SVF FLOW CONTROLS

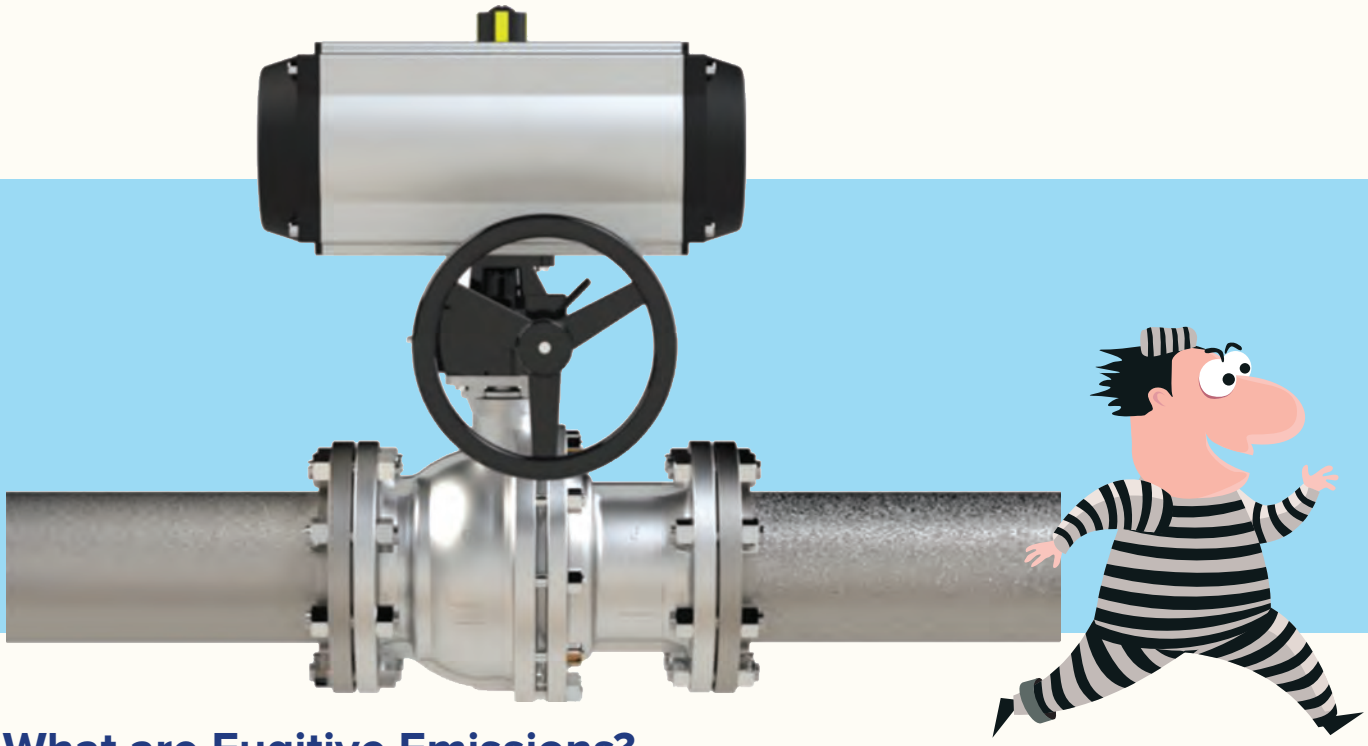
WHITE PAPER

Fugitive **Emissions**

Fugitive Emissions

Did you know?

"Fugitive" is used since the emissions are not accounted for or have "escaped" from the source.



What are Fugitive Emissions?

Fugitive Emission is defined as the unintentional and undesirable emission, leakage or discharge of gases or vapors from pressure containing equipment or facilities, and from components inside an industrial place like valves, pipe flanges, pumps, storage tanks, compressors, etc. According to The United States Environmental Protection Agency (EPA), emissions are what cannot "reasonably pass through a stack, chimney, vent or other functionally-equivalent opening."

The EPA states that valves and connectors account for over 90% of emissions from leaking equipment. Since these can potentially cause health and environmental issues, laws and regulations have been set in place to help reduce these leakages. The US Clean Air Act (1960s) was the first federal legislation introduced regarding air pollution. During the late 1980s, the legislation was amended to include volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) and the EPA instituted Leak Detection and Repair (LDAR) regulations which are procedures facilities use to locate and repair leaking components, i.e. valves, flanges, connectors, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system, degassing vents, accumulator vessel vents, agitator seals and access door seals.

Valve Design to Control Emissions

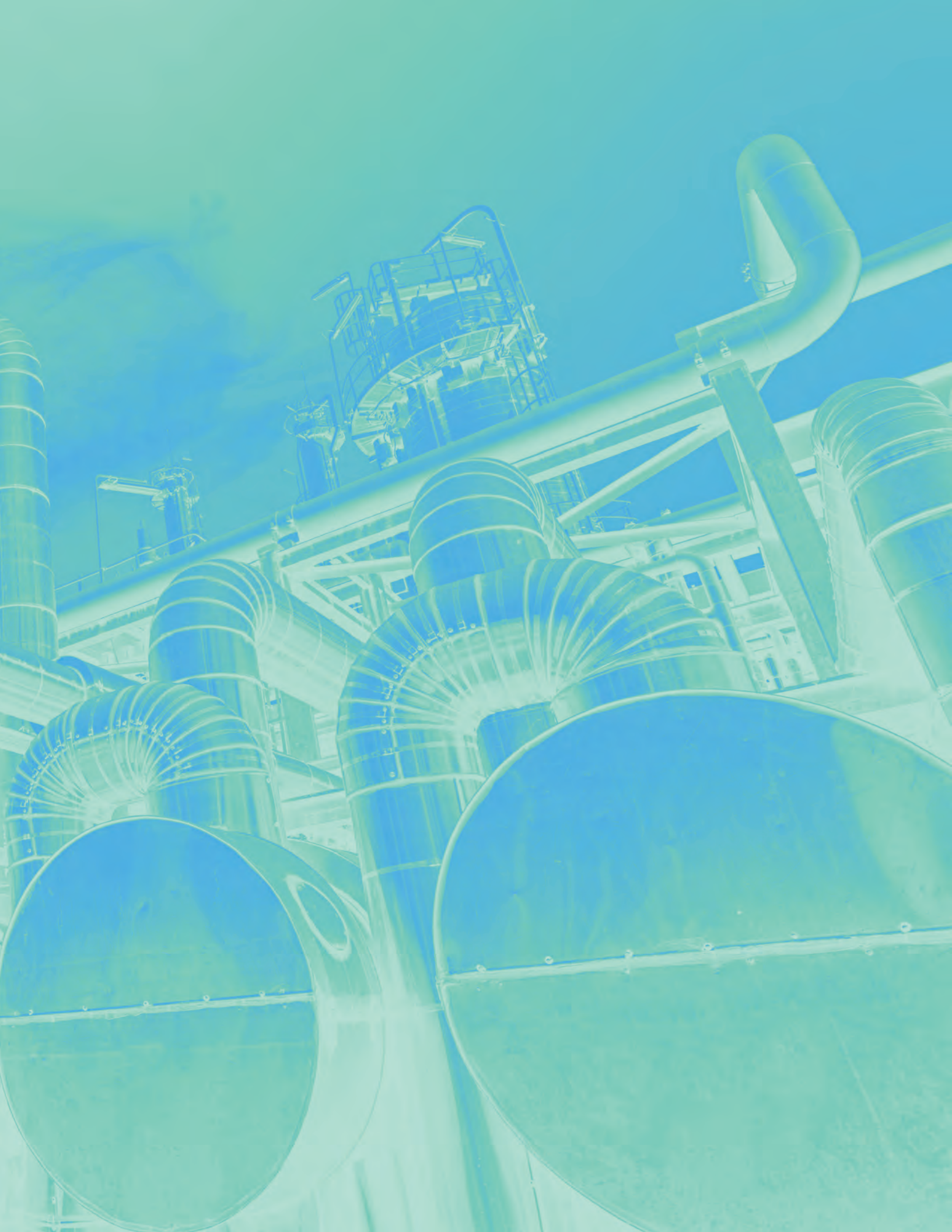
Stem Packing

Since valve stem leakage is the most common source for emissions, valve manufacturers have made improvements on the stem packing design to reduce emissions. Enhancing the sealing around the stem with the use of a “live-loaded” mechanism, disc springs, as well as utilizing O-ring seals for elastomeric materials ensures minimal leakage.

Seal design plays a key role in pressure containment for ball valves. Quarter turn rotation combined with live-loaded stem packing utilizing spring washers ensure sealing under high cycling, thermal cycling and for automated valves.

Secondary Containment

Secondary containment stem extensions have also been designed to enhance protection against fugitive emissions. The secondary containment extension is designed with secondary stem seals as a back-up, as well as sensing ports to provide a means of meeting EPA-LDAR mandates regarding the detection and repair of emission sources on manual and automated valves. Any media that escapes the valve stem is contained with the containment stem extension.



Standards to Regulate Emissions

The push for low emission valves has triggered many standards organizations to establish valve and packing test standards for emission performance.

ISO 15848-1

International Organization for Standardization (ISO) created ISO 1548-1, a valve test for shut-off valves centered on the performance of the stem packing and body seals. There are three types of classes for the is ISO 15848-1 certification. Temperature, tightness, and endurance.

Temperature Class:

- -320°F to Room Temperature
- -50°F to Room Temperature
- -20°F to 104°F
- Room Temperature to 392°F
- Room Temperature to 752°F

Tightness Class:

- A. ≤1.0E-05 mg/(s*m) HELIUM; ≤50 ppmv METHANE
- B. ≤1.0E-04 mg/(s*m) HELIUM; ≤100 ppmv METHANE
- C. ≤1.0E-02 mg/(s*m) HELIUM; ≤500 ppmv METHANE
- Body Seals: ≤50 ppmv HELIUM / METHANE

Endurance Class:

- **Isolating Valves**
  - C01 – 205 cycles
  - C02 – 1,500 cycles
  - C03 – 2,500 cycles
- **Control Valves**
  - CC1 – 20,000 cycles
  - CC2 – 60,000 cycles
  - CC3 – 100,000 cycles

TA LUFT 2021

The Technical Instruction on Air Quality Control (TA Luft) adapted the ISO 15848-1 standard for testing parameters but designated its own acceptable leakage rates for the tightness class.

Tightness Class:

- LA 1.0E-05 mg/(s*m)
- LB 1.0E-04 mg/(s*m)
- LC 1.0E-02 mg/(s*m)

Temperature Class:

- -320°F to Room Temperature
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Endurance Class:

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API 624

API 624 - Type Testing of Rising Stem Valves with graphite packing for Fugitive Emissions, issued in 2014. This test focuses on the performance of the packing on rising stem valves. There are 310 mechanical cycles, three temperature cycles at 500^{0}F, with an option of one cycle at -20^{0}F and maximum pressure of 600psi. During the test, no stem adjustment is allowed, and API 624 uses EPA Method 21 as the basis of evaluating leakage limits with an allowable limit of 100 ppm.

Tightness Requirements

- 100 ppm

Temperature Requirements

- Three cycles at 500^{0}F
- Optional 1 cycle at -20^{0}F

Endurance Requirements

- 310 cycles

API 641

API 641- Type Testing of Quarter-Turn Valves for Fugitive Emissions, issued in 2016. Similar to API 624, this test focuses on the performance of the stem packing as well as the connections. There are 610 required mechanical cycles, three temperature cycles up to a maximum of 500^{0}F, and a minimum allowed pressure of 100 psi. During the test, no stem adjustment is allowed, and API 624 uses EPA Method 21 as the basis of evaluating leakage limits with an allowable limit of 100 ppm.

Tightness Requirements

- 100 ppm

Temperature Requirements

- Three cycles at 500^{0}F
- Optional 1 cycle at -20^{0}F

Endurance Requirements

- 610 cycles

Temperature is KEY!

The main difference between ISO and API is the temperature requirements. The ISO standard allows the manufacturer the option to select from several temperature classes while API requires 3 cycles at 500^{0}F making it more of a stringent test process.

Why Upgrade to Fugitive Emission?

Industry Standards

Industry standards are continually changing to meet the stringent emission requirements per EPA Organizations such as:

- API (American Petroleum Institute)
- ISO (International Organization for Standardization)
- Ta-Luft (Technical Instruction on Air Quality Control)

Market Requirements

Green manufacturing is changing business and manufacturing practices, as well as mindset to reduce the industrial impact on climate change. Industries are creating emission requirements of their own, regardless of government directives.

Down Time

Process line shutdowns or plant shutdowns create downtime that can be potentially very costly. Upgrading to valve designs with low emissions or secondary containment that provide alerts for stem leakage can prevent shutdowns when leakage is found.

Fines

The Clean Air Act includes a provision that allows citizens to obtain an injunction and civil penalties of up to $37,500 per day for each violation. This creates a risk for any company as a potential target for suit or legal action.

SVF Flow Controls has a solution for your low emission requirements

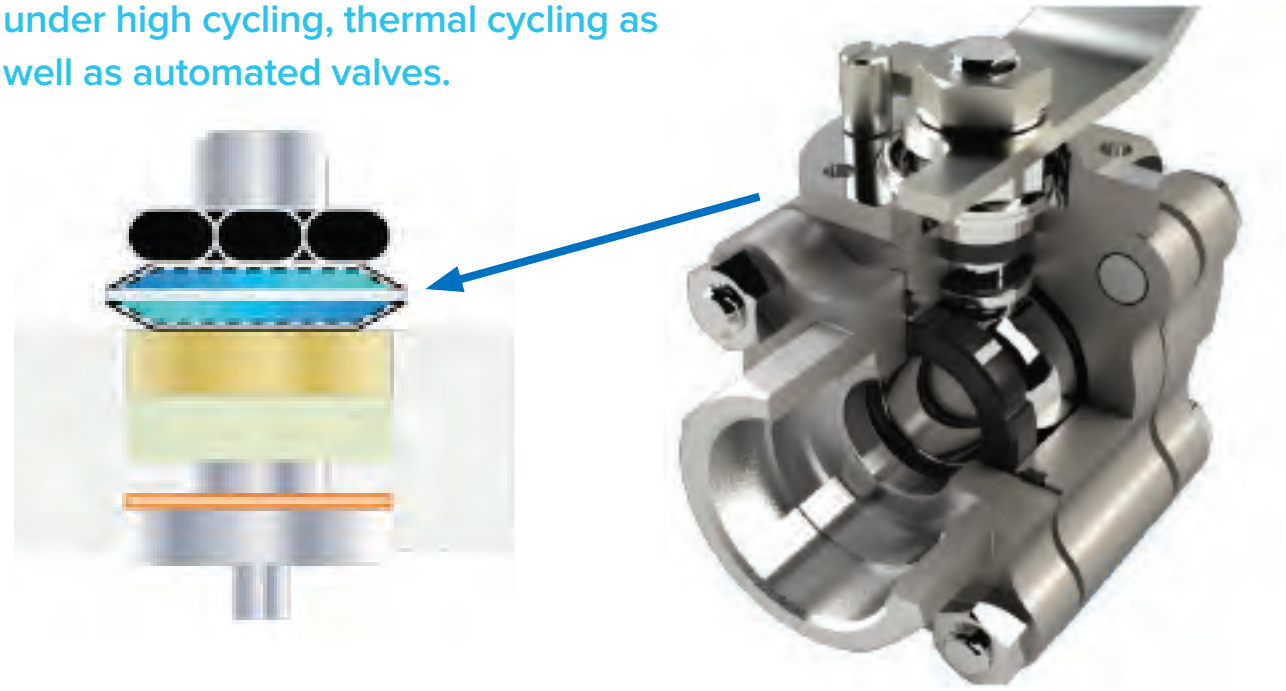
SVF Flow Controls can provide you with the right product solution for your requirements.

Live-Loaded Stem Packing

SVF Flow Controls offers a series of products that utilize live-loaded stem packing

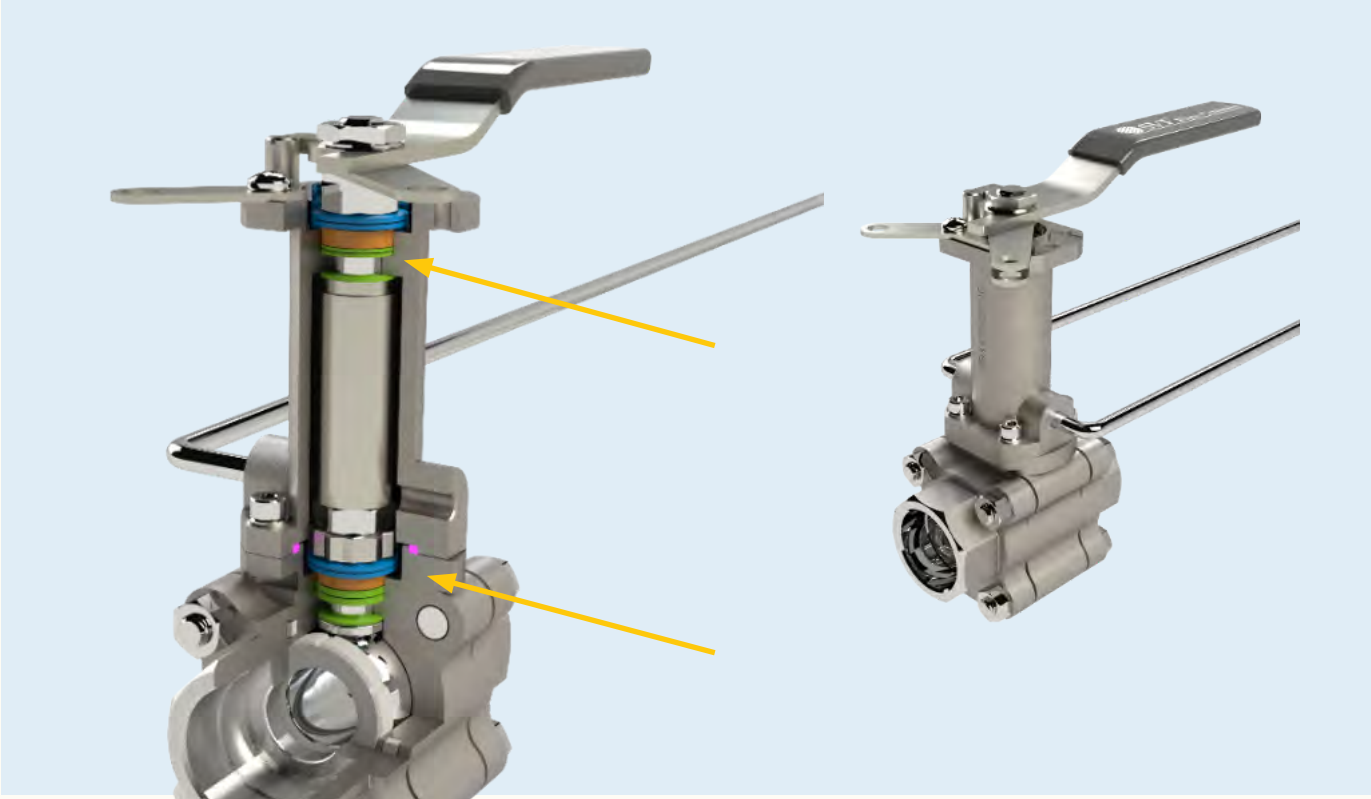
- CleanFLOW (SB7, SB7F, SMC9, TSB7, TSB7F, SB7X, OPUS) Series
- Series 8 (R8, B8, L8, N8, BN8, C8, D8/T7)
- High Pressure Valves (H7, P4, HBEV)
- Cryogenic Valves (KB9)
- Firesafe Valves (FB9, B41, B42, B43)

Disc springs feature ensures that proper sealing under high cycling, thermal cycling as well as automated valves.



Secondary Containment

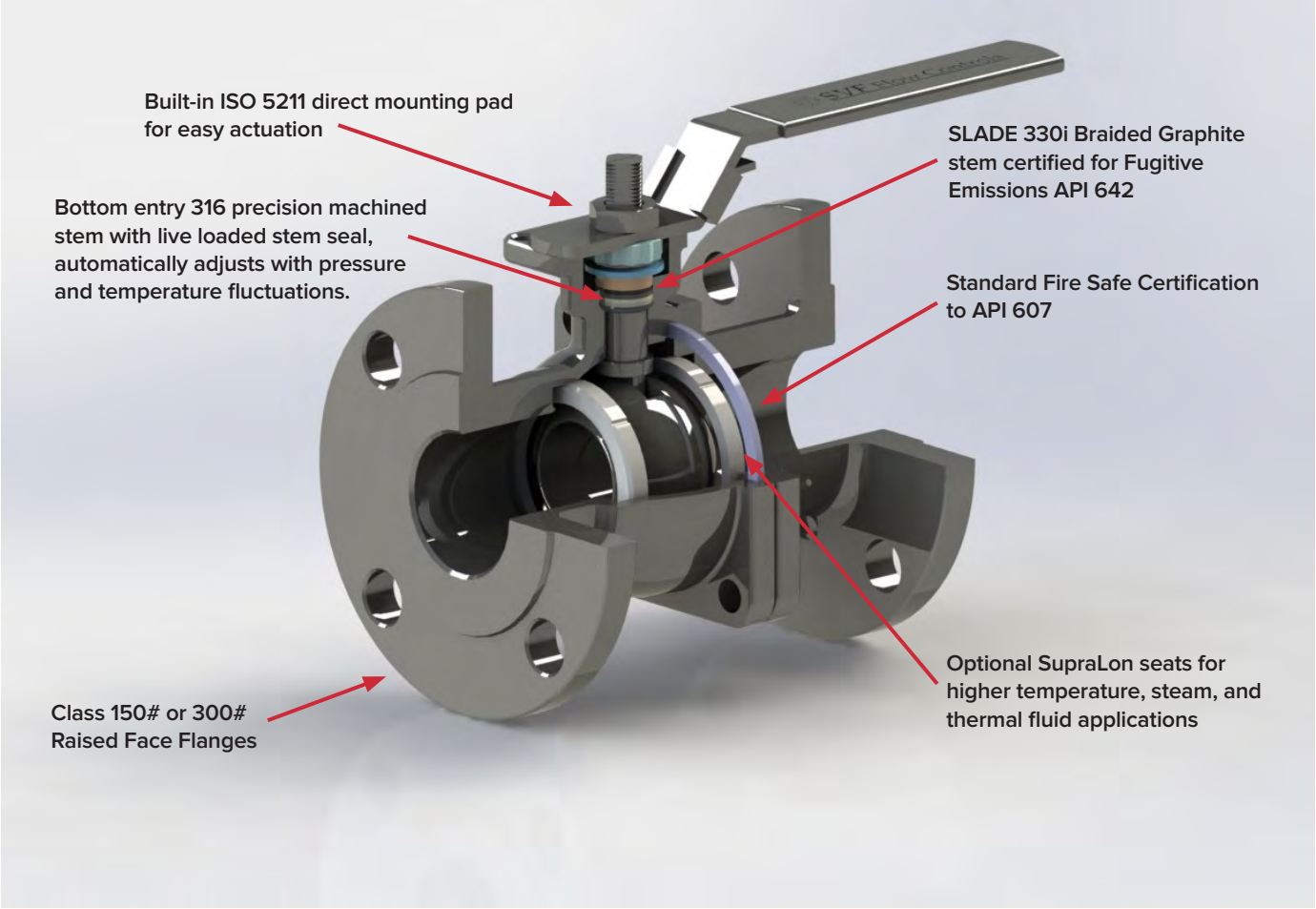
The SVF Secondary Containment “SC” Module offers enhanced protection against fugitive emissions in plant-wide applications. It is designed with two sensing ports to provide a means of meeting EPA-LDAR mandates regarding the detection and repair of emission sources.



- Live Loaded/High Performance-Secondary Containment Packing
- ½” NPT Sniffer Ports (x2)
- Standard ISO 5211 mounting system for modular attachment and field retrofits
- Fully enclosed Stem and Packing for insulated piping systems
- 304 Stainless Steel construction
- Optional locking device may be field retrofitted

API 641 Fugitive Emissions

Our next generation of flanged valves, B41D and B42D are API 641 certified for Fugitive emissions. The SVF B41D and B42D Flanged Ball Valves are high performance, full ported valves certified to API 607 Fire Safe standard, API 608 and feature an ISO 5211 mounting pad for easy actuation. The B41D / B42D series is also certified to API 641 Low Fugitive Emissions with the SLADE stem packing.



No matter what your emission requirements are, SVF Flow Controls has a solution.

What do I need to know?

Because the selection is vast for fluid handling applications, there are certain details that are critical to determine the right solution.

- Media
- Temperature
- Pressure
- Valve materials of construction
- Installation (Inside or Outside)
- End connection
- Manual or automated

In Closing

A process control scheme will likely be developed for very specific outputs, rates and materials. It may also need to address pressure and temperature conditions and hazardous area locations. With many options, classifications and control solutions available today it is always a good idea to work with a highly experienced automation supplier.

About the Author

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Jay Saldana is the Vice President of Engineering at SVF FLow Controls in La Palma, California. Since graduating with a Physics degree from California State University, Fullerton, Jay has gained expertise in the flow control and fluid handling industry over the past eleven years. He is currently a participating Resource Development Member for ASME BPE.

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