FUGITIVE EMISSIONS SUMMIT AMERICAS

2022

Solving the Fugitive Emission Challenge for Isolation Valves

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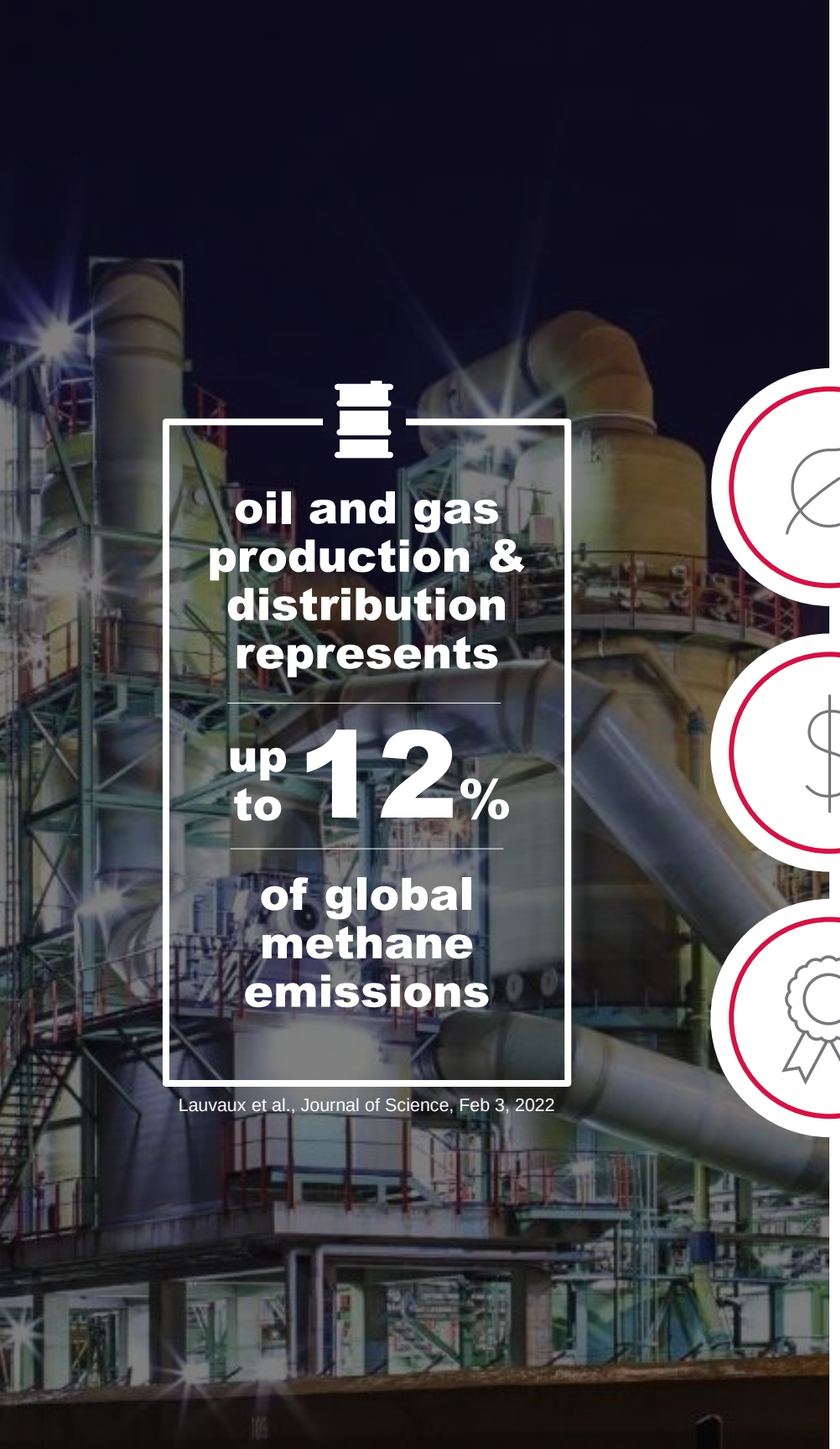
Agenda

- The Fugitive Emission Challenge
- Impediments to Solving the Challenge
- The Cost of Inaction
- Your Selection of Valve Technology Matters
- How to Get Started
- Low Emission Valve Technology
- The Value of an Expert Valve Partner

Fugitive Emission Reduction Has Become a Business Imperative



Lauvaux et al., Journal of Science, Feb 3, 2022

Increasing Environmental Regulation

Governments have sharpened their focus on environmental protection and tasked regulators with enforcing tighter emissions standards.

Limited Capital for Upgrade Projects

Increasingly competitive market dynamic dictate an even sharper focus on the efficiency of capital allocated to process improvement initiatives.

Sustainable Operations Becoming a Barrier to Entry

Producers along the value chain must increasingly demonstrate strong emissions credentials in order to gain access to end markets.

Your valve assets may be exacerbating these challenges

Without Deep Valve Knowledge, You May Be Risking Non-Compliance

Gaps in Expertise

Fugitive emissions standards have become increasingly complex, and often the expertise to address these issues does not reside in the plant.

Outdated Technology

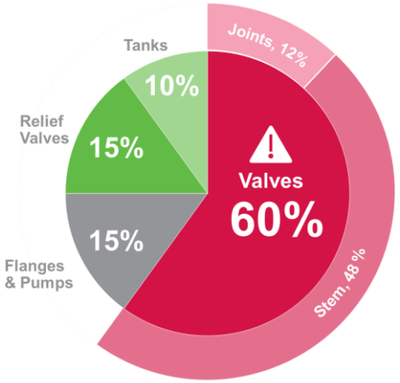
Conventional or inferior valve technology can be ineffective and introduce risk to your personnel, the community and the environment.

Cost of Intervention

Replacing emitting valves requires process shutdown. However the alternative is ongoing, costly, labor-intensive maintenance programs to identify and repair leaks to ensure compliance.

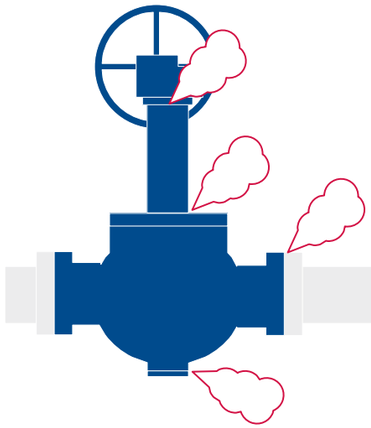
Your valve asset decisions may be increasing fugitive emissions

The Hidden Costs of Valve Fugitive Emissions



Outdated and incorrectly specified valve designs put your plant personnel, the community and the environment at risk

* Source: Monitoring and Containment of Fugitive Emissions from Valve Stems, University of British Columbia, Vancouver.



Valuable Product Loss

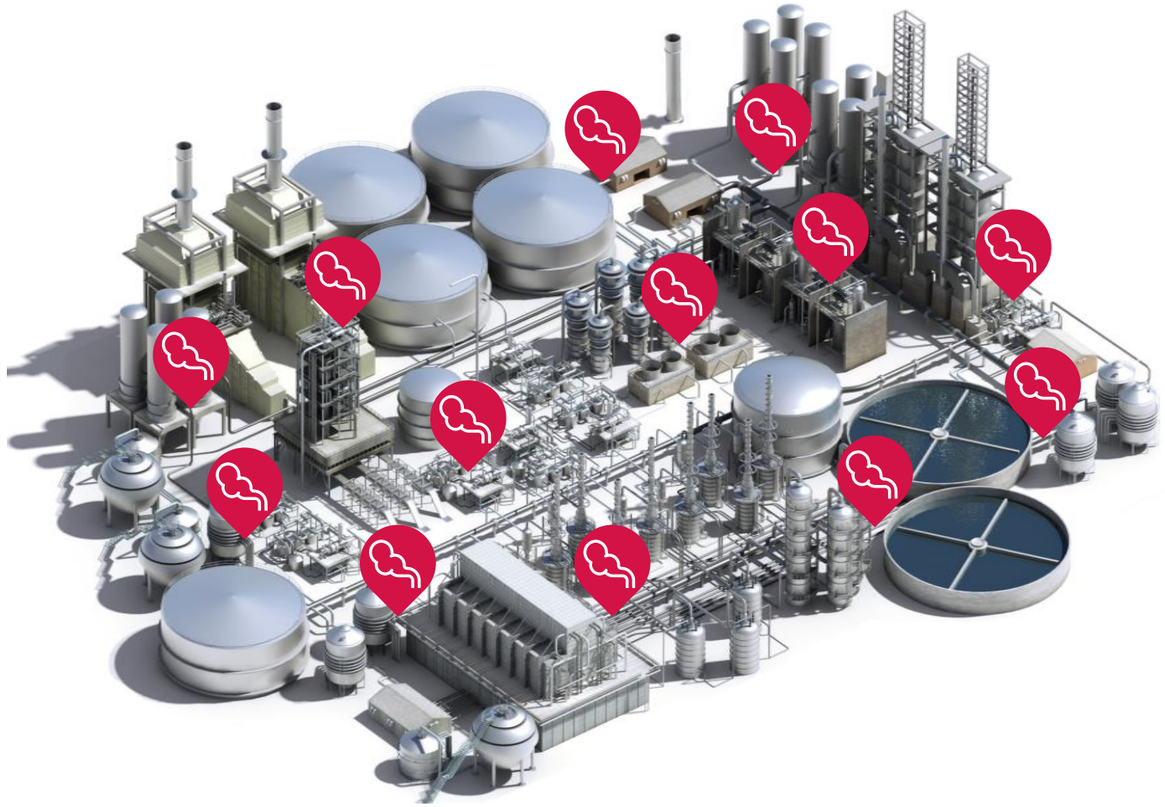
In addition to safety risks, fugitive emissions cost you saleable product

Non-Compliance Penalties

Hefty financial penalties await operators that fail to meet regulations

Higher Operating Costs

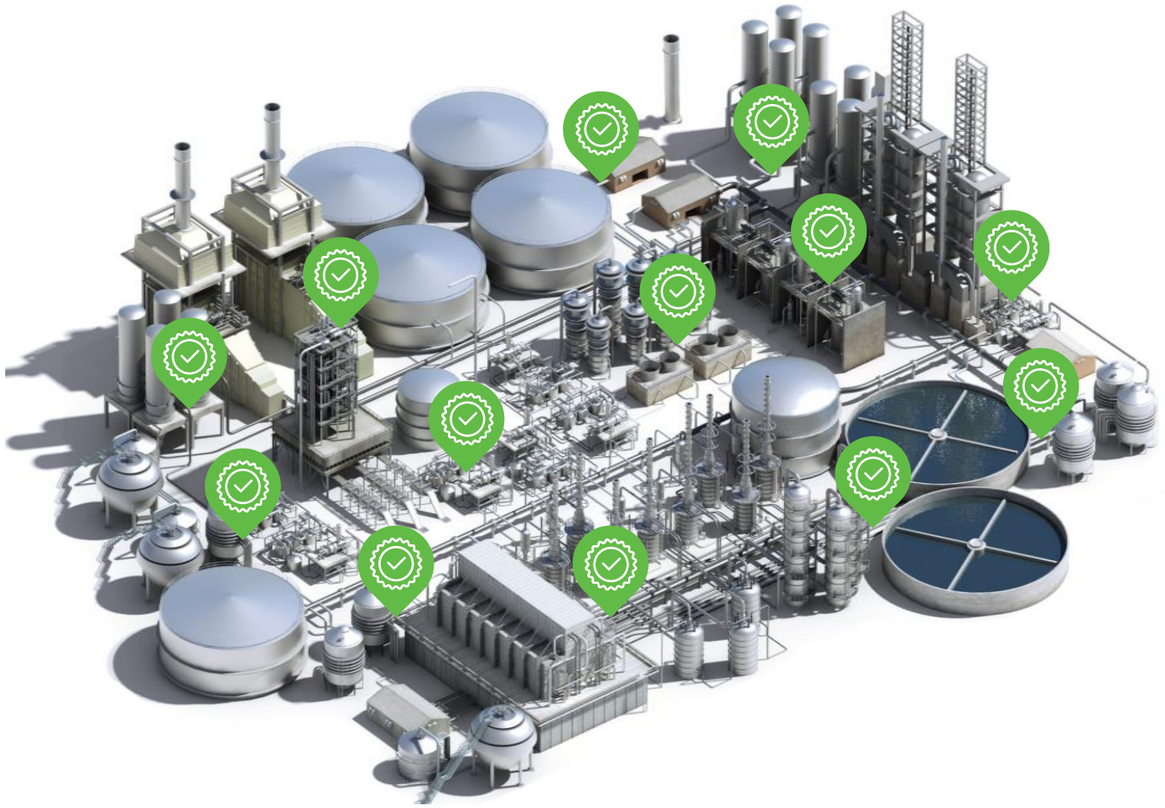
Outdated valve designs require regular servicing to remain in compliance



Consider the **cumulative impact** of fugitive emissions from the hundreds, if not thousands, of valves in a typical facility

Cost of lost product through fugitive emissions for a 250,000 bpd refinery: $3.2 Million annually

Your Selection of Valve Technology Matters



Targeted valve upgrades offer the opportunity to meaningfully advance your **sustainability goals** and **plant profitability**.

Minimize Safety Risks
Modern valve designs can minimize risk of harmful fugitive emissions to personnel and the environment.

Achieve Compliance
Advanced modern valves help you stay ahead of increasingly stringent and complex emissions regulation.

Improve Profitability
Improve the profitability of your operations with increased process efficiency and minimized product loss.

Decrease Operating Costs
Lower your maintenance labor and equipment costs related to identifying and repairing leaks.

Deploy superior valve technology at scale to reduce fugitive emissions

With Limited Capital for Upgrades Where Do I Start?

Outdated Technology

Valves with sliding stems, such as gate valves and rising stem ball valves, **extrude emissions** up through gland box when cycling, while also **wearing the packing faster**. Packing materials have also advanced, leaving **legacy compounds** far behind.

High Frequency Cycling

Valves in frequent cycling applications experience **repeated wear and side load impact on the packing materials** that are designed to contain fugitive emissions as the stem rotates or rises through the stem seal system.

Temperature Cycling

Individual components of a valve experience **thermal expansion and contraction** at different rates depending on their material properties. This asymmetrical movement **creates leak paths** for fugitive emissions.

Challenging Media

Valves used in challenging process media such as those in **corrosive or lethal services** should be given special attention when considering fugitive emission prevention to **protect personnel and the community**.

Accessibility & Downtime Risk

Consider valves on services that are **critical to plant throughput** with limited bypass or redundancy options. Or even valves in **challenging locations** that require equipment hire, additional labor and/or time to repair.

Identify and upgrade your highest risk valves to maximize returns on sustainability investments

What Does a Superior Low Emission Valve Look Like?

Quarter Turn Action
Rotary stems eliminate the flaw of rising stems that draw particulate up through the packing when cycling to create or reactivate leak paths.

Precision Machining
Smooth surfaces enable smaller tolerances between moving internal components to ensure tighter sealing without over-compression.

Engineered Sealing Materials
For enduring performance, materials must be optimized for cycle frequency, temperature range and process media permeability.

Live-Loaded Stem Seal System
The system dynamically self-adjusts to provide optimal packing compression over the lifecycle to ensure compliance without maintenance.

Certified Compliance
Ensure manufacturers are able to demonstrate proven testing performance to the specified standard to mitigate your compliance risk.

Side Load Protection
Support of the valve ball or disc eliminates sideways movement during cycling to prevent premature packing wear and deformation.

High Integrity Joints
Joints are the 2nd leading source of emissions in valves so ensure components used have similar thermal expansion & contraction rates.

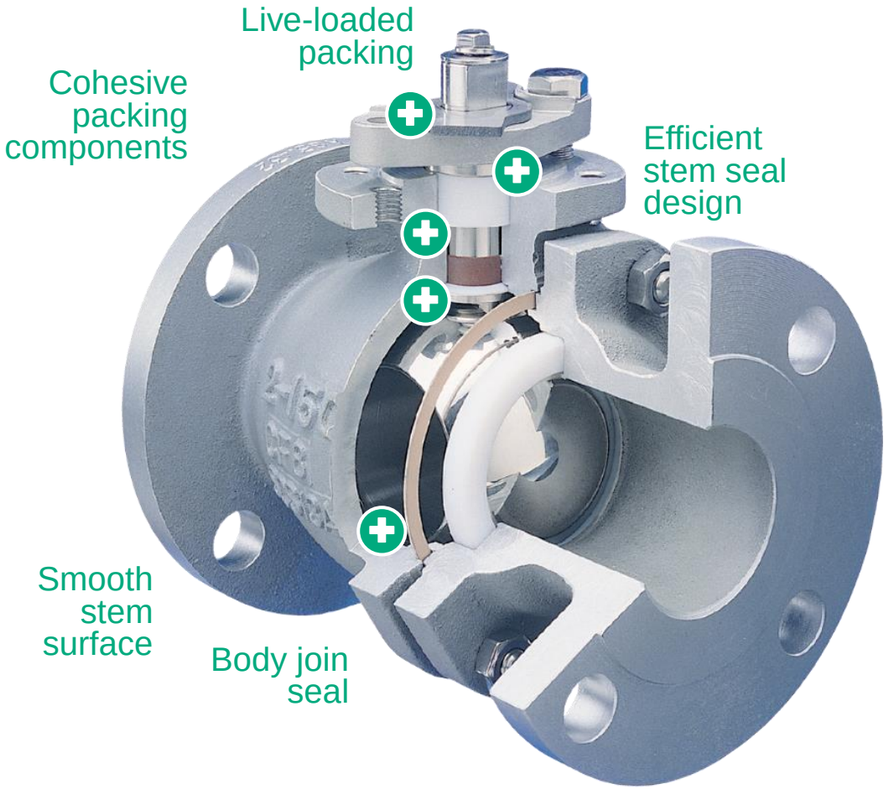
No-Bleed Automation
Venting of gas-powered devices can be a major source of emissions. Electric and emissions controlled actuators solve this challenge.

Specify these features when upgrading emitting valves

Isolation Valve Technology

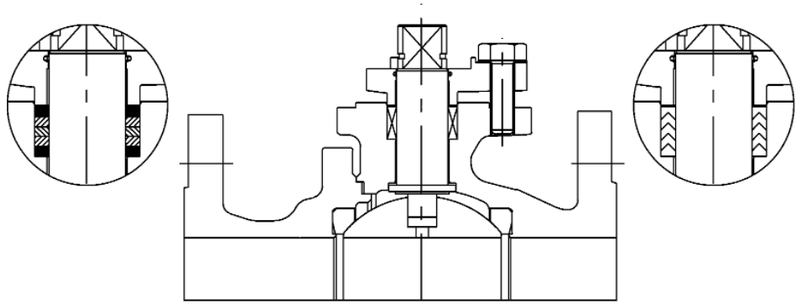
Superior emissions performance & reliability at an accessible cost

DESIGN FEATURES

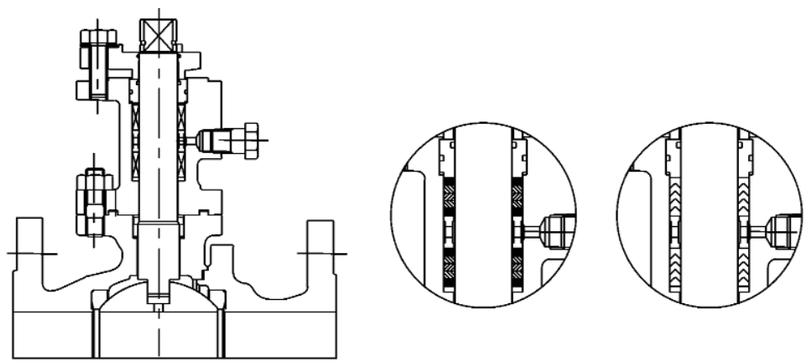


STEM SEAL DESIGN

Standard Seal



Secondary Seal



BENEFITS

LOW FE CERTIFIED

Futureproof your facility with ISO 15848 & API 608 certification to stay ahead of fugitive emissions regulation.

ZERO LEAKAGE

Achieve reliable, repeatable, zero leakage bi-directional shutoff for longer.

MINIMIZE MAINTENANCE

Reduce repair frequency and duration with smooth operation and live-loaded packing.

REDUCE COSTS

Lower your total cost of valve ownership with a design optimized for both upfront & service life spend.

Understanding Standards

Hierarchy of Regulation

International Bodies
Set vision and direction
Kyoto, Copenhagen, COP26

→ **National Governments**
Pass laws
Clean Air Act

→ **Environmental Agencies**
Set limits and penalties
EPA Procedure 21

3rd Party Testers

→ **Industry Standards**
Ensure Compliance
ISO 15848-1 & -2
API 608, 641, 622
Shell MESC 77- 300/312
TA Luft acc. to VDI 2440
ANSI / FCI 91.1

Yarmouth
CETIM
TÜV
B. Veritas

ISO 15848-1 / -2

Specifies testing procedures for evaluation of external leakage of valve stem seals (or shaft) and body joints of isolating valves and control valves intended for application in volatile air pollutants and hazardous fluids.

C01
205 mechanical cycles
0 temperature cycles

C02
1500 mechanical cycles
2 temperature cycles

C03
2500 mechanical cycles
3 temperature cycles

API 608

From July 1, 2020, the latest revision of API 608 – Metal Ball Valves mandates that compliant valves are certified to API 641 First Edition – 2016 – Type Testing of Quarter-turn Valves for Fugitive Emissions.

API 608
Design compliance

API 641
Fugitive emission compliance

API 622
Packing material compliance

Extend Your Sustainability Leadership with an Expert Valve Partner

Your selection of fugitive emission compliant **valve technology** matters.

A complete isolation valve portfolio

Deep Application Expertise
Identify high risk applications for upgrade with experts to achieve the best returns on your sustainability investments.

Unmatched Valve Technology Portfolio
Access the right certified solution to achieve compliance and low emission performance over an extended lifecycle.

Global Strength, Local Presence
Enlist the resources of a global manufacturer with end-to-end design, build, testing and certification capabilities.

Complete Accountability
Alleviate your risk with complete engineered solutions and a single call for service & support.

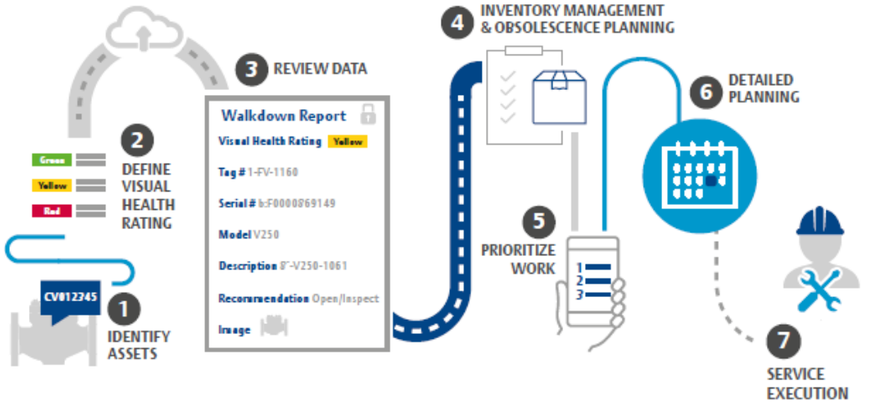
Lifecycle Services

Next Steps

Ready to take action to reduce valve fugitive emissions in your facility? Here is your path to implementation:

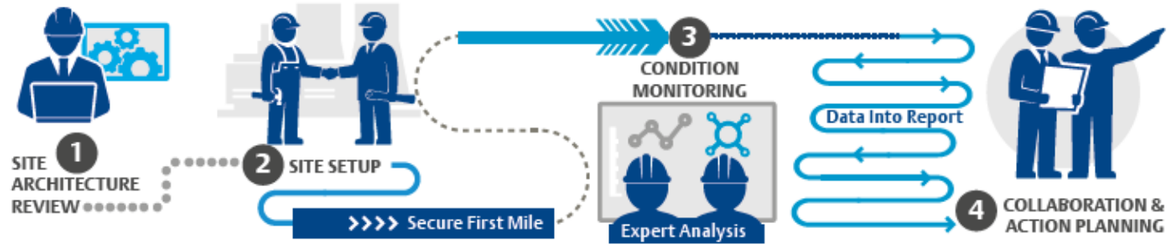
1. Identify and prioritise high risk valves for upgrade. Schedule a **Digital Walkdown & Installed Base Assessment** to get started.
2. Map out like-for-like superior valve technology alternatives. Valve application experts can help to identify.
3. Make a repair vs. upgrade cost analysis including downtime and fugitive emission reduction savings.
4. Leverage data from the **Digital Walkdown** to prioritize and integrate valve maintenance actions for your STO.
5. Get proactive with your fugitive emission reduction strategy using **Valve Condition Monitoring** to identify risks.

Digital Walkdown & Installed Base Assessment



Acquire, analyze, and organize your process and equipment data more efficiently & accurately when you partner with a valve expert.

Valve Condition Monitoring



Regardless of your maintenance strategy, implementing Valve Condition Monitoring can help you uncover issues before they impact your plant's compliance or reliability.

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Thank You

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