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5 Slurry Pump Hacks Every Millwright Should Know

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1. Safest Way to Remove a Stuck Impeller
2. Properly Pack Your Stuffing Box
3. Tricks to Tightening Mechanical Seals
4. Best Method for Shaft Sleeve Removal
5. Easiest Way to Mount Snap Ring Gaskets

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Safest Way to Remove a Stuck Impeller

Impellers can get stuck for many reasons. Here are two common problems you'll see in the field:

- **Using only one gasket or none at all** — it is important to always use two gaskets. They work against one another for easier removal. When you use one, the impeller will want to overtighten on the shaft, so it makes it more difficult to get off. Two gaskets slide against one another, making it easier to break loose. If you don't use any gasket at all, it all galls together.

- **Applying anti-seize to the hub face** — People like to use anti-seize on the threads, faces of the shaft sleeve, the impeller, and the gaskets. That actually causes it to overtighten: It allows the parts to become more slippery and it will overtighten on the shaft. A good rule of thumb is if you want to use anti-seize on the threads of the shaft and the impeller, keep the axial faces of the shaft sleeves, the gaskets, and the impeller hub dry. If you get anti-seize on those areas, the impeller will tighten even further on the shaft. This can lead to over-torqing and you may break the shaft or the impeller itself.

Most "stuck impeller" issues have to do with gaskets. But some extenuating circumstances exist that can also lead to impellers getting stuck on pump shafts.

For example, the threads can break on either the shaft or the impeller, the threads can get crossed, and you can't get the impeller to break loose. If you inspect the threads and they look damaged or broken,

Did You Know?

Putting a new impeller on worn threads results in rapid failure and damage to other wet-end parts.

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clean them up. We recommend cleaning them up by using a pencil grinder so you don't risk doing more damage.

While operators can still run their pumps with stuck impellers, the bearings will fail, and they risk damaging their pump motors. This can lead to additional repair issues.

When the bearings fail in the assembly, you cannot turn the shaft to break the impeller loose. At this point, there's not much that can be done other than to cut the shaft off behind the impeller to get it out.

Drop Arm Procedure

In those cases when normal maintenance procedures cannot remove the impeller, a technique using a drop bar and impeller inertia can be used to break the threads loose.

The end of a weighted bar is lifted and allowed to drop, turning the impeller in the normal operational direction. When the end of the bar hits a stop plate on the floor, the shock of the sudden stop combined with the inertia of the impeller will generally loosen the plug threads.

Drop Arm Device

Safety Tips

Pump operators should follow these safety guidelines if they have significant challenges removing their impellers.

- Make sure the impeller is fully seated before you start the pump. If the impeller is not screwed all the way on when you are ready to start the pump, it will collide with the shaft sleeve and may cause damage to the impeller or the sleeve itself.
- Under no circumstances should heat be applied to the impeller! Air and moisture trapped in the internal cavity can expand and cause the impeller to explode!
- Never run the motor backwards to loosen or remove the impeller! This can cause mechanical damage as well as putting personnel at risk.

For more information contact GIW Tech Services.

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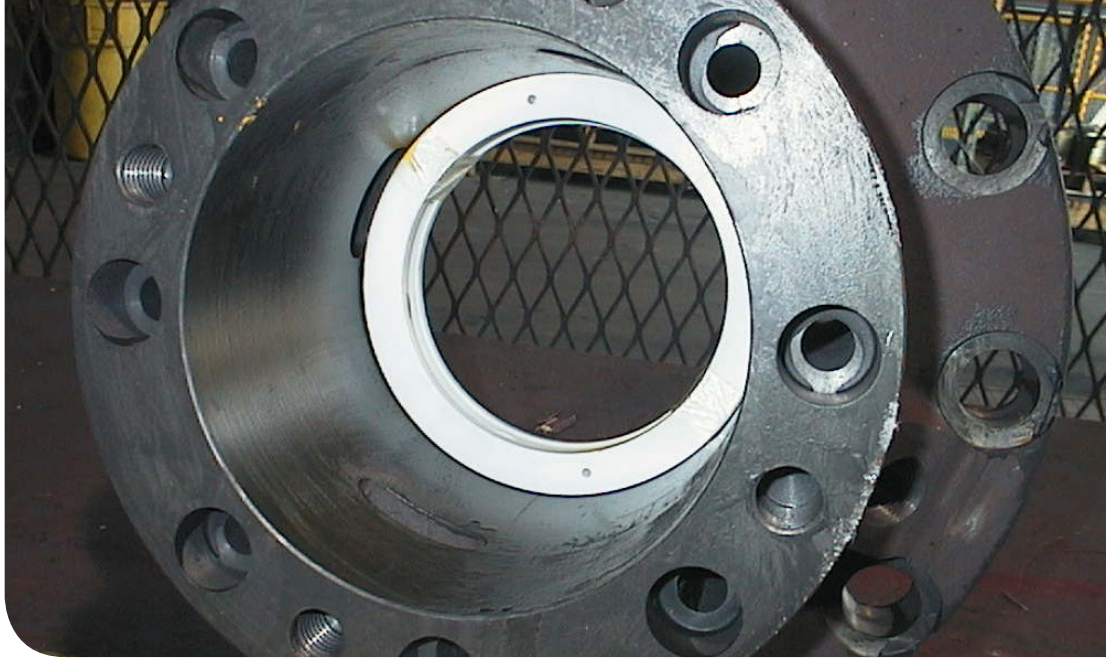

Properly Pack Your Stuffing Box

Keep your pump running efficiently with proper cleaning and packing procedures in just 6 steps:

1. **Inspect.** Disassemble the parts and inspect them to make sure there is no grooving, sharp burrs, or excessive wear in the area of the parts that you're removing.

2. **Align.** After inspection, check to make sure the stuffing box ID is concentric by taking a centering device, telescopic bore gauge, or micrometer and measuring in four places: 12, 3, 6, and 9 o'clock. This will allow you to align the stuffing box with the shaft sleeve. If you don't have a centering device or telescopic bore gauge, you can take a shaft sleeve and center it along with a piece of packing to see if it's centering correctly.

3. **Install lantern rings.** The number of rings of packing will depend on the design of the stuffing box, and that will determine how to pack your pump. See your pump BOM for details.

   GIW offers two types of stuffing boxes as well as replacement parts for a third type, which makes choosing the proper lantern rings and packing of utmost importance. Be careful not to pack for the wrong type!

   KE designs are best for minimum water usage and require one or two packing rings ahead of the lantern ring. In this model, the lantern ring aligns with the gland port with two to three pieces of packing behind.

Did You Know?

GIW offers two types of stuffing boxes and replacement parts for a third type. Be sure to choose the lantern rings for the right type!

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Throat bushing designs replace the forward piece of packing on a stuffing box. It produces a throttle effect that lightly restricts water flow. The throat bushing lantern ring design is longer making it important to align the throat bushing lantern ring with the gland port to avoid failure. This style is easier for maintaining in the field as it's not necessary to pull the throat bushing out unless it's damaged.

Forward flush designs, although phased out due to excess water usage, are still used where gland water supply is plentiful and it's not necessary to worry about process flow dilution. While GIW doesn't supply forward flush designs on new pumps, operators in the field still use them and GIW still supports and services them.

4. **Pack and tighten.** Once you know what style lantern ring is being used, you'll know the number of packing rings required. The next step is to ensure each packing ring is cut to the correct length prior to installation. Once verified, it's time to install the stuffing box packing rings. GIW sells these prepackaged and precut with angled ends, which ensures they're the correct length based on the shaft size and makes for easier installation. If packing is cut too short or too long, it can lead to premature failure.

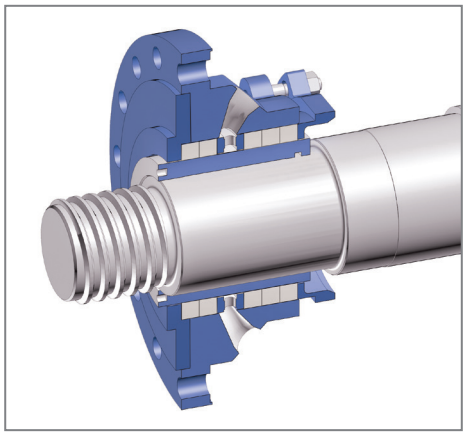
   When packing your stuffing box, ensure you stagger the joints so they are not in alignment and the last piece is at the six o'clock position. Firmly seat each of those rings with a suitable tamping tool. If you find tightness when installing packing, you can use a 2- to 3-inch-long piece of PVC pipe cut in half to tap packing into place. Another option is to use a lubricant on the underside of the packing to help it slide into place. Then, install and tighten the two-piece gland and compress the packing into the stuffing box. When you first tighten it, you don't want to overtighten. Once compressed, back the gland away to release any pressure off the packing. Then, finger-tighten the gland onto the packing.

5. **Apply seal water.** Once you've tightened the glands, apply the seal water right before you start the pump. If there's no leakage coming out at that point, the packing could be too tight. Loosen the packing so you have water flowing through the stuffing box at the gland.

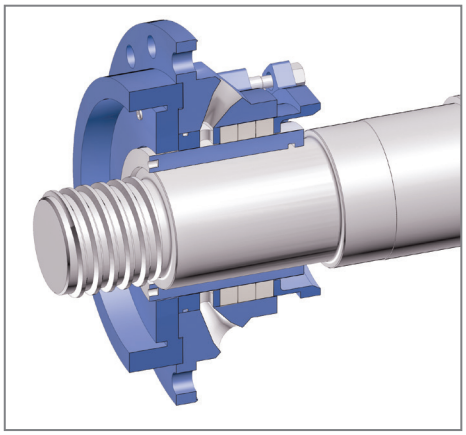
   After start up, look for leakage. Let it run for about an hour or so, allowing the seal water to saturate the packing so it seals correctly. Then, tighten the gland so a pencil-sized stream of cool water exits through the back of the stuffing box.

   It should be warm to the touch, and clear. If it's too hot for handwashing and cloudy, you need to loosen the gland studs.

Common Shaft Seal Arrangements



KE Design



Throat Bushing Design

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With an open-end wrench, tighten the gland one side at a time so you don't overdo it.

6. **Check the flush water requirements.** In most cases, this is going to be dependent upon the discharge pressure. Check the discharge gauge to see what the pressure is, then add 10 PSI.

   For example, if your discharge pressure gauge reads 75 PSI, you will need 85 PSI of pressure on the gland water line.

   Recommended flow rates are also available in GIW pump manuals, allowing pump operators to understand their flow rates by gallons per minute or liters per minute instead of by pressure.

After that, you're ready to go. A properly packed stuffing box can help you reduce operating costs by avoiding high water and power costs. It can also help you steer clear of the shaft sleeve wear that leakage can cause. Prolong your packing and shaft sleeve life while you protect against unexpected shutdowns and failures. Pack properly to extend the life of your pump — and keep your bottom line strong!

Important!

Don't overtighten the packing. This can cause it to burn during startup, glazing the bottom side of the packing, causing it not to seal correctly. If this happens, you may have to wait several hours for the stuffing box to cool down and reinstall.

3

Tricks to Tightening Mechanical Seals

While many centrifugal slurry pump owners choose expellers or stuffing boxes over mechanical seals, mechanical seals can offer significant savings if maintained correctly.

Mechanical seals eliminate the need for flush water that stuffing boxes require, minimizing water consumption and offering significant savings. They also allow pump operators to maintain environmental barriers between the process and the atmosphere, reducing the potential for leaks and drips while offering environmental protection.

Did You Know?

Since tightening mechanical seals is part of installation, GIW ships the seals with the tabs in place.

Tightening Mechanical Seals

To install or replace a mechanical seal, bolt the seal adapter plate to the pedestal, and hand-tighten the fasteners on. Then, locate the seal fit of the adapter to make sure it's centered and everything is concentric. With mechanical seals, concentricity has a very close tolerance, much closer than that of a stuffing box.

Next mount the adapter plate perpendicular to the shaft. Once the seal cartridge is in, draw it into the adapter on the pedestal evenly by attaching the gland bolts so as not to crack the seal.

An angularity check should be done on these to make sure the adaptor plate is perpendicular to the shaft. This can be done by mounting a dial indicator to the shaft and taking a face measurement of the hub plate to check for any issues. Check the seal instructions and drawing against the actual parts. Note the location of gaskets and O-rings. Be

certain that the locking tabs holding the rotating shaft section of the seal are in place and the fasteners are tight. This keeps the seal faces in contact to prevent damage. Check the fit of the shaft sleeve into the seal bore, and make sure the seal adapter fits into the hub plate or pedestal mounting bore.

Carefully slide the mechanical seal over the shaft sleeve toward the bearing assembly. Do not use any type of tool that could result in impact damage on the seal or any rotating pump part. Move the bearing assembly into position on the pedestal and install the bearing hold-down bolts. Remember that you'll have to adjust the impeller nose gap later.

Slide the mechanical seal into position. If it has quench ports, be certain they are aligned correctly. Lubricate the studs with anti-seize and install the washers and nuts. Center the seal on the shaft and torque the fasteners according to seal manufacturer instructions. Clamp the seal to the shaft according to the instruction sheet. The tightening sequence may be circular rather than staggered, and the final torque value is important. Use a torque wrench at the correct torque values.

Each mechanical seal is equipped with a number of lock tabs to hold the inner section in the proper location during assembly and adjustment. Never rotate the shaft with lock tabs in place. Remove the tabs and store them with their fasteners since they will be required for all future maintenance procedures. If you're using a quench or lubricating system, install it now.

Then, with the drive coupling or belts disconnected, turn the shaft by hand once to check for free rotation.

To adjust the nose gap, install the lock tabs in the seal and then loosen the shaft clamp. This allows the shaft to move axially. Do not rotate the shaft with the faces locked, or it may damage the O-ring between the seal and shaft sleeve. Loosen the bearing assembly hold-down bolts and move it forward carefully until it just contacts the suction plate. Leave one bolt on the drive end snug to keep the housing from tilting. Tighten the shaft clamp, loosen the lock tabs, and rotate the shaft one full turn to verify that the "high spot" is actually making contact.

Following the torque procedures and values for mechanical seals will insure a tight seal and proper installation.

Things to Consider before choosing mechanical seals:

Price — Mechanical seals can range in price from $6,000 to $40,000, stuffing boxes range from $500 to $3,000, depending on shaft size. However, mechanical seals can offer significant savings over the lifetime of the pump if maintained correctly.

Maintenance — Your maintenance crew must understand mechanical seals very well in order to reap the full benefit of your investment.

Slurry composition — Mechanical seals are ideal for slurry applications that don't have large particles. Also, one should be aware of slurry temperature, and pH of the materials.

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4

Best Method for Shaft Sleeve Removal

The key to maintaining any complex machinery is being proactive rather than reactive. That's why shaft sleeves and their maintenance are so essential to slurry pump operations.

After you remove the impeller, scrape the gasket material off the sleeve face to expose the threaded holes. Spraying both ends of the sleeve with penetrating oil and allow it to soak beforehand will assist in removal. Using the correct thread size, screw a slide hammer into one of the holes and pull the sleeve off. Sleeve removal can normally be simplified by pulling the packing from the stuffing box.

- **Cold chisel and hammer -** use proper eye protection and safety precautions. Create a few notches in the sleeve using a cut-off wheel on a grinder. Note that the hardened surface of the sleeve typically ends about ½" (12mm) from the shaft shoulder. Use the chisel to drive the sleeve off, rotating the shaft to distribute impacts evenly.

- **Remove a corroded shaft seal -** occasionally, the sleeve may become corroded to the shaft. This is typically caused when the shaft isn't coated with sufficient anti-seize, or the sealing o-ring is not properly installed and process fluid migrates under the sleeve. In this case, spray both ends of the sleeve with penetrating oil and allow it to soak. Multiple applications work best.

  Tap the outside diameter of the sleeve with a hammer while rotating the shaft. This will help break up the corrosion and

Did You Know?

The most efficient way to remove the shaft sleeve is by using a shaft sleeve lifting device.

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loosen the sleeve. There is a very small clearance between the sleeve and the shaft so it will move slightly as it loosens. Don't "beat on it" excessively or the radial bearing could be damaged. Reapply penetrating oil and remove the sleeve with the slide hammer.

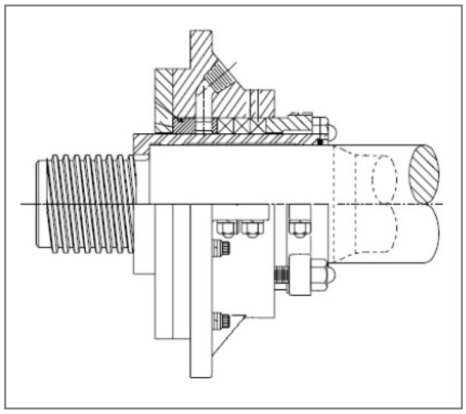
The sleeve material is normally 1026 steel so additional holes may be drilled and tapped into the face of the sleeve for the slide hammer if needed. Use the same bolt circle diameter as the existing holes to avoid shaft damage.

Using a torch is not recommended. Moisture trapped between the sleeve and shaft could create a hazardous condition. Excess heat could damage the shaft or other components.

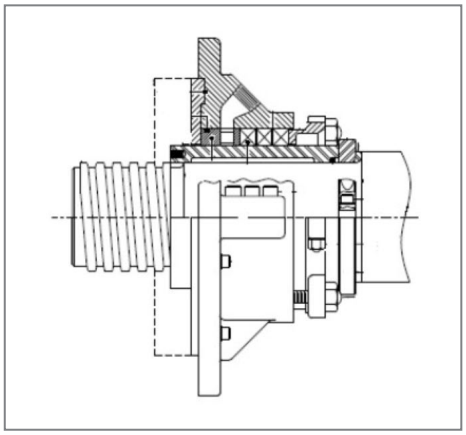
Once the sleeve is removed, clean the shaft to remove rust and dirt. Follow the instructions in the GIW Maintenance Manual and install the new sleeve with sealing o-ring and two (2) impeller gaskets.

To avoid early replacement, shaft sleeve best maintenance practices include regularly inspecting slurry pumps for unusual vibration or wear and establishing a routine maintenance schedule. As specified in your slurry pump user manual, replace oil quarterly. At this time, routine maintenance should include removing shaft sleeves to check for wear and repacking the stuffing box. The safest and most efficient way to remove the shaft sleeve is by using a shaft sleeve lifting device.

Hook style sleeves are standard on 2-15/16" – 4-7/16" stiffened shafts.



Hook Style Design



Impeller Release Ring Design

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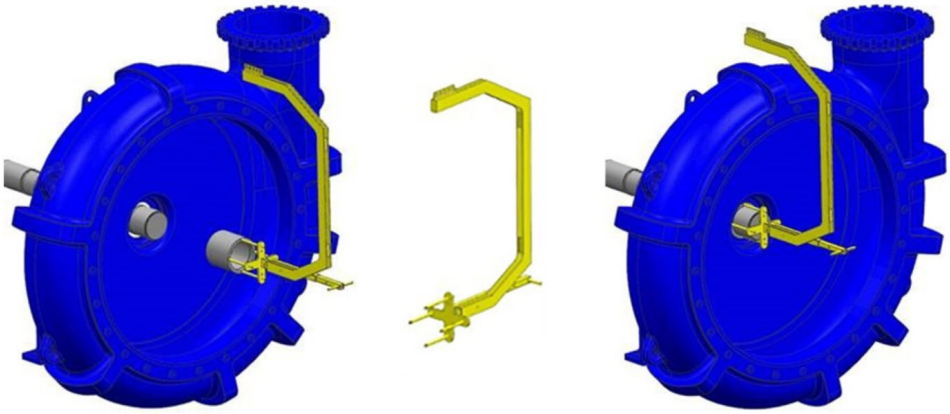
What are shaft sleeve lifting devices?

As pumps become increasingly larger, heavy pump components become more difficult to remove. To solve this issue, technicians at GIW have developed a specialized tool that allows for easy shaft sleeve removal. A shaft sleeve lifting device utilizes a pusher bolt system eliminating the need for a slide hammer. Much like impeller lifting jigs, shaft sleeve lifting devices are specifically configured to match the weight and center of gravity for the components they remove. Because the impeller must be removed before the shaft sleeve, a shaft sleeve lifting device should be used in conjunction with an impeller lifting device.



Shaft sleeve replacement process
To replace a shaft sleeve, follow the instructions indicated in your maintenance manual, beginning with removing the impeller. Then, once you've removed the shaft sleeve, it's essential to clean rust and dirt from the shaft. If excessive leakage exists near a shaft seal, it may be time to replace the worn shaft sleeve entirely. When installing a new sleeve, don't forget to include a sealing O-ring and two impeller gaskets.

GIW standard shaft sleeves are hard-faced with a flame-spray applied Nickel-Chromium alloy on top of 1026 steel for a smooth, resilient, and extremely hard surface, thereby providing extended packing life. They're much more cost-effective to replace and can safeguard against slurry pump malfunctions. It's important to know your shaft sleeves are functioning optimally for the best pump performance.

Important!

GIW Tech Services experts can ensure you choose the right shaft sleeves and lifting devices for your pumps. For a list of all our offerings and how they can benefit you, call +1 (706) 863-1011.

5

Easiest Way to Mount Snap Ring Gaskets

It may sound like an odd pairing, but baby powder can help with slurry pump maintenance.

Have you ever had an issue installing or maintaining your pump's snap ring gasket? Without lubrication, this gasket would bind and not install correctly and, once you'd installed the suction liner, it would be difficult to determine if the gasket was seated properly.

If you've ever attempted to put on wet gloves or socks before, you know how difficult it is to do. The same gripping phenomenon you experience when you try to put on wet clothes is what you see in snap ring gaskets.

This gripping action is friction, and you need a lubricant to combat it. However, traditional oil-based lubricants won't work. That's where our secret for dry lubrication comes in: With the use of baby powder or cornstarch, installation is much smoother and it's easy to see whether the gasket is in the right spot.

While lubricants such as soap, O-ring lubricant, white lithium grease or even anti-seize may be the go-to option since they are usually easy to find in a shop, dry lubricants such as baby powder may provide an advantage when assembling a pump fitted with a snap ring. This handy and cost-effective lubricant is a popular one for applications for which oil-based lubricants aren't desirable, particularly on rubber parts like snap ring gaskets. It's a method our GIW service and assembly crews use every day.

Did You Know?

Talcum powder acts as a dry lubricant and can absorb moisture, oils, and odors. These properties make it an important ingredient in baby powders, foot powders, first-aid powders, and cosmetics. It's also extremely versatile for use in many industrial applications — including slurry pump maintenance.

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About GIW

GIW Industries, Inc. is the leading manufacturer of centrifugal slurry pumps worldwide. GIW products are used across the globe in industries such as mining and mineral beneficiation, dredging, sand and gravel and coal preparation.

As a fully owned subsidiary of KSB, a worldwide pump and valve group, GIW engineers and produces slurry pumps under the GIW® Minerals brand name. GIW has two facilities for manufacturing and assembling all-metal and rubber-lined pumps and for casting a variety of abrasion and corrosion-resistant gray iron, ductile iron and white iron, and steel alloys.

Visit **giwminerals.com** or contact us at **GIW-Parts@ksb.com** to learn more about GIW® slurry pumps.

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