

Focus on Oxygen Analysis for “Dry” Processing Applications

Preventing Flash Fires & Explosions • Maintaining Product Quality

General

Powdered or granular materials are essential ingredients of many chemical processes. Many of these materials are flammable or may generate combustible dusts during processing. Such combinations of ingredients raise the possibility of flash fires or explosions within those processes.

There are many different “dry” processes including mixing, filling, blending, coating, milling, grinding, pulverization, shredding, classification, and conveying.

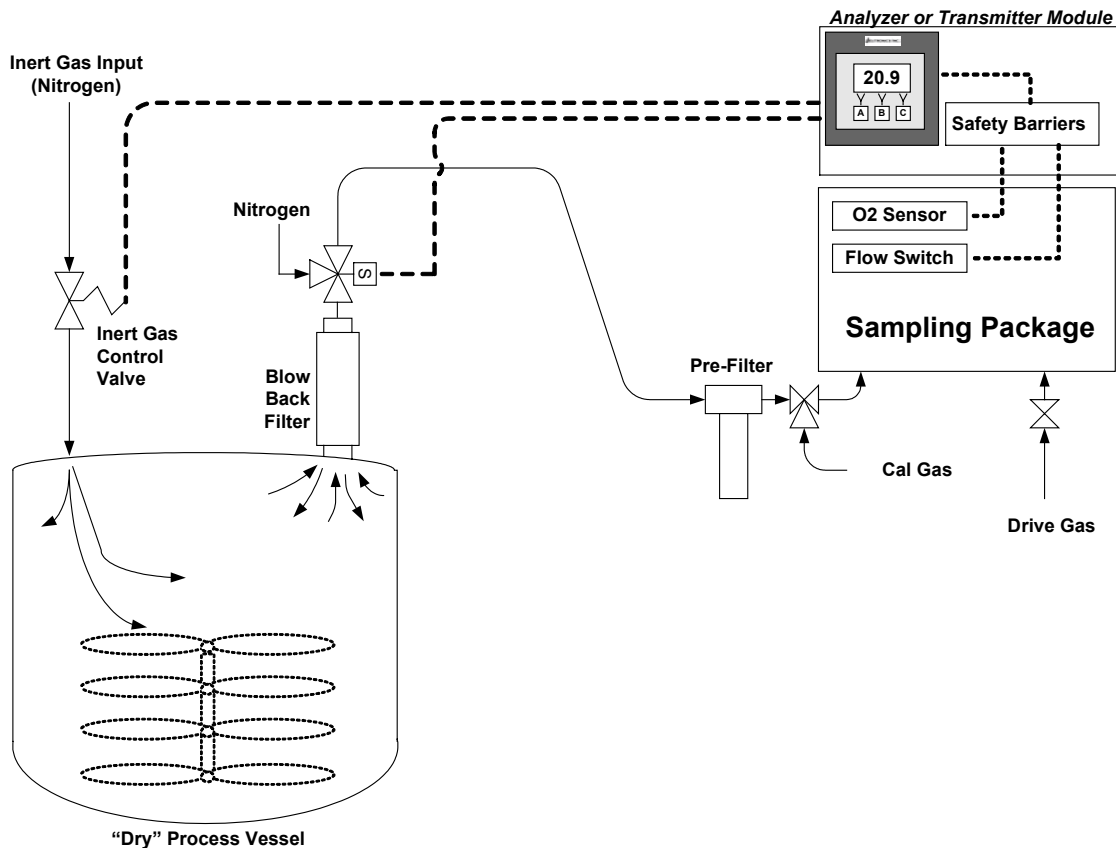
No flammable process is immune to the threat, however, if the oxygen concentration within the combustible mixture is decreased

sufficiently, a flame cannot propagate. So a common method of fire or explosion prevention is using an inert gas blanket within the process vessel.

The inert gas blanket will effectively deplete the oxygen concentration in the process and provide an adequate measure of safety.

Consequently, along with the purging of oxygen, the release of fine particles from the process occurs. To reduce the amount of losses from the chemical process it is wise to use the inert gas conservatively. Using an inert gas control system based on the concentration of oxygen in the process will optimize inert gas usage.

Product quality may also be affected by the presence of oxygen. Monitoring or controlling oxygen levels will prevent the degradation of oxygen sensitive processes.



The “Neutronics” System

A typical “Neutronics” analyzer system consists of four main subsystems:

1. **Analyzer/controller (or transmitter)**
2. **Sample Conditioning Package**
3. **Sample Preconditioning**
4. **Inerting Control Valve(s)**

The **Analyzer** is the electronics or the “brain” of the system. The analyzer takes sensor inputs and based on an algorithm, controls the flow of inert gas through a solenoid valve into the vessel or process atmosphere. The main features of the Analyzer include:

- Digital display of oxygen concentration and process status
- Alarm Relays for customer interface
- Color Coded LEDs for quick reference of the process conditions and alarms
- Relay control of the Inerting Control Solenoid Valve
- Analog current output (4-20 mA) of the oxygen concentration

Sensor inputs to the analyzer can include the oxygen sensor and sample flow detector, both mounted within the sample conditioning package. The OXYTRON model analyzer can also take several other inputs including process pressure/temperature sensors, digital interlock switches, ambient air sensors etc.

To provide interlocks or alarms for the interface to the process vessel, the analyzer also has analog current or voltage outputs and configurable alarm relays.

The analyzer is available in a waterproof stainless steel enclosure (Wall Mount), an explosion proof enclosure, as well as other mounting options.

Typically the Oxytron analyzer is mounted in the Non-Hazardous rated area.

As the name implies, the **Sample Conditioning Package** contains components to clean and condition the sample gas before exposure to the sensors. The standard sample conditioning package contains the following components:

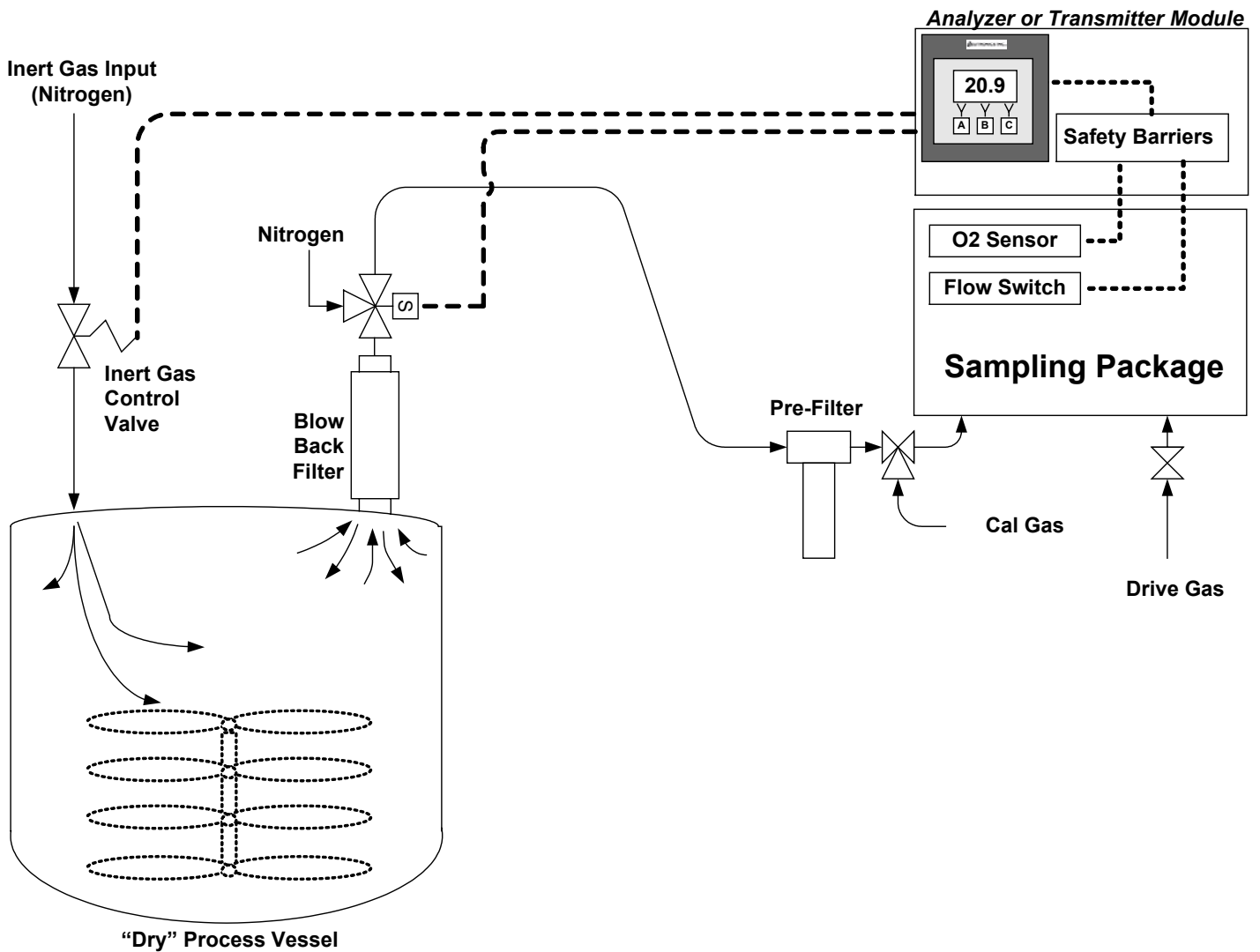
- Sintered Metal Particulate Filter
- Loss of Sample Flow Sensor
- Sample Flow Meter
- Sample/Calibration Gas Selector Valve
- Intrinsically Safe Oxygen Sensor
- Sample Flow Through Head
- Intrinsically Safe Vapor Condenser to prevent vapors in the sample from condensing
- Intrinsically Safe Eductor to extract sample gas
- Pressure Regulators to control drive gas
- Vapor Corrosion Inhibitor to protect case
- Stainless Steel Case with locking door
- Stainless Steel and Teflon tubing

The sample conditioning packages utilize an eductor to extract the gas sample from the process. An eductor uses the venturi principle to create a slight vacuum so no electrical pump is required. By installing Intrinsic Safety barriers on the oxygen sensor and sample loss sensor signal lines, the sample conditioning package is rated Intrinsically Safe. The safety barriers are mounted inside the Oxytron analyzer enclosure. Thus, the sample conditioning package may be mounted in the Hazardous Location close the process point.

Externally mounted **Sample Preconditioning** components work in conjunction with the sample conditioning package to ensure the sample gas is clean and uninhibited on the path to the oxygen sensor. Various Sample Preconditioning components are available depending on the application:

- Large Capacity Particulate/ Coalescing Prefilter
- Water Spray Scrubber to remove acids
- Water Cooled Demister to remove hot mists and aerosols from the sample gas
- Blowback Filter to automatically remove particulates from the sample gas
- Auto Drain to remove accumulated condensates for the prefilter while operating in a vacuum

Typical Installation of Single Channel Analyzer or Transmitter System on “Dry” Process Vessel



1. Blow Back Sample Filter to remove heavy particulates, self cleaning element prevents frequent clogging.
2. Secondary Pre-filter removes fine particulate down to 0.1 micron.
3. Sample Conditioning Package extracts & cleans gas sample before directing it to the oxygen and loss of sample flow sensors.
4. Analyzer or transmitter module interprets oxygen sensor signal and may be configured to control the oxygen level within the process vessel.
5. Safety Barriers maintain the Intrinsic Safety of the Sample Conditioning Package.
6. Inerting Control Solenoid Valve allows inert gas flow into the vessel to maintain safe oxygen level within the vessel headspace.