

APPLICATION BRIEF

Nitrogen Blanketing for Storage Tanks and Vessels

Many industries store liquids, gases and even slurries in storage tanks or vessels. Often, when the storage material comes in contact with oxygen, the substance oxidizes and degrades, or potentially creates a hazardous situation.

Nitrogen Blanketing

Tank blanketing or tank padding is a process of introducing an inert gas, such as nitrogen (the most cost effective), to a storage tank to counter the effects of oxygen on the storage material which is usually a liquid. When purging a tank with an inert or inactive gas, the storage vessel material does not come in contact with the oxygen. For this reason, the life of the product is prolonged, and potential explosive conditions are mitigated.

Refineries, pharmaceutical companies, the petrochemical industry use tank blanketing to prevent contact with oxygen and as a way to avoid potentially hazardous conditions. The blanketing process controls the atmosphere above a combustible or flammable liquid, and this reduces the ignition potential. Manufacturers use the method for storage of adhesives, chemicals, fuels, pharmaceuticals, photographic chemicals, inks, and soaps.

Food and Beverage

Food manufacturers use tank blanketing for storing cooking oils, fats, foods and purified water to reduce oxidation, increase product shelf life or prepare the product for transportation or final packaging. The FDA regulates gas-blanketing systems in the food industry, and the manufacturer must follow strict maintenance programs to comply with all product-contact regulations regarding filter specifications purity and toxicity. When using inert gases, such as nitrogen, strict protocols must be followed to ensure that workers are not exposed to harmful or lethal doses of any non-breathable substance. Additionally, in the United States, OSHA regulates any commercial use of tank blanketing.

Tank Blanketing Systems

Tank blanketing systems are found on fixed roof tanks. The system includes a valve that controls the nitrogen coming into the tank. The valve is continuously adjusted to maintain a small constant positive pressure in the vapor space of the tank. Usually, under static conditions the valve is closed, shutting off the flow. If there is leakage in the vessel, the pressure will drop, and to compensate, a low flow of nitrogen into the vessel will occur. Similarly, if the temperature drops, there is a decrease of pressure in the vapor space and nitrogen will flow into the tank.

When emptying the tank, significant flow rates of nitrogen can result. In this case, it is essential to maintain a positive pressure in the tank. If the tank pump-out rate is higher than the rate of nitrogen flow replacement, a negative pressure can cause the tank to suck in and collapse.



Storage Tanks

Industries using Blanketing

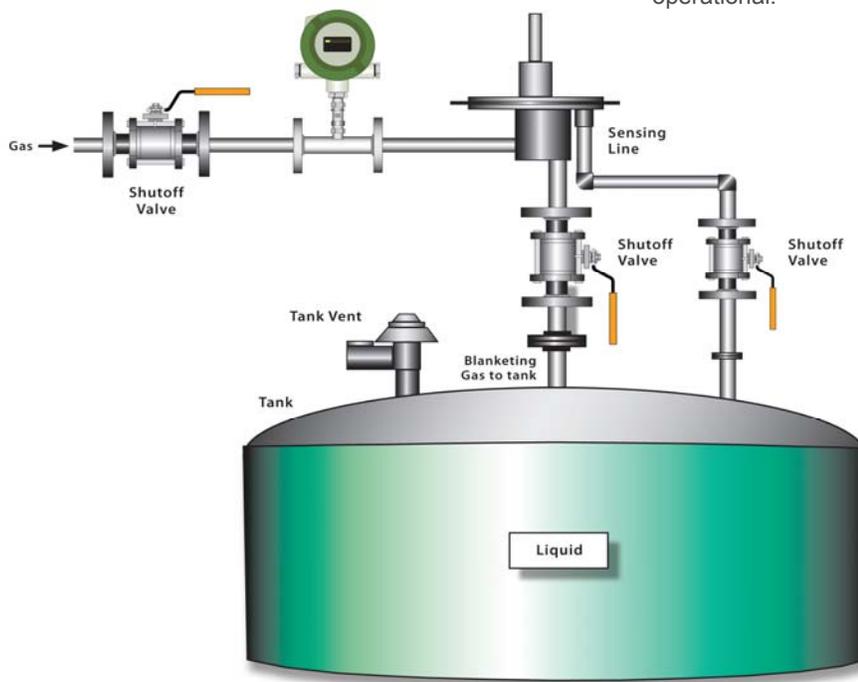
- Food and beverage
- Petroleum
- Pharmaceutical
- Petrochemical

Thermal Mass Flow Meters in Tank Blanketing

Facilities management is often interested in measuring the flow of the inert gas (nitrogen) to monitor consumption. Thermal mass flow meters can measure and totalize the amount of inert gas. They also can alert the operator if the gas is leaking to prevent losses. Some systems use the expensive Coriolis meter, in which case the thermal mass flow meter offers significant savings.

The Sage thermal mass flow meter is available with remote electronics permitting the display to be at ground level rather than near the top of the tank, where the flow meter will likely be installed.

The Sage meter measures flow rate providing a 4-20 mA signal and also shows totalized flow on the display with a pulse output which can be received by the customers' external totalizer.



Considerations for Flow Meter Selection

- Mass flow measurement without the need for temperature and pressure correction
- Approved for use in Class I Div. 1 and Class I Div. 2 hazardous area
- No moving parts reduce maintenance; advantageous over positive displacement flow meters or turbine meters
- Calibrated for nitrogen gas composition
- Wide turndown for precision measurement at low or high flow
- Temperature compensation for accuracy and repeatability with changing process and ambient temperatures
- Easy in-situ calibration verification method to verify the accuracy, and operation of the sensor and transmitter

The Sage thermal mass flow meters meet and exceed the selection considerations for measuring nitrogen gas flow in tank blanketing applications. Sage Metering is the only manufacturer offering an easy, in-the-pipe method to verify that the meter is accurate and that both the sensor and transmitter are clean and operational.

Recommended Sage Prime

The flow meter's sensor type will depend on the pipe size going to the tank blanketing valve (typically $\frac{1}{2}$ " or 1"). A Sage Prime with an in-line flow body would be used on either a $\frac{1}{2}$ " or 1" line while the Prime with insertion probe could be used for pipes 1" and larger.

Sage Rio

When Class I Div 1 classification is needed a Rio would be appropriate.

Thermal Mass Flow Meter in Tank Blanketing Application

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