

Vehicle Practice

Reference:	Revision:
VP 03 15	0
Page: 1 of 5	
Date:	
Revised: 2001 01 23	

HYDRAULIC CYLINDER INSPECTION AND REPAIR

Practice:

1.0 INTRODUCTION

Hydraulic cylinders on aerial devices and derricks require maintenance, repairs or replacement.

* **Refer to VP 01 14 for the proper disposal of used oil.**

This practice provides information on the following:

- 1.1 Types and causes of cylinder failures.
- 1.2 Disassembly and assembly of failures.
- 1.3 When to replace cylinder parts.
- 1.4 General clearances between pistons and cylinder barrels.
- 1.5 Replacement seals.
- 1.6 Cylinder modifications.

2.0 TYPES AND CAUSES OF CYLINDER FAILURES

2.1 Examples of External Leaking Failures

- 2.1.1 Hydraulic oil dripping by a piston rod due to a worn seal, pitted or scraped piston rod.
- 2.1.2 A leaking "O" ring under a pad mounted holding valve.
- 2.1.3 Fittings or end gland threads.
- 2.1.4 Scraped end gland rod surface due to bent piston rod.
- 2.1.5 Pinched or broken "O" rings.
- 2.1.6 Leaking through a porous weldment. (Areas can be ground out and rewelded by certified welder).

Prepared by: W.D. Fraser

Approved by: J. Abraham

Fleet Services



Reference: VP 03 15	Revision: 0	HYDRAULIC CYLINDER INSPECTION AND REPAIR
Page: 2 of 5		
Date: Revised: 2001 01 23		

2.2 Example of Internal By-pass Failure

Defective seals will cause hydraulic fluid to by-pass the pistons. The procedure to verify this condition is as follows:

2.2.1 Move control valve lever to bottom out piston rod assembly.

2.2.2 Disconnect return line from the cylinder.

2.2.3 While holding control valve lever in the bottoming out position, check for oil leaking from the cylinder outlet.

2.2.4 Cracks where cylinder barrel pin boss attaches to the cylinder barrel.

3.0 DISASSEMBLY AND ASSEMBLY OF CYLINDERS

3.1 Clean the outside of the cylinder prior to disassembly.

3.2 Disassemble cylinder as outlined in Service Manual.

3.3 Remove pilot operated holding valve assembly if applicable.

3.4 One method of removing a piston rod and piston from a cylinder is to mechanically pull it out of the barrel.

Caution: Never use compressed air to push a piston and rod from a cylinder.

3.5 End gland lock ring grooves are sharp and must be filled prior to pulling the rod and piston assembly by:

3.5.1 Cold solder cut into a strip, fitted into the groove and smoothed with appropriate tool.

3.5.2 Auto body fill mixed to directions and smoothed into lock ring groove (a thin layer of grease in the groove firstly makes removal of the body fill easier).

3.6 After the cylinder has been disassembled, clean all parts in a suitable cleaning solvent. Pay particular attention to the oil passages in the components to be sure they are free of contamination.

3.7 Inspect the piston rod for alignment and check the thread and chrome condition. This includes the rod eye end if threaded.

Reference: VP 03 15	Revision: 0	HYDRAULIC CYLINDER INSPECTION AND REPAIR
Page: 3 of 5		
Date: Revised: 2001 01 23		

- 3.8 Check end gland bearing surface for wear.
- 3.9 Inspect the cylinder barrel for deep grooves and the end gland/barrel thread for damage.
- 3.10 When the cylinder is disassembled, check cylinder end bearing for possible wear and replace if necessary.
- 3.11 Assemble cylinder as outlined in service manual using new seals, packings, wear rings and "O" rings as needed.
- 3.12 With the piston in place, install a new O.E.M. approved nut and torque to manufacturer specifications.
- 3.13 After assembly is completed, torque gland nut to O.E.M. specifications and bench test the cylinder for operation and check for external oil leaks.
- 3.14 Purge air from cylinder prior to final installation on unit.

4.0 **WHEN TO REPLACE OR REPAIR CYLINDER PARTS**

4.1 **Cylinder Barrel**

A scored cylinder barrel is to be sent to a rebuilder for honing if marks are deep enough to be clearly visible or felt by running your thumb nail across them.

If the marks are not deep and only light scruffs, an in-house honing may smooth them (Ref. 5.1 regarding allowable clearances).

4.2 **Piston Rod, Piston, End Gland and Rod Eye**

4.2.1 **Piston Rod** - The piston rod should be replaced if bent or has major thread damage consisting of stripped or damaged threads.

Note: Rebuilding threaded areas by welding and machining is not approved.

4.2.2 **Piston** - Scoring of the piston diameter does not normally affect the cylinder operation. Excessive scoring marks can be removed with a file providing O.E.M. clearances can be maintained.

4.2.3 **End Gland** - Minor scrapes can be removed with sandpaper providing O.E.M. clearances can be maintained.

Reference: VP 03 15	Revision: 0	HYDRAULIC CYLINDER INSPECTION AND REPAIR
Page: 4 of 5		
Date:		
Revised: 2001 01 23		

4.2.4 **Rod Eye** - Welded rod end only.

Note: May be machined off, replaced and welded by a certified welder. Finished weld shall be NDT inspected by a company that is certified to CSA W178.1-1996.

5.0 **CLEARANCE BETWEEN PISTON & CYLINDER, ROD AND END GLAND**

5.1 **Piston & Cylinder Barrel**

5.1.1 Cylinder barrel to piston clearance for new 4" - 6" I.D. cylinders is between .004" and .008". Rebuilders can hone to .012" to remove scrapes. If the .012" clearance is exceeded, the cylinder has to be replaced. Rule of thumb for piston to cylinder barrel clearances is .001 per inch of diameter plus .001.

5.1.2 Replacement seal kits are designed within these clearances.

5.2 **Piston Rod & End Gland**

New piston rod to gland clearance is .003 - .006". If the rod was rechromed, it must meet O.E.M. dimensional specifications.

6.0 **REPLACEMENT SEALS**

6.1 **Types of Seals**

6.1.1 "O" Rings with back-up washers are used in many cylinder applications.

6.1.2 "V" Type Packing Seals - used in older cylinder applications requiring a large gland groove and is not easily substituted. Caution is required to ensure the joints of the individual packings are staggered when set in position.

6.1.3 Poly-Pack Seals - used in current model cylinders. Poly-Pack seals may replace "O" ring seals if original equipment manufacturer has substituted it with a specific seal kit.

6.1.4 Wiper Seals - used only to wipe clean the rod as it enters the cylinder.

7.0 **INSTALLATIONS OF SEALS**

The sliding of seals into the cylinder is aided by a liberal coating of grease. Also fill lock grooves as stated in 3.5 prior to installation.

Reference: VP 03 15	Revision: 0	HYDRAULIC CYLINDER INSPECTION AND REPAIR
Page: 5 of 5		
Date: Revised: 2001 01 23		

8.0 ORDERING OF REPLACEMENT SEALS

8.1 Replacement seals are to be O.E.M. or equivalent.

9.0 CYLINDER MODIFICATIONS

Honing and/or rebuilding of hydraulic cylinders or components within original specifications is permitted and shall be completed by hydraulic rebuilders or by a qualified Machine Shop.

Note: Cylinder design modifications are not approved for aerial device, derrick/digger, mobile cranes and any other load lifting device.

10.0 All contractors must give a written report for each cylinder stating the cylinder serial number and the work that was done, and whether or not it was repaired or overhauled.