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Maintenance Schedule for ACI Pneumatic Operated Unloaders
ACI Services, Inc.
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⚠ WARNING! NEVER LOOSEN BOLTS, NUTS, OR REMOVE PLUGS WHILE THE COMPRESSOR IS RUNNING OR CONTAINS PRESSURE. ANY COMPARTMENT IN THE UNLOADER CAN POTENTIALLY CONTAIN PRESSURE EVEN IF THE COMPRESSOR IS NOT RUNNING. (Certain vent connections or plugs may be loosened temporarily only as described under the detailed maintenance schedule 3-month interval.)

⚠ WARNING! IF THE UNLOADER HAS BROKEN OR MISSING PARTS, LEAKING GAS, AIR, OR OIL, OR IS MAKING NOTICABLY UNUSUAL SOUNDS IT MUST BE SERVICED IMMEDIATELY REGARDLESS OF THE NORMAL MAINTENANCE SCHEDULE. ANY OF THESE CONDITIONS MAY RESULT IN EXTENSIVE DAMAGE TO THE UNLOADER OR COMPRESSOR, A DISCHARGE OF GAS, PERSONAL INJURY OR LOSS OF LIFE.

⚠ IMPORTANT! THE RECOMMENDATIONS AND MAINTENANCE INTERVALS IN THIS DOCUMENT ARE GUIDELINES BASED ON TYPICAL SERVICE CONDITIONS WITH CLEAN, DRY PROCESS GAS; CLEAN, DRY ACTUATOR CONTROL AIR OR GAS; GOOD GENERAL MAINTENACE PRACTICES. ACTUAL CONDITIONS MAY REQUIRE MORE FREQUENT INSPECTIONS AND MAINTENANCE.

⚠ IMPORTANT! IT IS RECOMMENDED THAT ALL O-RINGS AND SEALS ARE REPLACED EVERYTIME THEY ARE EXPOSED REGARDLESS OF MAINTENANCE SCHEDULE TIMING.

MAINTENANCE SCHEDULE SUMMARY

	Daily	Every 3 Months	Every 6 Months	Annually	Every 3 Years
Observe exterior condition of unloader	●				
Check for breather filter leaks (if applicable)	●				
Verify that position indicator is correct	●				
Listen for unusual sounds	●				
Check condition of transparent cover		●			
Inspect all unloader vents for leaks		●			
Examine unloader for oil contamination			●		
Clean breather filter (if installed)			●		
Check actuator piston retainer nut				●	
Inspect plug seating surface				●	
Check all external fasteners for proper torque				●	
Disassemble and inspect					●
Install seal replacement kit					●

DETAILED MAINTENANCE SCHEDULE

Daily

1. **Observe exterior condition of unloader.** Watch for any parts that may be missing, loose bolts or nuts.
2. **Check for breather filter leaks.** This is applicable only if the air vent (AV1)[3] uses a breather filter rather than being tubed to an outside vent.
3. **Verify that position indicator is correct,** i.e. indicator moves during load step changes, and shows closed (in) and open (out) when it should.
4. **Listen for unusual sounds**, especially when the unloader closes or is operating unloaded.

Every 3 Months or 2,000 Hours

1. **Check the condition of the transparent cover** over the position indicator for any cracks or chips.
2. **Inspect all unloader vents (GV1, GV2, AV1)[3] for leaks** with a soap and water solution. NEVER loosen a vent or drain ***plug*** while the unit is running or pressurized. (a) For any vent connection that is connected to a ***tubing*** run, the unit should be running during the inspection. Very slowly loosen (DO NOT REMOVE) the compression fittings and check for leaks. Re-tighten fittings. (b) For any vent connection that uses a breather filter (typical for AV1), simply check the breather for leaks with the unit running (keep in mind that a single puff of air is normal when the unloader activates). (c) It is never recommended that GV1 or AV1 be plugged (also GV2 if the control medium is flammable gas), but if they are for some reason, the unit must be shut down and the plugs removed. The unit must then be re-started, and all connections checked for leaks. (A pressure gauge or leakage monitor may also be used for continuous monitoring.) (d) For actuators where air is used as the control medium, GV2 is typically plugged and may be checked using method (a) above.

Every 6 Months or 4,000 Hours

1. **Examine unloader for oil contamination.** Disconnect tube or plug fittings, or breather filter at the unloader. These include control medium (CM), air vent (AV1), and gas vents (GV1 and GV2). DO NOT remove the primary drain plug (GVD) unless the cylinder head is going to be removed during a shutdown. Allow any built-up oil to drain. NOTE: Any significant oil build up typically indicates a back-flow from a vent/drain system and requires servicing the check-valve between the unloader connection and the vent/drain header.
2. **Clean breather filter** if so equipped (the air vent AV1 should have this if it is not tubed to the vent system).

[3] GV1, GV2, and AV1 are stamped on the unloader to identify connections. They are also identified on the unloader assembly illustrations. GV1 is the primary gas seal between the volume pocket and actuating piston chamber. GV2 is the secondary "gas" seal in the actuator cover but is only a gas seal if gas is being used as the actuator control medium, otherwise it is sealing air pressure. AV1 is simply a vent on the underside of the actuating piston to permit displacement of the atmospheric air under the piston. The only time it will have a constant flow is if there is a leak either from GV1 or around the actuator piston seal ring.

DETAILED MAINTENANCE SCHEDULE (continued)

Annually or 8,000 Hours

1. **Inspect actuator piston retainer nut** and set screws to insure they are tight (piston is secure). This requires removal of the actuator cover. Observe caution tag for actuators that are spring loaded.
2. **Inspect plug seating surface** for nicks, defects, or excessive wear (requires removal of head assembly but no further disassembly). Width of seating surface should not be more than 0.060 inch wide. Visually inspect seating surface inside head if possible – otherwise it may be necessary to feel this surface for any nicks, defects, or excessive wear.

Every 3 Years

1. **Disassemble unloader and inspect parts for wear and damage**. Replace as required. Refer to "Signs of Part and Seal Damage Requiring Replacement" Section of this Product Bulletin.
2. **Install seal replacement kit.**

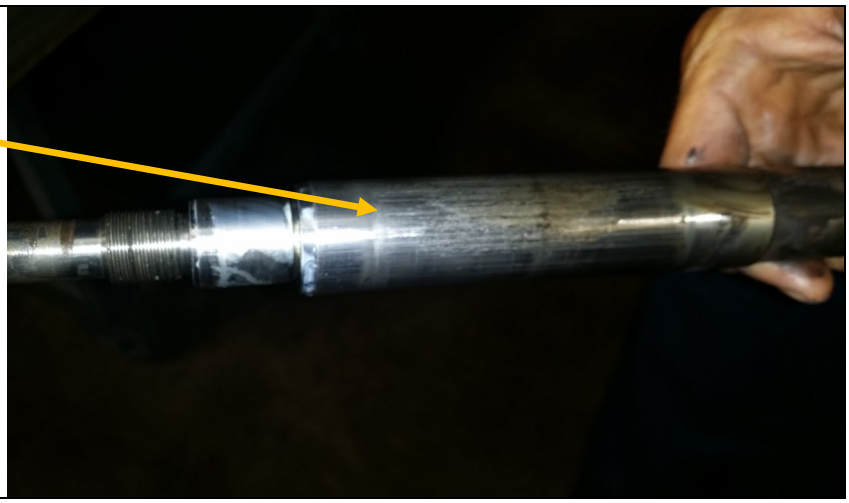
Signs of Part and Seal Damage Requiring Replacement

Part wear can eventually cause seal failure, which can cause a leak path for compressed gas and/or Actuation control medium. ACI Services recommends the replacement of damaged parts with genuine ACI manufactured parts. Typical part wear occurs between the moving actuator parts, Unloader Shaft or Actuator Piston, and the parts that do not move, Seal Cartridge or Actuator Cylinder.

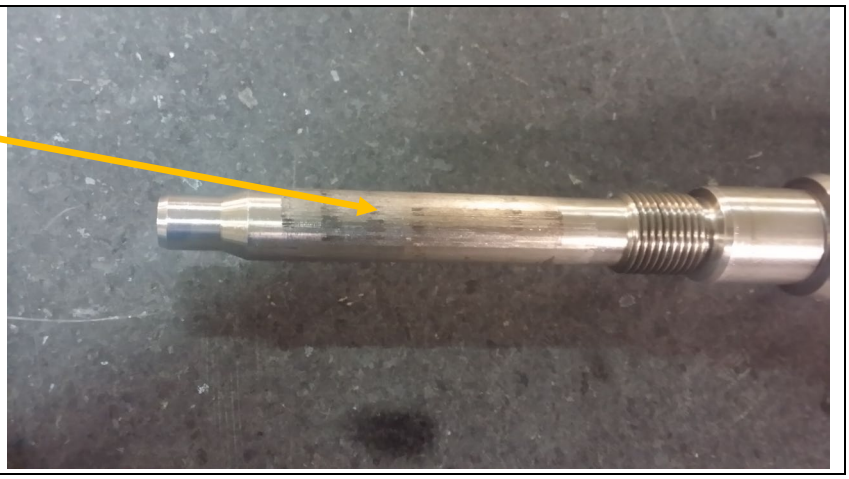
ACI recommends replacement of all damaged parts and seals. Ensure all replaced parts and seals are clean and free of foreign debris or particles before re-installation. Examples of foreign debris include, but not limited to, dirt, sand, or wood particles. The follow pages are explanations and photographs of typical part and seal damage to inspect when rebuilding any ACI Actuator assembly.

Unloader Shaft

1. Check the area of the Unloader Shaft that travels through the inside diameter of the Seal Cartridge.

Example of scoring marks on an Unloader Shaft from contacting the inside diameter of the Seal Cartridge.	

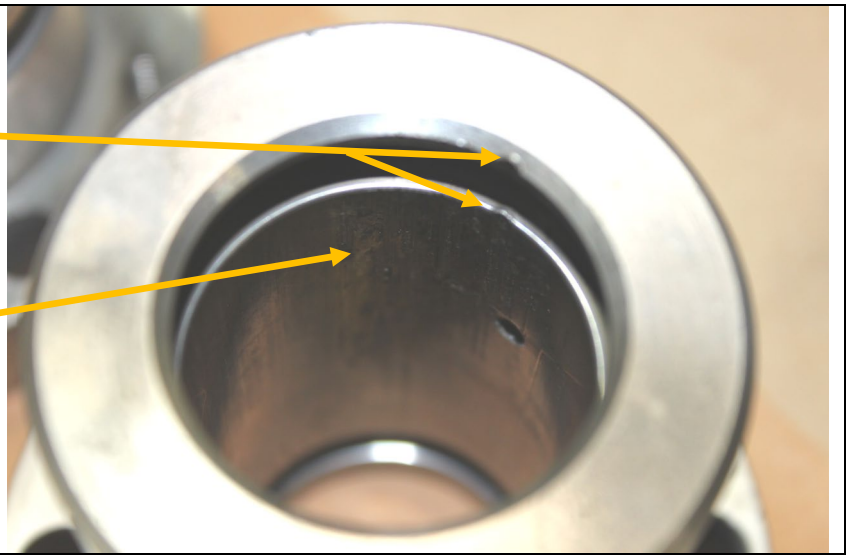
2. Inspect the area of the Unloader Shaft that travels through the Actuator Cover.

Example of scoring marks on an Unloader Shaft that was in from contact with inside diameter of the Actuator Cover.	

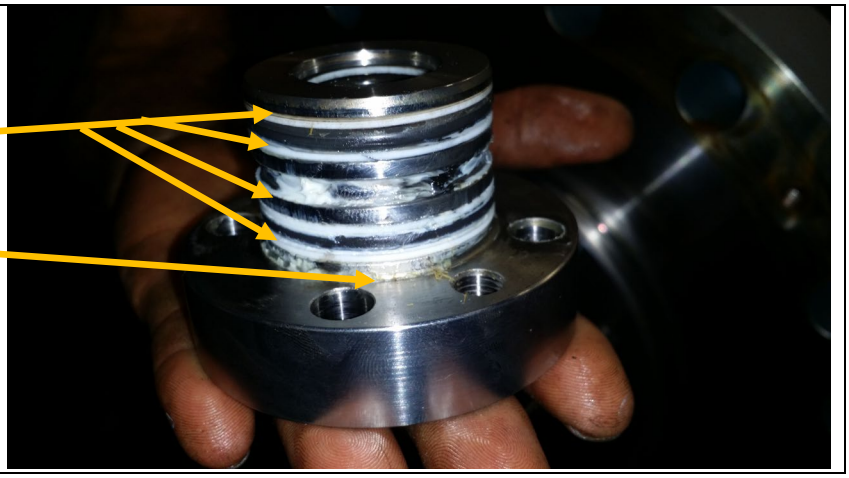
As stated previously, any scoring on the shaft areas that travels between the Seal Cartridge and Actuator Cover will cause o-ring failure, which would cause compressed gas and/or Actuator control medium leaks. O-ring failure that causes compressed gas or Actuation control medium leaks can cause major issues if damaged part replacement and new seal installation is ignored.

Seal Cartridge

1. Typically, scoring issues on the inside diameter of the Seal Cartridge is caused by the Unloader Shaft actuating through it. The Seal Cartridge is bolted to the Unloader Bonnet. Check the inside diameter walls of the Seal Cartridge to be sure there is no evidence of material removal from coming in contact with the Unloader Shaft. As stated previously, any scoring marks near the o-ring grooves will cause o-ring failure.

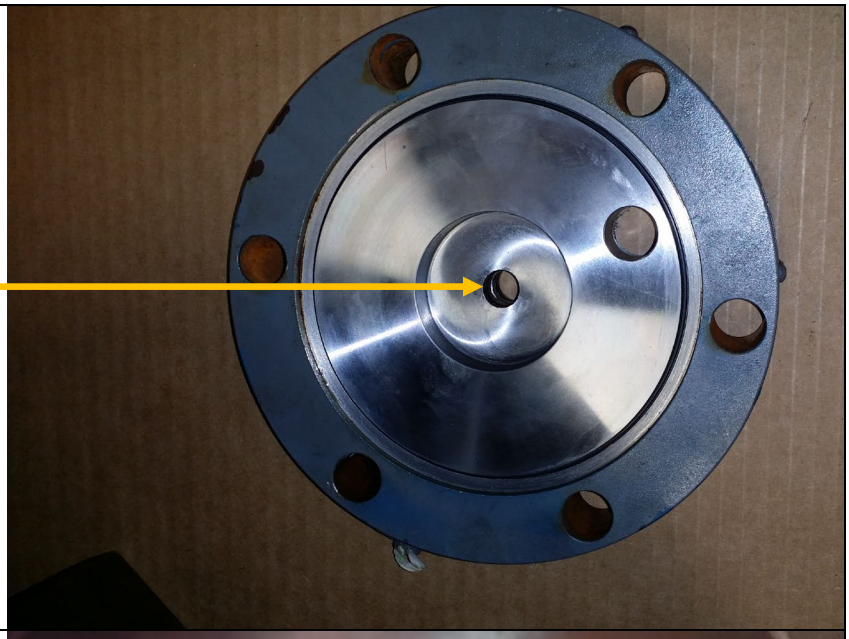
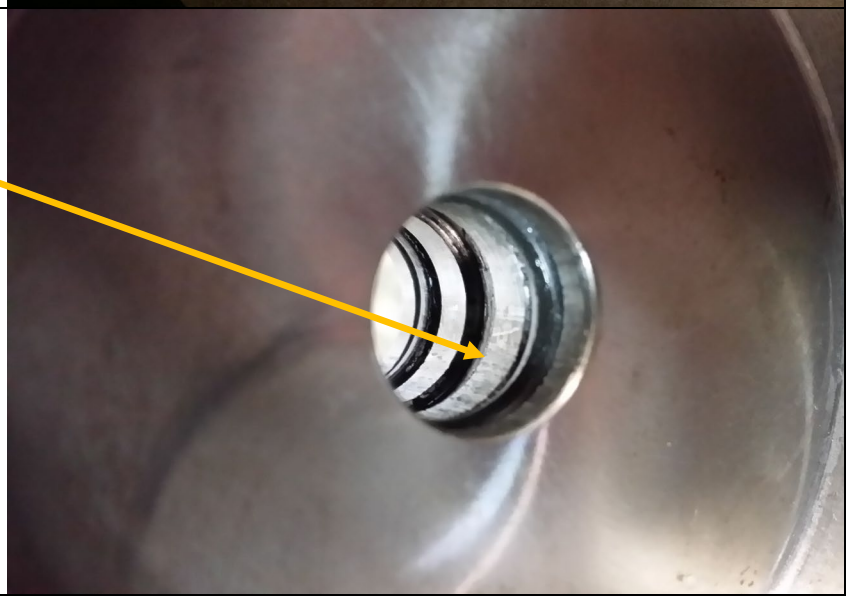
Example of indentions near o-ring grooves, which would cause o-ring failure. **Evidence of material removal from the inside diameter of the Seal Cartridge due to contacting the Unloader Shaft.**	

2. Make sure there are no indentions on the outside diameter of the Seal Cartridge. Just like the inside diameter, look for any indentions near the o-ring grooves that could possibly cause o-ring failure. O-ring failure would allow compressed gas to enter the Actuation chamber.

Outside diameter of the Seal Cartridge to inspect. **An example of wood particle debris that needs to be removed before installing.**	

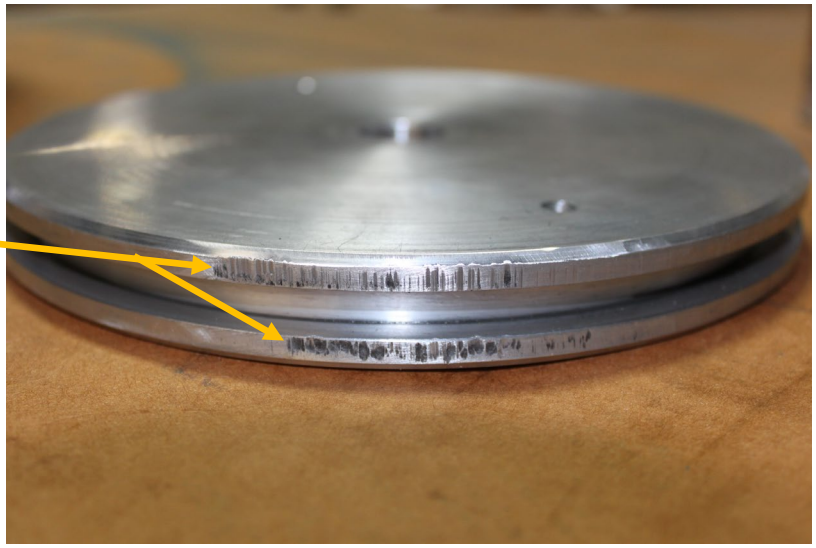
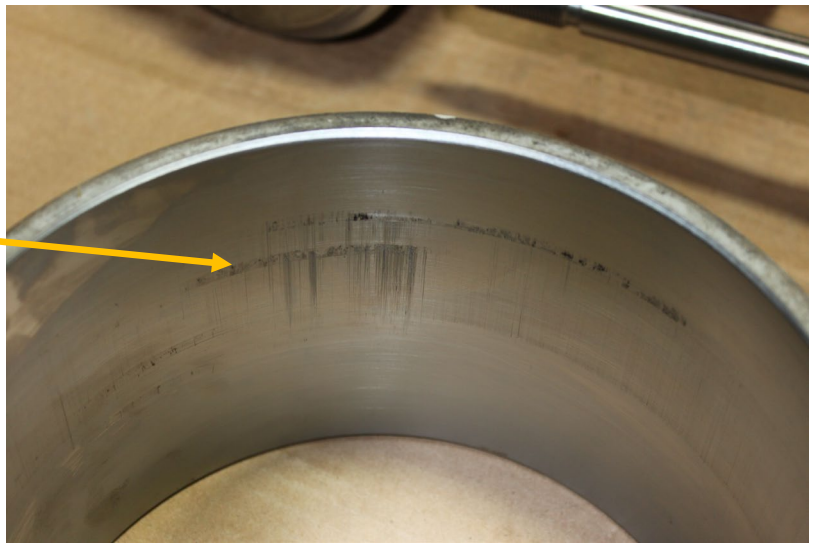
Actuator Cover

1. Check the inside diameter of the Actuator Cover for indentions near the o-ring grooves. Any indentions near the o-ring grooves would cause o-ring failure, which would cause the Actuation control medium to leak out to atmosphere. This would also cause the Actuator to not operate correctly and stay in the open position adding the pocket volume to the compressor until repaired.

This is the inside diameter of the Actuator Cover to inspect for indentions near the o-ring grooves.	
This is an example scoring marks near the o-ring grooves that can cause possible o-ring failure.	

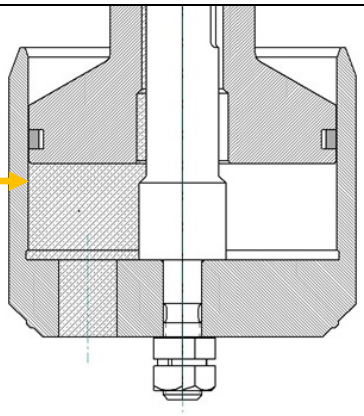
Actuator Piston & Actuator Cylinder

1. Check for grooving damage along the edge of the Actuator Piston. If grooving exists on the Actuator Piston, there will also be damage to the Actuator Cylinder inside diameter wall. When there is improper torqueing of the Spanner Nut and Set Screws, the Actuator Piston can become loose and cause the Actuator Piston to scrape across the Actuator Cylinder wall creating scoring marks. This would cause the U-Cup to wear prematurely. Failure of the U-Cup would cause the complete Actuator assembly to be non-operational.

This is an example of an Actuator Piston with grooving damage to the edge from scraping across the Actuator Cylinder wall.	
This is an example scoring marks on the inside diameter of the Actuator Cylinder wall.	

Balance Plug

1. When misalignment occurs, there can be an area of wear on the inside of the Balance Plug where it travels along the Balance Piston and Stem. Inspect the inside diameter of the Balance Plug for wear marks.

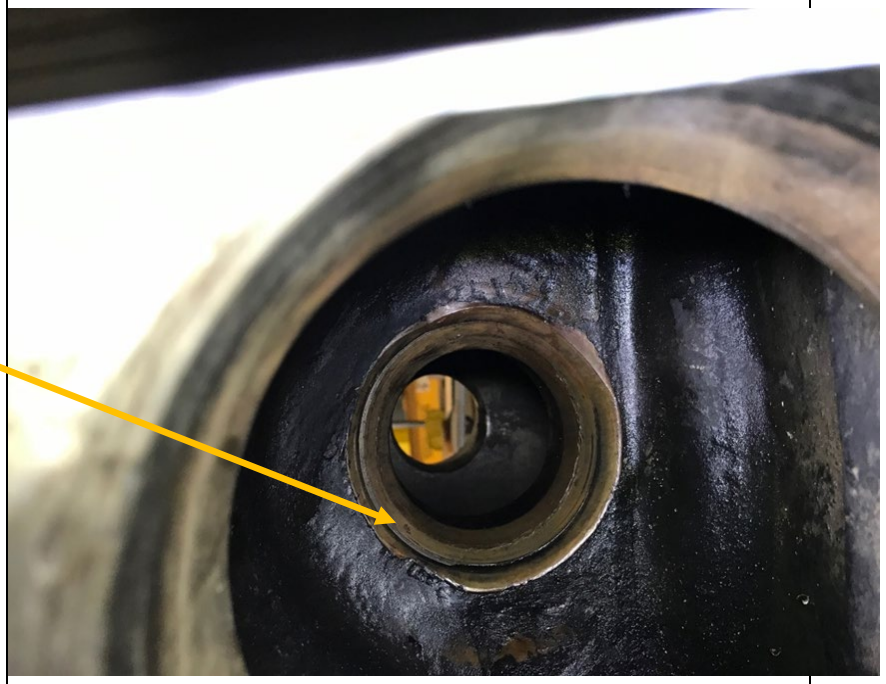
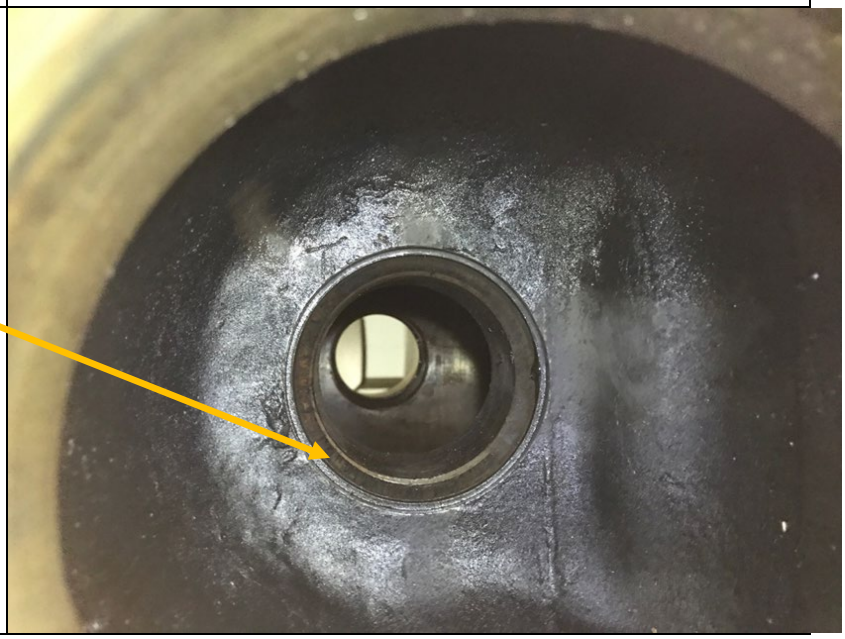
This is the area of the Balance Plug inside diameter to inspect for wear marks.	

2. Secondly, check the condition of the Balance Plug where it seats to seal the pocket volume. Damage can occur due to applying a higher than recommended amount of actuation pressure. It is best to refer to the supplied ACI Services assembly drawing for the recommended actuation pressure to apply according to the operating discharge pressure of the compressor.

Check this area of the Balance Plug seat for damage. This is the area that seals the volume pocket from the compressor.	

Plug Seat in Head End Head, Valve Pocket Component, or Cylinder Body Pocket

1. Inspect the seat surface for damage from impact with the Balance Plug sealing to close the pocket. As stated previously, damage is most likely cause from applying a higher than recommended amount of actuation pressure.

This is an example of a seat with a significant amount of wear. A seat is typically found in a Head End Head, Valve Pocket Component, or in a Cylinder Body Pocket. This particular seat is in a Cylinder Body Pocket and required repair work by re-chamfering the sealing area to remove a rolled edge.	
This is an example of a Cylinder Body Pocket seat without wear issues. This seat in particular did not require any repair other than polishing the chamfer.	

In Conclusion

It is best practice to follow the Maintenance Schedule as outlined in this Product Bulletin. ACI Services, Inc. recommends replacing all seals and damaged parts every time rebuilding or maintaining Pneumatic Unloaders.

Below are the ACI Vision, Mission, Core Values, and Competitive Advantages.

The ACI's Vision: ACI will influence every compressor.

ACI's Mission: To solve every customer's compression challenge.

ACI's Core Values: **A**ccountability, **C**ustomer Focus, **I**ntegrity and Professionalism.

ACI's Competitive Advantages:

- Extraordinary responsiveness and flexibility with our customers
- Fully evaluated, adapted solutions
- Innovative new products

Please contact ACI Services Inc. with any question, concern, or troubleshooting needs.

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