

Focus on Inert Gas Control of a Typical Chemical Reactor Process Vessel

Minimize VOC Emissions while Preventing Flash Fires & Explosions

INTEGRATION OF THE "OXYTRON" INERTING CONTROL SYSTEM

General

Flammable solvents, slurries and highly combustible powders are essential ingredients of many chemical processes. Such combinations of ingredients raise the possibility of flash fires or explosions within those processes.

No flammable process is immune to this threat.

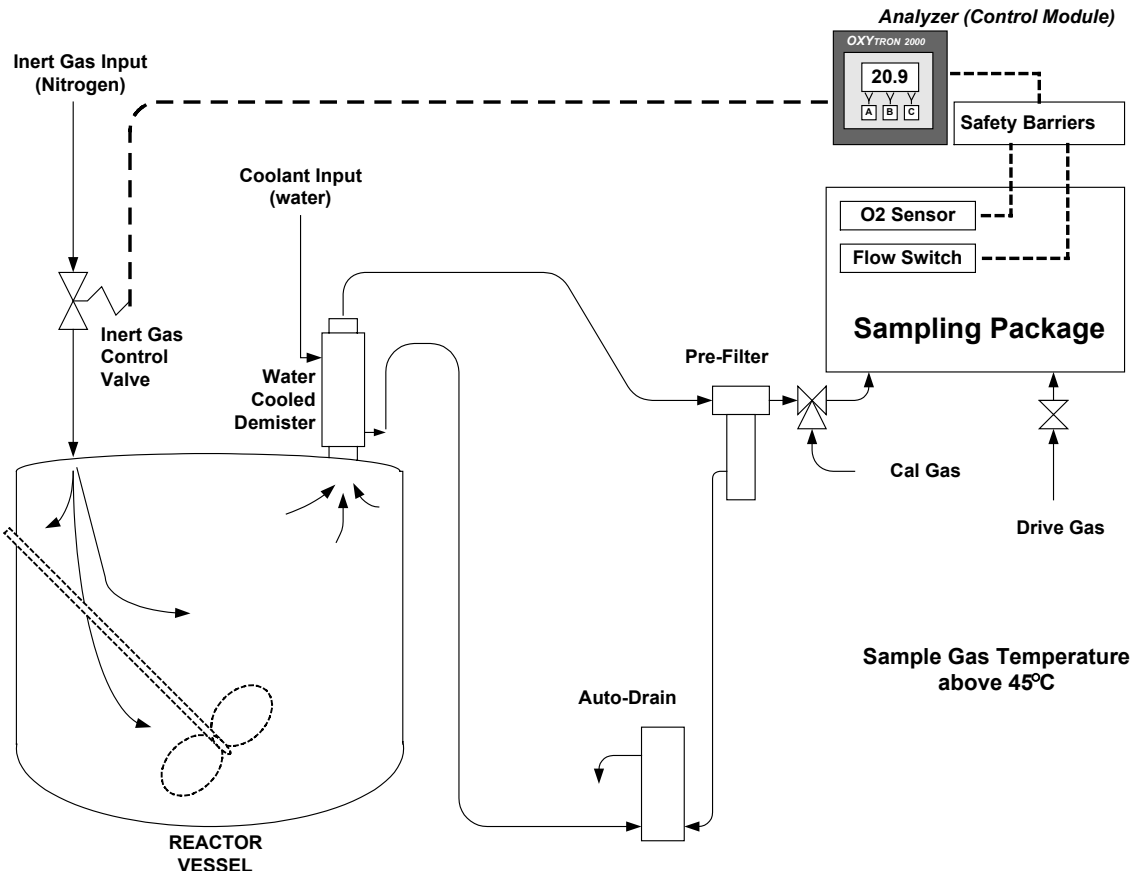
If the oxygen concentration within the combustible mixture is decreased sufficiently, a flame cannot propagate. So a common method of fire or explosion prevention is using an inert gas blanket within the process vessel.

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 Volatile Organic Compounds or "VOCs" from the process occurs. To reduce the amount of VOCs 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 and minimize VOC emissions.

This technical bulletin may be used in determining the inerting control system design and implementation.



The “**OXYTRON**” System

The Oxytron system consists of four main subsystems:

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

The **OXYTRON 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 elevated temperature of the chemical reactor atmosphere. The main features of the Oxytron 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
- Analog voltage output (0-5 VDC) of the oxygen concentration

Sensor inputs to the Oxytron can include the oxygen sensor and sample flow detector, both mounted within the sample conditioning package. The OXYTRON 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 elevated temperature of the chemical reactor atmosphere, the Oxytron also has analog current or voltage outputs and configurable alarm relays.

The Oxytron analyzer is available in a Waterproof Stainless Steel Enclosure (Wall Mount), an explosion proof enclosure, as well as other options.

The standard Oxytron analyzer can communicate to upto two sample conditioning packages and thus be able to control upto two processes simultaneously.

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:

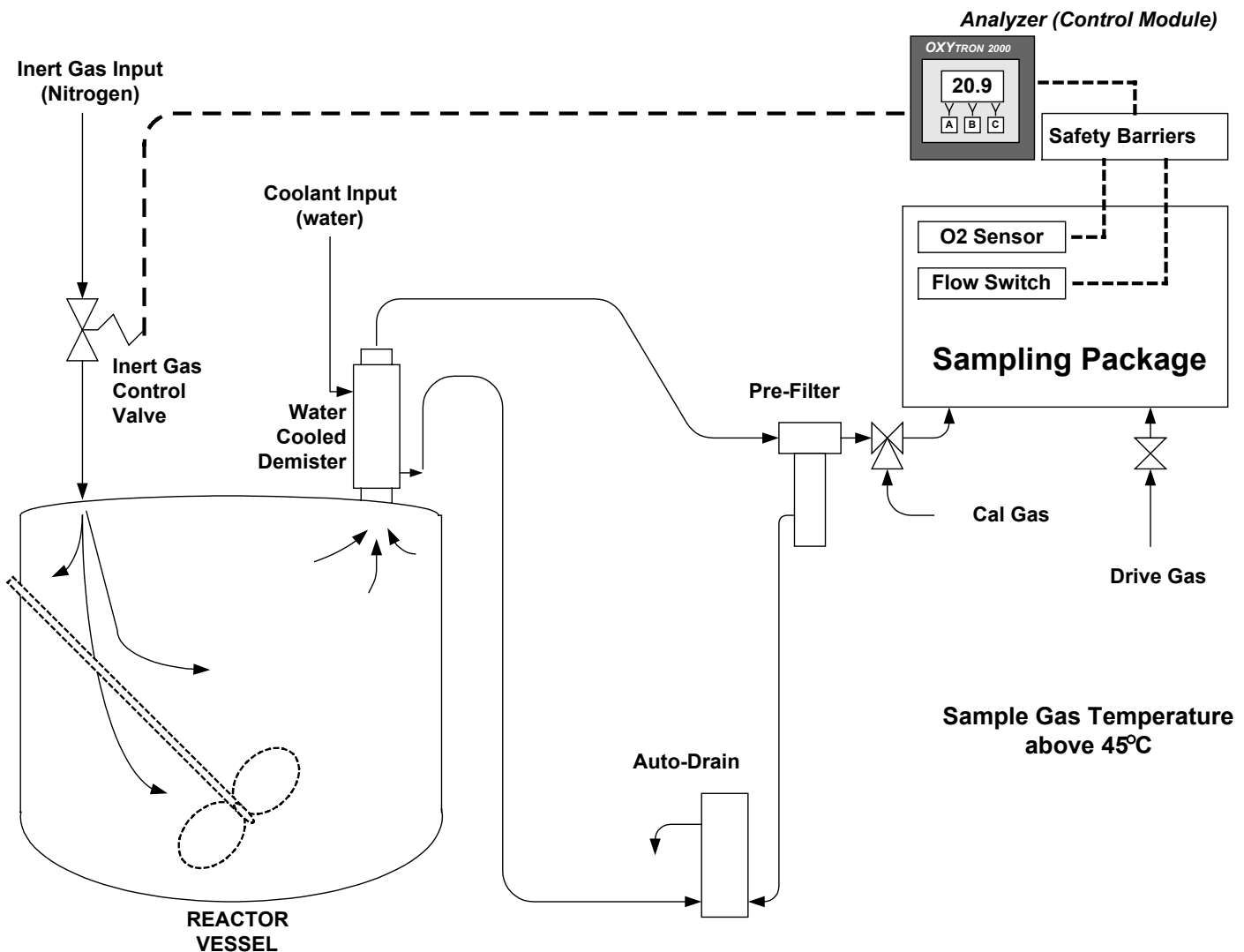
- SS Sintered Metal Particulate Filter
- SS Loss of Sample Flow Sensor
- SS/TF Sample Flow Meter
- SS/TF Sample/Calibration Gas Selector Valve
- Intrinsically Safe Oxygen Sensor
- SS Sample Flow Through Head
- Intrinsically Safe SS Vapor Condenser to prevent vapors in the sample from condensing
- Intrinsically Safe SS/TF Eductor to extract sample gas
- Pressure Regulators to control drive gas
- Vapor Corrosion Inhibitor to protect case
- SS Case with locking door
- SS/TF 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 Oxytron System on the elevated temperature of a chemical reactor atmosphere or Mixer
 (Ambient temperature process does not contain acid vapors)



1. Coalescing Sample Prefilter to remove particulates and catch condensing process solvent vapors.
2. Automatic Drain to remove filter condensate while maintaining eductor vacuum.
3. Sample Conditioning Package extracts & cleans gas sample before directing it to the oxygen and loss of sample flow sensors.
4. Oxytron Analyzer monitors and controls the oxygen level of the elevated temperature of the chemical reactor atmosphere.
5. Safety Barriers maintain the Intrinsic Safety of the Sample Conditioning Package.
6. Inerting Control Solenoid Valve allows inert gas flow into the elevated temperature of the chemical reactor atmosphere on demand.