Instrument Presentation: Gas Regulator

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Introduction

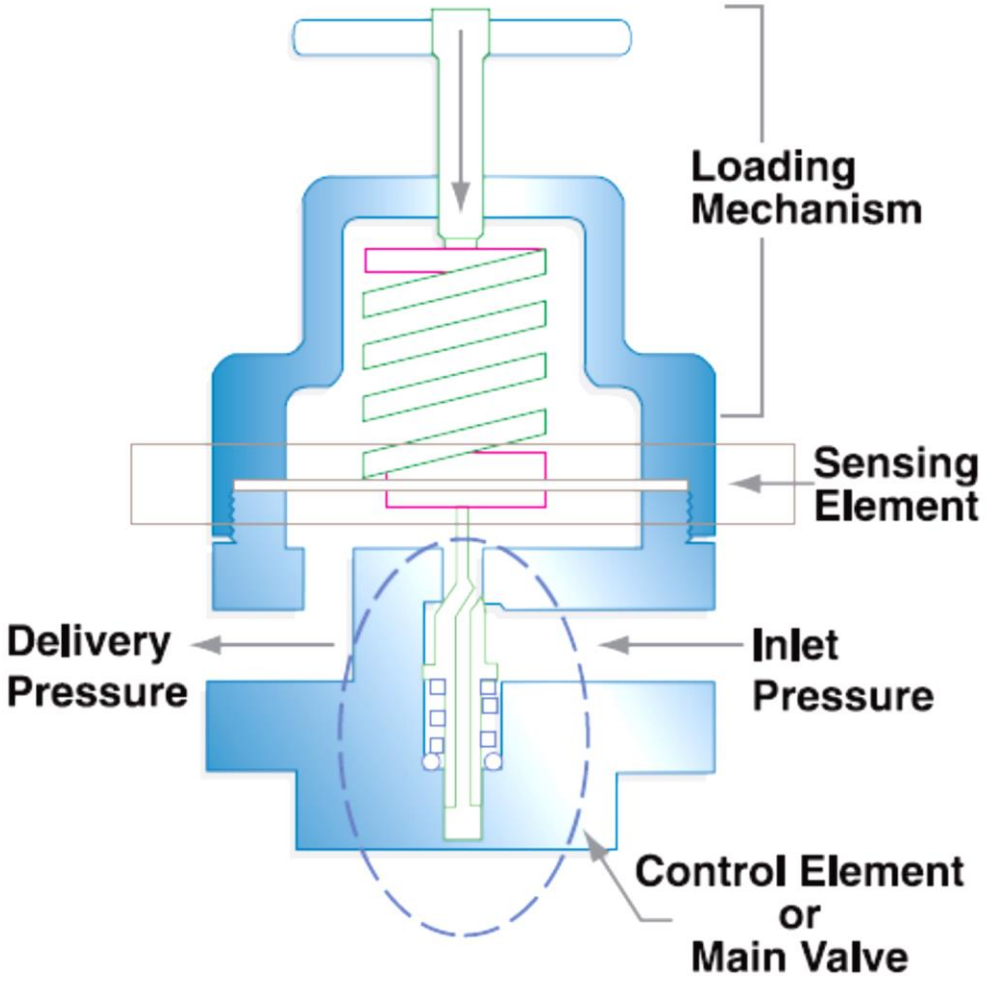
- A **gas regulator** is a control valve that reduces the input pressure of gas to a desired value at its output.
- A pressure regulator's primary function is to match the flow of gas through the regulator to the demand for gas placed upon it, whilst maintaining a constant output pressure.
- Pressure regulators are found in many common home, laboratory and industrial applications.

There are three basic operating components in most regulators

- Loading mechanism
- Sensing element
- Control element

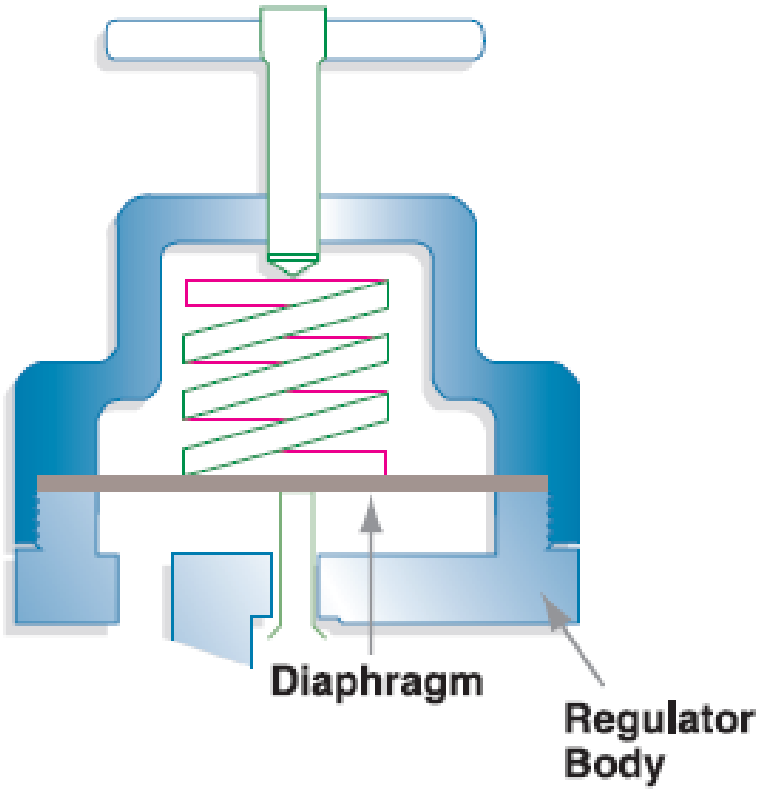
Working principle

- The **Loading Mechanism** determines the setting of the regulator delivery pressure.
- Most regulators use a spring as the loading mechanism.
- When the regulator hand knob is turned, the spring is compressed.
- The force that is placed on the spring is communicated to the sensing element and the control element to achieve the outlet pressure.



Sensing element

- The **Sensing Element** senses the force placed on the spring to set the delivery pressure.
- Most regulators use a diaphragm as the sensing element.
- The diaphragms may be constructed of elastomers or metal.
- The sensing element communicates this change in force to the control element.

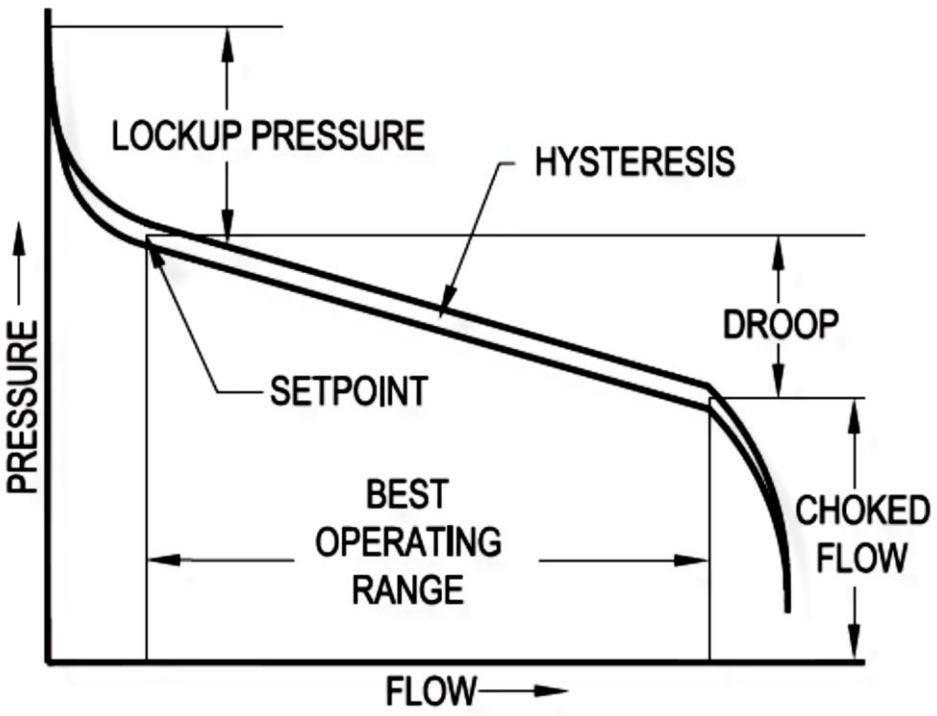


Control element

- The **Control Element** is a valve that actually accomplishes the reduction of inlet pressure to outlet pressure.
- When the regulator hand knob is turned, the spring (loading mechanism) is compressed.
- The spring displaces the diaphragm (sensing element). The diaphragm then pushes on the control element, causing it to move away from the regulator seat.
- The orifice becomes larger in order to provide the flow and pressure required.

Regulator accuracy and capacity

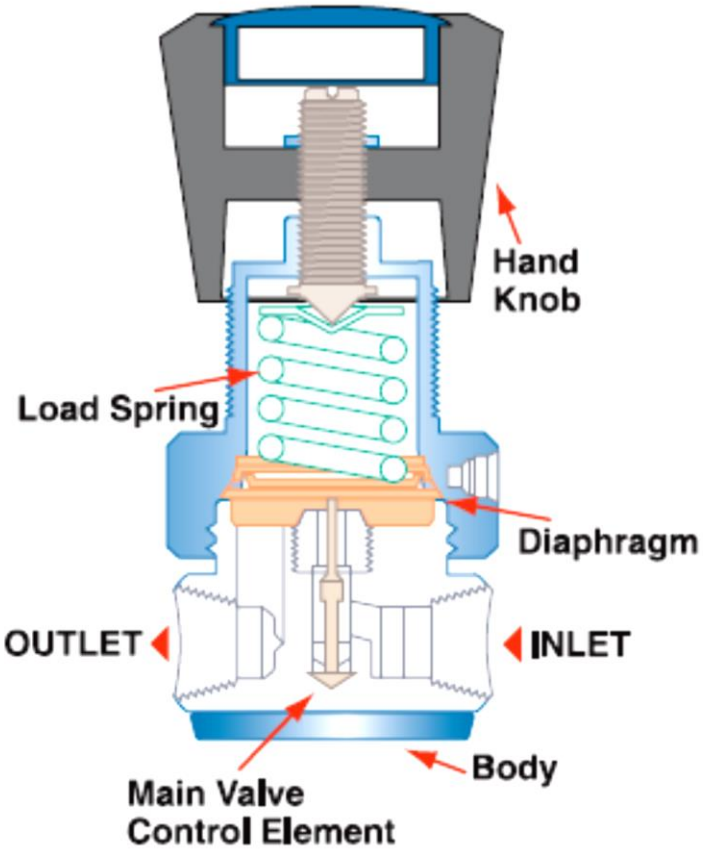
- The resulting graph shows the drop in outlet pressure as the flow rate increases. This phenomenon is known as **Droop**.
- Pressure regulator accuracy is defined as how much droop the device exhibits over a range of flow, **less droop equals greater accuracy**.
- One should examine pressure versus flow curves to select a regulator for the proposed application.



DIRECT ACTING
PRESSURE REGULATOR
OPERATING MAP

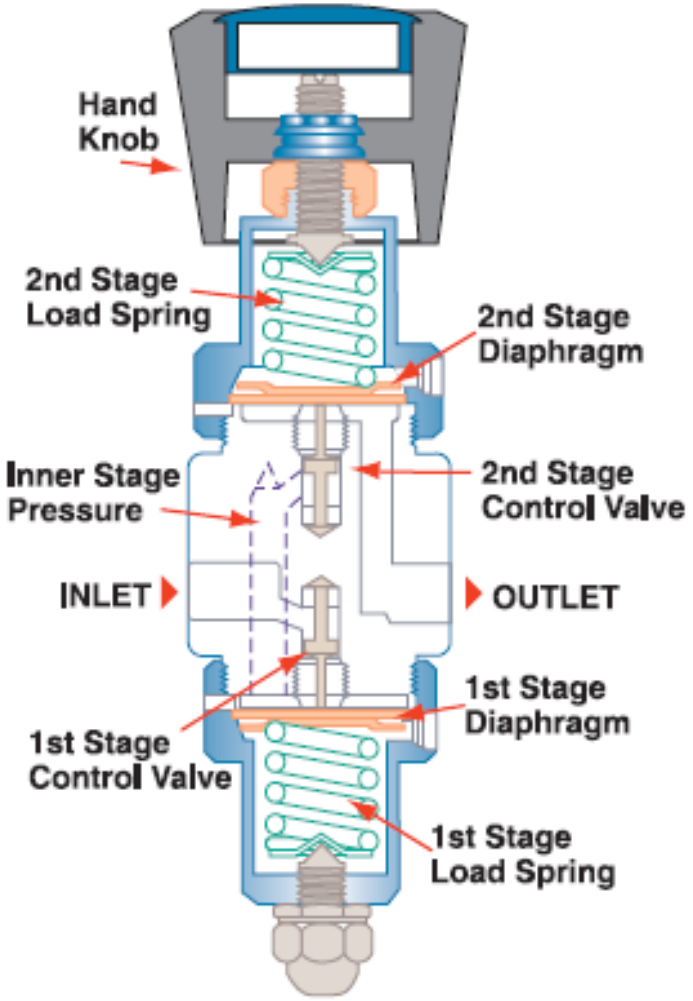
Single-stage regulator

- Single-stage regulators are an excellent choice for relatively small reductions in pressure.
- Single Stage Regulators accomplish the pressure reduction in a single step.
- Delivery pressure cannot be as tightly controlled as with a dual stage regulator.
- Single stage regulators should only be used where an operator can monitor and adjust pressure as needed, or where the regulator is supplied with a nearly constant source pressure.



Dual stage regulator

- Dual Stage Regulators reduce the source pressure down to the desired delivery pressure in two steps.
- Each stage consists of a spring, diaphragm and control valve.
- The first stage reduces the inlet pressure to about three times the maximum working pressure.
- The final pressure reduction occurs in the second stage.
- The advantage of a dual stage regulator is its ability to deliver a constant pressure, even with a decrease in inlet pressure.

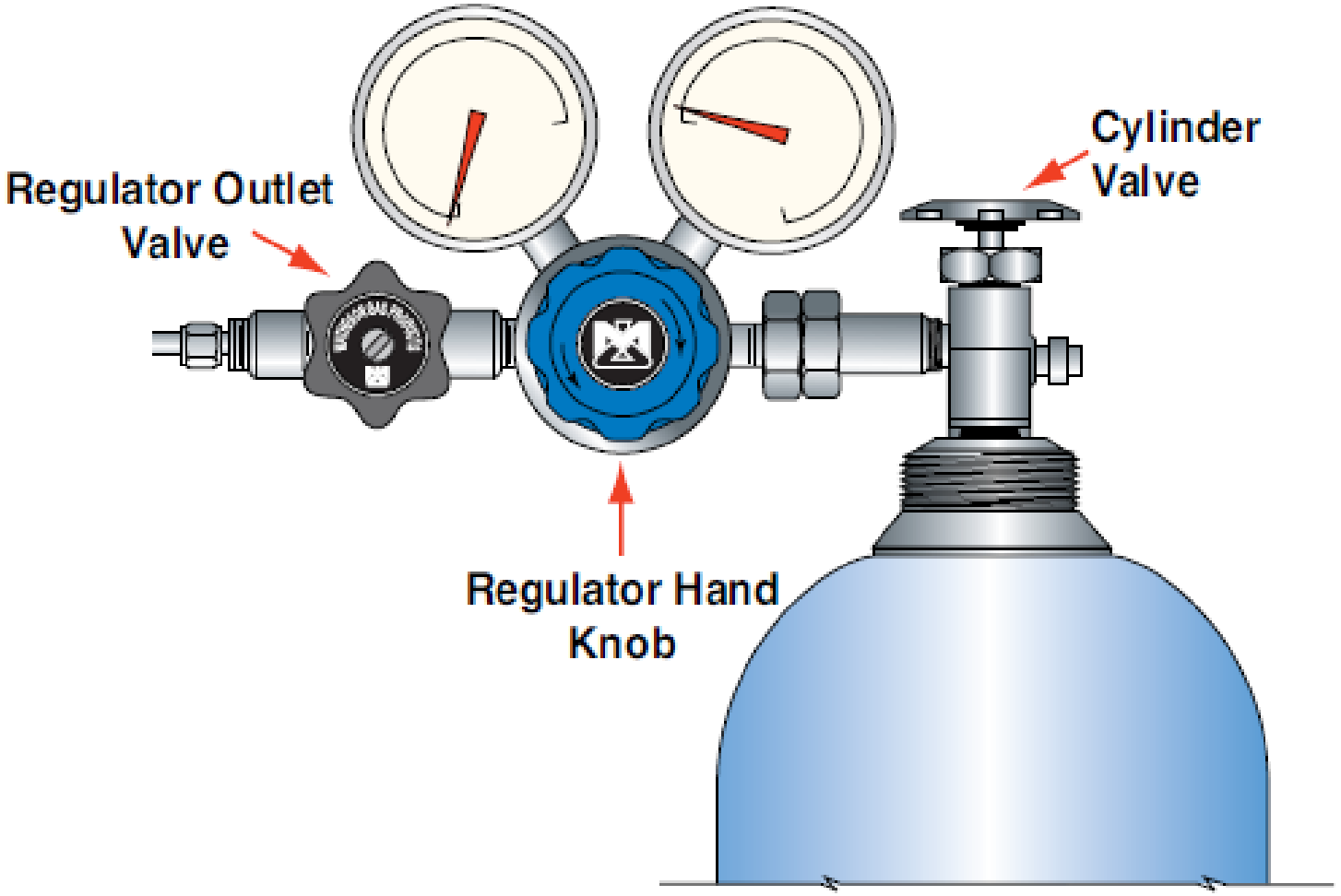


Materials used

A wide range of materials are available to handle various fluids and operating environments. Common regulator component materials include brass, plastic, and aluminum.

Brass is suited to most common applications and is usually economical. Aluminum is often specified when weight is a consideration. Plastic is considered when low cost is of primarily concern or a throw away item is required. Stainless Steels are often chosen for use with corrosive fluids, use in corrosive environments

Installation directions



Thank you