Pressure Regulator Maintenance (Guidance)

RECORD OF REVISIONS

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Contact the Standards POC for upkeep, interpretation, and variance issues.

Chapter 17	**Pressure Safety POC and Committee**

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Regulator maintenance is an important part of maximizing your system's performance and extending the service life of system components. A maintenance schedule is the frequency at which recommended maintenance operations should be performed. Adherence to a maintenance schedule should result in minimizing downtime due to regulator failure as well as enhancing safety in the work area. Regulator service defines the gas service in which the regulator is installed in terms of its corrosive nature. There are three categories: noncorrosive, mildly corrosive, and corrosive. Establishing the category a regulator fits into can be difficult.

Recommended Schedule - This schedule should be used as a general guide. Be sure to follow the manufacturer instructions supplied with your regulator.

Service	Function Test[5]	Inert Purge	Leak Check[5]	Creep Test	Overhaul	Replacement[1,2]
Noncorrosive	prior to use	NA	monthly	annually	5 yrs	10 yrs
Mildly Corrosive[4]	prior to use	at shutdown	1-2x/month	6 months	3-4 yrs	6-7 yrs
Corrosive[4]	prior to use	at shutdown	2x/month	3 months	1-2 yrs[3]	3-4 yrs[3]

[1]More frequent overhaul or replacement may be required for regulators installed in a corrosive ambient environment.
[2]If diaphragms are neoprene or other elastomer, they may dry out and require more frequent replacement.
[3]If regulators are not properly installed and used, or a poor grad of gas is used, or purging is not properly done, overhaul and/or replacement may be required more frequently.
[4]For regulators used in toxic or corrosive gas applications, ensure proper precautions are followed as recommended by the manufacturer; e.g., don't use a self-venting regulator with ambient discharge.
[5]Leak testing is required when bottles are changed, maintenance is performed, or system configuration is changed.

In addition, a pressure regulator should also be checked after cylinder changes or system maintenance. The user is solely responsible for determining the frequency of maintenance based on the application, that the recommended checks can be safely performed, and that the recommended checks are adequate to ensure proper and safe operation of the user's system. **A regulator that does not comply with the recommended checks or malfunctions in any manner must be immediately removed from service. Do not attempt to repair the regulator.**

Glossary

Creep	A gradual increase in outlet pressure above the setpoint and occurs two ways: Changes to the motion of the regulator springs when gas flow is stopped Foreign material becomes lodged between the poppet and seat preventing tight shutoff Gas
Drop	a change in outlet pressure from a no flow to a flowing condition while the inlet pressure remains constant.
Inlet Pressure	The pressure measured immediately at the regulator entry.
Outlet Pressure	The pressure sensed at the regulator's outlet port.
Rise	An increase of outlet pressure as the inlet pressure decreases

Maintenance Checks

Function Test

1. Check the regulator function. Confirm delivery pressure increases when the adjusting knob is turned clockwise and decreases when turned counter-clockwise. To decrease delivery pressure the system must be flowing or vent the downstream system.

2. Check flow shutoff. Confirm after flow is stopped, that delivery pressure does not exceed the regulator's maximum outlet pressure.

Inert Purge

1. To increase regulator life use an inert gas to purge regulators that are used with corrosive or reactive materials after each use. Depending on the type of regulator for an effective purge, it may be necessary to fully reduce and re-pressurize the regulator body.

Leak Test

1. Check for regulator seat leak. Leak test methods should be appropriate for the system leak integrity requirements. Suggested method: Fully close the regulator by turning the adjusting knob counter clockwise until the stop is reached. Apply pressure to the regulator inlet. Close the upstream supply valve. Monitor the pressure between the supply valve and the regulator for 5 minutes. The pressure should not decrease.

2. Check for leaks to atmosphere. There should be no leaks to atmosphere. Leak test methods should be appropriate for the system leak integrity requirements. For example with an inert gas - With a regulator under pressure (both high and low pressure side) check all connections for leaks using a gas bubble leak check solution (Scott Model 46-B Series or Snoop®). If a leak is detected, shut down the gas source, reduce pressure to atmospheric, and tighten or redo the leaking connection.

Creep Test

1. Regulator creep is a phenomenon in which delivery pressure rises above a set point. Creep can occur in two ways. The first is due to changes in the motion of the regulator springs when gas flow is stopped. When flow has stopped, the springs must move to a new position of equilibrium, causing a slight increase in delivery pressure. This type of creep may be thought of as the opposite of droop. The second and more insidious type of regulator creep is caused by foreign material being lodged between the poppet and seat, thus preventing tight shut-off.

2. The result is that inlet and delivery pressure can equalize across the regulator, exposing all tubing and instrumentation to the inlet pressure. Regulator creep as a result of seat failure due to foreign material is the single most common cause of regulator failure. In order to prevent costly damage to the gas delivery system and the instrumentation it serves, care must be taken to ensure that regulator connections are capped to protect against ingress of dirt or foreign material. Tubing should also be flushed or blown clean to remove any foreign matter. A pressure relief valve should be installed downstream of the regulator as additional protection against creep.

3. To creep test, isolate the downstream side of the regulator by closing the regulator outlet valve, instrument valve or process isolation valve. Close the regulator by turning the adjustment knob counterclockwise until it reaches stop or rotates freely. Slowly turn on the gas supply. When the regulator inlet gauge registers full cylinder delivery pressure, shut off the gas supply. Turn the regulator adjusting knob clockwise until delivery pressure gauge reads approximately half of scale [e.g.,. 50 psi (3 bar) on a 100 psi (7 bar) gauge]. Close the regulator by turning the adjustment knob counterclockwise until it rotates freely or reaches the stop. Note the reading on delivery pressure gauge. Wait 15 minutes and recheck the setting on delivery pressure gauge. **If any rise in delivery pressure is detected during this time, the regulator is defective. Remove and replace.**

Proper Inactive Regulator Mode

A regulator should not be used as a shutoff valve. Close the supply valve or cylinder valve when equipment is not operating or is unattended, and vent and back out the regulator to the no flow condition.

A corrosive or reactive material is to be removed from a regulator by purging with an inert, during periods of in-operation.

A regulator is not to be left at a preset when a gas cylinder supply valve is opened. It should be at the no-flow condition.

Regulators should not be allowed to flow unrestricted to atmospheric pressure for any extended period of time. Such operation could result in excessive wear and improper regulator operation.