Milwaukee Cylinder: Re-assembly Procedure for Series H High Pressure Hydraulic Cylinder

16 Dec 2013
Procedure Steps

1. Starting Point
2. Putting Seals on Piston
3. Installing Blind End Tube Seals
4. Installing Tube into Blind End-End Cap
5. Installing Rod End Tube Seals
6. Piston Installation
7. Final End Cap Assembly
8. Installing Rod Bushing & Seal
9. Installing Retainer Plate
10. Installing Tie Rods
11. Final Torque

Related Part of Cylinder for Procedure Steps

1. (4 bolts)
2. (4 nuts)
3. (4 tie rods)
4. (4 bolts)
5. (4 nuts)
6. (4 bolts)
7. (4 nuts)
8. (4 bolts)
9. (4 nuts)
10. (4 tie rods)
11. (4 bolts)
1. Starting Point

- Cylinder Completely Disassembled and Cleaned

- Parts:
  - End Caps
  - Cylinder Barrel
  - Tie Rods
  - Piston Rod Assembly
  - Retainer Plate
  - Fasteners
  - Seal Repair Kit
    (Recommend replacing all seals with new seals)
2. Putting Seals on Piston
   2.1 Install Back-Up Ring

Note the use of a plain flat tipped screwdriver with the corners rounded off and smoothed out.
2. Putting Seals on Piston
2.2. Install Piston Cup Seals

Cup seals can be stretched with the rounded off screwdriver to install in the piston grooves.

Note: Cup should be outward facing with B/U rings on the backside of cup
Carefully expand the ring to fit over the piston OD and fit into the groove. Be careful not to over expand the ring as this may split the ring.
Installation of seals and cast iron rings completed.
3. Installing Blind End Tube Seals

3.1 Install Tube Seal Back Up Ring

The back-up ring is installed first on the end of the tube.

Note: The correct location for installation is the smallest diameter of the barrel.

Note: Only install seals on one end of the tube at this step. Other side will be added later in the procedure.
Install o-ring on top of back-up ring and lubricate before assembly with end cap.

Note: Lubricate with hydraulic system fluid or light grease compatible with system hydraulic fluid.
Lubricate tube groove before installing tube.

Note: Lubricate with hydraulic system fluid or light grease compatible with system hydraulic fluid
4. Installing Tube into Blind End-End Cap

4.2 Set Tube in End Cap Grove

Set tube in end cap groove.
Gently tap the tube with a plastic or rubber mallet until tube bottoms out in groove.
Tube is now seated into the groove of the end cap. Visually inspect to ensure tube seal has not been damaged. The tube seal should not be visible. Look for signs of seal damage such as scrapings or seal parts. Replace if damage occurred.
5. Installing Rod End Tube Seals
5.1 Install Tube Seal Back Up Ring

The back-up ring is installed first on the end of the tube.

Note: The correct location for installation is the smallest diameter of the barrel.
Install o-ring on top of back-up ring and lubricate before assembly with end cap.

Note: Lubricate with hydraulic system fluid or light grease compatible with system hydraulic fluid.
6. Piston Installation
2 Methods

6.1 (Preferred) Using tapered sleeve

– A “Tapered Sleeve” is a tool used to compresses seals prior to entering the tube barrel
– Allows for easier installation
– Tapered Sleeves are available for purchase from Milwaukee Cylinder.
  • Or, Milwaukee Cylinder can provide you a tapered sleeve drawing

6.2 Alternate Procedure: Manual Seal Compression

– This procedure is used only when a tapered sleeve device is not available
Begin by lubricating the piston seals and cast iron rings.

Note: Lubricate with hydraulic system fluid or light grease compatible with system hydraulic fluid.
Apply lubricant to ID of tube, and then set the tapered loading sleeve on the tube.

Note: The large end of the taper is farthest from the tube.
Set piston rod assembly on open end of loading sleeve and carefully slide assembly into the tube.
6.1 Piston Installation Using Tapered Sleeve
6.1.4 Remove Tapered Sleeve

Remove tapered loading sleeve.
Begin by lubricating the piston seals and cast iron rings. 
Note: Lubricate with hydraulic system fluid or light grease compatible with system hydraulic fluid
Apply lubricant to ID of tube, and set piston in tube on a slight angle. Squeeze the cast iron ring together at the Gap and push the piston down to the first piston cup seal.
Using the rounded screwdriver work the piston cup seal into the tube
Push the piston down into the tube up, inserting the 2\textsuperscript{nd} cup seal, through to the last cast iron ring.

Note: Since the 2\textsuperscript{nd} cup seal is facing outboard, installation is much easier than the 1\textsuperscript{st} cup seal.
Squeeze the cast iron ring together at the Gap and push the piston down as done in previous step.
Begin by applying lubricant to inner bores and tube groove.

Note: Lubricate with hydraulic system fluid or light grease compatible with system hydraulic fluid.
Set tube in end cap groove.
Note alignment with opposite end.
Complete end cap assembly by gently tapping with a plastic or rubber mallet until seated on tube.
7. Final End Cap Assembly
7.4 Visual Inspection

Tube is now seated into the groove of the end cap. Visually inspect to ensure tube seal has not been damaged. The tube seal should not be visible. Look for signs of seal damage such as scrapings or seal parts. Replace seal if damage occurred.
8. Installing Rod Bushing & Seal
8.0 Reference Drawing

Reference this drawing for seal location and orientation
Next step install wave spring over rod & into end cap bore.
8. Installing Rod Bushing & Seal
8.2 Rod Bearing Installation

Next step apply lubricant on the rod bearing and install over the rod & into end cap bore.
Next step apply lubricant on the first rod seal vee ring and male adapter.

Note: The “V” always is positioned outward facing.
Next step install vee ring over rod & into end cap bore. Using the rounded screwdriver work vee ring into end cap bore.
Repeat previous procedure to install the second vee ring
Install the third and last vee ring
8. Installing Rod Bushing & Seal
8.7 Rod Wiper Installation

Install the rod wiper into the groove in the rod bushing
Note: Cup side faces into the cylinder
Next apply lubricant on the inside diameter of the rod bushing and install over the rod & into end cap bore.
Install the rod bushing retainer plate over the rod bushing
Apply anti-seize grease to the retainer plate bolts
Tighten all bolts moving diagonally across corners.
Note: Only tighten until bolt is fully engaged. These will be torqued in the last step of the procedure.
Begin by installing the tie rod nuts onto the tie rods. Apply anti seize grease to the threads and to the face of the nuts.

Note: Once nuts are fastened to the tie rod, ensure only 2-5 threads are protruding past the nut.
10. Installing Tie Rods
10.2 Install Tie Rods to Rod End Cap

Install tie rods in cylinder and snug down
10. Installing Tie Rods
10.3 Clamp Cylinder

clamp cylinder on flat surface
clamp cylinder tie rods with a vice grip
To prevent tie rods from turning
11. Final Torque
11.1 Torque Tie Rods

Torque all tie rod nuts moving diagonally across corners.

Note: Torque Specifications are available in the Milwaukee Cylinder Catalog
11. Final Torque
11.2 Torque Retaining Plate Bolts

Torque all retainer plate bolts moving diagonally across corners.
Assembly is now complete.
Note: Torque Specifications are available in the Milwaukee Cylinder Catalog
Note: Recommend conducting a pressure test and operational test