Principles of Odorization

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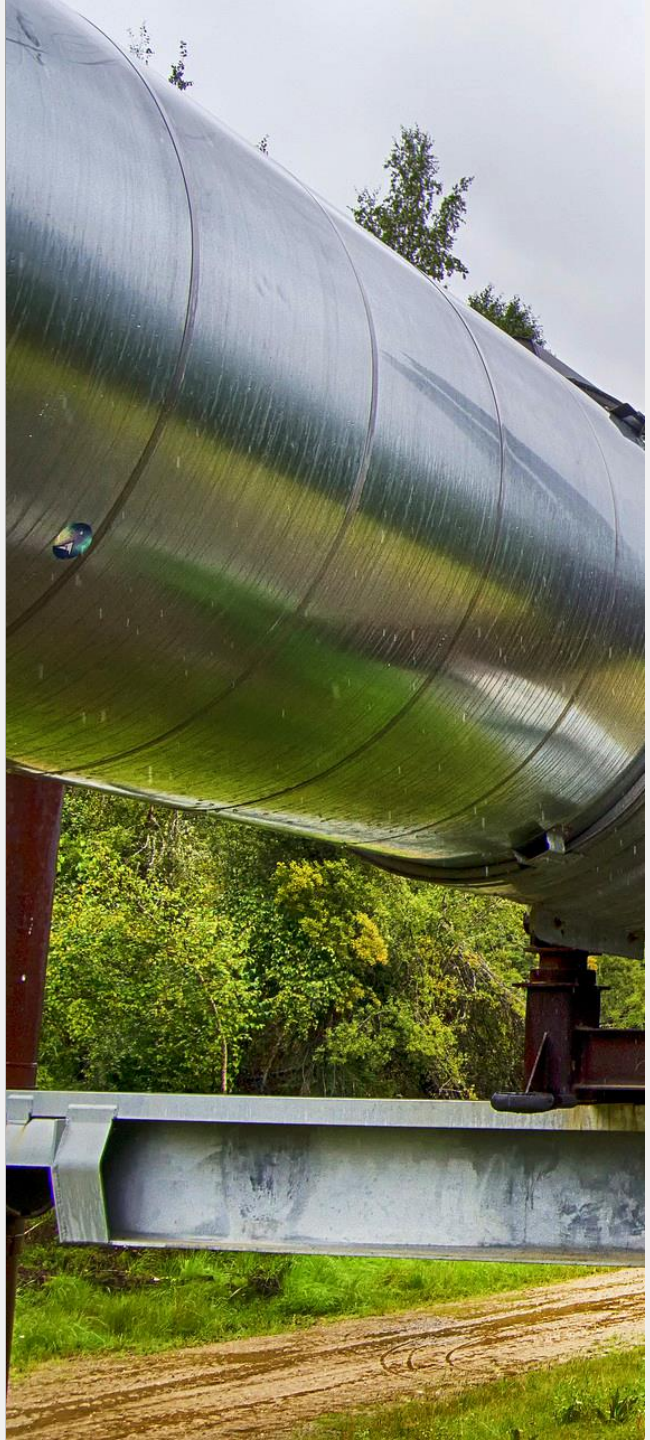


Agenda

- What is Odorization?
- Types of Odorizers
- Installation Consideration
- Supporting products and technologies

What Is Odorization & Why?

Odorization is the process of adding odorant to natural gas so that its presence can be detected by people

What Prompted the Regulation?

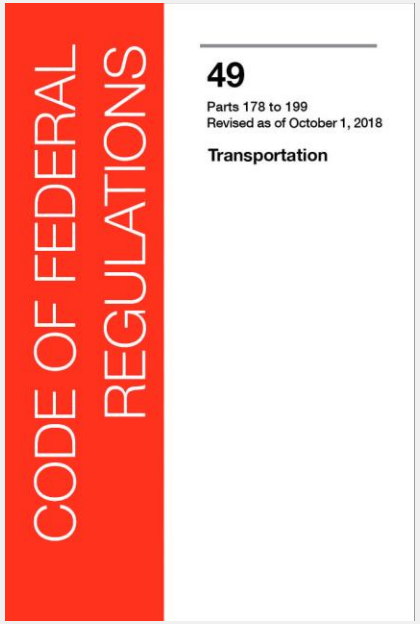
Federally required, **for the safety of the public.**

In 1937, there was an explosion that leveled an elementary school in New London, Texas, **killing 311** people of which the majority were children.

How Do We Odorize?

Code of Federal Regulations

"A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of 1/5 (20%) of the lower explosive limit, the gas **is readily detectable by a person with a normal sense of smell**."



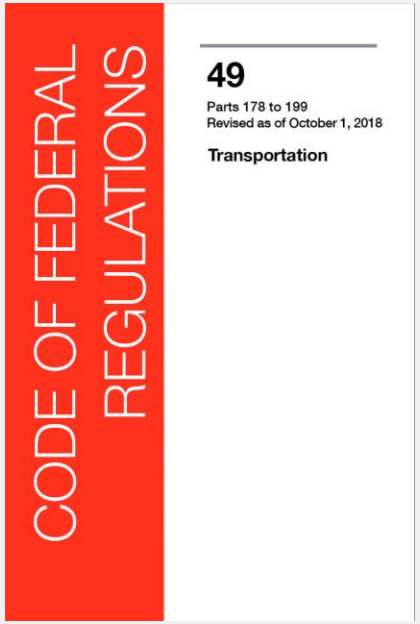
REMEMBER

CFR Title 49 Part 192.625

How Do We Odorize?

Code of Federal Regulations

"Equipment for odorization must introduce the **odorant without wide variations in the level of odorant**."



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What is Odorant?

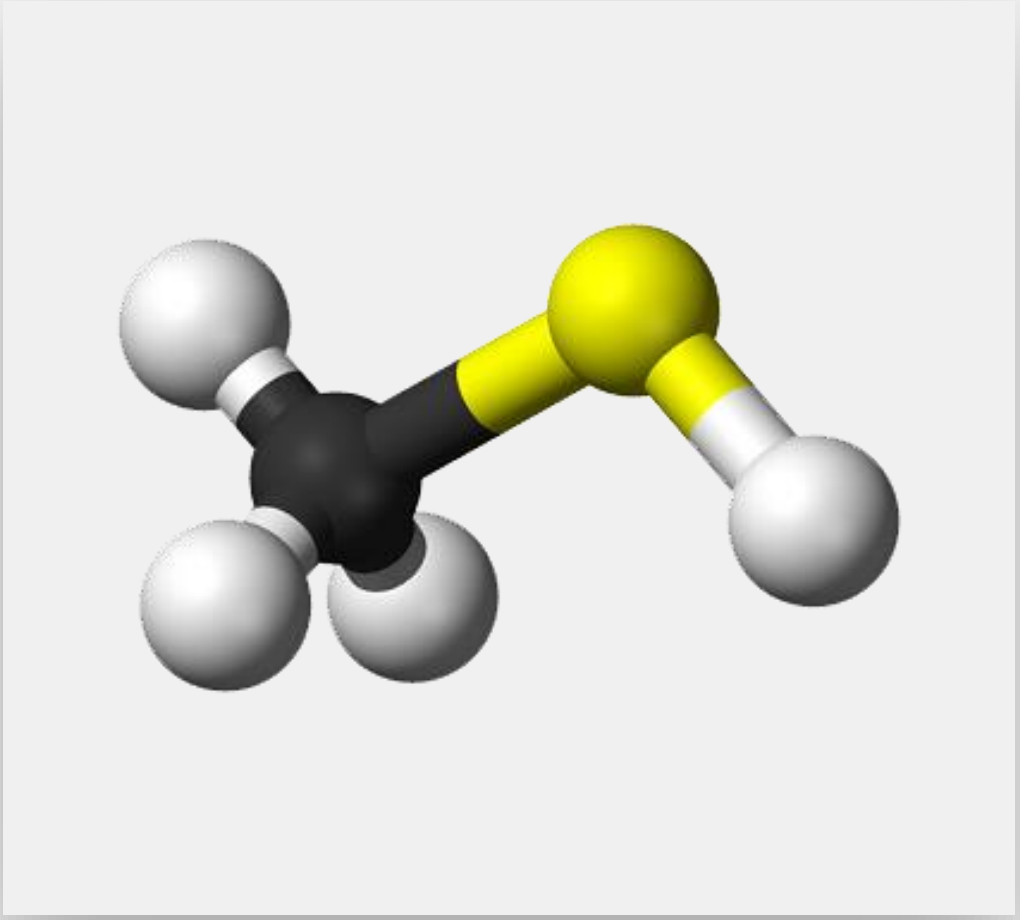
In the US, usually TBM based blends

Detectable at < 1PPB

Highly flammable

Non-toxic to mammals

Toxic to aquatic life

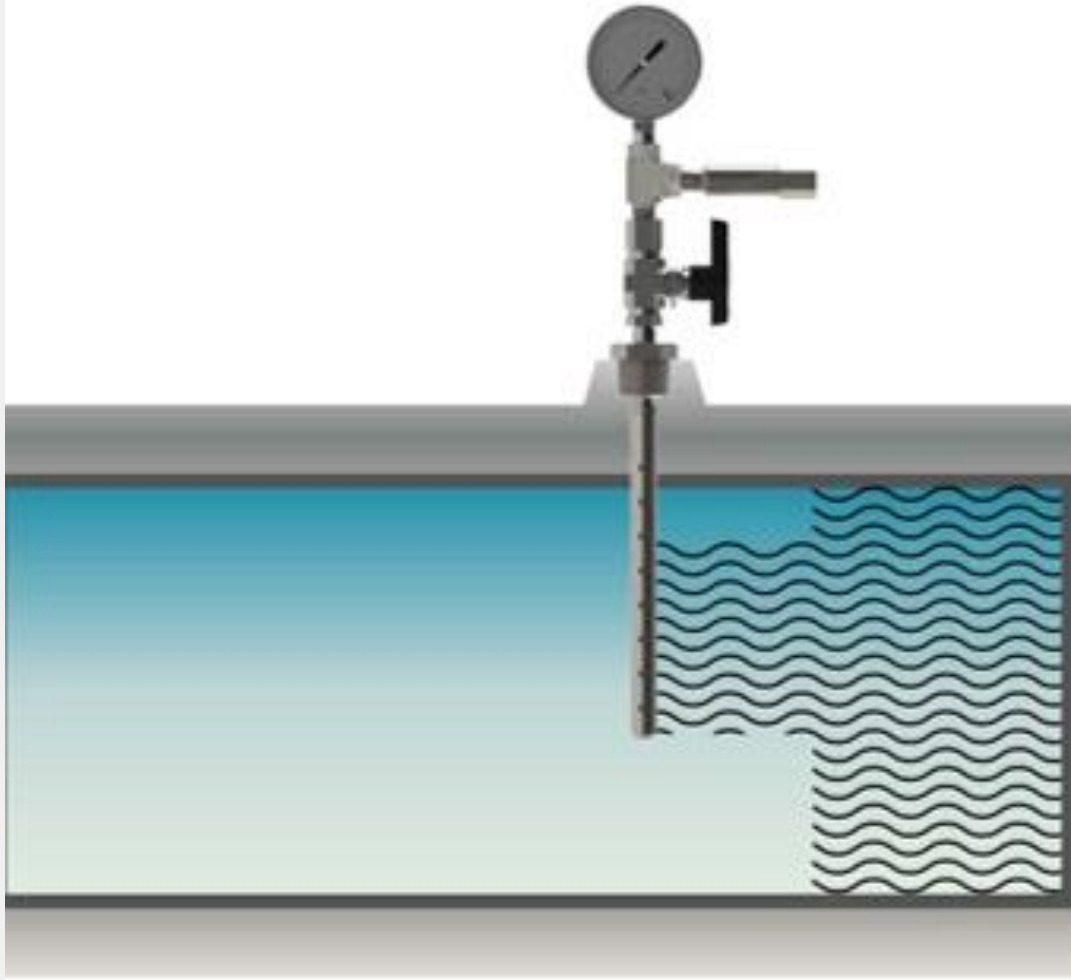


Odorization Rates

In the US, lbs of odorant per million standard cubic feet (lbs/MMSCF)

Typical injection rates range from 0.5 to 1 lb/MMSCF

Typical alarm rates at around 0.35 (low) and 1.5 (high)

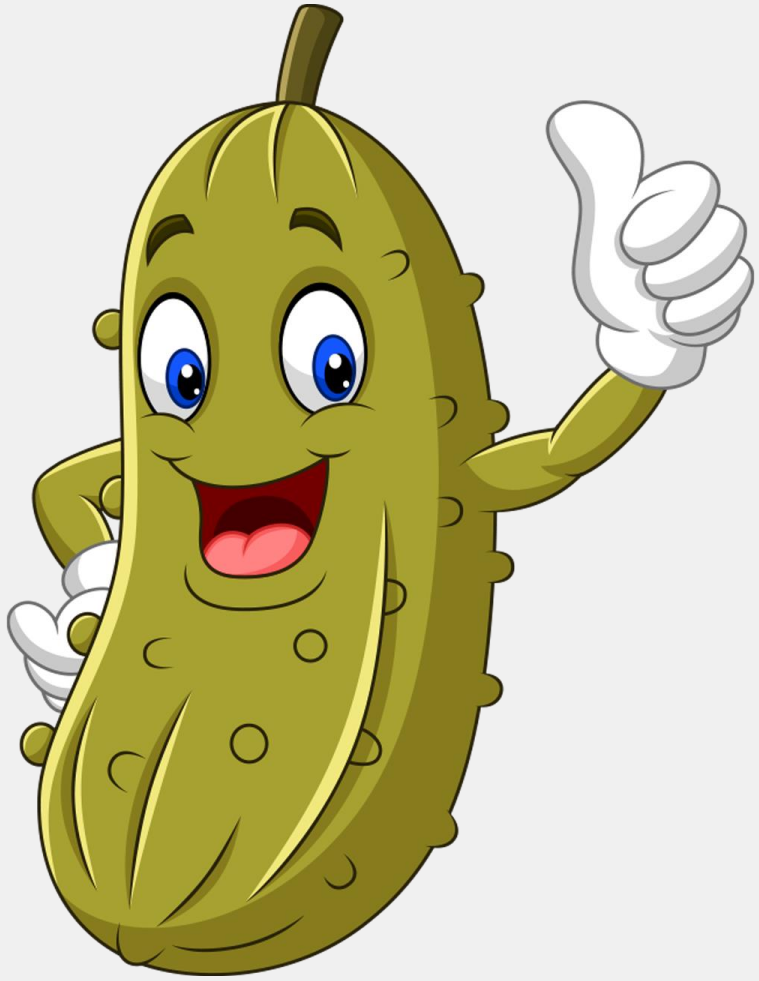


Odor
Fade

Odor fade can occur for a variety of reasons:

- **New steel pipe will strip odor**
- **Cleaning agents can strip or mask odor**
- **Accumulated liquids in low sections of pipe – especially below rivers or lakes**

What is Pickling?



Mercaptan interacts with new steel which removes the odor from the gas

It is necessary to precondition (pickle) the line to prevent this

This is an entire course of its own

Methods of Odorization

- Wick
- Passive Bypass
- Injection Pumps
- Pumpless Vapor/Pumpless Liquid

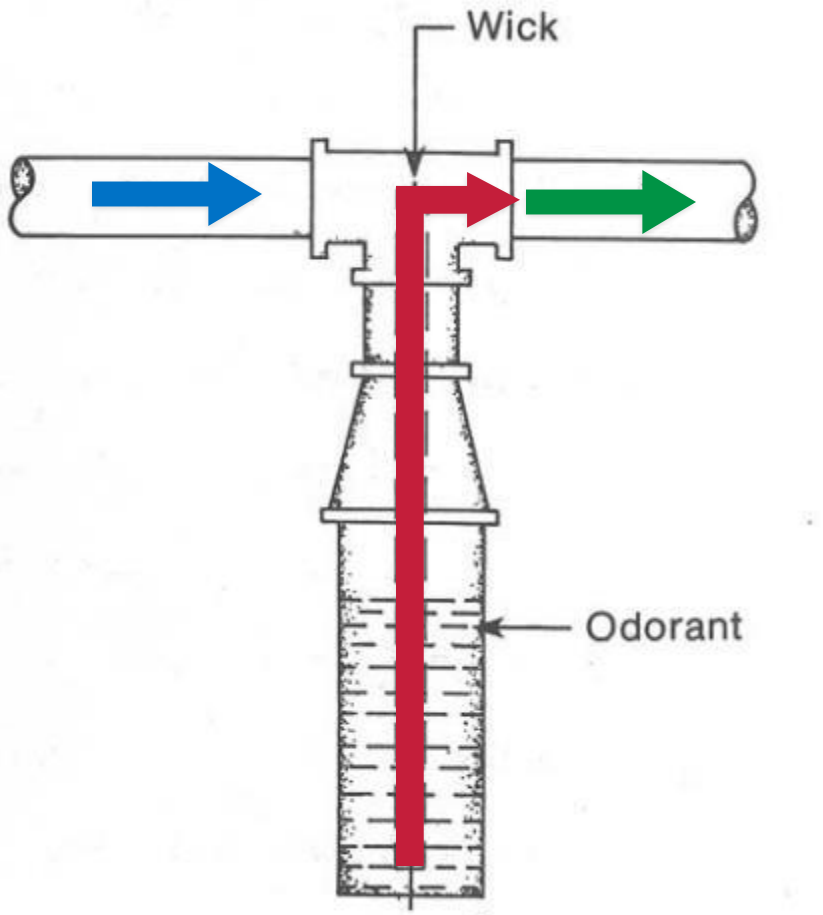
Odorizer Method
Wick

How It Works

Odorant is drawn up the wick from the container and into the gas stream

Disadvantages:

- During low or high flow periods, the gas can be under/over odorized
- No documentation of correct odorization



Odorizer Method
Passive Bypass

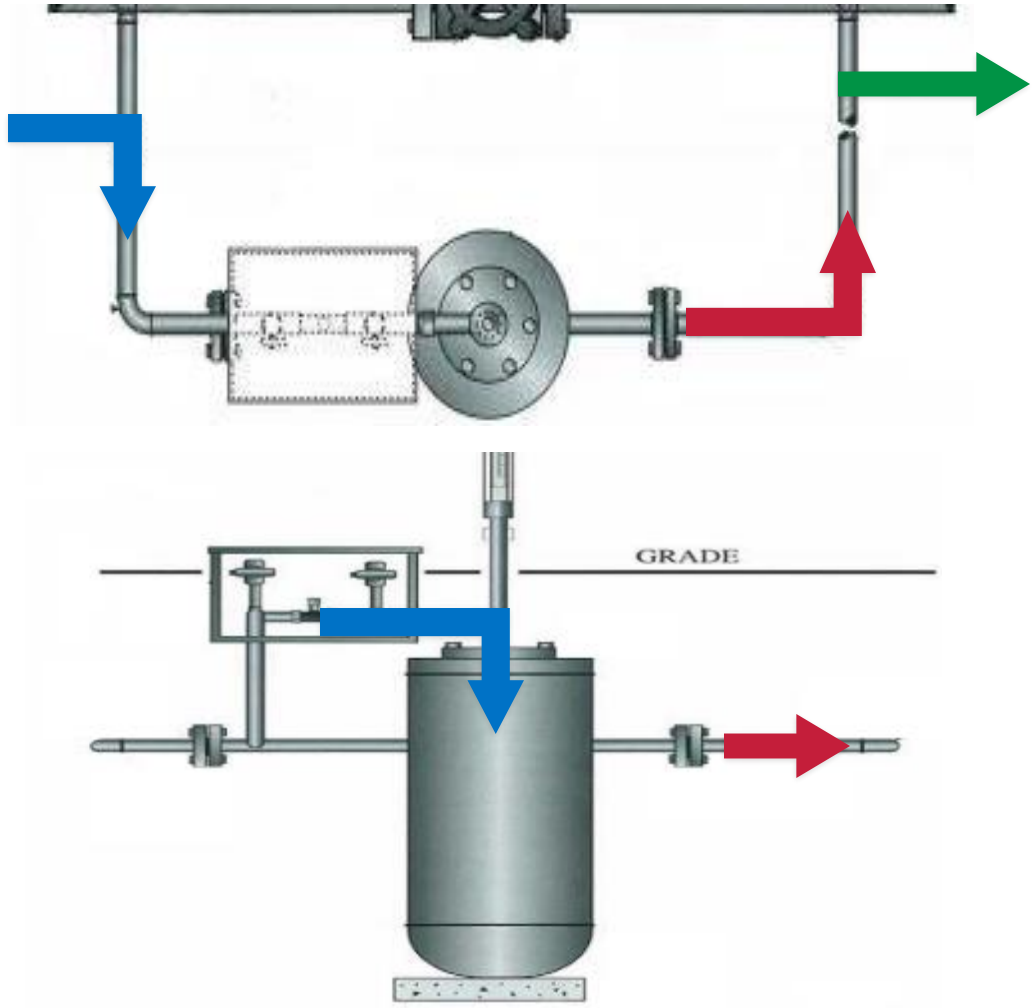
How It Works

A small amount of mainstream gas is bypassed through the unit, and the odorant–laden gas is returned to the main line

Disadvantages:

- Not a good solution for wide variations in flow rate or pressure
- No documentation of odorant delivered

KingTool is the most well-known manufacturer in this niche



Smart Odorizers

- Monitor gas flow and inject proportional to flow
- Monitor their own performance and adjust or alarm appropriately
- Are fully compliant with US 192.625
- Do not experience the high and low odorization swings of passive systems
- Are more sophisticated, therefore more expensive

Pump
Liquid Injection

How It Works

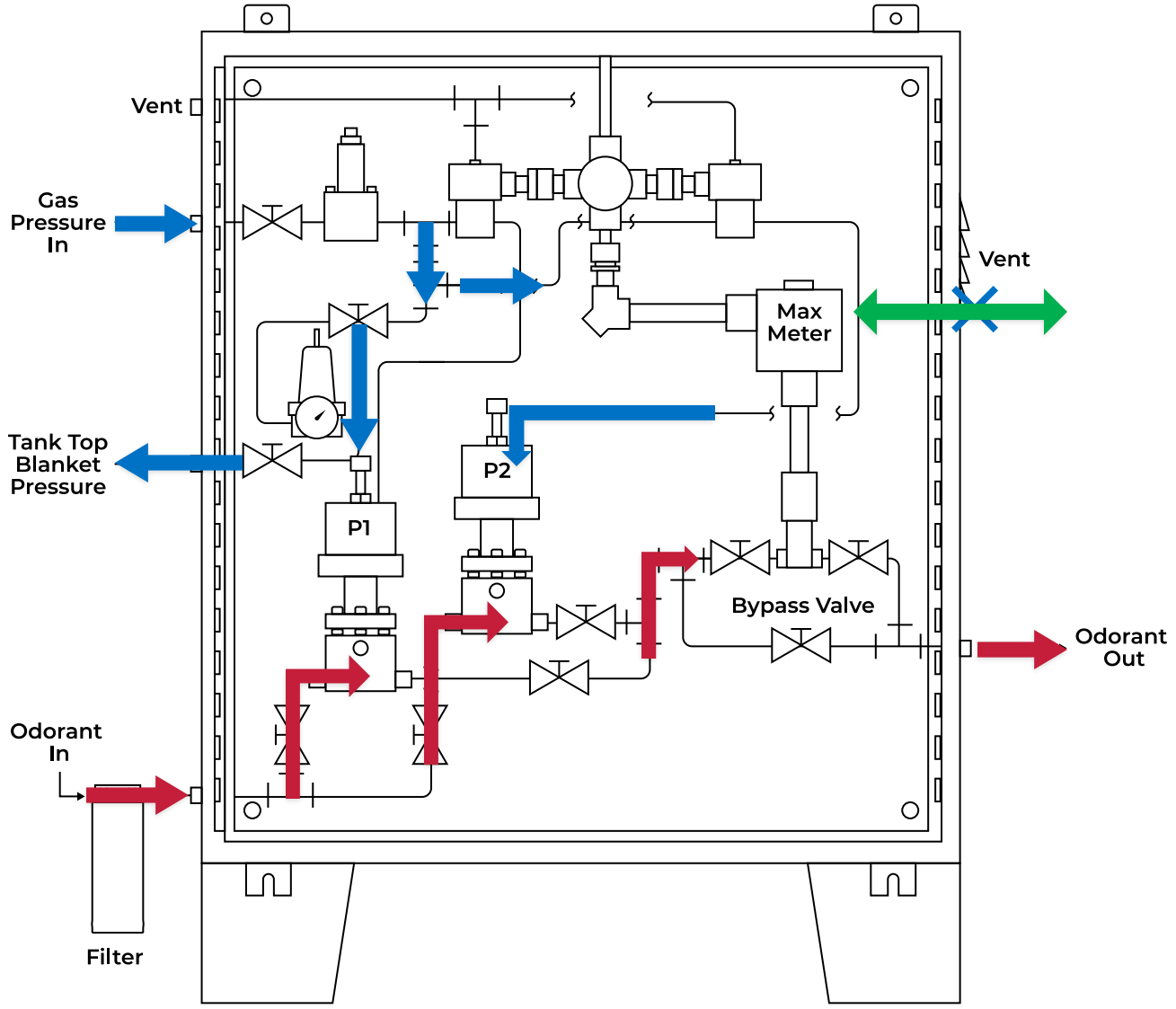
A positive displacement pump is used to push odorant into the line at a controlled rate

Advantage:

- Odorize gas at higher volumes and pressures
- Operates in lines with no pressure drop
- Some systems allow the use of multiple pumps for extremely high flow rates using one controller

Disadvantage:

- Dynamic seals wear



Pumpless Vapor Injection

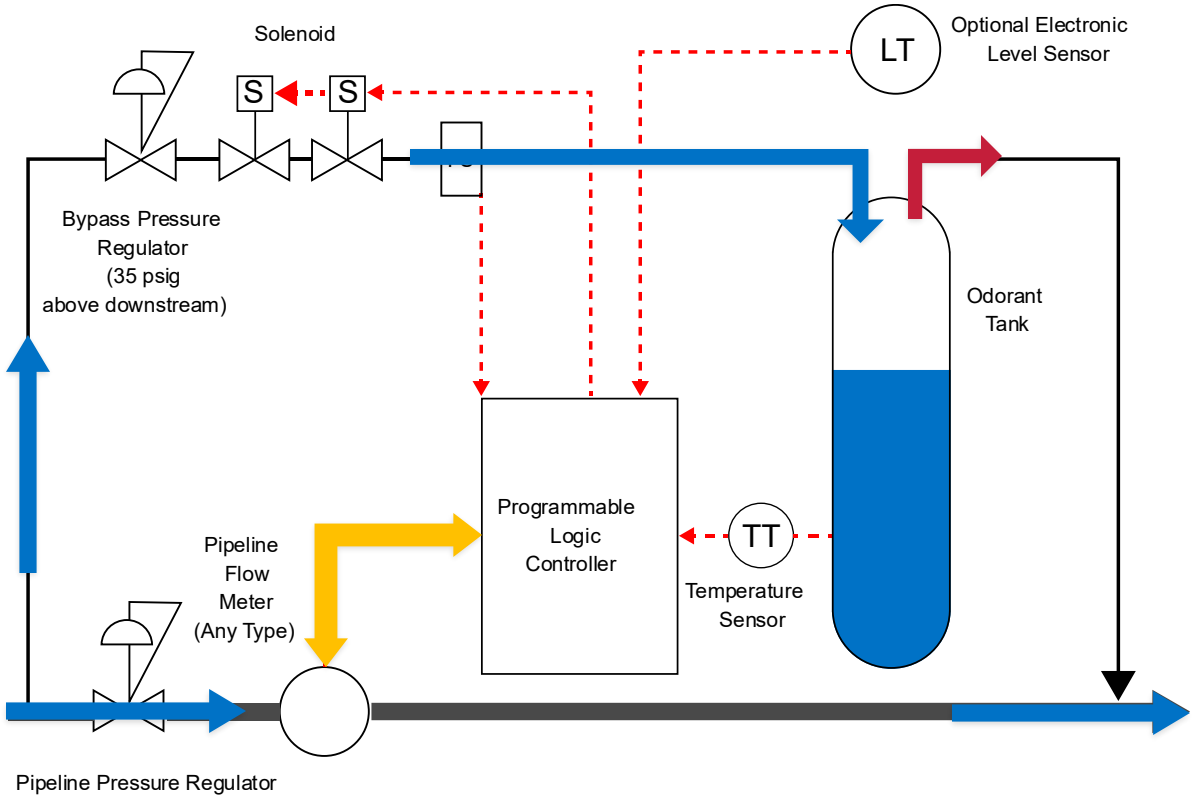
How It Works

Unit diverts un-odorized gas through odorant tank to mix with odorant vapors, saturated gas is return to the down stream line.

Advantage:

- Odorant rate is constantly corrected for pressure, temperature and flow variations
- System allows for repairs prior to gas/odorant infusion
- No issues with vapor locking pumps

NOTE:
Differential pressure in the line is a requirement



Pumpless
Liquid Injection

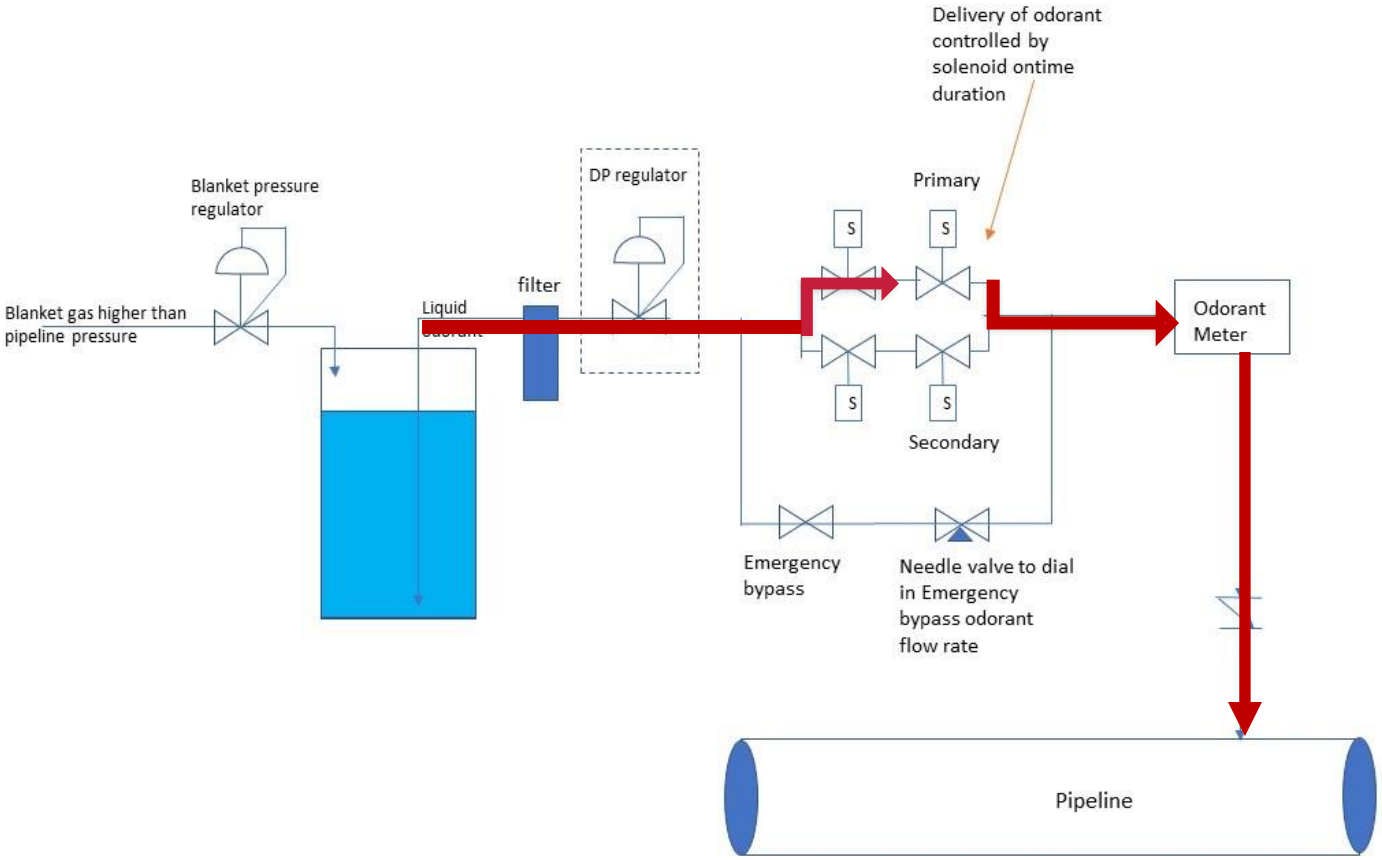
How It Works

Unit utilizes pressurized gas to generate a blanket pressure on tank higher than pipeline. This pressure is used to inject liquid odorant

Advantage:

- Odorant injection at constant rate by varying injection amounts
- No gas emissions
- No issues with vapor locking pumps

NOTE:
Differential pressure in the line is a requirement



Installation Considerations for Odorization

- Secondary containment
- Hazards
- Equipment protection
- Sensitive areas

Secondary Containment

Secondary containment is required to contain any spills that might occur to prevent costly environmental cleanup

Preferred is powder coated or galvanized steel

Concrete can be used, but as it is porous, it will absorb some odorant and continue to smell strongly even after cleanup.

Natural Hazards

The Risk

Odorant is stored under pressure in the tank

Debris from a storm may damage the tubing, allowing the odorant to spill

Even if it is captured with in the secondary containment, the odor will be overwhelming

Respirators will likely need to be worn to clear debris

Meanwhile, the populace for miles around will be disturbed by the smell and making leak calls.

Equipment Protection

Tubing

Odorant is pumped to the pipeline under high pressure

Any leak in the tubing may cause odorant to spray out uncontrollably

Protect the tubing underground with secondary conduit

Protect the tubing above ground by attaching to permanent structures

Equipment Protection

Shelter

A shelter such as this can help protect against falling or windblown debris.

Additionally, it keeps the system away from prying eyes and general mischief.

Even a simple metal shade canopy offers some protection from the elements.

Sensitive Areas

The Risk

The location for an odorizer cannot always be placed in a remote area.

Proximity to hospitals, nursing homes, schools, and churches requires extra consideration.

Even during normal situations such as standard maintenance odor can be released

Supporting Technologies for Odorization

- Sniff Test
- Filtration
- Spill kit
- Flare
- Neutralizer
- Level monitoring

Sniff Test

“readily detectable by a person with a normal sense of smell”

Odorant Measurement

Automatic sampler

Manual sampling

Filtration

Liquid

Gas

Exhaust

Spill Kit

Odorant Spill Kit

- PPE
- Absorbent
- Odorant neutralizer
- Cleanup tools
- Steel drum / plastic overpack
- Welker
- MRR
- Perc
- GOSS

Odorant Flare

Odorant Flare

- Used to flare off blanket gas from odorant tanks or blow down small lines

Odorant Removal

Neutralizers

Chemical

Enzymatic

Thank you!

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