

*Nitrogen gas in the head space of a vessel keeps out oxygen and water vapor, contributing to safer operation, better product quality and higher yields.*



## AIRCO'S TANK BLANKETING FOR CHEMICAL PROCESSING APPLICATIONS

### A LOOK AT THE PROBLEM

Chemical processing involves risks and hazards. Chemical vapors released during storage or handling, for example, can form flammable mixtures when they come in contact with air. Atmospheric oxygen in the head space of storage vessels can react with the chemicals, producing unwanted by-products that affect purity and quality. Atmospheric moisture can also react with

stored chemicals, causing product degradation or loss while corroding vessels and process equipment.

To solve these problems, Airco Gases has developed an efficient, cost-effective and proven method of preventing atmospheric oxygen and moisture from coming in contact with chemicals in storage tanks, reactors and other vessels — its nitrogen-based tank blanketing systems.

## WHAT IS TANK BLANKETING?

Tank blanketing is a process for maintaining a dry, inert atmosphere of nitrogen gas over chemicals during storage, processing, or reaction.

How does it work? Nitrogen gas is injected into the vessel, filling the head space with dry, inert gas that prevents the liquid from contacting atmospheric oxygen or moisture.

## BENEFITS OF TANK BLANKETING

- **Improved operating safety.** Placing a blanket of dry, inert gas over process liquids prevents volatile chemicals from reacting with atmospheric oxygen to form flammable or explosive mixtures.
- **Higher yields.** By eliminating accidental reactions, tank blanketing assures that more of the process liquid can be used in the primary reaction. The result is higher yields, increased productivity.
- **Purer products.** There are no unwanted reaction by-products. The integrity of the process fluid is assured. Product quality is enhanced.
- **Lower capital costs.** By keeping moisture out of storage vessels and away from process fluids, tank blanketing reduces corrosion, increasing the operating life of tanks and other process equipment.

## TANK BLANKETING METHODS

The three methods of tank blanketing are continuous purge, balanced pressure, and oxygen monitored.

### CONTINUOUS PURGE

The continuous-purge tank blanketing system (Figure 1) is used when the storage vessel is not pressure-rated, or when the potential exists for process fluid to block vents and lines.

**How it works:** The system introduces a steady flow of nitrogen into the tank head space. The flow of nitrogen gas must be equivalent to the liquid pump-out rate. This prevents air from entering the vessel through the vents as process fluids are withdrawn.

**Note:** Nitrogen sparging — the injection of nitrogen bubbles directly into the liquid

via a diffuser — also can be used in this application, and has the added benefit of removing dissolved oxygen from the process fluid. Airco provides a full range of nitrogen sparging systems for chemical process applications.

### BALANCED PRESSURE

The balanced-pressure tank blanketing system (Figure 2) is used in tanks that are pressure-rated.

**How it works:** Pilot-operated pressure regulators maintain a positive pressure (typically 2-10 inches water) of nitrogen gas in the tank's head space.

When the tank breathes or process fluids are withdrawn, and pressure downstream of the regulators falls below a predetermined set point, the regulator opens to admit nitrogen gas into the tank. Steady nitrogen pressure is maintained, so no air can enter.

Pressure relief valves on the storage tank relieve excess pressure that can build up on warm days or while filling the vessel. Vacuum relief valves let air or nitrogen gas into the vessel to break vacuums that can form during low atmospheric conditions or if regulators fail while the tank is being emptied. Operations of valves and regulators is automatic, with minimal maintenance required.

### OXYGEN MONITORED

The most sophisticated method of tank blanketing is the oxygen-monitored tank blanketing system (Figure 3). It is used in batch processes and other applications where precise control over the amount of oxygen in the tank or vessel is desired.

**How it works:** An oxygen analyzer continuously samples the gas in the tank's head space. When the oxygen content reaches a predetermined set point, the analyzer sends a signal to an actuator, which opens a valve to admit nitrogen gas into the tank.

When the oxygen level is reduced to a level below the set point, the analyzer shuts the valve. By introducing nitrogen gas into the tank head space only when it's needed, the oxygen-monitored system significantly reduces nitrogen consumption to minimize operating costs.

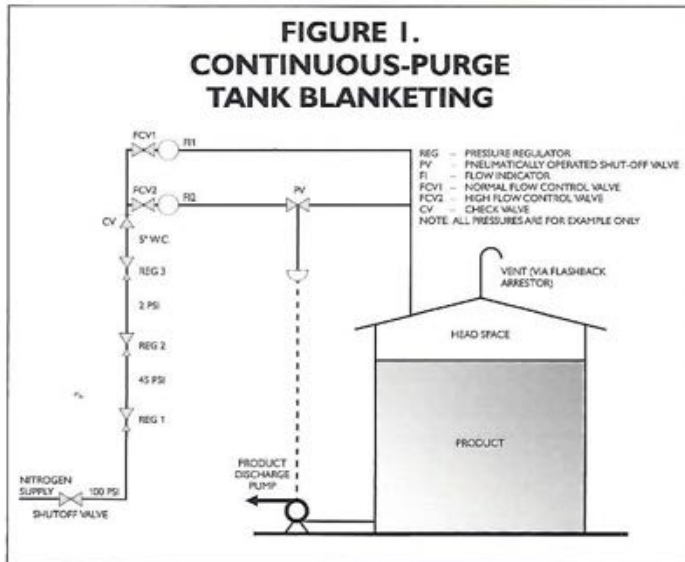
## SELECTING THE OPTIMUM TANK BLANKETING METHOD FOR YOUR PROCESS

Airco engineers can help you select the tank blanketing method that's right for your process based on such factors as:

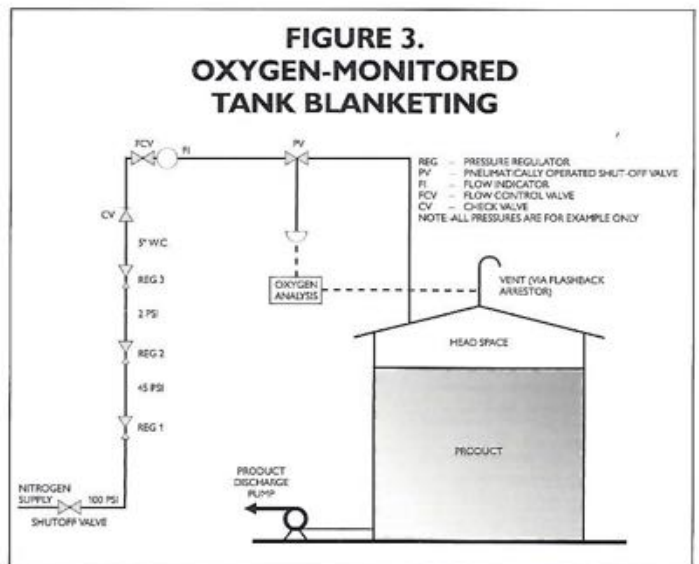
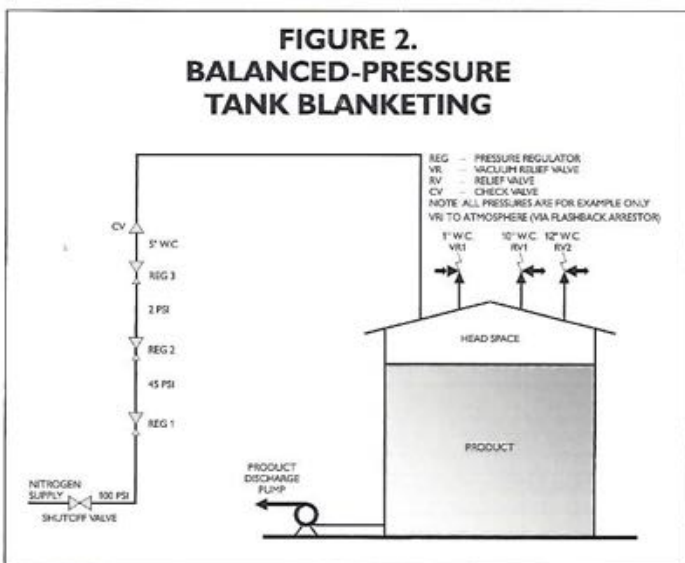
- the properties and hazards of the materials being stored;
- the type, size, pressure rating, and relief valve setting of your tank;
- the type of process (continuous vs. batch);
- flow rates;

- average monthly throughput;
- ambient temperature of tank and average temperature of stored chemicals; and
- ambient temperature in your geographic region.

The Airco engineering team carefully examines all of these factors before proposing a tank blanketing system for your process. Proprietary Airco technology enables us to quickly and cost-effectively find solutions to even the most difficult tank blanketing challenges.



The continuous-purge tank blanketing system is used in tanks that are not pressure-rated, or when the potential exists for the stored process fluid to block vents and lines.



Oxygen-monitored tank blanketing systems can result in significant cost savings, because monitoring the oxygen level prevents overuse of nitrogen.

The balanced-pressure tank blanketing system controls the flow of nitrogen into the tank head space based on pressure to prevent air from leaking into the vessel.

## **A NITROGEN SUPPLY METHOD FOR EVERY TANK BLANKETING APPLICATION**

Choosing the right nitrogen supply method is critical to cost-effective tank blanketing.

From bulk liquefied gas delivery to your own on-site membrane or pressure swing adsorption (PSA) system, Airco can custom tailor a gas supply system that's right for your tank blanketing application — based on your gas consumption and demand, flow rate, volume, purity, and pressure requirements.

## **FOR MORE INFORMATION**

To find out more about Airco's nitrogen-based tank blanketing systems and begin integrating them into your process, contact Airco's Commercial Development department, Chemical Processes section; telephone (908) 771-1155; fax (908) 771-1148.

## **SAFETY NOTICE**

The information presented in this bulletin is general and not intended to be used in specifying equipment. Airco will provide technical assistance regarding equipment and process procedures for your specific applications. Our goals are to ensure that your tank blanketing system operates safely as well as efficiently.



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