PROCESS INSTRUMENTATION

Bleeding Gas - **Is Bleeding Cash**

Siemens Zero-Bleed Valve Positioners Offer Safety, Control and Significant Savings to Pipeline Operator

www.usa.siemens.com/positioners

By replacing legacy electropneumatic valve positioners with digital, zero-bleed ones can generate significant cost savings for medium-to-large pipeline operators seeking a sure way to reduce costs, nuisance alarms, emissions and compliance issues

Most midstream pipeline operators would agree that precision and control are critical requirements to the efficient transportation of their customers' natural gas production. Valve positioners — auxiliary components that regulate pressure and flow by adding or subtracting compressed natural gas in their correspondent actuators — play an essential role in providing operators with that control by monitoring pressure, temperature and flow of these natural resources during processing and transportation.

For this reason, positioners are commonly found in transmission compressor stations and along distribution pipelines. Depending on the length of a pipeline, there can be hundreds, sometimes thousands, of control valves and positioners.

Since these devices only encounter refined natural gas rather than crude or corrosive compounds during use, positioners tend to have a longer lifecycle than most other control system components in a processing plant. As such, they are often overlooked when considering plant upgrades.

But what many operators may not realize is that the long-lasting performance of legacy electropneumatic positioners may be costing them dearly.

Reliability but with a big cost. Where reliability and durability are gained, substantial OPEX and precious natural resources are potentially being lost. Electropneumatic positioners, the most commonly used analog positioner in pipeline processing plants, are designed to leak by default. Walk into any area with this traditional positioner and the hissing sound of released compressed natural gas — along with the sulfuric odor of added mercaptan — indicate that the positioner is doing its job. These positioners continuously bleed natural gas and mercaptan as a way to regulate pressure and position of the actuator.

Unfortunately, this inherent inefficiency can quickly become a liability if too much gas or mercaptan is leaked. Most positioners are located in unmanned areas that largely rely on sensors and relays to communicate with a pipeline operator's control system. Many of these systems operate within highly regulated parameters that monitor mercaptan levels for safety and environmental purposes.

When mercaptan thresholds are exceeded, an alarm is triggered, and a technician must be dispatched for physical site assessment before the alarm can be disabled. In some in-

stances, pumps or valves may even be shut off, resulting in costly disruptions to operations and production.

Stop the bleeding with fully digital Siemens SIPART PS2 valve positioners

But bleeding gas and mercaptan can add up to more than the cost of a technician's truck roll. The inefficiencies of a standard analog valve positioner can undermine any enterprise efforts to reduce emissions and remain compliant with environmental regulations that, if violated, can lead to fines and legal fees. Moreover, when the total costs of processing and compressing natural gas are considered, positioner inefficiencies can add up to hundreds of thousands, even millions, of dollars lost each year.

Fortunately, upgrading to zero-bleed digital positioners that are part of the Siemens SIPART portfolio of positioners for linear and part-turn actuators. It can effectively eliminate wasted money and resources while allowing operators to gain greater precision and insight into valve, actuator, and positioner performance throughout processing plants, pipelines and distribution centers.

A traditional, analog electropneumatic positioner is a force-balanced instrument that continuously modulates to balance a spring-loaded pressure upon a diaphragm. This early industrial configuration results in the proper, albeit imprecise, positioning of a valve, but is also the reason these positioners bleed a steady stream of gas and mercaptan into the air.

Digital positioners, on the other hand, are capable of greater precision in valve positioning and require 90 percent less compressed gas to execute the same position signal. For example, the Siemens SIPART PS2 positioner uses a closed-loop control with a 99 percent position and tight closing function. Its smart chamber pressure control feature ensures faster valve adjustment while non-contacting integral pressure sensors monitor the compressed gas supply and valve chamber pressure.

In addition, the SIPART PS2's integrated booster applications provide the same level of precision and speed for larger drives. In comparison to legacy, electropneumatic positioners, this closed-loop control feature can potentially save hundreds of therms worth of natural gas and mercaptan each day. With this capability, operators can significantly reduce energy consumption and associated compression costs.

Millions in potential savings. Consider, for example, the savings from an actual use case calculated by a multistate U.S. pipeline services company. As shown in Table 1, its engineers calculated that the all-in savings of migrating from an analog, electropneumatic positioner to a digital, zero-bleed one, such as the SIPART PS2, to be nearly $2,500 per valve per year, depending on the price of natural gas.

For pipeline operators, the savings can quickly add up. A mid-size pipeline operator with hundreds of miles of pipeline and scores of compressor stations along their lengths could save millions of dollars a year, quickly paying for their investment in zero-bleed digital positioners in as little as a year with substantial returns for years to come.

In fact, adding these calculated cost-savings to a simple assumption of five compressor stations for 350 miles of pipeline, with each station operating up to 20 valve positioners or more, converting legacy ones to zero-bleed, digital models could generate a potential savings of $250,000 in the first year alone. Conversely, of course, this figure could be seen as the opportunity cost of keeping the status quo intact.

Table 1's calculation is based on the average cost per therm of natural gas and the average electropneumatic positioner's gas consumption. Excluded from this calculation, however, are the costs of compressing and processing that precede the gas bleeding as is the cost of processing the mercaptan that is added to the gas for safety. Though these numbers remain largely undefined due to varying prices from one gas company to the next, the additional savings remain with the operator.

Compressed Natural Gas Cost Calculation for Analog Positioners

Natural Gas *(Average cost per therm)*	$0.95
Positioner Consumption of Natural Gas *(Average per day)*	$6.84
Annual Cost of Natural Gas *(To power an average electropneumatic positioner)*	*$2,497*

[1] natural gas therm = 100,000 BTU

Table 1. Conservative calculation of the natural gas cost of analog positioners at a mid-size U.S. pipeline operator. Zero-bleed digital positioners, such as the Siemens SIPART PS2, eliminate this cost.

Zero-bleed and fail-safe, another digital benefit

A pipeline company's uptime and efficiency are often contingent on the performance of its valves, but miles of pipeline — not to mention harsh conditions such as dust, moisture, high temperatures and vibration — can pose a particular challenge when it comes time to perform the necessary preventative maintenance for optimal output. Digital positioners can leverage remote diagnostics for greater operating visibility and reduced service costs.

For hard-to-reach areas that still require optimal valve performance, remote mount technologies and digital monitoring make it possible to separate the feedback portion of the positioner from the main control. This provides greater accessibility and protection from extreme environments.

Remote diagnostics can take many forms but provide heightened visibility into these inaccessible areas. Siemens Valve Monitoring App, for example, collects and analyzes key performance indicators (KPIs), such as friction, number of valve strokes and other predictive valve data tracked through SIPART PS2 positioners. At the same time, the app can provide maintenance information on static friction, seal and spring health, plus NE107-compliant alerts — all of which can be remotely monitored by operators.

A range of enclosure options, including aluminum, stainless steel and flameproof enclosures as well as non-corrosive sound absorbers, can add an additional level of durability to the SIPART PS2 zero-bleed, digital positioners and extend

each one's lifecycle for greater return on investment. When onsite maintenance or servicing is required, diagnostic information is readily available on a local screen and allows for operators to quickly capture valve status and select the necessary control mode or booster applications.

Digital, zero-bleed SIPART PS2 positioners also adjust automatically to a connected valve for streamlined implementation and offer a greater range of application parameters plus preprogrammed control modes for increased flexibility. What's more, they virtually eliminate false alarms that are triggered from mercaptan sensors along with the costly truck rolls and production disruptions that go along with it.

Siemens SIPART PS2 digital positioners can also act as valuable interfaces between control systems that maximize savings and security even further by sending valve data to a virtual cloud that allows advanced tools such as Artificial Intelligence (AI) and machine learning to analyze information for early failure detection and long-term performance trends, offering greater transparency and connectivity at the enterprise level.

When connected to the cloud, individual valve maintenance can be predicted using multiple data points such as hysteresis, linearity and repeatability. Additional diagnostic data such as valve strokes, directional changes, fault messages, alarms, temperature and leakage are sent for control deviation and valve assessment.

Intelligent testing such as Full Stroke Tests and Partial Stroke Tests are designed to reduce the impact of failure or emergency situations and prevent the operational and financial consequences that can come with valve failure. Both can be performed at regular intervals with the SIPART PS2 positioner to prevent valve blockage due to corrosion or furring. To maximize plant availability, additional testing like the Step Response Test and Multi Step Response Test provide valve performance data that allow operators to make improvements or adjustments as necessary.

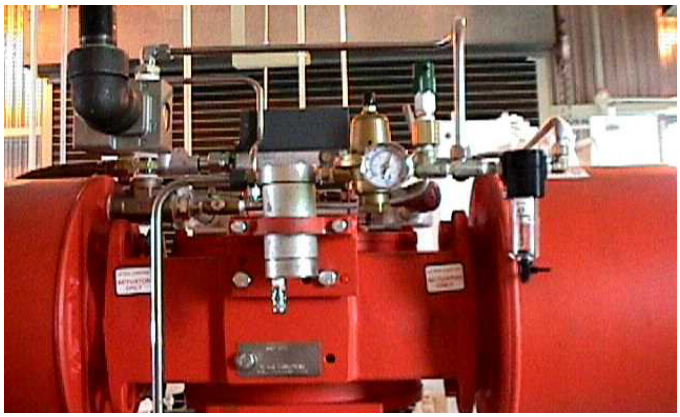
A sustainable, regulatory-friendly solution

Though natural gas is a fossil fuel with lower emissions than coal or oil, its primary constituent — methane — is leaked during extraction and transportation and remains a relevant environmental concern today. According to the U.S. Department of Energy, methane is 86 times more potent of a greenhouse gas than carbon dioxide over a 20-year period.[1] That's why "continuous pneumatic leak identification and repair" continues to top the list of emission-reducing initiatives for The Natural Gas STAR Program.[2] This is the agency's partner program for companies committed to implementing cost-effective methane emissions reduction opportunities.

In a recent study conducted by the EPA as part of a Methane Emission Reduction Initiative, an estimated $192 million dollars is lost each year due to natural gas leaks.[3] Another study by The Natural Gas STAR Program reported that compressor stations produce an estimated 50.7 billion cubic feet of methane emissions annually and that 95 percent of these emissions are from only 20 percent of the "leaky components" at compressor stations.[4] Since a single compressor station can contain up to 20 positioners or more, upgrading from electropneumatic to digital, zero-bleed positioners has the potential to drastically reduce fugitive emissions while providing operators more control and flexibility throughout their processing plants.

Scaling the benefits in competitive markets

Given today's environmental and market pressures, midstream oil and gas operators must find new ways to reduce emissions and operating costs to meet the changing consumer and market demands while maximizing their operational and economic efficiency. Leveraging digital positioners like the SIPART PS2 positioner enable operators to optimize valve performance and advance environmental initiatives while significantly improving their bottom-line. To learn more information about digital positioners and the entire Siemens SIPART family, go to https://www.usa.siemens.com/positioners



1 National Energy Technology Laboratory (NETL). 2010. Cost and performance baseline for fossil energy plants, Volume 1: Bituminous coal and natural gas to electricity. Revision 2. November. DOE/NETL-2010/1397. United States Department of Energy.

2 Environmental Protection Agency. 2016. Technology Transfer Workshop: Pipeline Blowdowns in Transmission and Distribution. United States Department of the Interior.

3 Environmental Protection Agency. 2014. Improvements Needed in EPA Efforts to Address Methane Emissions From Natural Gas Distribution Pipelines. United States Department of the Interior.

4 Environmental Protection Agency. 2016. Directed Inspection and Maintenance at Compressor Stations. United States Department of the Interior.

Legal Manufacturer
Siemens Industry, Inc.
100 Technology Drive
Alpharetta, GA 30005
United States of America
Telephone: +1 (800) 365-8766
usa.siemens.com/pi