

GAS DISTRIBUTION SYSTEMS

From Pressure Regulator to
Complete Gas Distribution System

Swagelok®



Aidan Lourier & Laurenz Scholten

September 15, 2026

Introduction Swagelok



Aidan Lourier
Mechanical Engineer



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Sales Engineer

Agenda

- What is Gas Distribution?
- Gas Distribution Case
- Automatic Change Over



What is a Gas Distribution Application?



What is a Gas Distribution Application?

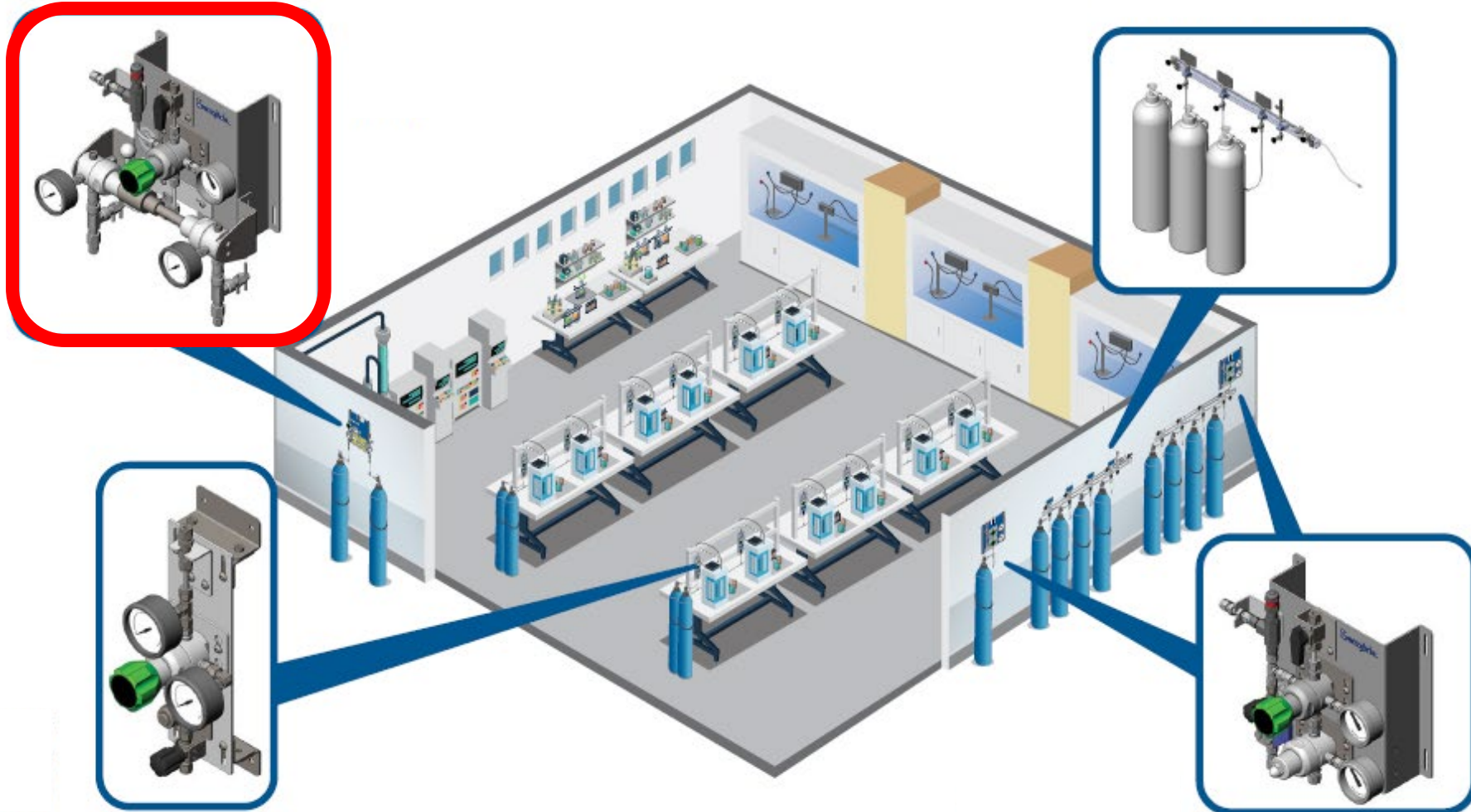


What is a Gas Distribution Application?



What is a Gas Distribution Application?

Auto-Changeover



What is a Gas Distribution Application?



What is a Gas Distribution Application?



Gas Distribution Case

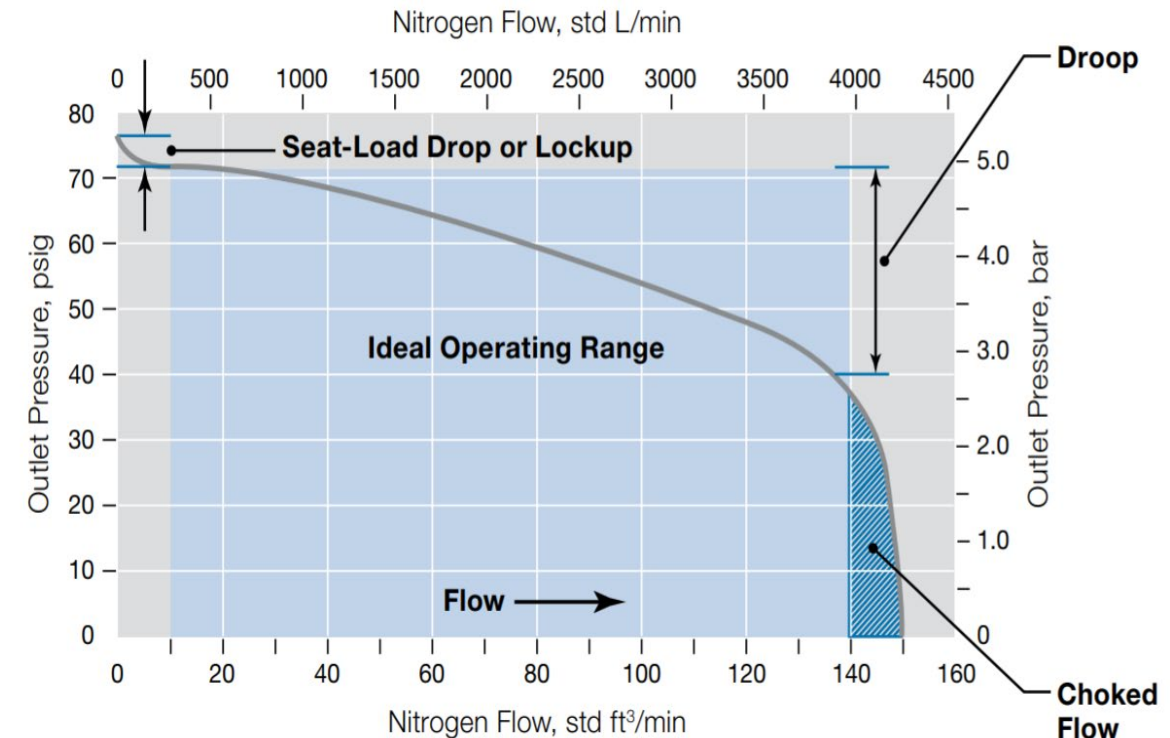
- Component Request: Pressure Regulator
- Place: Laboratory storage facility to feed the N2 infrastructure
- Media: Nitrogen Cylinder
- Pressure Inlet: 200 barg
- Outlet Pressure: 10 barg
- Flow Range: 60 std L/min to 500 std L/min
- Quantity: 2x
- Mounting: Mounted on the wall
- Critical system



Gas Distribution Case

Flow curve consists of three parts:

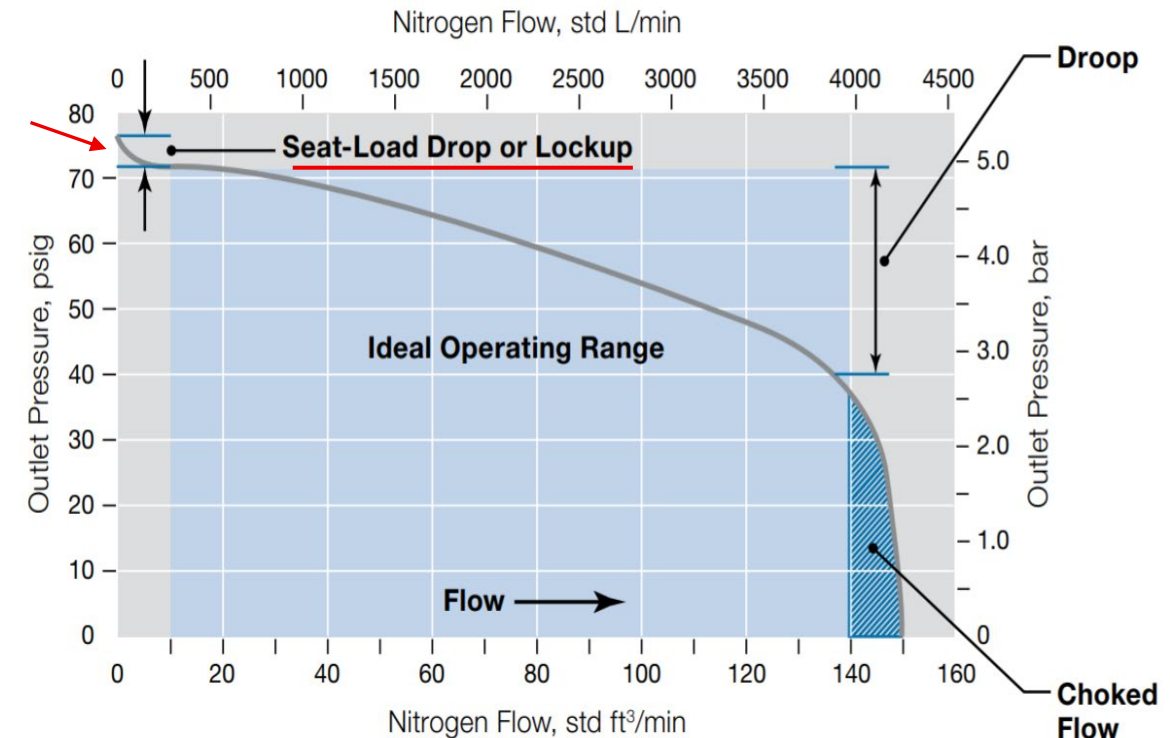
- A steep drop on the far left, which shows seat-load drop or lockup
- The ideal operating range, a relatively flat part in the middle
- A steep drop on the far right, which shows the choked-flow area



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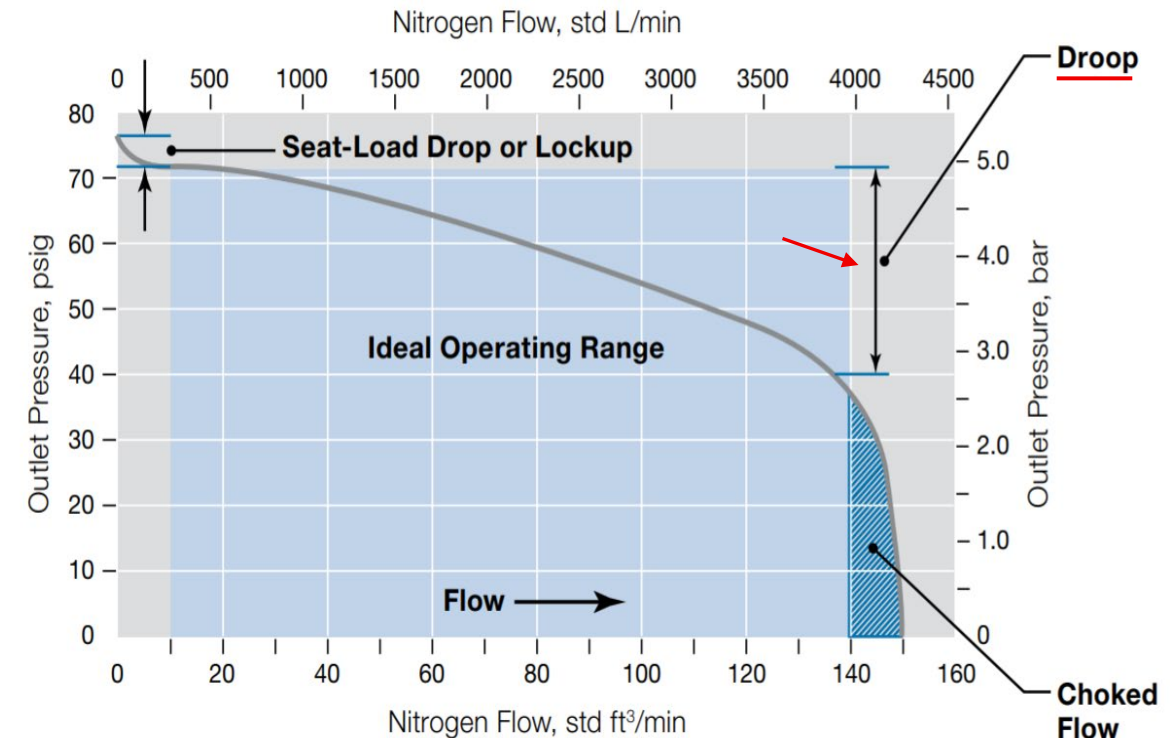
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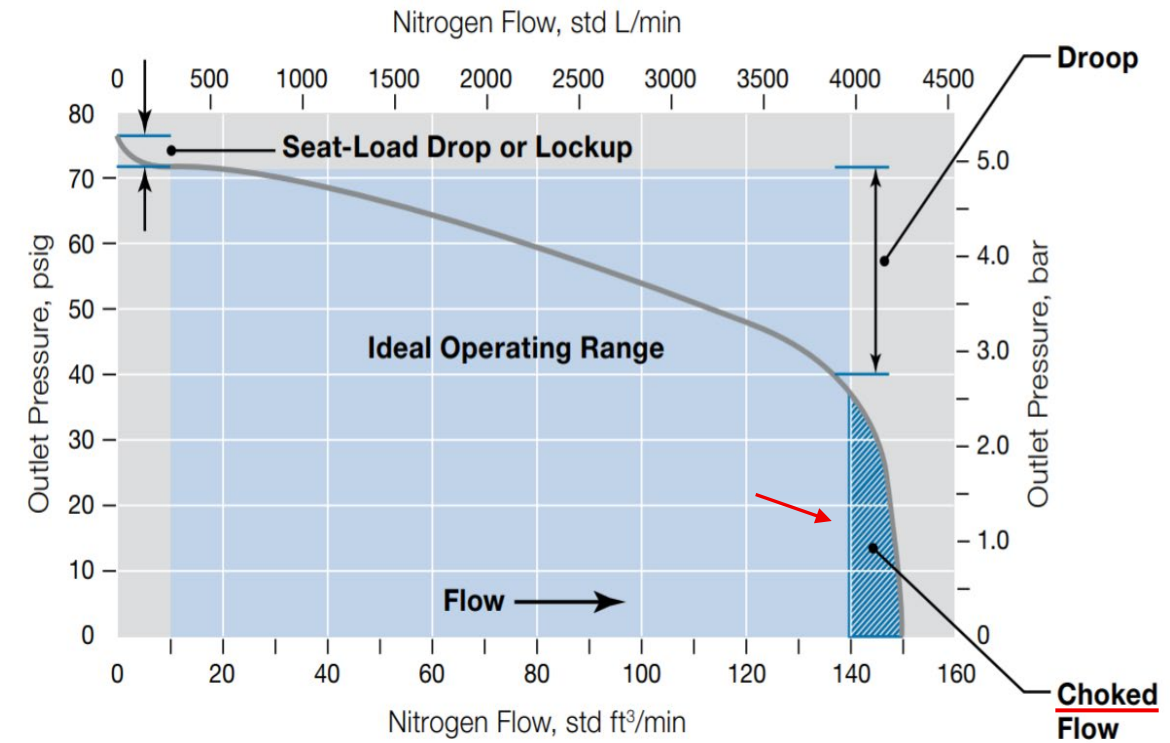
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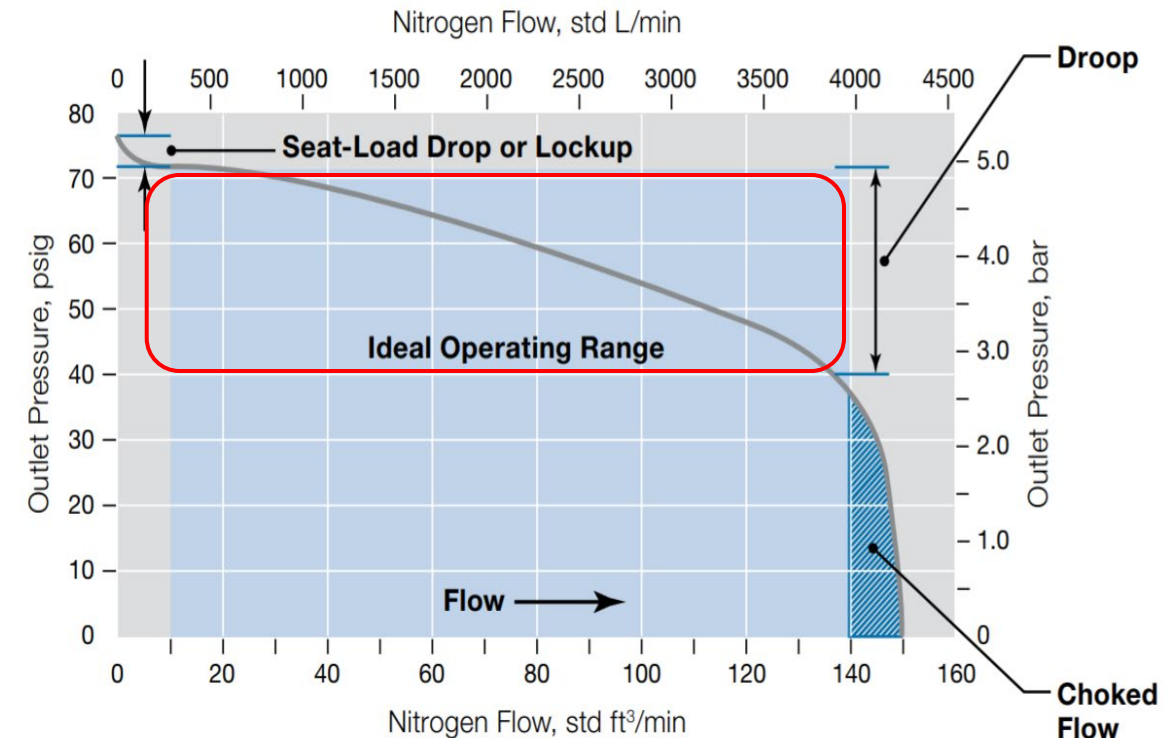
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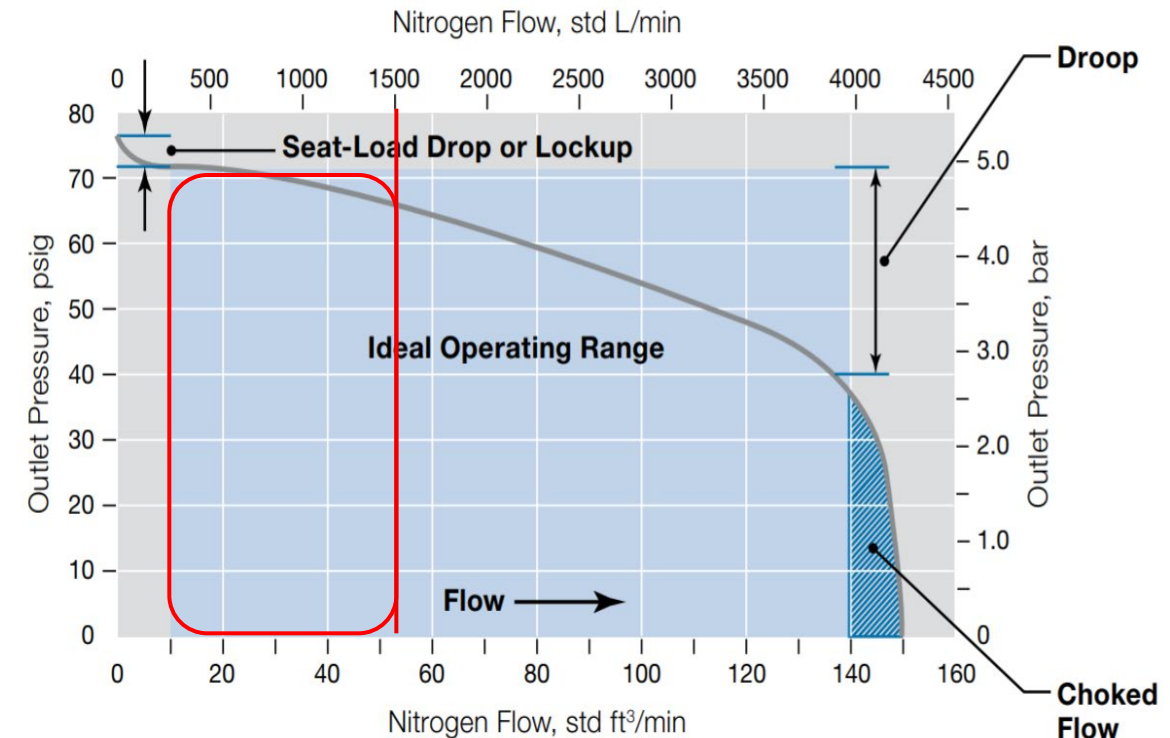
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Gas Distribution Case

Characteristics:

- Flow performance is less sensitive to outlet pressure
- Much more sensitive to inlet pressure
- $\downarrow$ Inlet pressure = $\downarrow$ Flow capacity

Why is it important:

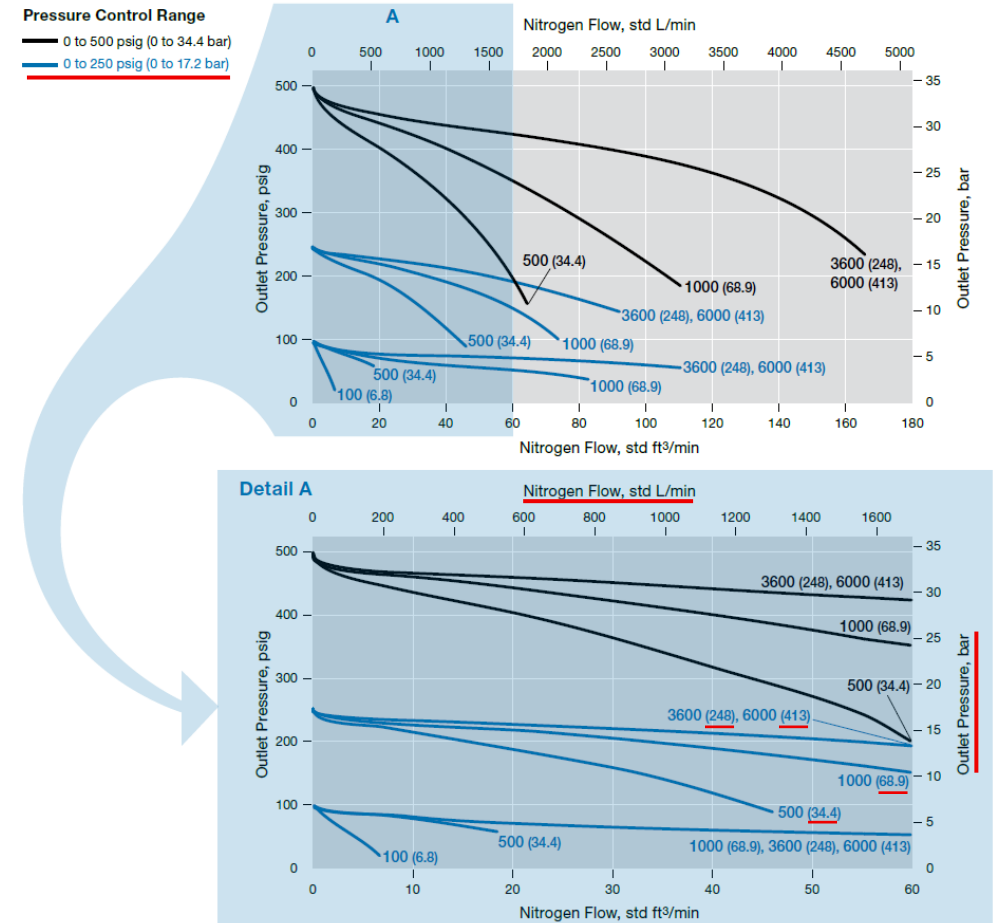
- As your cylinder drains, flow capacity is reduced
- With multiple regulation stages, downstream regulator is limited by upstream setting

KPR Series Pressure-Reducing Regulators Gas Flow

Flow Curves

The flow curves assume an initial set flow rate of 0.035 std ft³/min (1 std L/min) and an initial temperature of 70°F (20°C).

Flow Coefficient 0.20, Pressure Control Ranges 0 to 500 psig (0 to 34.4 bar) and 0 to 250 psig (0 to 17.2 bar)



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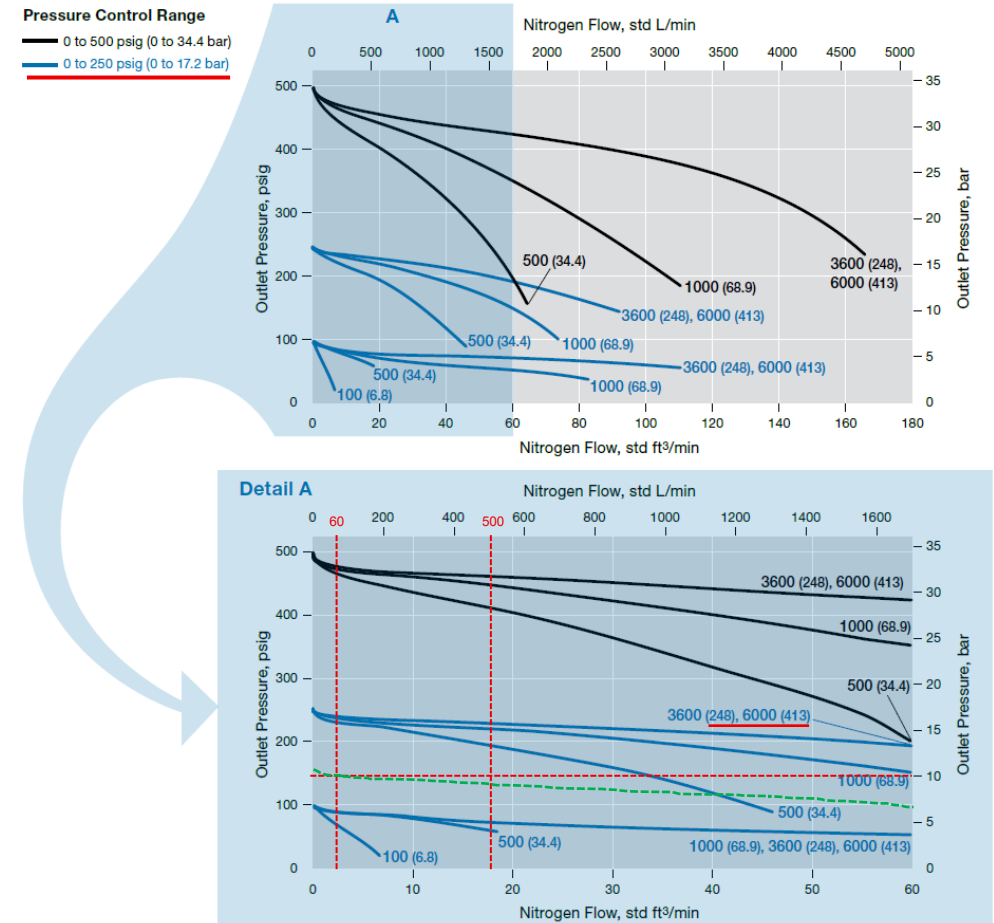
Swagelok®

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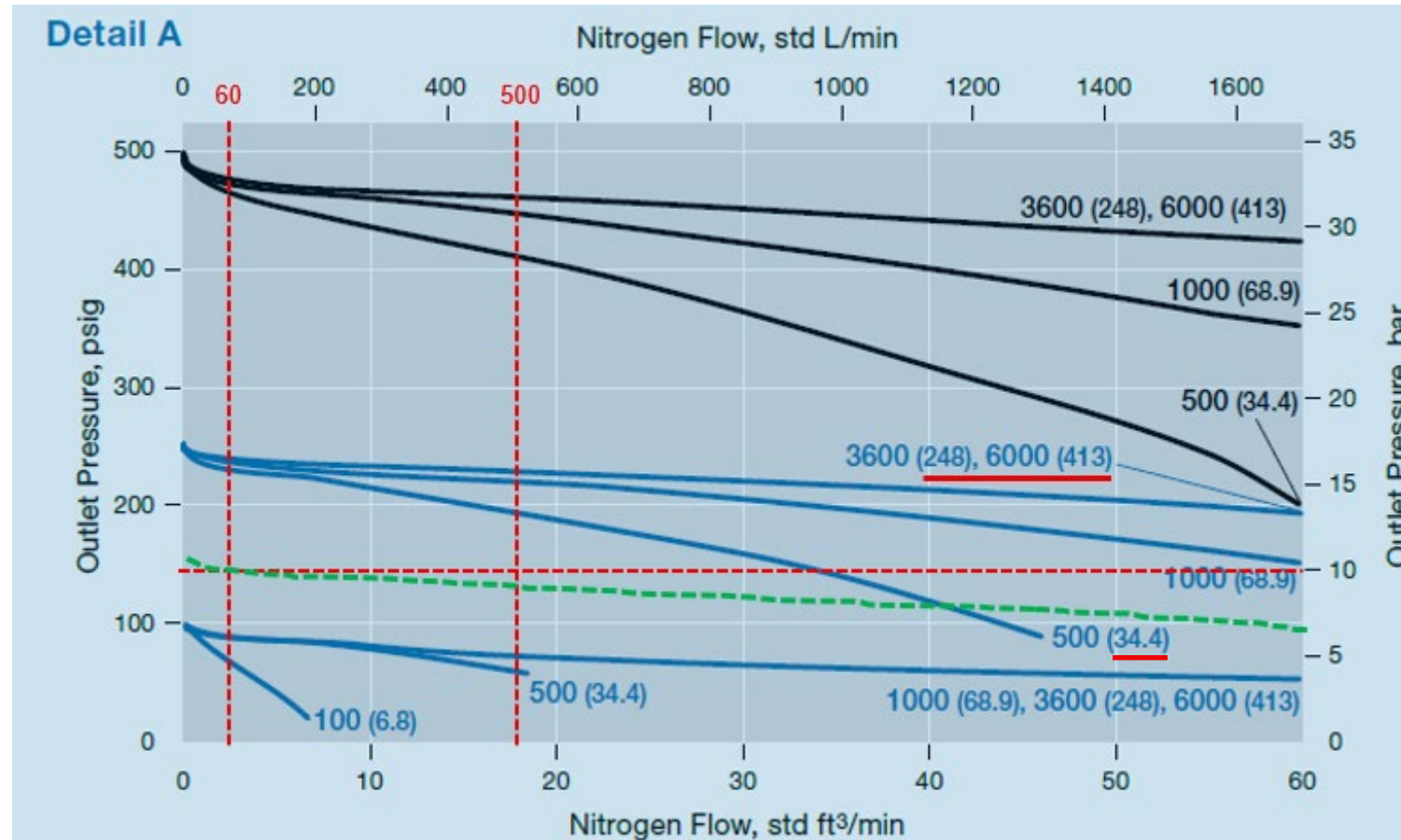
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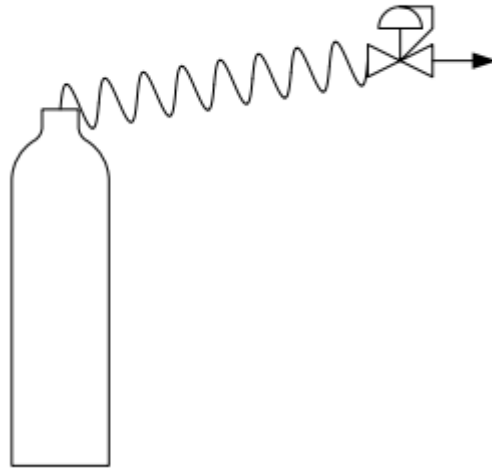
Swagelok®

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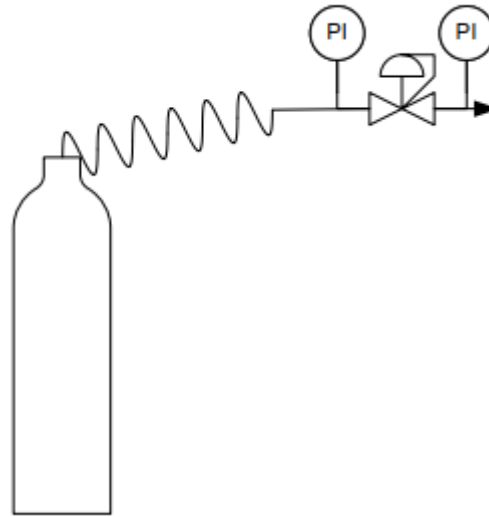
Gas Distribution Case

- Is this usable?
- Is this safe?
- Is this maintainable?



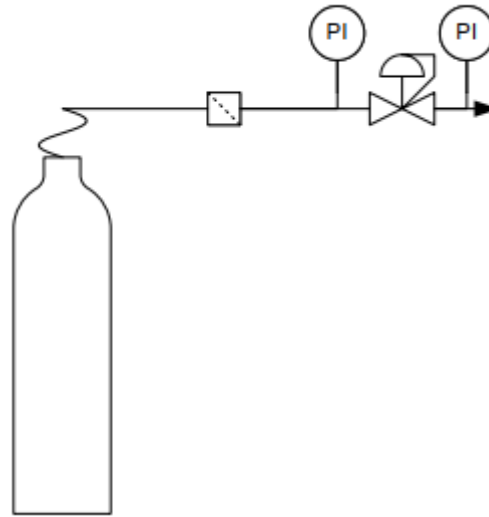
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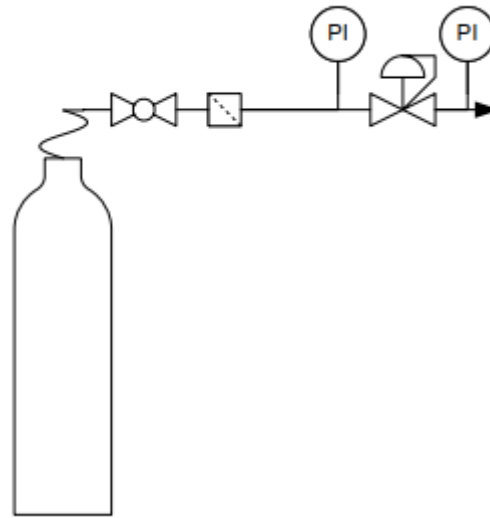
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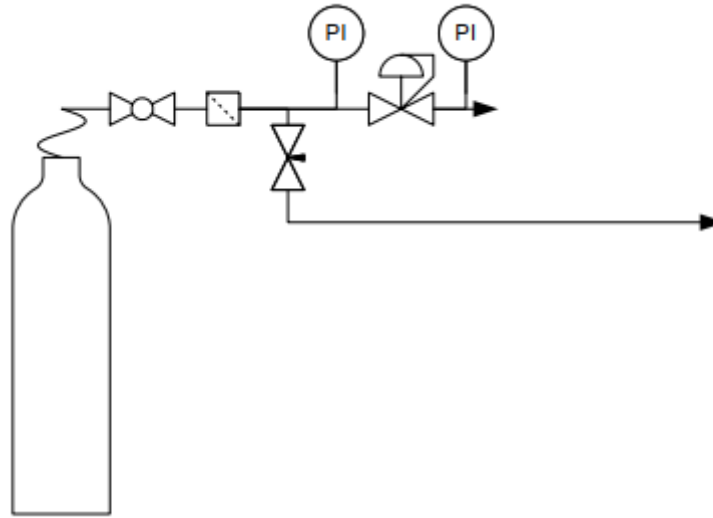
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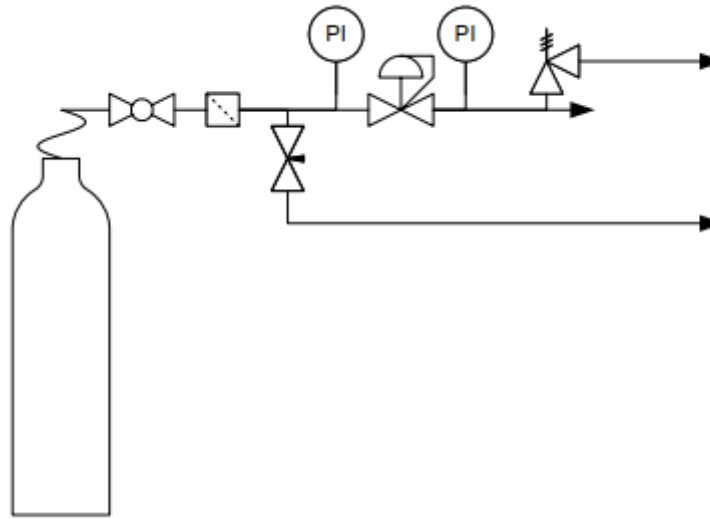
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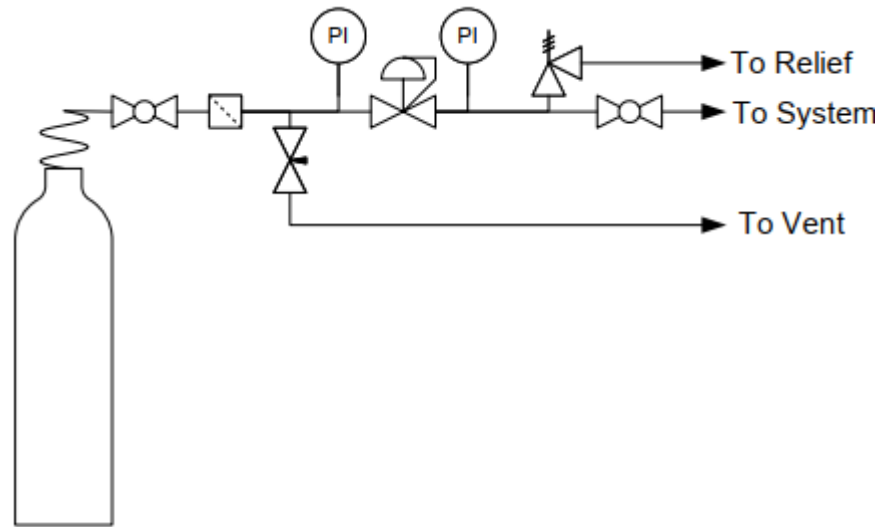
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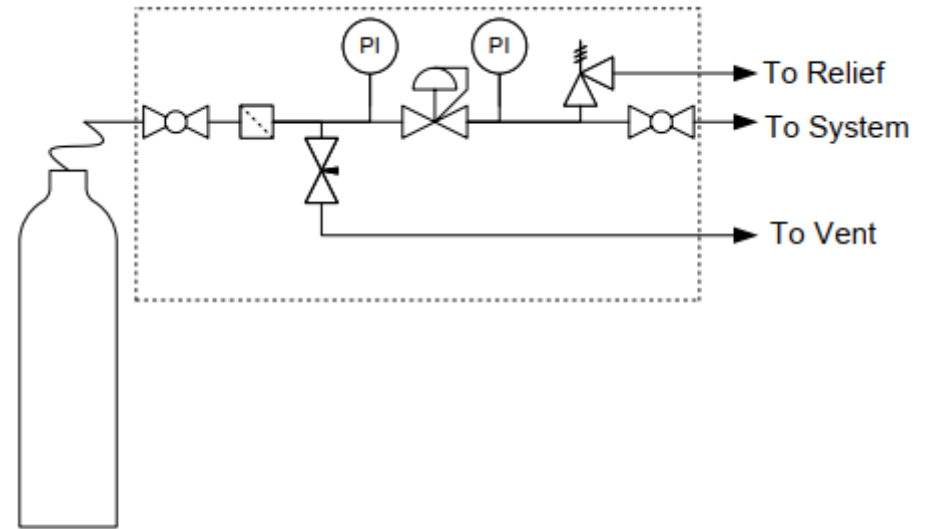
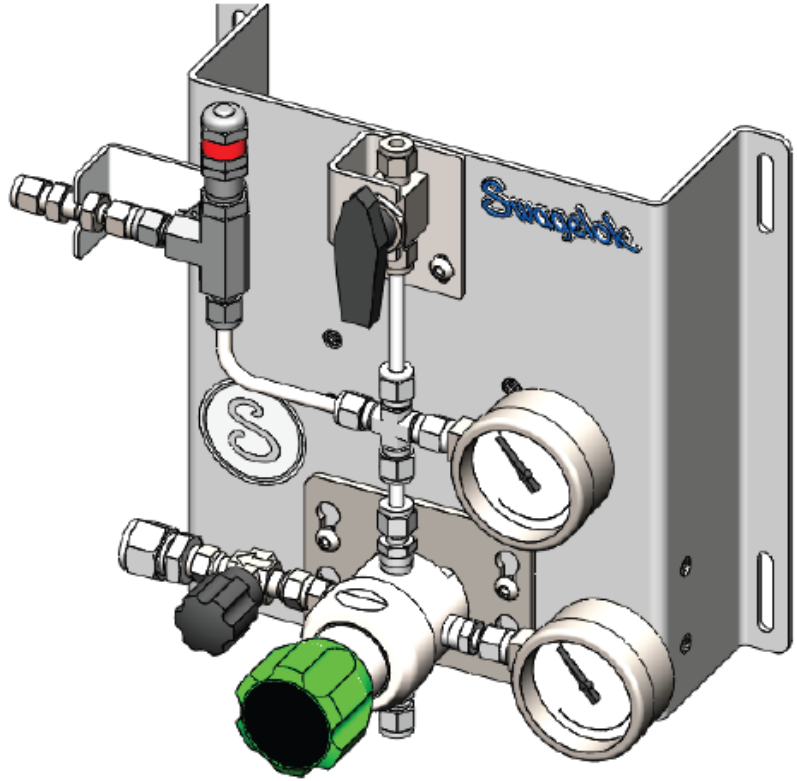


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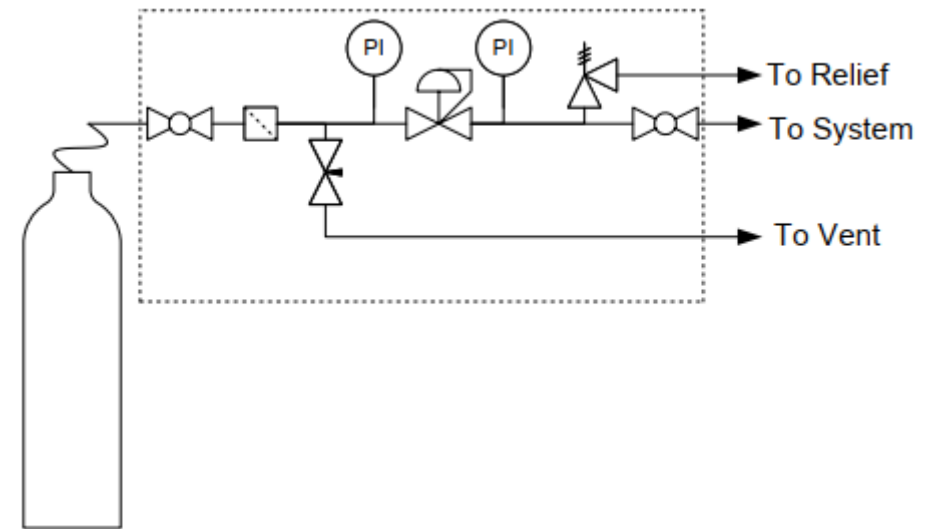
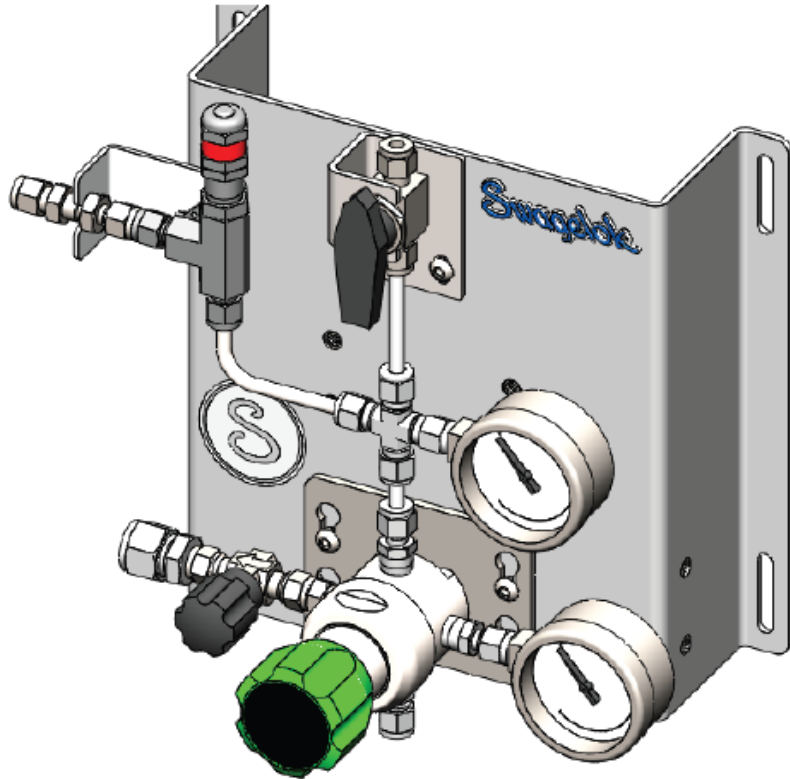
Gas Distribution Case



Gas Distribution Case

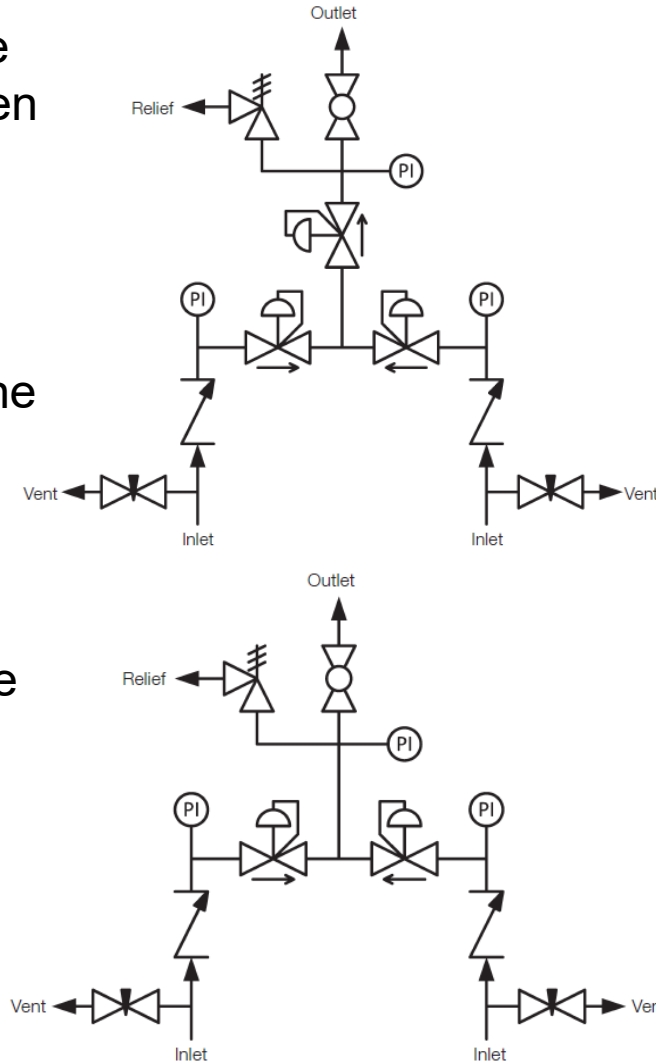
Customer asks:

Can we include Pressure Transducers so we can remotely check the pressure, so we never run out of gas?



Automatic Change Over (SCO)

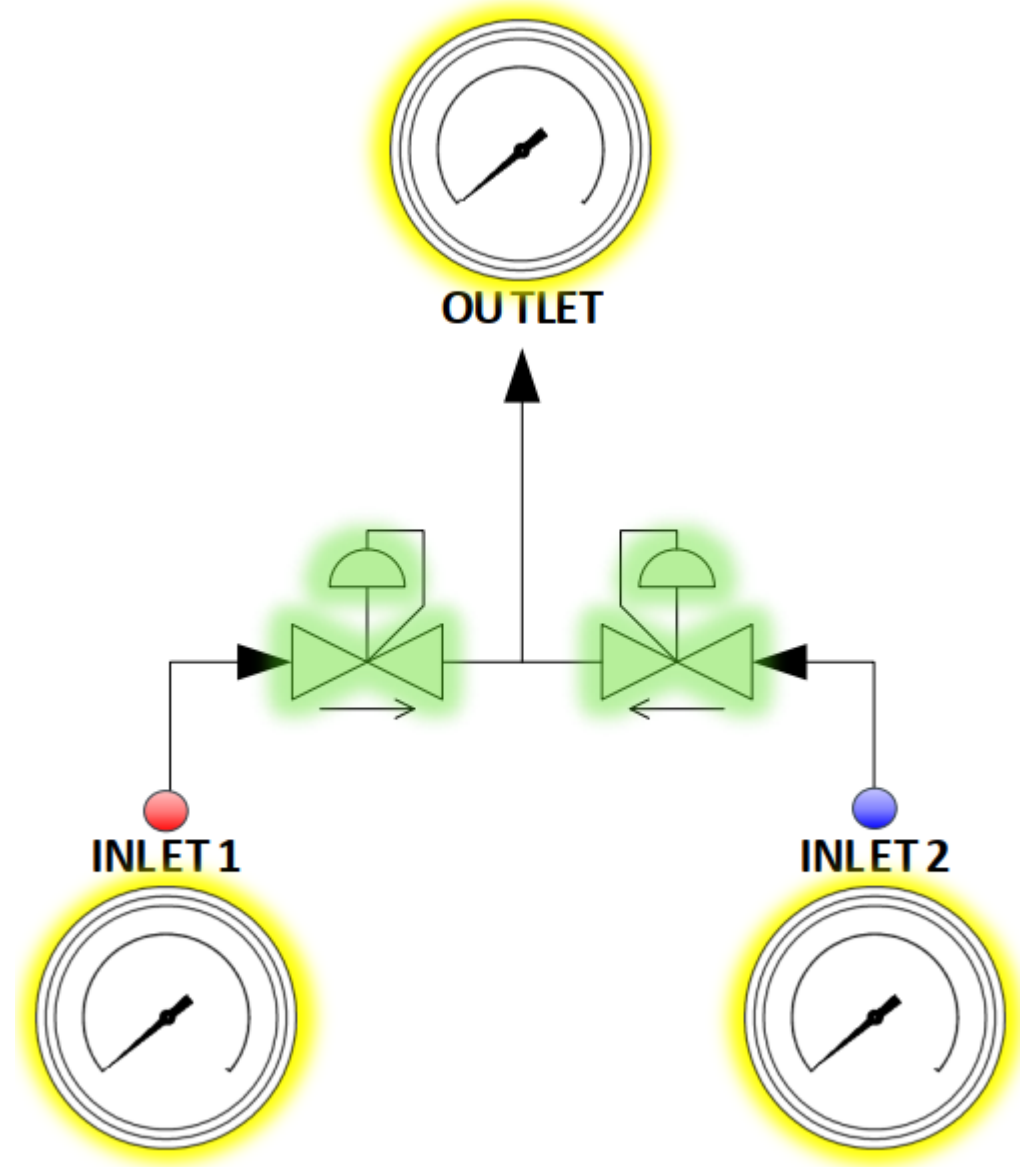
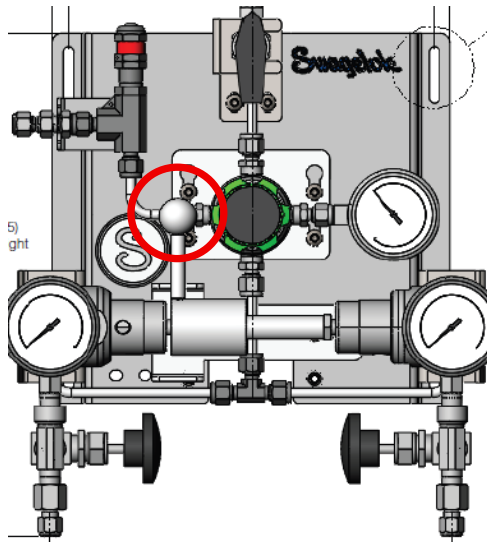
- Automatic Changeover is a special type of primary gas control system used when the continuous supply of gas is important.
- The SCO automatically starts drawing from a secondary source of gas once the pressure of the primary source equals the set changeover pressure.
- Once the system is drawing from the secondary source, operators can isolate and replace or refill the primary source while gas is still being supplied to the system.



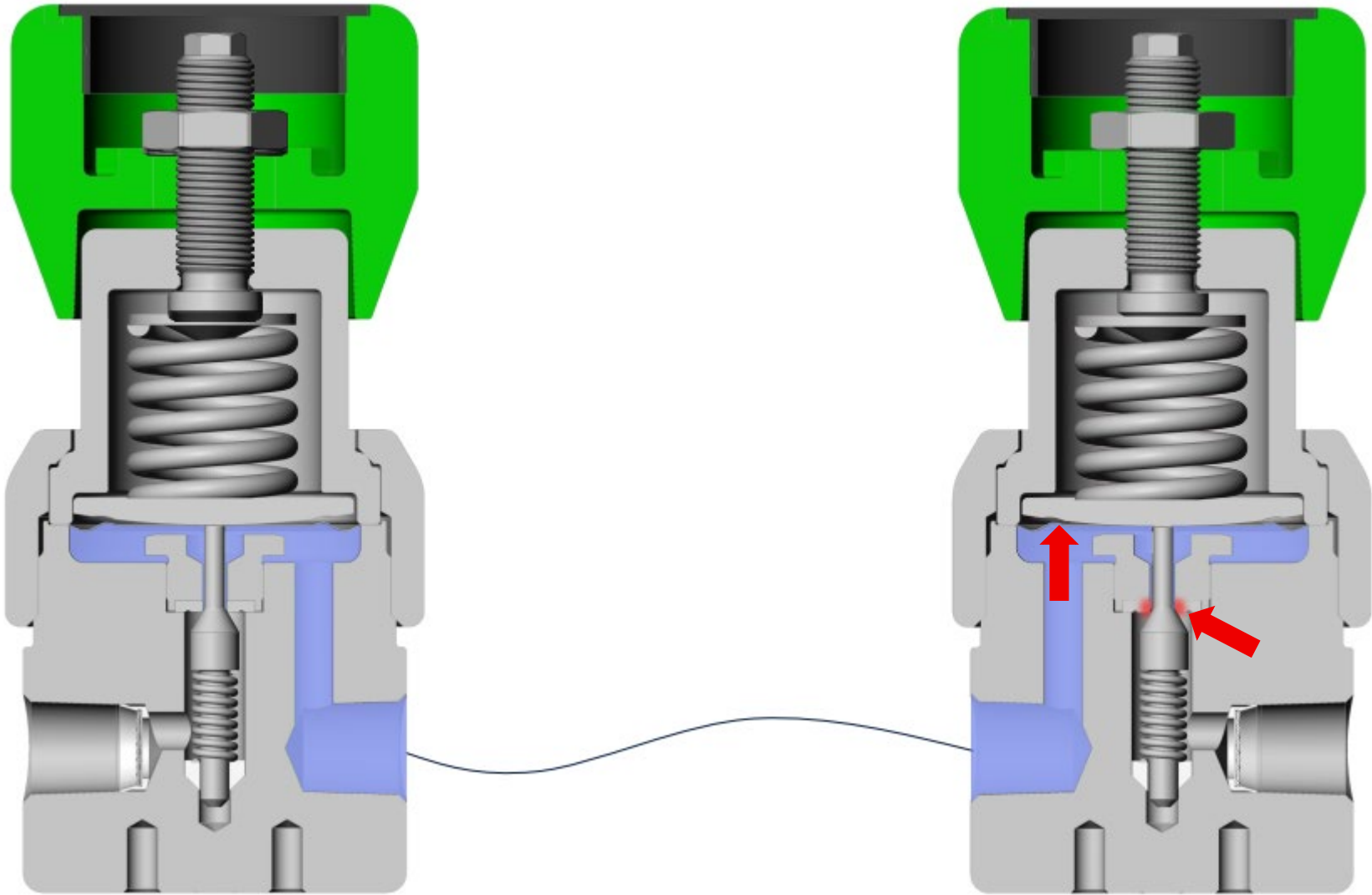
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SCO – Automatic Change-Over

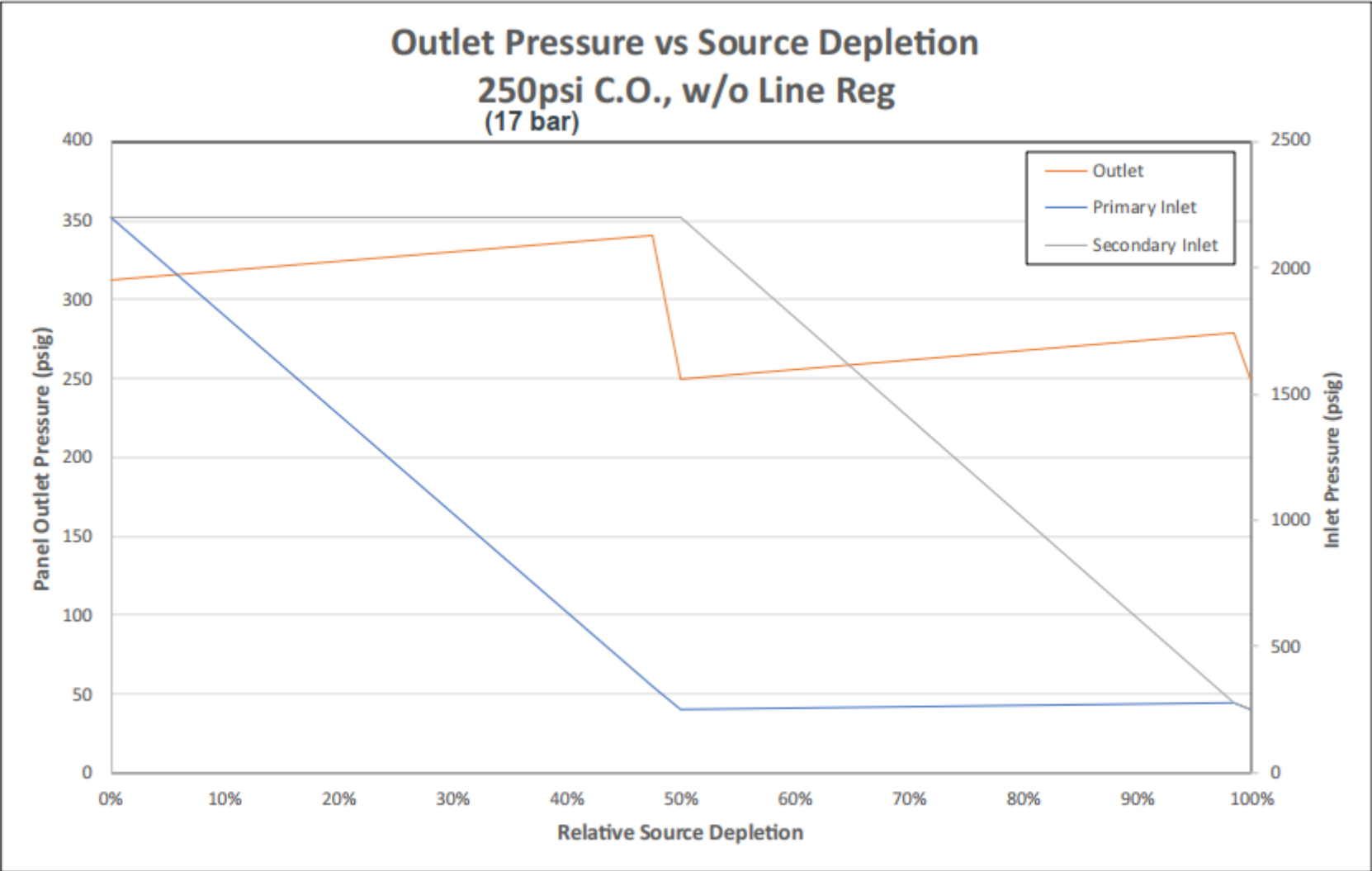
- 2 Inputs, 1 output
- Each Input feeds a regulator
- Regulators are connected at the outlets
- Regulators set at different pressures
- “Higher” regulator will feed first (primary source)
- “Changeover” Pressure is the “lower” Regulators’s setting



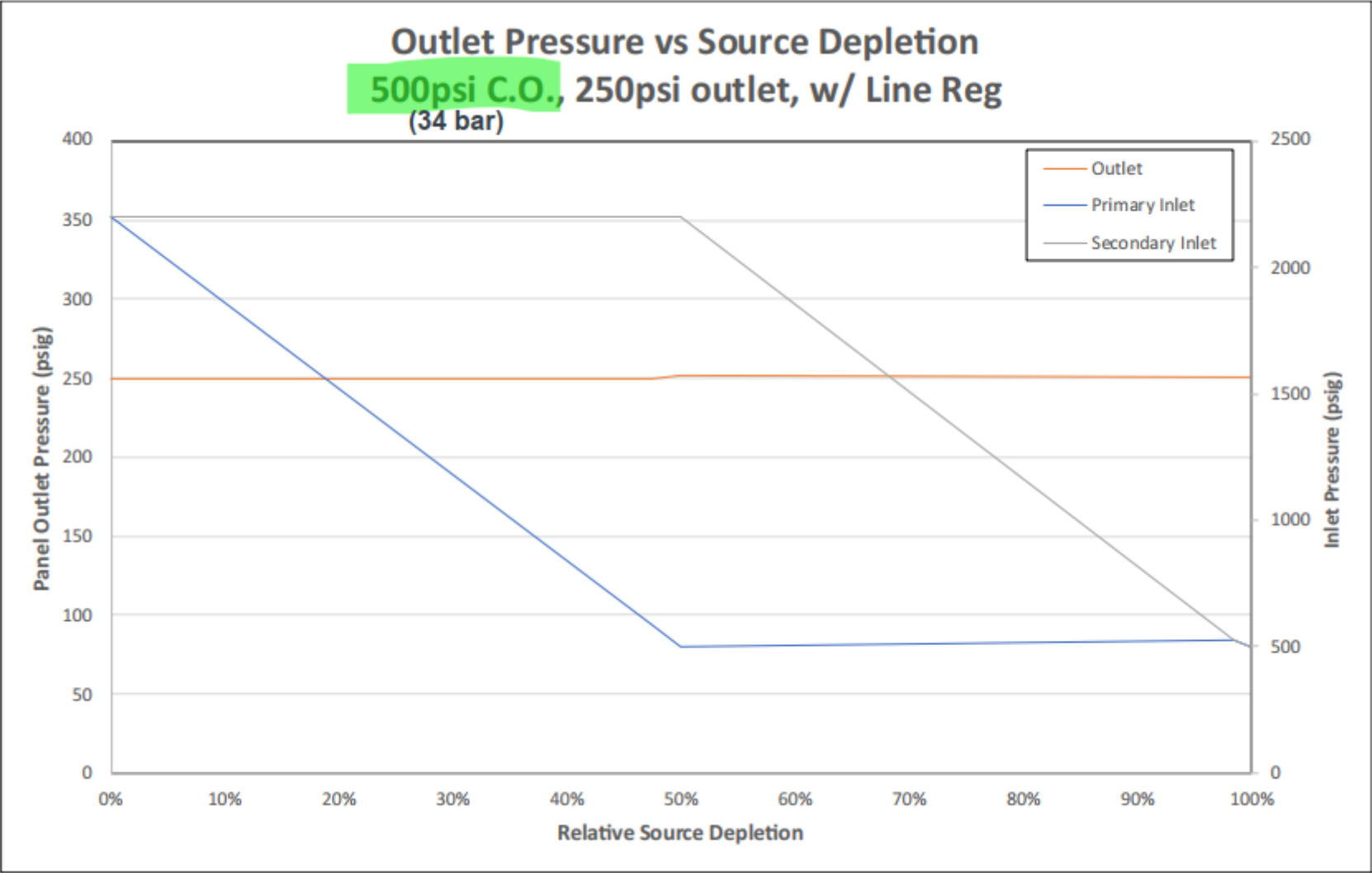
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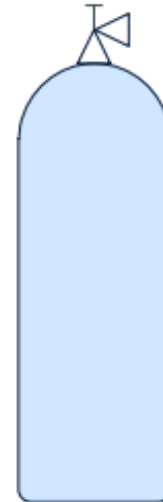
Automatic Change Over (SCO)

- A lower changeover pressure will maximize gas utilization
- A lower changeover pressure reduces the flow capacity of downstream regulators and increase the risk of particulates coming from the cylinder.



201 bara
C.O. Pressure (35 bara)

$$\frac{201 \text{ bara} - 35 \text{ bara}}{201 \text{ bara}} \approx 82,6\%$$



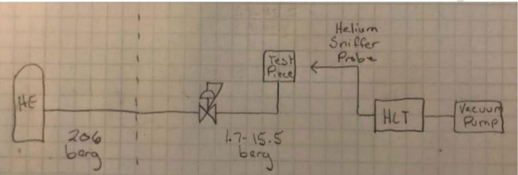
201 bara
C.O. Pressure (18 bara)

$$\frac{201 \text{ bara} - 18 \text{ bara}}{201 \text{ bara}} \approx 91,0\%$$

- *Numbers assume ideal gas behavior

Gas Distribution System Evaluation and Advisory

Gas Distribution System Evaluation and Advisory Services™ – Service Report



HE supply system

Problem Statement: The customer expresses that the current HLT provides random false failure readings and the point of use regulator is difficult to dial in the pressure precisely

Process Conditions:
Pressure: 206barg
Temperature: 20°C
Flow: Static conditions

Evaluation Table

System Location	Observation	Evaluation	Recommended Action	SEQF	Rating (1-5)	Relative Value	Cost to Implement
Source	Pressure ratings downstream the regulator: 1.7- 15.5 barg Upstream pressure: 206barg	A Full bottle pressure of 206bar to the point of use regulator creates unnecessary high-pressure lines inside the lab environment.	Add a first stage high pressure regulator near to the supply bottle to reduce the incoming pressure to 35barg	Safety	3	▲▲	\$\$

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Service Report



Gas Distribution System Evaluation and Advisory Services™

[COMPANY NAME]
[ADDRESS 1]
[ADDRESS 2]
[CITY], [STATE], [POSTAL CODE]
[COUNTRY]

Prepared by: [FIRST NAME LAST NAME]
[DOX MONTH 2000]
Swagelok [LOCATION OR BUSINESS NAME]

Swagelok



Questions?



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