



Technical Bulletin TB-029 Pump Mechanical Seal Installation

Revision 0, 3/20/2018, Ross Putvin

Clean Surfaces Are Critical To Ensuring Seal Performance



Replacing the Seal

When replacing the mechanical seal on an end-suction centrifugal pump it is critically important to ensure that no contaminants are present on either of the sealing surfaces. Something as simple as a light touch of the sealing surface can lead to premature seal wear or failure. Performing the task on a clean bench away from dust, dirt, debris, water, oil, etc. is recommended.

The following procedure is a step-by-step guide to replace the mechanical seal and rebuild the wet end of a standard Dry Coolers / Kinetic pump. This begins with the pump completely disassembled, ready for rebuild.

Materials Required

- Motor
- Adapter with wear ring (smaller pumps do not have an adapter wear ring)
- Pump seal kit (shaft o-ring, shaft seal, adapter seal, seal spring, lubricant, case o-ring, slinger)
- Reused internal components: Shaft Sleeve, Shaft Key, Retaining Nut & Bolt
- Impeller
- Pump case (with wear ring)
- Cleaner/degreaser
- Isopropyl alcohol
- Hand tools – 1/2", 9/16", 3/4", 15/16" open-end wrenches, scraper, paper towel

Procedure

1. Clean the motor shaft (Illustration 2). Ensure all oil, paint, rust, grease, dirt, or other contaminants are removed from the shaft and mating surface of the motor. Any foreign matter on the shaft can lead to an improper seal or premature wear of the seal. If the shaft key is installed remove the key and clean both the key and keyway. A degreaser or solvent safe for use on ferrous metals is recommended to ensure a clean surface.



Illustration 2: Cleaning the Motor Shaft

2. For 1.625" diameter motor shafts a slinger is required (illustration 3). The inner diameter of the slinger is beveled on one side and flat on the other. Place the slinger on the motor shaft such that the bevel faces the motor, providing a flat surface to assembled the seal components against.

3. Place the shaft o-ring onto the motor shaft, and slide it back until fully seated against the slinger (for 1.625" shafts) or shaft shoulder (1.25" shafts) (Illustration 3).
4. On the pump adapter, clean the contact surfaces thoroughly (Illustration 5). Ensure the old seal has been removed and the seal pocket in the adapter is completely clean and dry.



Illustration 4: Lubricating the Adapter Seal Pocket
Illustration 5: Cleaning the Adapter Seal Pocket

5. Lubricate the seal pocket on the adapter (Illustration 4). A small amount of lubricant is needed to facilitate installation. Excessive lubricant can prevent a proper seal and cause leaks after assembly. Wipe away any excess with a clean paper towel.
6. Open the new seal kit and carefully remove the components (Illustration 6). The critical sealing faces are protected with a white paper wafer between them. **DO NOT TOUCH THE FACES OF THE SEAL.** Use the wafer as a barrier to protect the face of the seal during assembly. Any dirt,



Illustration 6: New Seal Kit

debris, scratches, oils, etc. can compromise the seal. (discard the paper wafer after use). **ALWAYS SET SEALS FACE-UP TO PROTECT THE SEALING SURFACE FROM CONTACT.**

7. GENTLY set the seal into the adapter with the protected face of the seal facing outward from the adapter.
8. Using the palm of your hand and with the wafer in place to protect the seal, press the seal into the adapter body evenly until it is completely seated into the pocket. The seal may not be flush with the face of the adapter when fully installed. The o-ring or rubber on the outside of the seal is the only force that must be overcome to press the seal in place. DO NOT USE MECHANICAL MEANS – a hammer, wood block, shop press, or similar tools WILL damage the seal.
9. Flip the adapter over and inspect the seal installation (Illustration 7). Ensure the seal is fully seated at all points. If the seal is not evenly and completely against the adapter body attempt to press the seal in with more force than previously applied.



Illustration 7: Inspecting Seal Seated
Illustration 8: Adapter Seal Fully Installed and Cleaned

10. To ensure the face of the seal is still clean use a small amount of isopropyl alcohol with a clean paper towel to gently wipe the face of the seal clean. DO NOT USE ANY OTHER CLEANERS OR SOLVENTS ON THE SEAL. (Illustration 8)
11. Taking great care not to touch the seal with the motor shaft, install the adapter onto the motor with the seal facing away from the motor.
12. Using similar methods to the motor and adapter, ensure the impeller is clean, and free of dirt, debris, rust, etc on the mating surfaces and keyway. (Illustration 9)

13. Ensure the seal's spring seats fully onto the impeller by placing the metal cupped end of the spring onto the impeller. (Illustration 10). Remove and set the spring aside after verifying fit.



Illustration 10: Checking Seal Spring Fit on Impeller

14. Prepare a clean and dry work area to assemble the shaft seal onto the shaft sleeve. Place a clean paper towel on the work bench to avoid working directly on the table/bench surface.
15. Place the shaft sleeve on the work surface with the beveled end down. (Illustration 11)
16. Lubricate the upper 1/3 of the outside of the shaft sleeve to facilitate seal installation. Excessive lubrication can build up on the sleeve surface and contaminate the seal face during assembly. Take care to not over-lubricate the shaft sleeve.



Illustration 12: Seal Orientation on Sleeve

17. Place the shaft seal onto the shaft sleeve with the rubber side of the seal facing up. Be sure to protect the seal from incidental contact. and **do not touch the sealing face**. (Illustration 12)
18. Using the palm of your hand press the shaft seal down the shaft sleeve until the seal is approximately 1/4" from the bottom of the sleeve. Proper spacing will be established in a later step and is not critical at this stage. (Illustrations 13 & 14)



Illustration 14: Hand-Spaced Seal on Sleeve

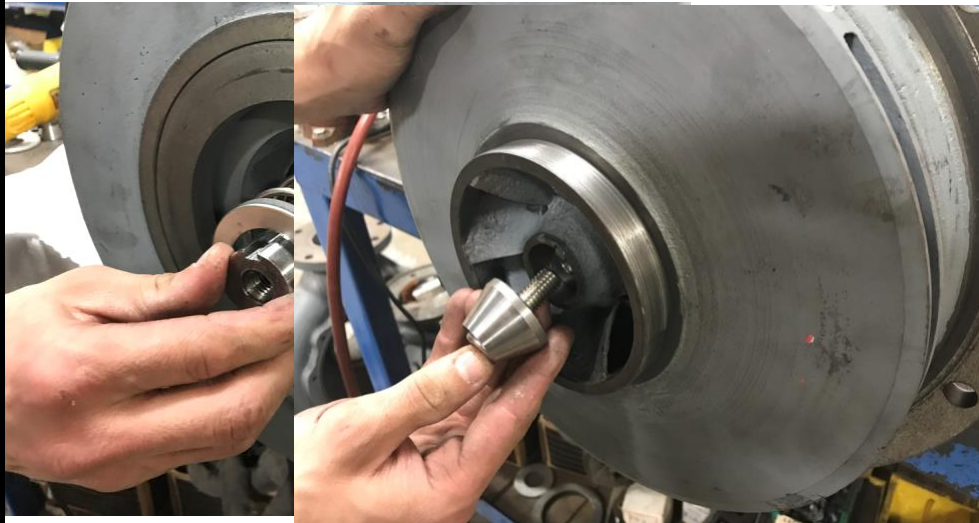
19. Slide the shaft sleeve over the motor shaft, seal-end first, until contact with the other side of the seal is made. Continue sliding the shaft sleeve into the assembly until the sleeve makes contact

with the slinger (1.625" shafts) or shaft shoulder (1.25" shafts). Seal spacing on the shaft sleeve is now set. (Illustrations 15 & 16)



Illustration 15: Shaft Sleeve on Motor Shaft
Illustration 16: Properly Spaced Seal

20. Slide the seal spring, open-end first, onto the seal assembly. Ensure the spring is fully seated on the narrow end of the shaft seal. (Illustration 17)



The Seal Spring
Illustration 18: Installing the Retaining Nut

21. Place the shaft key into the shaft keyway
22. Install the impeller onto the motor shaft. Ensure the key is fully seated in the impeller keyway and is not shifted back on the motor shaft. Ensure the seal spring is seated on the face of the impeller and even pressure is applied to the seal.

23. Install the retaining nut and bolt into the shaft to secure the impeller and seal onto the motor. Tighten fully to remove any movement from the assembly. (Illustration 18)
24. Rotate the motor shaft several times, paying close attention to the face of the impeller, and ensure the impeller is spinning evenly with no wobble, misalignment, or play through the entire revolution. (Illustration 19)
25. Install the case o-ring on the adapter. Apply a light amount of lubrication to the o-ring to prevent the o-ring from binding during installation of the pump case. (Illustration 20)
26. Using similar methods to the adapter and impeller, clean and inspect the pump case. Ensure the wear ring shows even wear, and the case is free from dirt, debris, rust, or other contaminants.
27. Install the pump case onto the main assembly. Ensure the case o-ring is not pinched during installation. (Illustration 21)



Alignment – No Impeller Wobble

Illustration 20: Installing the Case O-Ring



Illustration 21: Installing the Pump Case

28. Using a staggered or “star” pattern, evenly tighten all of the bolts to fasten the pump case to the adapter.
29. Reinstall the pump, confirm the seal is holding water, and resume operation.

RELATED BULLETINS:

- Technical Bulletin TB-013: Pump Evaluation

REVISION LEVEL:

- Rev 0: 3/20/2018, Ross Putvin