

**Improve safety, emissions control
and product integrity**



Total Tank Protection - Inside and Out



You face more than your share of tank protection challenges

The safety of your personnel relies on an effective emergency preparedness plan. While protecting your employees, you also have the added pressure making certain you don't lose any assets. Over and under pressurization of your tanks can lead to damage or even failure, so ensuring all pressure setpoints are correct and optimal becomes your mission 24/7.

The risks are great

Abnormal conditions can lead to an emergency event like an external fire, explosion damage and equipment failure. Protecting your personnel cannot take second place. You need to carefully consider the quality and value of the products you choose to protect your assets. When something does go wrong, you need fast information about all of your assets so you can quickly respond to potential emergencies.



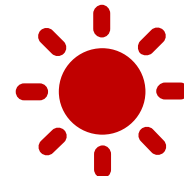
Safety

The most important thing is to protect personnel and assets. It requires expertise in managing pressure control systems to ensure proper tank pressure management.



Integrity

Valuable tank assets must be protected against moisture, contamination and product loss. Dependable tank pressure control systems can help achieve these results.



Environment

Companies and governments around the world are focused on the positive environmental benefits of reducing emissions. Addressing this requires products that are engineered using the latest technology.





Low Cost-to-Protection Ratio

Protect your investment. Proper venting and safety equipment costs only a small fraction of total capital expenditure required for building and installing storage tank facilities.



“The average hourly cost of facility downtime is approximately \$12,500, but substantially higher at many continuous process facilities.”

–ABC Advisory Group



“The biggest challenge facing operators is keeping track of changes to regulations as well as ensuring that staff are on top of safety requirements.”

–Tank Storage Awards Judging Panel, 2018

Your single source for tank pressure and flame management solutions

Our ability to provide comprehensive equipment, expertise, and service simplifies your complex challenges. Lower your risk by improving safety, product integrity and environmental compliance.

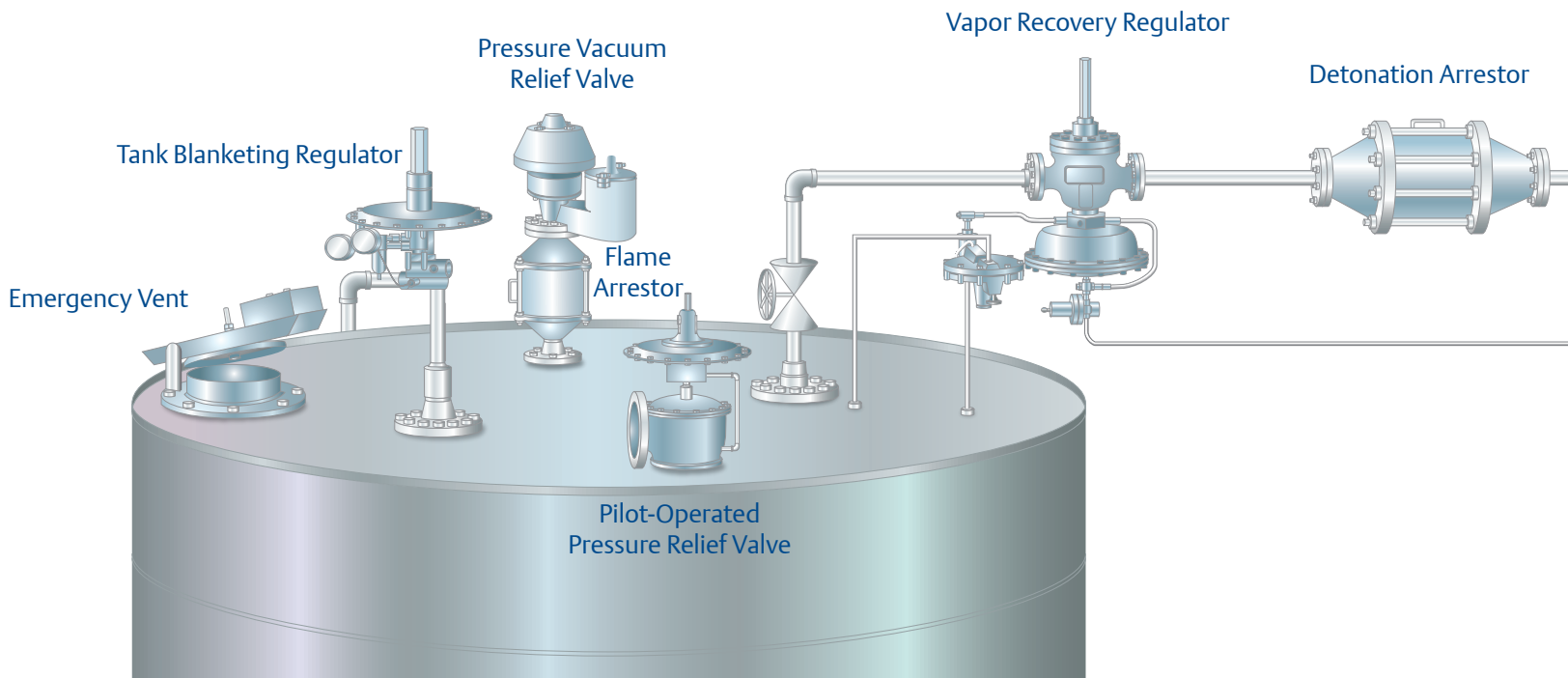


Emergency Pressure Relief Vents

Emergency venting provides high capacity pressure relief under abnormal pressure conditions. Under these conditions, the normal venting capacity designed for normal fluctuations in tank pressure is inadequate. Emerson emergency pressure relief vents meet API standard 2000 for emergency venting due to fire exposure. Advanced sealing technology provides excellent set point accuracy (+/- 3%) and emissions control (1 SCFH at 90% of setpoint).

Tank Blanketing Regulators

Tank blanketing consists of providing a gas delivery system to maintain the pressure in the tank's vapor space as the temperature and liquid level changes. **This prevents outside air from entering the tank, which reduces the possibility of explosion and oxidation from the oxygen which is in the air.** Tank blanketing regulators are often used to control the delivery of gas and can reduce the amount of gas used by 50% or more if equipped with low setpoint technology. Low setpoints ensure that only the amount of gas required for blanketing is used and no more. This reduces operating expenses.



Emerson's tank protection solutions provide the broadest array of safety and environmental protection equipment and expertise. We provide unparalleled service across a full range of oil and gas, chemical and other industries worldwide.

Pressure Vacuum Relief Valves

A pressure vacuum relief valve allows a tank to “breathe” as its pressure changes due to changes in temperature, liquid level or both, during normal operation. Pressure and vacuum setpoints can be selected that minimize the amount of vapors vented, reducing product loss and controlling emissions.

Pilot-Operated Pressure Relief Valve

These valves can be used instead of weight-loaded ones to provide a higher level of performance. They feature a pilot-operated pressure side which **allow tank operating pressures to be set closer to the maximum allowable operating pressure.** This increases efficiency, and reduces evaporation losses and emissions.

Flame and Detonation Arrestors

Flames can enter tanks from the atmosphere through an unconfined vent or from within vapor pipes being used in confined vapor control systems. A flame inside or outside of the system can lead to catastrophic damage. **Flame arrestors provide critical tank protection by reducing the temperature so that a flame cannot be sustained. They also reduce the momentum associated with gas motion.** By doing so, arrestors provide critical tank protection. Specially-designed flame cell elements maximize flow and minimize pressure drop.

Vapor Recovery Regulators

In some applications, a vapor recovery regulator is used to relieve pressure from a tank, sending the vapors to a vapor control system such as a flare, a scrubber or a vapor recovery system.



Unique capabilities that go beyond basic tank protection needs

Tank protection needs vary, depending on what's inside the tank, the tank itself and the environment surrounding it. For this reason, Emerson has developed a wide variety of solutions that allow customized tank protection designs that are suitable to your unique requirements.

What's your challenge?



It's usually necessary to work with several different suppliers in order to source the required protection system. This can lead to equipment compatibility issues.

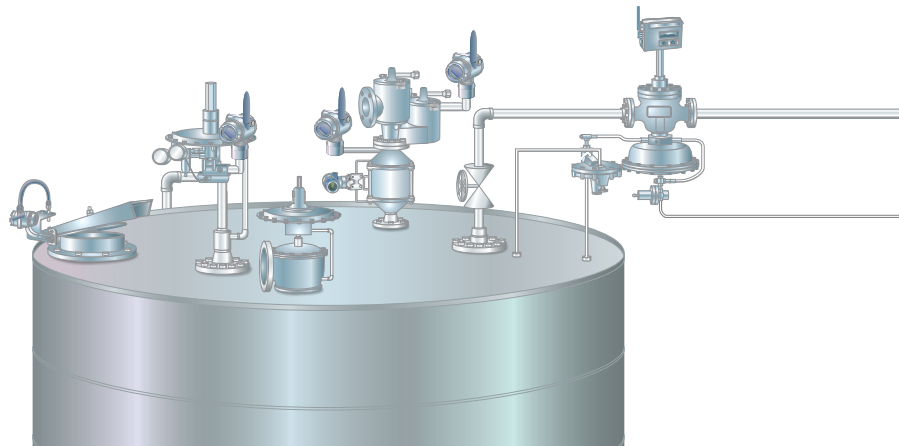
What's your opportunity?



With Emerson's complete set of solutions, you can facilitate sourcing and also work with a team that has the expertise to help you design and integrate the best system for your needs.

Full Range of Protection, including Remote Monitoring

- Monitor devices from a control room
- Minimize time spent on top of tanks
- Know if a failure has occurred
- Know if a device is working
- Know right away!

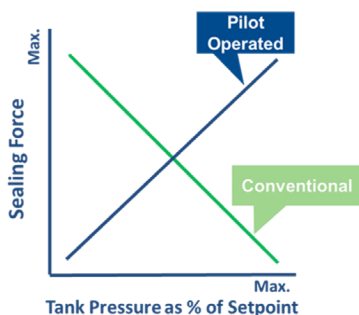


An industry leader, Emerson provides a wide range of products, engineering know-how and services that successful tank management requires. This includes remote monitoring which enables immediate response to potential emergencies for improved safety, emissions control and asset protection.

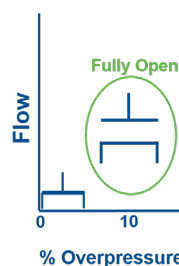
Advanced Technology to Control Emissions and Increase Productivity



Anderson Greenwood™
9000 Series



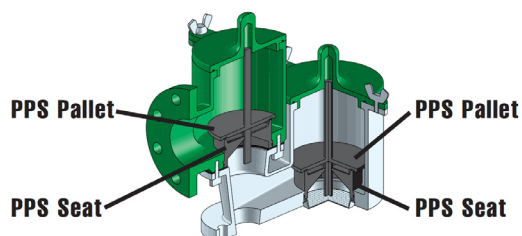
- A conventional valve's sealing force decreases as it approaches the setpoint, whereas a pilot operated valve's **sealing force is tighter**.
- Choice of **rapid snap opening** or proportional modulating action to suit the process
- **Balanced against back pressure** enabling connection to a closed header system without loss of valve lift or set pressure fluctuations



Anderson Greenwood
Series 4020/4040

Full lift technology allows valves to open at only 10% overpressure, so they can be set closer to the tank's maximum operating pressure. This allows tanks to be filled and emptied more quickly and operated at higher pressures for increased productivity and reduced evaporation.

Robust Designs to Meet Challenging Applications



Fisher™ 850 Series

- **Polyphenylene Sulfide (PPS)** is an advanced composite thermoplastic material that provides superior resistance to corrosion, chemical attack, liquid and vapor adhesion and temperature extremes.
- **Dual pallet guide system** reseats the valve in the same spot each time to ensure the valve's sealing tightness.



A product family that includes models meeting every major global standard, including:

- * ATEX
- * ISO
- * PED
- * UL
- * FM
- * US Coast Guard

Pressure Vacuum Relief Valves: Protection from normal changes in tank pressure



Product Line Overview

We offer an extensive line of pressure vacuum relief valves, including conventional models, high capacity/full lift designs and pilot operated, to suit your various application needs.

The quality and reliability of all of these designs have been proven over many years of field operating performance under challenging conditions.



Fisher™ 950



Fisher 850



Anderson Greenwood 4040

Anderson Greenwood™ 4020



Anderson Greenwood 90/9000

Conventional Lift

- Most common
- Opens gradually as tank pressure increases

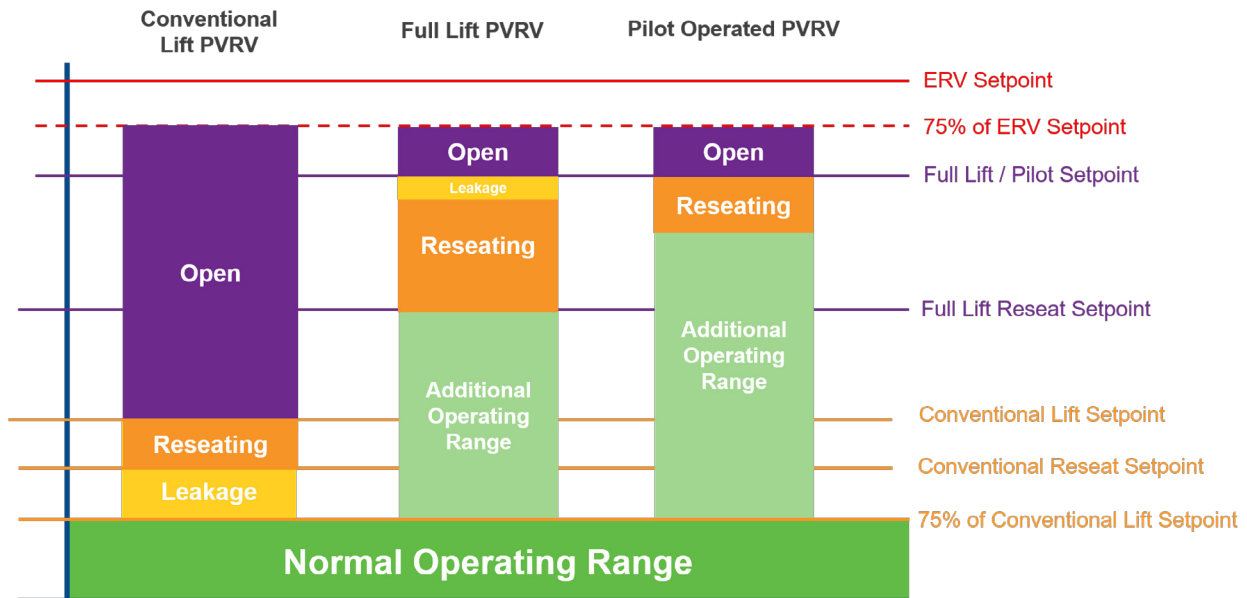
High Capacity/Full Lift

- Fully open at 10% overpressure
- Tighter sealing

Pilot Operated

- For special applications including toxic or hazardous chemicals, system backpressure and operating pressure close to maximum allowable working pressure
- Bubble-tight and full lift at less than 10% overpressure to minimize emissions

Comparison of Conventional, Full Lift and Pilot Operated Valves



Conventional Lift Valves are economical, but Full Lift and Pilot-Operated Valves provide additional operating range which means they can be set closer to the tank's maximum operating pressure. This translates to increased productivity and reduced evaporation (emissions).

Emergency Pressure Relief Vents: The last line of defense protection from abnormal tank pressures

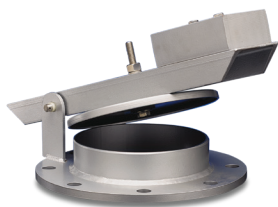


Product Line Overview

Emergency vents represent the last line of defense. Because of this, pressure and vacuum (negative pressure) setpoints are near a tank's maximum allowable working pressure/vacuum. Our range of emergency vents include models for pressure and vacuum, pressure only, hinged style, lift up style and even an option for wireless or wired remote monitoring.

Pressure and Emergency Protection

- Provide emergency relief when tank exposed to pressure and vacuum not handled by standard tank valves



Fisher™ 2000



Fisher 2100

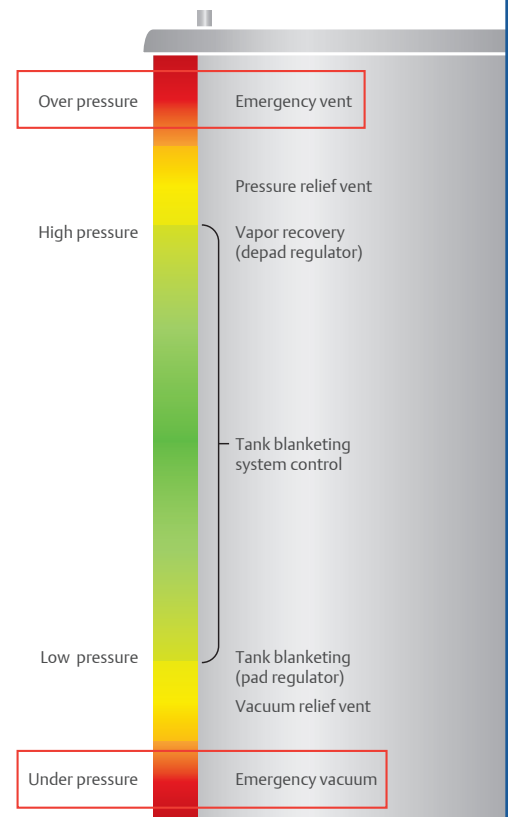


Fisher 2500

Protect against Emergency Pressure and Vacuum

Tank pressure control should include several layers of protection. Normal pressure changes that occur in a tank due to liquid level and temperature changes are managed by pressure vacuum valves, and tank blanketing and vapor recovery regulators.

Emergency vents protect against abnormal pressure or vacuum that can occur due to a fire or system failure. In such instances the excessive positive or negative pressure needs to be relieved quickly in order to ensure safety and protect tank assets.



Remote Monitoring for Quick Response to Emergencies



Fisher™ 2000 with Wireless Remote Monitoring Option

The remote monitoring option, which is available on the 2000 Series, includes a proximity indicator and wireless transmitter. The proximity indicator senses movement of the emergency vent. “Open” or “Closed” signals are received by the wireless transmitter and can be sent to a control room via a WirelessHART® gateway. In addition to this wireless option, a wired option is also available.

This option enables quick response to a potential problem.

Flame and Detonation Arrestors: Protection from potentially catastrophic events



Product Line Overview

Protection from flames is of critical importance in tank applications. If proper protection is not applied, catastrophic events can result. Flame arrestors are designed to stop flames in both unconfined and confined applications, and in severe conditions.

Unconfined flames require end-of-line deflagration arrestors that stop flames travelling below the speed of sound. Confined flames may require deflagration or detonation arrestors, which stop flames travelling faster than the speed of sound.



Fisher™ FVFA
Flame Arrestor



Anderson Greenwood™
Amal ERQ



Anderson Greenwood
Amal IRQ



Fisher Series 7



Fisher DFA



Fisher EN DFA

Anderson Greenwood
Amal IRDB



Unconfined Flame Protection (Deflagration)

- Preventing fire in the atmosphere from entering the tank

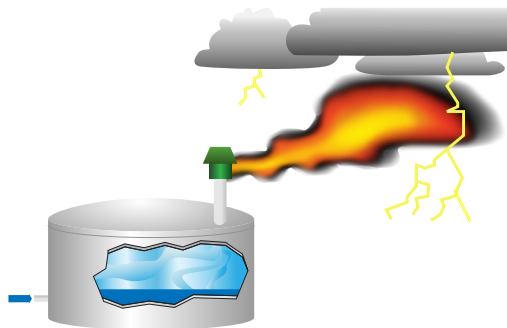
Confined Flame Protection (Deflagration)

- Installed in pipes to prevent flames from passing through
- Most applications are in vapor control systems

Confined Flame Protection in Extreme Conditions (Detonation)

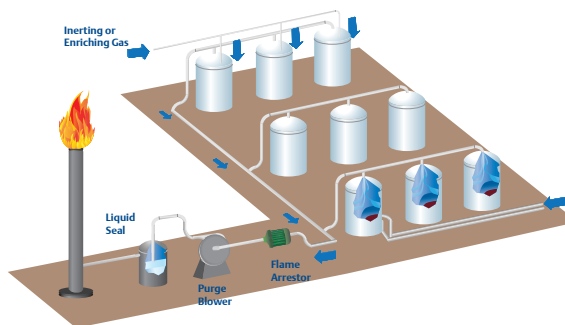
- Unstable detonation that can occur as flame propagates down a pipe and begins to move at a supersonic or hypersonic velocity
- Protect against stable detonation which is less severe

Protect against Unconfined Flames



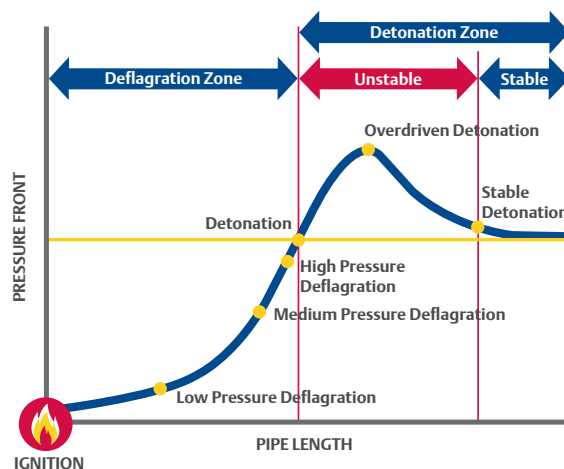
Unconfined flames are end-of-line applications that are not restricted by a physical barrier such as a pipe. Since they are not restricted, they propagate slower, below the speed of sound. Still, they require protection so that a flame is prevented from moving into a tank and igniting.

Protect against Confined Flames



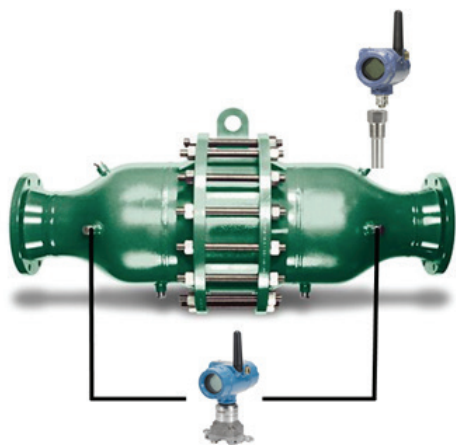
The heat and pressure energy of a confined flame is not relieved as readily as that of an unconfined flame. This makes a tremendous difference in how the flame propagates and what kind of flame arrestor is required to stop it.

Protect against Confined Flames in More Extreme, Unstable Conditions



Determining the location where a flame propagation transitions to a stable detonation is unpredictable because of the many variables involved. Therefore, it is recommended to use unstable detonation arrestors only for detonation applications.

Remote Monitoring to Ensure Arrestor Performance



Flame Arrestor Extended Burn Sensing

The temperature of our arrestors can also be remotely monitored so that the occurrence of a flame event can be known, and actions to inspect and perform maintenance can be taken to ensure continued safety.

Flame Arrestor Fouling Detection

Our arrestors have the ability for pressure differential sensing and remote monitoring. If a higher than acceptable pressure drop is detected, then maintenance can be performed before the overall system process is negatively impacted.

Tank Blanketing and Vapor Recovery Regulators: Mitigate effects of oxygen, maintain liquid integrity and relieve tank pressure to vapor control systems



Product Line Overview

Emerson offers a broad range of regulators for both tank blanketing and vapor recovery. Low setpoints allow minimizing blanketing gas usage, leading to savings in operating cost. Our regulators for vapor recovery offer similar precision and are therefore preferred over other valves in many applications.



Fisher™ ACE95



Fisher T205



Fisher Y692



Fisher 1190



Fisher T208



Fisher 1290

Tank Blanketing

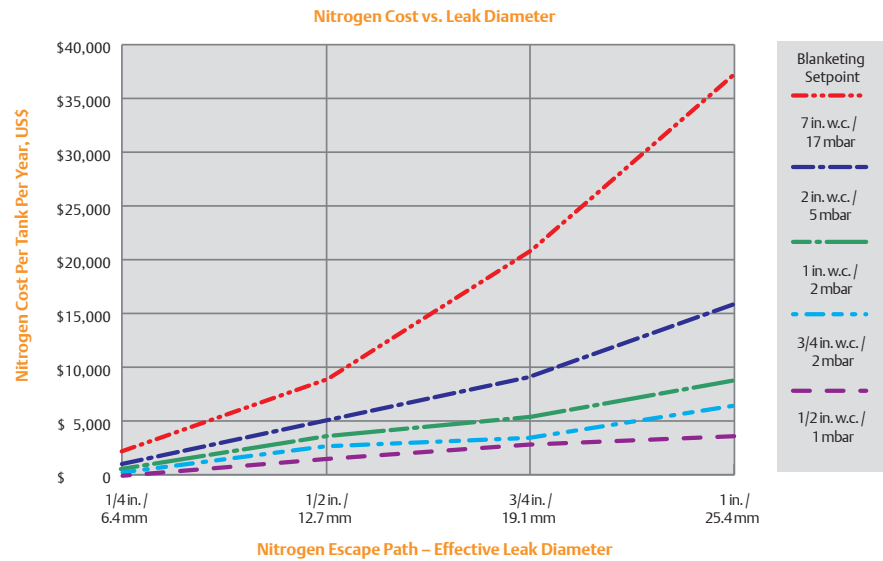
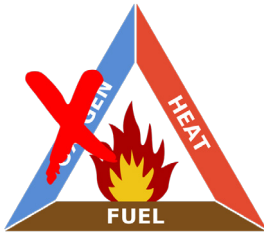
- Low setpoint technology
- Pilot-operated models providing higher capacity and accuracy
- Direct-operated models providing fast response

Vapor Control

- Pilot and direct-operated models

Protect against Potential Impact of Oxygen

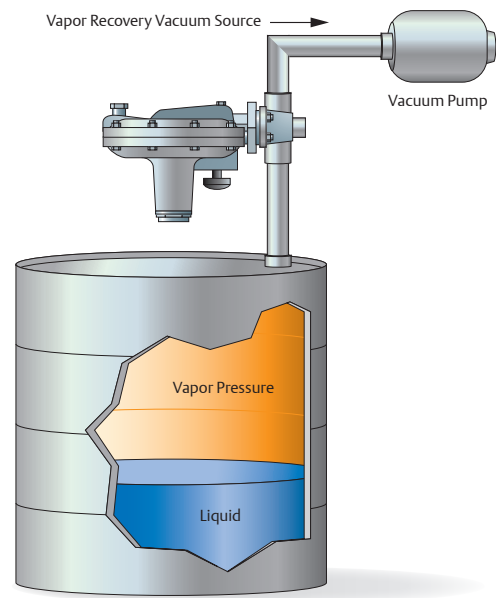
Tank blanketing limits the potential impact of the oxygen that occupies the vapor space in a tank. Pressure regulators are typically used to control the delivery of blanketing gas. A regulator senses the tank pressure and activates based on its setpoint. Emerson regulators feature low setpoint technology which minimizes the amount of blanketing gas consumed.



Cost savings based on nitrogen cost of US 2.00/1000 SCFH

Relieve Tank Pressure to Vapor Control Systems

Vapor recovery regulators provide precision control of vapors that are usually sent to vapor control systems. The Fisher™ 1290 Series and 9000 Series are pilot-operated designs and the Fisher T208 Series is direct-operated. Similar to tank blanketing regulators, these designs are also selected based on the factors noted above.



Total Tank Protection from Your Trusted Advisor



FISHER™ ANDERSON GREENWOOD™

As a trusted advisor to our customers in bulk liquids storage, we are uniquely positioned to help them solve their toughest challenges, with consulting expertise and a vast array of tank solutions. Even when operating with limited budgets or staff, our scalable solutions enable customers to gain unique visibility into essential assets, mitigate equipment failure and risks, with proven quick and measurable returns on investment.

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