Replacing High-Bleed Pneumatic Devices

Lessons Learned

from Natural Gas STAR Partners

NiSource and

EPA's Natural Gas STAR Program

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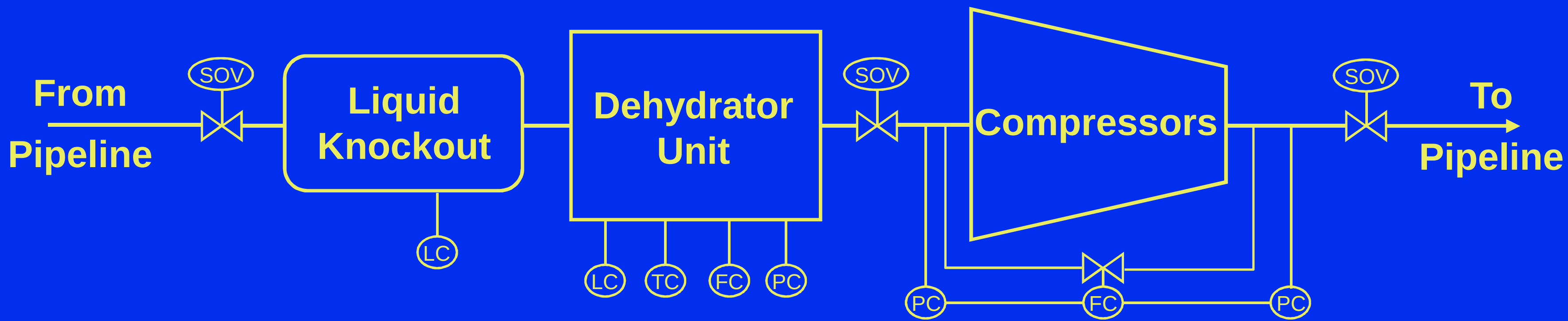
Pneumatic Devices

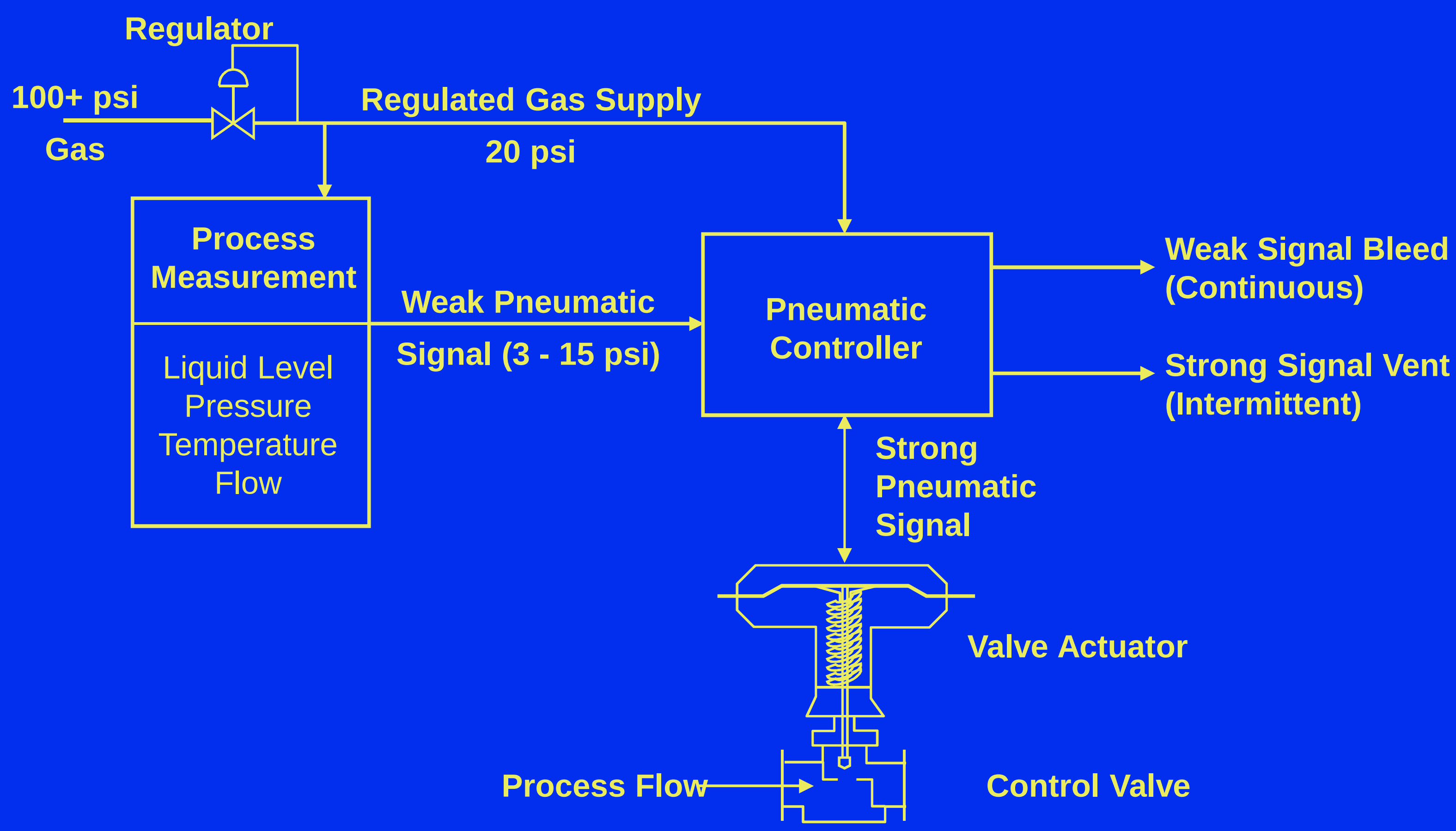
- Pneumatic devices are found in every gas production, processing, transmission and distribution facility
- Most pneumatic devices leak gas by design
- Losses from pneumatic devices are the largest source of methane emissions
- Replacing, retrofitting, or maintaining high-bleed devices saves gas and money
- These methods can be highly cost-effective

Location of Pneumatic Devices at Compression Stations



SOV	=	Shut-off Valve (Unit Isolation)
LC	=	Level Control (Knockout, Contactor, TEG Regenerator)
TC	=	Temperature Control (Regenerator Fuel Gas)
FC	=	Flow Control (TEG Circulation, Compressor Bypass)
PC	=	Pressure Control (FTS Pressure, Compressor Suction/Discharge)

Pneumatic Device Schematic



Sources of Methane Losses

- As part of normal operations, pneumatic devices release natural gas into the atmosphere
- High-bleed devices bleed in excess of 6 scf per hour
  - Equates to >50 Mcf per year
  - Typical high-bleed pneumatic devices bleed an average of 140 Mcf per year
- The actual bleed rate is largely dependent on the device's design

Magnitude of Methane Losses

- Major source of methane losses from the natural gas industry
- Pneumatic devices are used throughout the natural gas industry
  - Between 90,000 to 130,000 in the transmission sector
  - Over 250,000 in the production sector
  - In the distribution sector most pneumatic devices are non-bleeding pressure regulators

Losses from Pneumatic Devices

	Gas Industry	*Oil Industry*
Production	**31 Bcf**	**22 Bcf**
Processing	**16**	**---**
Transmission	**14**	**---**
Total	**61 Bcf**	**22 Bcf**

Total Gas/Oil **83 Bcf/yr**

Three Options for Reducing Losses

- **Option 1**: Replace high-bleed devices with low-bleed devices
- **Option 2**: Retrofit controller with bleed reduction kits
- **Option 3**: Maintenance aimed at reducing losses

Option 1: Replace High-Bleed Devices

- Most applicable to:
  - Controllers: liquid-level and pressure
  - Positioners and Transducers
- Suggested Action: Evaluate replacements
  - Replace at end of device's useful life
  - Early replacement

Option 1: Replace High-Bleed (cont'd)

- Costs vary with size
  - Typical costs range from $700 to $3,000 per device
  - Incremental costs of low-bleed devices are modest ($150 to $250)
  - Gas savings often pay for replacement costs in short periods of time

Option 2: Retrofit with Bleed Reduction Kits

- Most applicable to:
  - High-bleed controllers
- Suggested Action: Evaluate retrofits
  - As alternative to early replacement
  - Retrofit kit costs approximately $250-$500

Option 3: Maintenance to Reduce Losses

- Applies to all pneumatic devices
- Suggested Action: Modify routine maintenance procedures
  - Field survey of installed controllers
  - Where process allows, tune controllers to minimize bleed

Option 3: Maintenance (cont'd)

- Suggested Action (cont'd)
  - Re-evaluate the need for pneumatic positioners
  - Repair/replace airset regulators
  - Reduce regulated gas supply pressure to minimum
  - Routine maintenance should include repairing/replacing leaking components
- Cost is low

Summary of Decision Process

1. Locate and inventory the high-bleed devices
2. Measure & record bleed rates, use vendor specifications, or use EPA defaults
3. Establish technical feasibility of alternatives
4. Evaluate economics of alternatives
5. Develop an implementation plan

Economics of Replacement

Implementation[a]	Replace at End of Life	Early Replacements	
		Level Control	Pressure Control
Cost ($)	150 – 250[b]	380	1,340
Annual Gas Savings (Mcf)	50 – 200	166	228
Annual Value of Saved Gas ($)[c]	150 – 600	498	684
Payback (months)	5 – 12	9	23
IRR (%)	97 – 239	129	42

[a] All data based on Partners' experiences. See *Lessons Learned* for more information.
[b] Range of incremental costs
[c] Gas price is assumed to be $3/Mcf.

Economics of Retrofit

	Retrofit [a]
Implementation cost [b]	$250-500
Bleed rate reduction (Mcf/device/year)	219
Value of gas saved ($/year) [c]	657
Payback (months)	9
IRR	129%

[a] On high-bleed controllers
[b] All data based on Partners' experiences. See *Lessons Learned* for more information
[c] Gas price is assumed to be $3/Mcf

Economics of Maintenance

	Reduce supply pressure	*Repair & retune*	*Change settings*	*Remove valve positioners*
Implementation Cost ($)[a]	153	23	0	0
Gas savings (Mcf/yr)	175	44	88	158
Value of gas saved ($/yr)[b]	525	132	264	474
Payback (months)	3.5	2	<1	<1
IRR	343%	574%	--	--

[a] All data based on Partners' experiences. See *Lessons Learned* for more information
[b] Gas price is assumed to be $3/Mcf

Recommendations

- Evaluate all pneumatics to identify candidates for replacement and retrofit
- Choose lower bleed models at change-out where feasible
- Identify candidates for early replacement and retrofits by doing economic analysis
- Improve maintenance
- Develop an implementation plan

Discussion Questions

- To what extent are you implementing this technology?
- How can this technology be improved upon or altered for use in your operation(s)?
- What are the barriers (technological, economic, lack of information, regulatory, etc.) that are preventing you from implementing this technology?