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Decisions depend on valve design and application.

As with any mechanical apparatus, proper and proactive maintenance and care of solenoid valves can extend their lives and ensure predictable operation. This article will address how maintenance of such a small component can be worthwhile and the difference upkeep can make to the system; when to repair vs replace; whether maintenance can prove more or less time- and resource-consuming than replacement; and how to troubleshoot these valves.

When to maintain To determine when best to service a solenoid valve, consider these questions:

• What is the opportunity cost of valve failure at an inopportune time?

• Is there the risk of safety hazards in the event of a failure?

• What is the financial cost of a valve failure in terms of productivity and scrapped work?

• What is the cost for service in terms of time and manpower?

Generally speaking, if the machinery is being taken apart for other service, that may be the best time to complete the valve maintenance procedure. A proactive approach can result in the best possible performance of the valve and the overall system, as well as extended product life.

The frequency at which a solenoid valve should be serviced is very much design- and application-dependant. Certain applications are particularly damaging to the valve's internal and external components and will require more frequent attention. For example, without lubrication, components wear quickly. In this case, it would not be unusual to replace components at 100,000 cycles or less. However, media that are lubricated or provide lubricity can offer component life up to millions of cycles.

For standard valves, controlling media as common as air and water can be a challenge. Some of the most damaging applications are those that involve dry air and rapid cycling. The lack of lubrication and the pounding of the internal parts can cause valves to deform and deteriorate. Valves controlling water can experience mineral buildup, especially when water sits idle in the valve for extended periods of time.

If one considers a solenoid valve's small clearances between moving parts and small orifices through which media travel, it stands to reason that unfiltered, corrosive, or viscous (adhering to the inner components) media can substantially increase the likelihood of premature failure. In these situations, building a maintenance regime into the valve's use can extend life as well as maintain the consistency of the overall application's functionality.

Repair or replace In order to make the repair vs replace decision, consider again the valve itself as well as the overall application. As with other products, there are varying levels of durability built into different solenoid valves.

Certain types are so simple in design and construction that low replacement cost makes this the most simple and cost-effective choice. However, high-end designs exist where the interaction of components is so critical that servicing the valve in the field is not recommended for fear that the original function may not be attained. Likewise, the replacement cost may be significantly greater in comparison to a maintenance scenario, especially in cases with custom designs or exotic materials.

Maintenance generally implies solely the replacement of the rubber parts and springs. If the remaining parts show wear or are damaged, it is time for replacement. On the other hand, if the valve's connections have sweat fittings or its location makes its removal difficult or dangerous, it may be wiser to leave the valve body in place and rebuild its components regularly. The caution here is to verify that the valve seat is not nicked or worn, which may result in seat leakage even with new seals.

Where cost is the determining factor, replacement is most often the best choice. Generally, solenoid valves are inexpensive in comparison to service labor cost. The time and manpower it takes to disassemble the valve, replace the parts, reassemble, install, and check for proper performance often outweighs the cost of labor simply to install a new valve.

Valve maintenance Replacement part kits for solenoid valves can be purchased from the manufacturer. These typically will contain replacement O-rings, springs, a plunger, and possibly diaphragms, pistons, and a host of related components. Of course, be sure that the replacement kit is appropriate for the particular valve. Here are the steps of the maintenance regimen:

• Safety. Before repairing a valve, always disconnect the power source and depressurize the system. Consideration should be given to safe handling of the unit based on the fluid controlled therein.

• Coil. Inspect the coil for cracks in the encapsulation. In wet or humid environments, these can lead to moisture penetrating the coil, resulting in valve failure. Connections to the coil should be checked for damage or corrosion. Never power up an ac coil without ensuring that the coil is properly installed on the valve's sleeve or stem. The resulting high inrush of current will likely result in a coil burn-out.

• Pressure vessel. When the coil is removed, the resulting unit is the pressure vessel. The sleeve will have a feature to accept a sleeve removal tool, usually a wrench. Care should be taken to never remove the sleeve by clamping onto the sleeve tube, as this may cause the tube to dent or bend.

Removal of the sleeve from the valve body will expose the internal components of the valve operator. These include the plunger with a seal, the plunger return spring, an O-ring, the sleeve, and the operator body. These should be examined for damage or wear and replaced as needed.

The seals may exhibit swelling, cracking, or general deterioration. The spring should be inspected for worn or broken coils. The body orifice may be nicked or the crest may be worn. When the plunger lifts, it normally makes contact with the sides and stop of the sleeve. As a result, the top of the plunger and the inside of the sleeve may show wear as well.

For more complex solenoid valve types using diaphragms, pistons, spools, and levers, specific

manufacturers' instructions must always be followed.

• Reassembly. Once all necessary parts are replaced and the valve cleaned of buildup and grime, reassemble the pressure vessel according to the manufacturer's directions and reattach the coil. Then reinstall the newly assembled valve back into the application. Power to the valve should not be reengaged until you are positive that the parts are installed correctly.

Valve troubleshooting At this point, you might have done all of the right things to maintain an application's solenoid valve, yet you still experience problems. There could be any number of malfunctions with the valve:

• It does not energize when power is applied.

• There is internal or external leakage.

• It makes a chattering noise when energized.

• It is sluggish or sticks in position.

• There is reduced flow output.

The accompanying section "Troubleshooting Guide for Solenoid Valves" covers the most common problems and corresponding actions.

For problems and questions beyond these, always contact your solenoid valve manufacturer. The manufacturer is your best source of information on its particular valve and can help you address any special needs you have based on the application or complex valve design. **MT**

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Troubleshooting Guide for Solenoid Valves

PROBLEM

PROCEDURE

Valve fails to operate

1. Check electrical supply with voltmeter. Voltage must agree with nameplate rating.

2. Check coil with ohmmeter for shorted or opened coil.
3. Make sure that pressure complies with nameplate rating.

Valve is sluggish or inoperative—electrical supply and pressure check out.

1. Disassemble valve; clean out extraneous matter. The plunger must be free to move without bind

2. If a diaphragm design, check the diaphragm for tears and/or clogged or obstructed bleed hole o
3. Check all springs. If broken, replace.

External leakage at sleeve flange or joint between body and cover	Check that the sleeve and/or cover screws are torqued to specifications. If leakage persists, replac

External leakage at speed control device

Check O-rings for damage and replace if necessary.

Internal leakage

1. Disassemble valve, remove extraneous matter, and clean parts in a	mild soap and water solution
2. Examine diaphragm sealing surface for dirt. Remove all foreign particles.	Examine orifice for nic
3. Check plunger return spring. Replace if broken.	

Chatter or buzz sound when energized

1. Remove power from the coil.
2. Inspect the plunger and sleeve forexcessive wear or contamination.

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