

Reducing Emissions Through Retrofitting of High Bleed Devices



imagination at work

Presented By: Greg
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**Every year, a single
unit of pneumatic
control valve
instrumentation
typically releases
500,000 scf of natural
gas emissions into
the atmosphere.**





This is
equivalent to
28 tons of CO₂
or the annual
greenhouse
gas emissions
from **5**
passenger
vehicles.

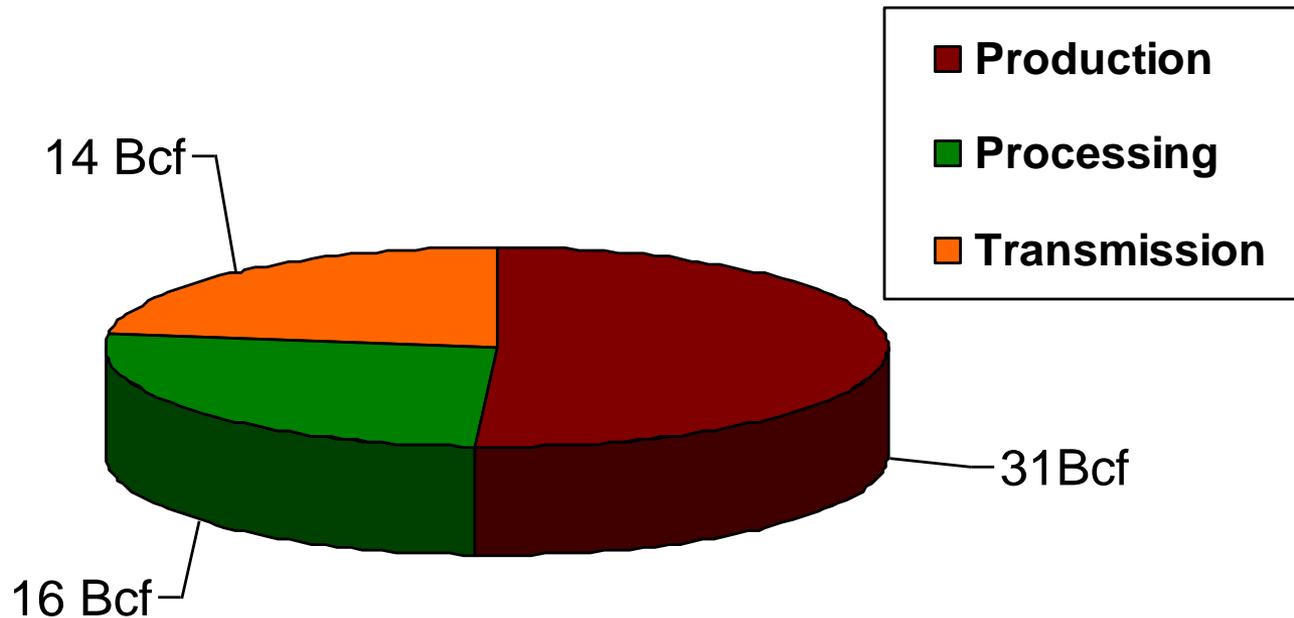
Pneumatic Devices per Sector

	Number of Devices in Natural Gas Systems	Number of Devices in Petroleum Systems
Production and Gathering	478,000	399,000
Transmission and Storage	85,000	-

*Source: EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2009*. April, 2011.
epa.gov/climatechange/emissions/usinventoryreport.html.

Pneumatic Device Emissions

Methane Emissions (Bcf) from Pneumatic Devices Per Year



One of The Largest Sources of Vented Methane Emissions in the Natural Gas Industry

Where Pneumatic Devices are Used

Various Segments of the Gas Industry Have Different Equipment and Different Standard for Using Pneumatic Devices

	Standard Uses of Pneumatic Devices			
	Production	Processing	Transmission	Distribution
Control Valves Operated by Gas?	Yes	Very Few	Yes	Yes
Isolation Valves Operated by Gas?	No	Some	Yes	Some

Pneumatic Devices Linked to Control Valves Are the Largest Source of Pneumatic Emissions in the Natural Gas Industry*

**Source: EPA Methane Emission for the Natural Gas Industry Volume 12: Pneumatic Devices*

Average Bleed Rates for NG Sector

Canadian Petroleum Association (CPA) Study*

	Measured Emissions Rates for Continuous Bleed Devices			
	Production Onshore	Production Offshore	Total Production	Transmission
Number of Measurements	9	9	18	23
Minimum, (scfd/device)	380	108	108	152
Maximum, (scfd/device)	2,334	962	2,334	4,215
Average, scfd/device	1,189 ± 39%	556 ± 33%	872 ± 30%	1,363 ± 29%

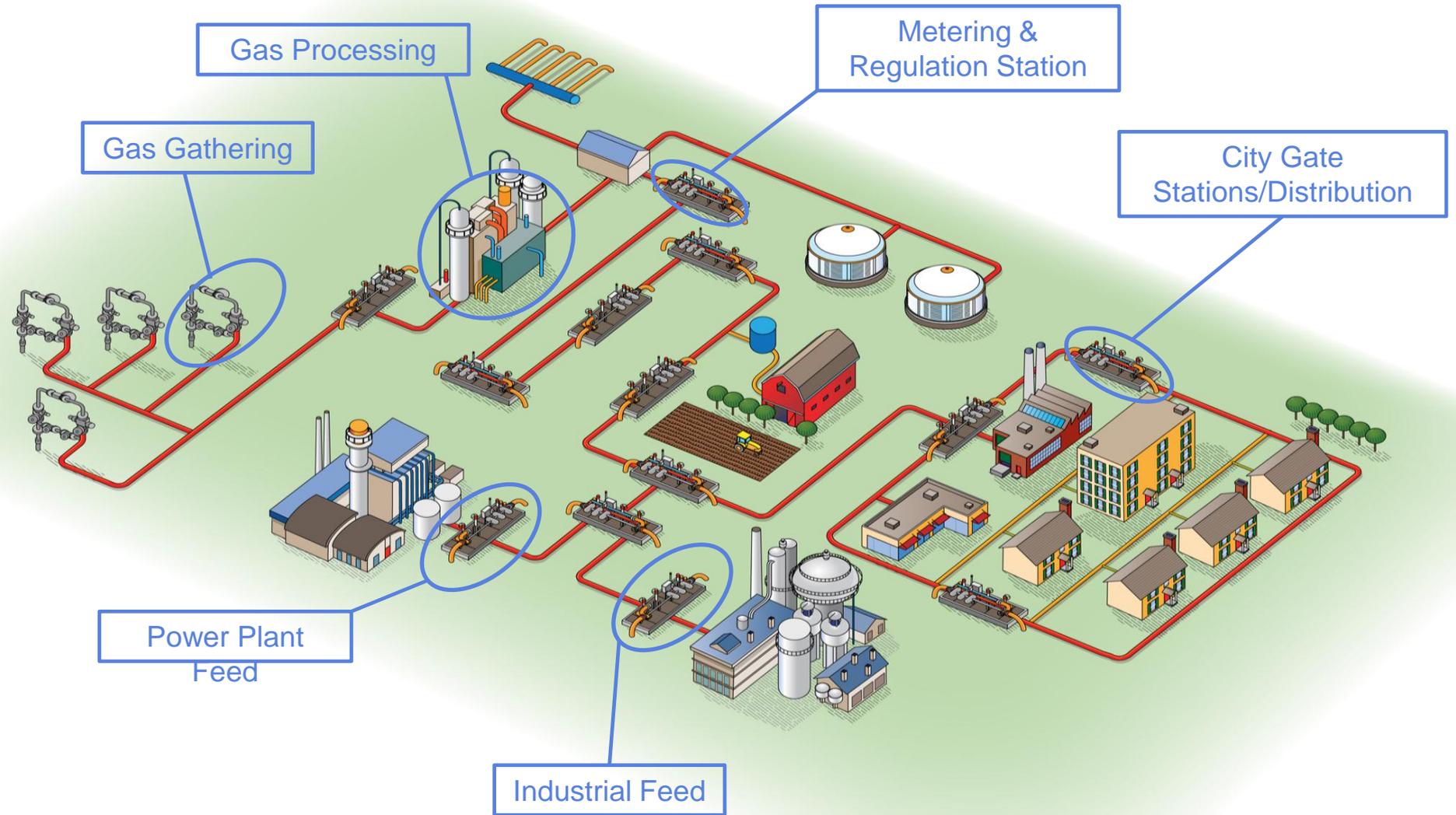
Minimum Production : 39.42 mscf/year per device

Minimum Transmission: 55.48 mscf/year per device

***A Detailed Inventory of CH₄ and VOC Emissions From Upstream Oil and Gas Operation in Alberta” – Canadian Petroleum Association*

Identifying Retrofit Opportunities

Retrofit Opportunities

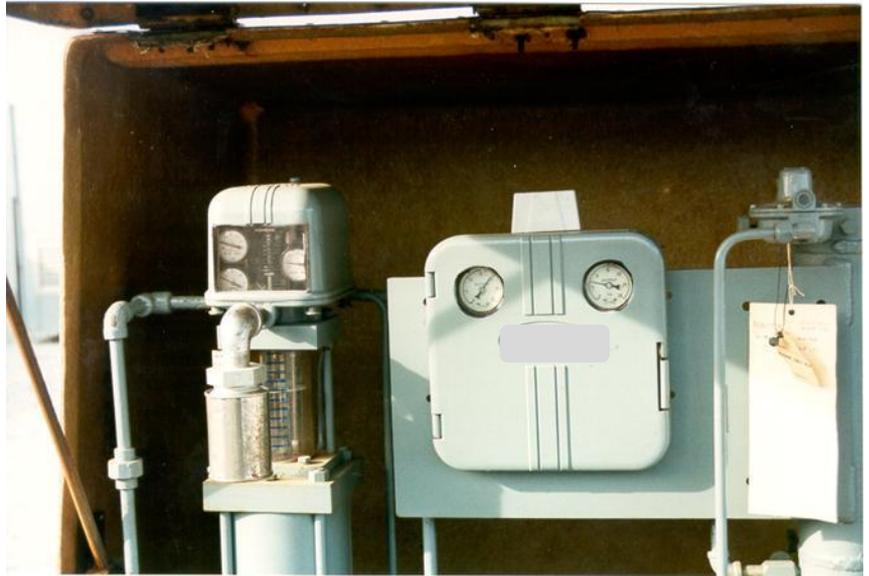


Types of Devices

- **Continuous** bleed devices are used to modulate flow or pressure and will generally vent gas a steady state
- **Actuating or Intermittent** bleed devices perform snap-acting or control and release gas only when they stroke a valve open or close or as they throttle gas flow
- **Self-Contained** devices release gas into the downstream pipeline, not the atmosphere

Why Retrofit?

- Reduce or Eliminate emissions from high bleed instrumentation
- Minimize control instrumentation maintenance
- Simplify Control Logic
- Maintain System consistency
- Retrofit will pay for itself
- Increase durability and ruggedness



The Replacements

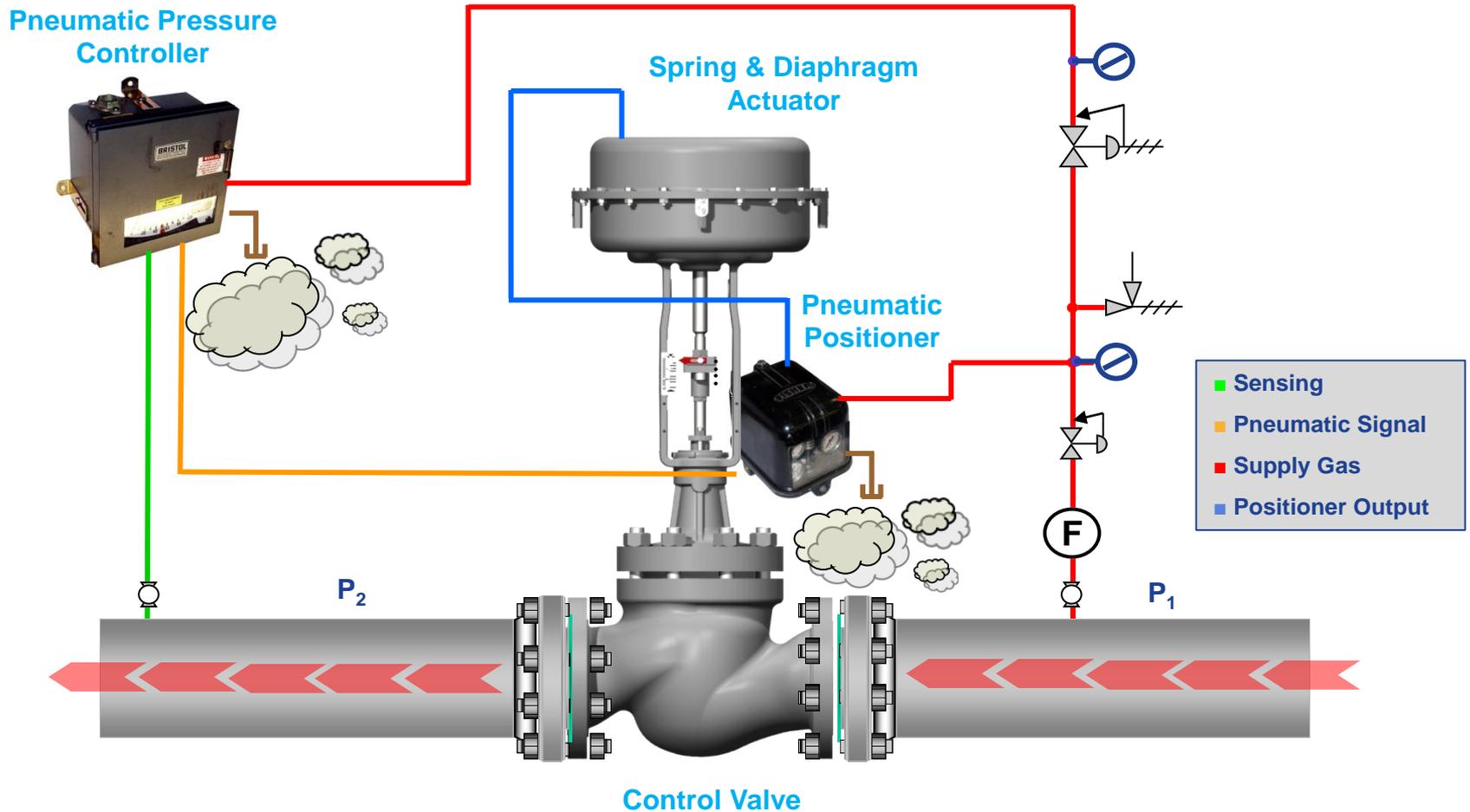
Lower Bleed Pressure Controllers



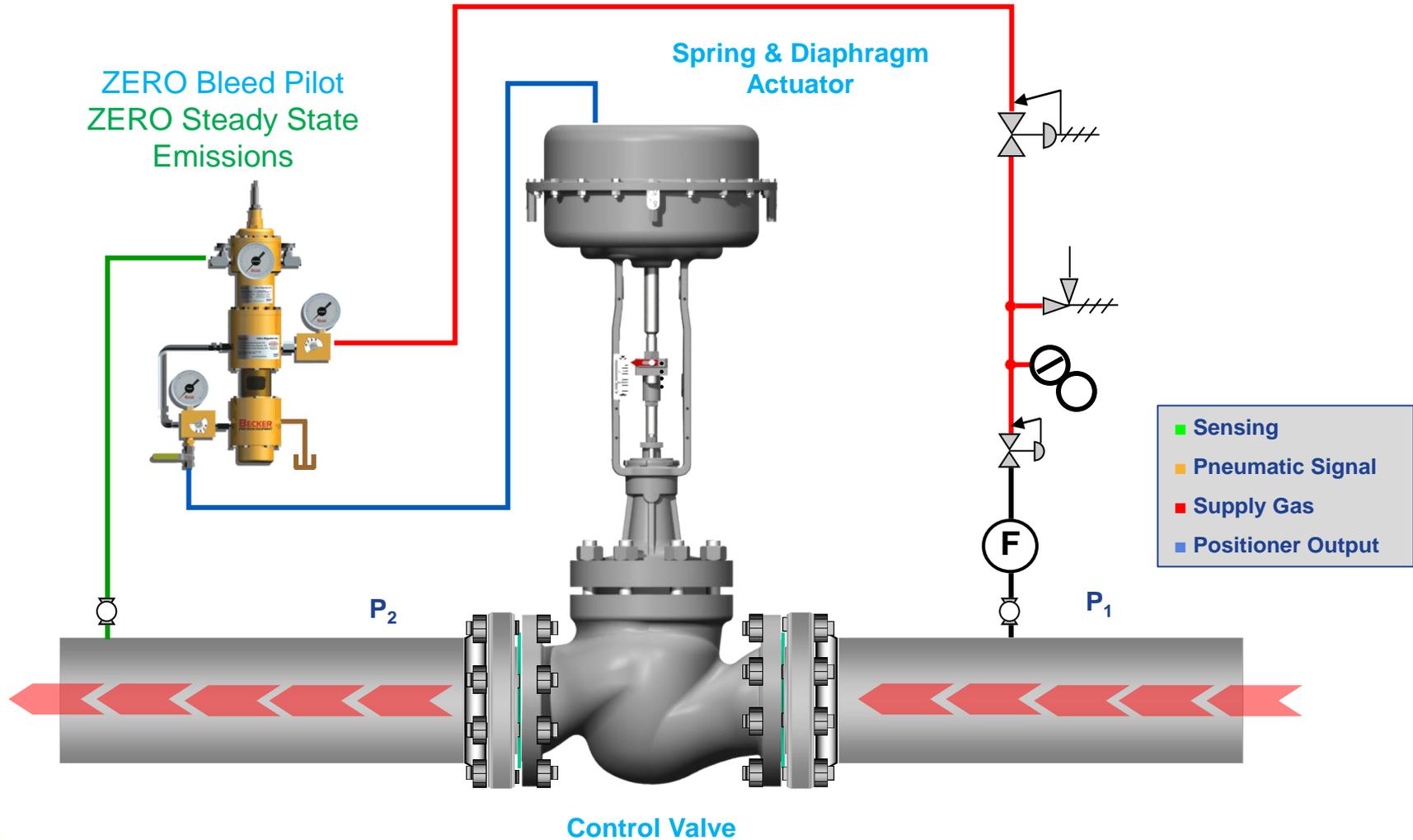
ZERO Bleed Pilot Controllers



Typical Control Valve Configuration

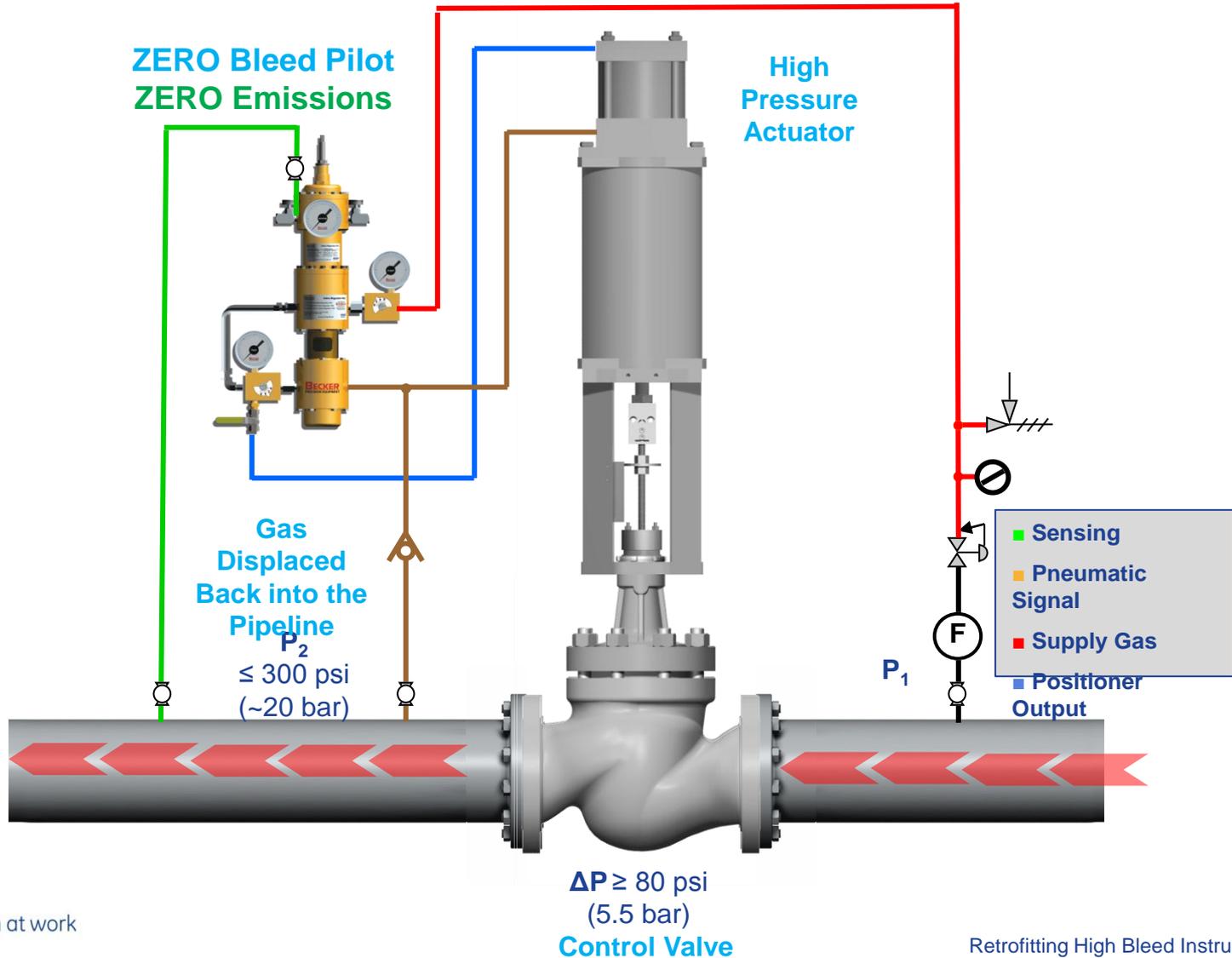


ZERO Steady State Bleed Solution



Bleed To Pressure System

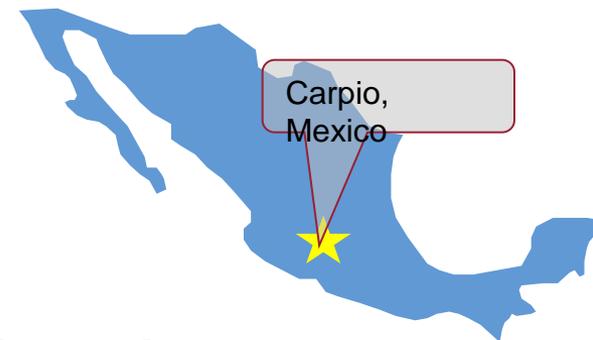
Completely Eliminates Emissions



Retrofit Examples

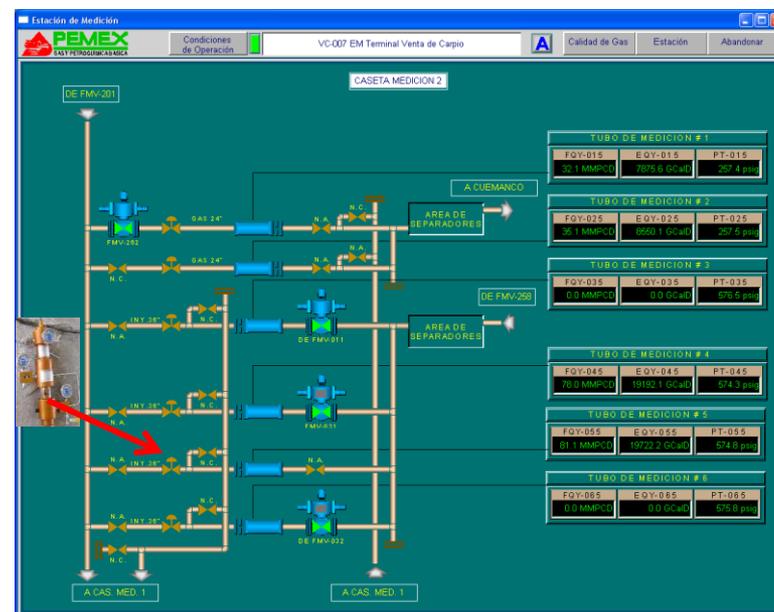
Newer Trial Site: PEMEX

Venta de Carpio Gas Station



Application: Sales & Metering Regulation Station

- Existing Equipment: Fisher 4150
- Retrofit: VRP-SB-CH



Bleed to Pressure Example

Before

Company: National Grid UK

Problem: Frequent Gas Call Outs and Station in Enclosed Building

Previous Equipment:

- Four (4) Moore 750 Pneumatic Valve Positioners
- Eight (8) Bristol 624 – II Pneumatic Pressure Controllers
- Four (4) Actuators on Axial Style Valves



Bristol 624 Controllers Constantly Venting Gas



Axial Style Valve Equipped with Moore 750 pneumatic positioner, two inch (50mm) diameter piping used to vent gas to atmosphere

Bleed to Pressure Example

After

Company: National Grid UK

Problem: Frequent Gas Call Outs and Station in Enclosed Building



Becker Solution:

- Replaced Moore 750 Positioners with Becker HPP and Bristol 624 –II Controllers with Becker VRP
- Implemented Becker Bleed to Pressure System with Becker LPDA actuator
- Eliminated natural gas emissions from station with Becker ZERO BLEED™ instrumentation



Becker VRP ZERO BLEED™ feature eliminated Steady State Emissions



Becker High Pressure Positioner (HPP) and LPDA actuator allows gas to be discharged into a downstream Bleed to Pressure system—eliminating ALL emissions

Bleed to Pressure

ROI



Station Control Valve Emissions - Before			
Original Instrumentation	Quantity	Approximate Annual Vent (scf)	Approximate Lost Gas Value*
Bristol 624 – II Controller	8	633,310	\$4,433.00
Moore 750 Positioner	4	1,945,167	\$13,616.00
Total Gas Lost		2,578,477	\$18,049.00

*Assumed European NG price of \$7/MCF

Emissions Reduced Summary - After	
Total Annual Emissions Reduced	2,578,000 scf*
Equivalent to the Annual CO₂ Emissions From:	26 Passenger Vehicles
Equivalent to the Carbon Sequestered Annually by:	28 Acres of Pine Forest
Total Annual Savings	\$18,049.00
Approximate Payback Period	< 2 years

*Equivalent to 142.2 Metric Tons of CO₂

Partial System Upgrade

Nicor Gas - One of the nation's largest distribution companies

Largest natural gas distributor in Illinois

Network of more than 29,000 miles of pipeline



Partial System Upgrade cont.

Recognized benefits from ZERO Bleed pressure control system

Implemented system-wide retrofit

- Replaced 25 “high-bleed” pneumatic controls
- 15 locations
- Mechanical controls used for all new installations

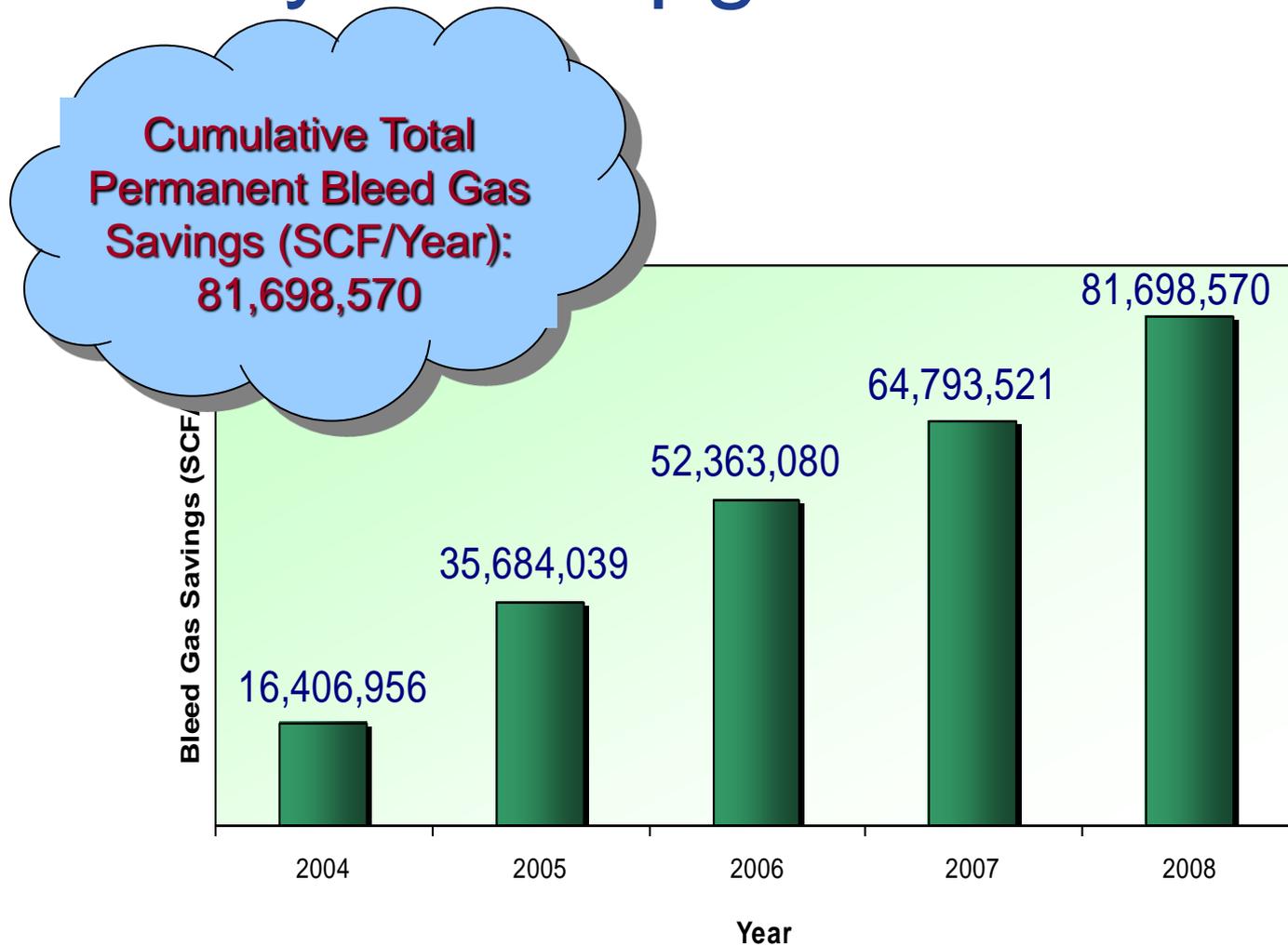


Before



After

Partial System Upgrade cont.



*Source: EPA Methane Emission for the Natural Gas Industry Volume 12: Pneumatic Devices

Partial System Upgrade cont.

Total emissions reduced from this project equivalent to:

- 89,200 passenger cars not driven for a year
- 2,540 railcars of coal not burned
- 1,132,700 barrels of oil not used
- 12,489,100 tree seedlings carbon sequestered
- 110,700 acres pine acres carbon sequestered

Eliminated emissions equivalent to the gas use of over 1,850 homes

**Source: EPA Methane Emission for the Natural Gas Industry Volume 12: Pneumatic Devices*

Tools For Retrofitting

The EPA Website

More detail is available on these practices:

epa.gov/gasstar/tools/recommended.html



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Recommended Technologies and Practices

[Natural Gas STAR partners](#) share information on cost-effective methane emission reduction technologies and practices via submission of [annual progress reports](#) detailing their emissions reduction activities. To promote technology transfer and share industry best practices, the Natural Gas STAR Program provides information on cost-effective methane emission reduction opportunities through a variety of documents including *Lessons Learned Studies*, *Partner Reported Opportunities (PRO) Fact Sheets*, Technical Presentations, and *Partner Update* articles (to learn more, see descriptions of [Natural Gas STAR technical resources below](#)). *Lessons Learned Studies* and *PRO Fact Sheets* are also available in [Arabic, Chinese, Russian, and Spanish translations](#).

Please note that EPA does not advocate any particular vendor's equipment or technology. The intent of the information presented below is to provide partner companies and others in industry with information for evaluating the applicability of these technologies and practices to their operations.

[Compressors/Engines](#) | [Dehydrators](#) | [Directed Inspection and Maintenance](#) | [Pipelines](#) | [Pneumatics/Controls](#) | [Tanks](#) | [Valves](#) | [Wells](#) | [Other](#)

Each technical document on this page shows economic payback values at a natural gas price of \$3, \$5, and \$7. However, the table on this page is arranged by economic payback based on a natural gas value of \$5/Mcf. This is considered a conservative natural gas value and some individual documents may reflect calculations assuming higher natural gas values. Actual payback may vary depending on individual partner operating circumstances.

Compressors/Engines

Document Title	Capital Costs	Production	Gathering and Processing	Transmission	Distribution
Estimated Payback: 0-1 year					
Replace Gas Starters with Air or Nitrogen PRO Fact Sheet #101 (PDF) (2 pp., 71K)	< \$1,000	X	X	X	
Reduce Natural Gas Venting with Fewer Compressor Engine Startups and Improved Engine Ignition PRO Fact Sheet #102 (PDF) (3 pp., 75K)	< \$1,000	X	X	X	X
Reducing Methane Emissions from Compressor Rod Packing Systems Lessons Learned (PDF) (8 pp., 271K) Presentation (PDF) (15 pp., 875K) June 2006	< \$1,000	X	X	X	
Test and Repair Pressure Safety Valves PRO Fact Sheet #602 (PDF) (3 pp., 107K)	< \$1,000	X	X	X	X
Reducing Emissions When Taking Compressors Off-Line Lessons Learned (PDF) (11 pp., 248K) Presentation (PPT) (19 pp., 590K, About PPT) EXIT Disclaimer	\$1,000-\$10,000	X	X	X	X
September 2004					

Quick Finder

- [Recommended Technologies and Practices](#)
- [Technical Document Translations](#)
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You will need Adobe Reader to view some of the files on this page. See [EPA's PDF page](#) to learn more.

GE Valve Emissions Calculator

GE Oil & Gas Valve Emissions Calculator
Becker Products

Registration:

Name:

Company:

Title:

E-Mail:

Country:

Would you like to receive information about other Becker products?
 Yes No
* indicate required fields

→ Let's Go → Skip Registration

Provides calculations based on predominate regional currency & market price

Registration *may* be skipped
**If registration skipped tool will default to USD(\$)* market pricing

Site Overview

On average half a million cubic square feet of natural gas is released into the atmosphere every year from a single pneumatic control valve instrument. This is equal to an amazing 28 tons of CO₂. Read on to find out how you can eliminate some, or even all, of these emissions by using a Becker Valve Regulator Pilot (VRP).

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www.ge-valve-emissions-calc.com

Calculation Reference Name

Reference Name:

Valve Controller

Select Pneumatic Controller Model: 

None
Average Model

Bristol 624-II
Fisher 4100Z
Fisher 4150K
Fisher 4160K
Fisher 4195K
Fisher C1
Foxboro 43AP
ITT Barton 335P
Other

Optional: 

scf/hour

Select Pneumatic Positioner Model: 

None

Enter Quantity:

Enter Specific Bleed Rate (Optional): 

scf/hour

Approximately how long have these devices been installed:

Years

→ Calculate

Select from a drop down menu of common manufacturer models.

**Selection will default to manufacturer consumption rate.*

If model is unknown you be elect to use “Average Model” which defaults to an assigned value

Hover over any of the “Information Icons” for more information on the field

Easily override bleed rate

As an option, you may take age into account. **The calculator assumes 1% increase in bleed rate a year*



Your Emissions Reduction with a Becker Valve Regulator Pilot (VRP)

Summary Of Input:

- 1 Average Model
- 1 Average Model

By replacing this instrumentation with a Becker Valve Regulator Pilots (VRP):

You could reduce your emissions output by approximately **500,196 standard cubic feet** of methane a year.

Which is equivalent to approximately **28 tons of CO₂** a year.

Providing a total annual lost gas savings of approximately **¥ 45,693.00***.
*at a rate of ¥ 91.35 per thousand cubic feet (Mcf) of natural gas

Equivalent CO₂ tons & local market price

This emissions reduction would be roughly equivalent to :

Eliminating the annual greenhouse gas emissions from **5 passenger vehicles**.

Or

The carbon sequestered annually by **5 acres of pine forests**.

PLEASE NOTE: This calculation is provided as a convenience; it is not intended and should not be relied on as a representation or warranty. Actual results may vary depending on the circumstances.

- Edit
- VRP Payback Report
- Share My Findings
- New Calculation

Mobile Device Compatible Calculate on the go!





imagination at work