Cost Effective Gas & Vapor Monitoring in Chemical and Pharmaceutical Manufacturing Facilities

Chemical and Pharmaceutical facilities use a variety of hazardous gases and solvents in their production processes. Whenever these substances are transported, processed or stored, the potential risks are high for hazardous conditions. These substances must be continuously monitored to protect personnel and facilities from accidental releases or leakage.

In addition, the MACT/NESHAP regulations stringently restrict emissions of common solvents and reactants and require plants to continuously monitor and record compliance status from affected operations including process vents, storage tanks, wastewater emissions, and fugitive emissions from leaking components.

In many cases, the primary line of defense in protecting workers and equipment from these atmospheric hazards is a hazardous gas monitoring system. Using the correct system will not only prevent personnel injury and property damage but also improve process efficiency and productivity while working within the required safety codes.

Hazardous gas monitoring systems benefit the chemical and pharmaceutical industry in the following applications:

- LFL monitoring in ovens, dryers, and incinerators
- Combustible, toxic and oxygen monitoring in production and storage areas
- Emissions monitoring for total VOC's or carbon bed breakthrough in pollution control equipment
- BTU monitoring for optimum combustion efficiency of flare stacks

LFL Monitoring in Ovens, Dryers, and Incinerators

Many chemical and pharmaceutical processes involve coating a product with a flammable solvent or mixture of solvents and then heating them in a dryer, batch oven, reactor or other source. The solvents evaporate off in the heating process and are directed to an incinerator for destruction, leaving behind the finished product. In addition to the solvents the atmosphere may also contain moisture, halogenated hydrocarbons, silicones and other unknown substances.

Danger is present when hazardous buildup of flammable vapors in the atmosphere gets rich enough to ignite or explode. The National Fire Protection Association (NFPA) establishes fire safety standards, including standards for safe operation of processes. NFPA 86, the Standard for Ovens and Furnaces, addresses the safe operation of ovens, dryers, furnaces and fume incinerators. These codes establish that the safety ventilation rate shall be designed to prevent the vapor concentration from exceeding 25% LFL. This rate is based on the oven's maximum solvent load. If the process typically runs below its maximum load, then excess ventilation air is being run through the oven. This excess ventilation results in higher operating costs. However if a continuous solvent vapor concentration indicator and controller is installed to continuously monitor the oven, the vapor concentration is allowed to rise as high as 50% LFL.

This real-time measurement allows the implementation of several money-saving steps:

- A reduction of ventilation air without affecting existing production rates
- An increase in production speed without increasing existing air or fuel cost
- Compound savings by reusing, rather than expelling, some of the hot exhaust stream back into an oven zone
- Reduction of oven exhaust rates to lower the demand on VOC destruction oxidizers
- Reduction in fuel costs by burning richer samples

Benefits can range from a simple reduction of heated ventilation air to a combination of reduced heating, increased burner efficiency and increased production. This can result in dramatic fuel savings as well as protection of your investment.

PrevEx® Flammability Analyzers are industrial-strength assemblies that solve all of the sampling, measuring and reporting problems found in chemical and pharmaceutical applications for LFL monitoring. Its unique sensing flame technology has proven itself to be the most reliable in the industry, ensuring unmatched safety and ultra-fast response time, even when sampling a mixture of several different flammable vapors. Additional features include: rugged durable construction, immune to poisons and corrosives, reads everything accurately, low maintenance, easy calibration and failsafe operation.

Combustible, Toxic and Oxygen Monitoring in Production and Storage Areas

Hazardous gases or vapor-producing liquids are transported, used and stored in the production plant. In any of these operations there exists the possibility that the hazardous gases or liquids could accidentally leak or spill into the surrounding area. Pumps, control valves, piping systems, manifolds, expansion joints, connection nozzles and gas cabinets are some of the potential sources for leaks or spills. With so many opportunities for leakage, continuous monitoring of such hazards is an essential part of keeping the plant safe and minimizing product loss.

Monitoring the area of the chemical and pharmaceutical facility requires a gas detection system that can provide multiple channels of continuous detection for wide area sensing, offering maximum coverage.

The SmartMaxII® gas detection system is specifically designed for area monitoring of hazardous gases & vapors including combustible, toxic, hydrocarbons & oxygen. Each SmartMaxII system can continuously monitor and control the readings from as many as four sensors. It is fully equipped with all the alarm, display, and output features you need, including on-board relays, 4-20mA output and RS-485 serial port.

Emissions Monitoring for Total VOC's or Carbon Bed Breakthrough in Pollution Control Equipment

The MACT/NESHAP regulations require the industry to continuously monitor VOC emissions and report compliance status. VOC abatement systems are used to bring exhaust emissions in line with regulations. Carbon adsorption beds are frequently used in chemical and pharmaceutical production to control VOC's by capturing and recycling solvents. Flame Ionization Detectors (FIDs) are used as watchdogs to monitor the carbon bed exhausts for solvent breakthrough and to control the switching of the carbon beds when they have become saturated. Flame ionization detectors improve the effectiveness of the carbon bed system in terms of the quantity of solvent recovered, reduced emissions, improved bed cycling and lower steam regeneration costs.

Incineration is another way to bring exhaust emissions in line with regulations. A flame ionization detector at the outlet of the oxidizer ensures that it does not exceed emission levels into the atmosphere. In addition, by using two flame ionization detectors (one on the incinerator's input and one on the output) you can measure and compare hydrocarbon concentrations before and after processing, indicating efficiency. Depending on the type of operating permit, the use of a FID may also allow the oxidizer's operating temperature to be reduced to more economical levels. Direct online measurement provides proof of complete destruction even at lower temperatures.

Control Instruments' flame ionization detectors are industrial grade analyzers that measure the emissions of total hydrocarbons and VOC's in the parts per million range. The Model SNR650 is a high temperature unit that mounts directly onto the process ductwork, eliminating sample handling problems and resulting in fast and easy installation, low maintenance, less downtime and very fast total system response.

BTU Monitoring for Optimum Combustion Efficiency of Flare Stacks

Waste products are collected from various processes around the chemical and pharmaceutical plant and are sent to a flare stack for destruction. EPA code 60.18 states for optimum combustion efficiency of the stack the waste stream must run at a minimum heating value of between 300-450 BTU/ft3. Continuous monitoring of the waste stream is necessary to identify the minimum heating value and ensure proper combustion efficiency of the stack. In addition, by measuring the heating value of the waste stream it can be determined whether the waste stream can be used as a standalone fuel source or whether it needs to be blended with a constant fuel source such as natural gas.

CalorVal BTU analyzers optimize the efficiency of the flare stack through measuring and controlling blended gas mixtures. These fully- heated analyzers feature a micro combustion type calorimeter and have a uniform response to a wide variety of combustibles. Its industrial strength design allows quick and reliable monitoring of the heating value and energy content of varying flammable solvents and combustible gases in the BTU range.

Remote access and control

All Control Instruments products can be teamed up with powerful operator interfaces that allow you to view, access, and control multiple remote sensors and analyzers from a convenient central location. This allows operators and management to remotely request on-line, detailed information regarding the status of the analyzers operation, including diagnostics and historical records.