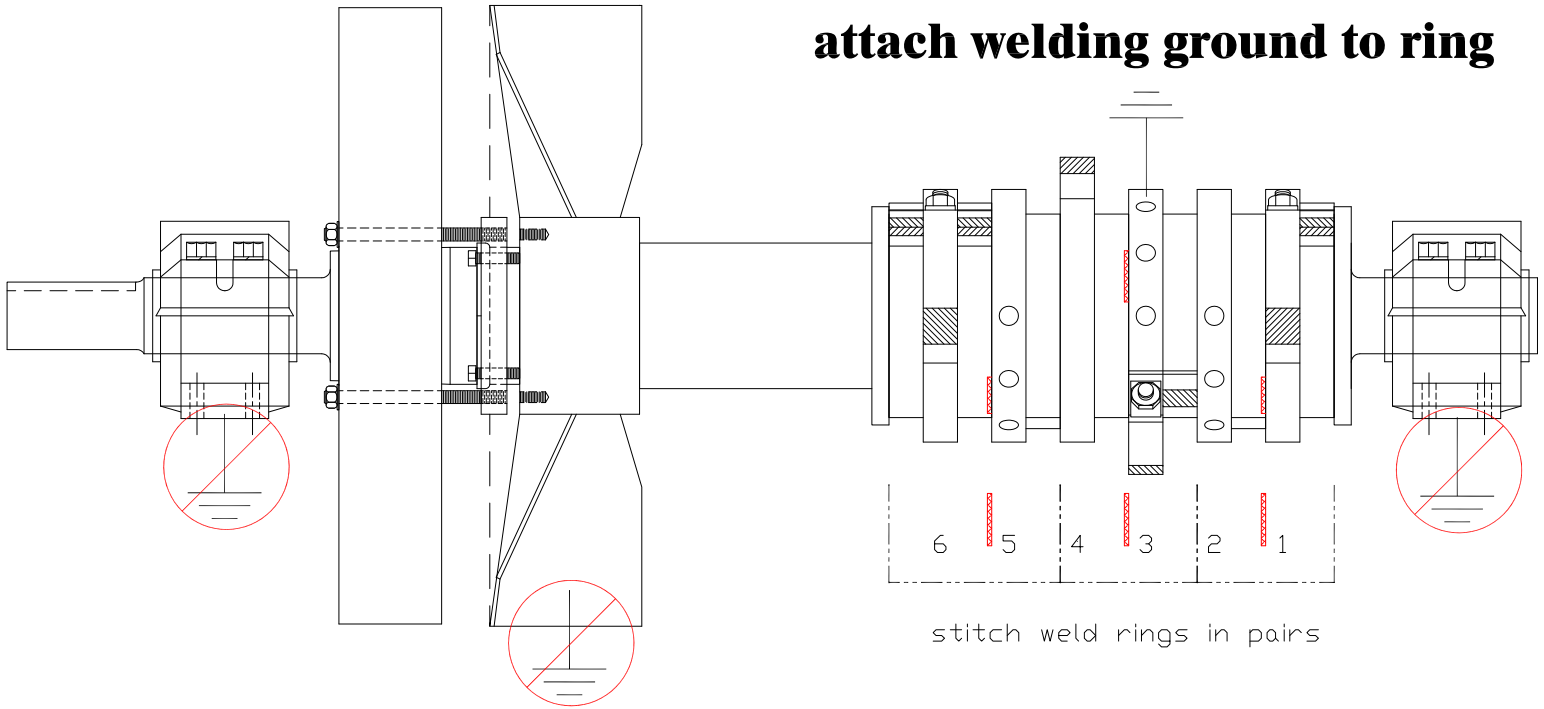
Due to the wide variation in applications, there is no standard interval between checks that would be applicable to all installations. Actual operating experience will allow each customer to determine the maximum time interval between checks for the particular installation.

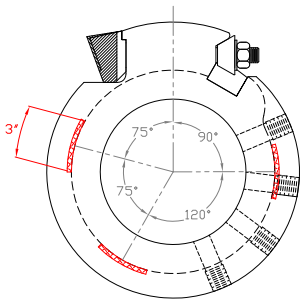
√ Be careful when installing new parts as fingers are easily smashed.

√ 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.


Stitch Weld Rings Together in Pairs
End Flange

attach welding ground to ring





do not let welding current run through shaft or bearings

DAMAGE MAY OCCUR!


Attach welding ground to
ring lug.


(1) Stitch weld by shear pins


(1) Stitch weld behind ring lug


(1) Stitch weld opposite ring lug