

# Regulator Instability ?

It's not an unstable regulator--It's the challenging application!

## What causes regulator instability?

**SMALL VOLUME PIPING** - This can create a volume downstream of the regulator such that any flow into or out of this volume will cause rapid or large changes in the piping pressure. These changes can require a regulator to respond more rapidly than is possible, thus the control of pressure will be erratic.

**RESTRICTED PIPING** - This occurs where the piping volume downstream has restrictions due to abrupt changes in direction or piping volume and can act very much the same as small volume piping.

**SUDDEN CHANGES IN FLOW RATE**- A rapid change in flow rate out of the downstream piping system causes a transient decrease in control pressure. The regulator plug, having a mass, will not instantly travel to the new position to increase the flow into the system. Therefore, the pressure will fall below setpoint for a short period of time. When the regulator plug does begin to travel and achieves the load flow equivalent, many times the mass of the moving parts in the regulator will not stop at the appropriate position but will overshoot. This can be the beginning of a sustained cycle.

**TURBULENT PIPING** - This would most often be the result of extreme piping expansions or contractions from swages or other piping components.

**OVERSIZED VALVE** - This can result in the regulator being able to satisfy downstream requirements too quickly and to then exceed downstream requirements. In the next instant the valve is called on to reduce the flow, and due to its mass the valve overshoots the appropriate position initiating a cycle.

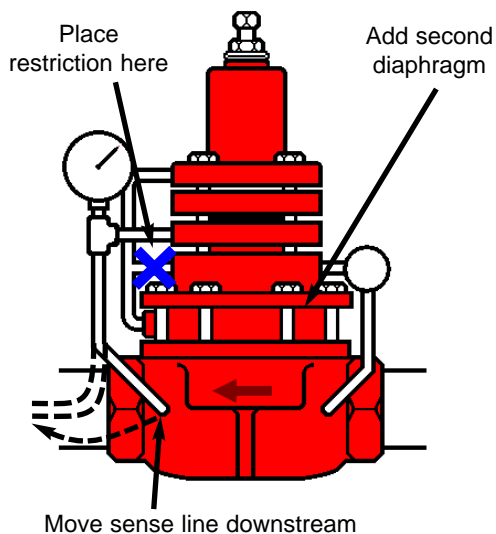
**EXCESSIVE PRESSURE DROP** - The result can often be the same as in the oversized valve.

The most common application in which we encounter these problems is in the area of compressor suction control. The difficulty arises from the need for an unrestricted flow through the regulator. To minimize the restriction a large throated regulator is selected. At relatively low pressure this arrangement works satisfactorily. The real problem comes when the compressor is shut down for a period of time, and the pressure from the field rises substantially. When the compressor is restarted the regulator is suddenly called upon to control a large and many times excessive pressure drop. The regulator at this point is too large for stable control.

## What are some remedies?

### Low Pressure Regulators

1. Use reduced trim
2. Move the sense line
3. Restrict the actuator line
4. Install a second motor valve diaphragm
5. Use stiffer pilot spring



### High Pressure Regulators

1. Use reduced trim
2. Move the sense line
3. Restrict the actuator line
4. Reduce pilot supply pressure
5. Use stiffer pilot spring

