



Sample SCR System

### The Selective Catalytic Reduction (SCR) Process

Selective Catalytic Reduction is a process used to reduce nitrogen oxides in combustion gases, to comply with air pollution control standards for emissions reduction in coal-fired, oil-burning, and municipal waste incineration-fueled power generation plants, as well as in gas turbine power plants.

Large quantities of nitrogen oxides (NOx)-notably nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>)-are byproducts of combustion. Nitrogen oxides contribute to acid rain and cause the formation of photochemical oxides, such as ozone. The SCR process reduces nitrogen oxides in flue gases to pure nitrogen and water, using a catalyst and a reducing agent, most commonly ammonia (NH<sub>3</sub>).

SCR technology is used worldwide, and its use in the United States is expected to expand as EPA limits become more stringent.

#### NH<sub>3</sub> Monitoring

NH<sub>3</sub> monitoring of the SCR process is necessary for "process control"-to control and minimize ammonia emissions, or "slips", which can make fly ash unusable and contaminate the gas absorption equipment. It is also essential for worker protection from excessive ammonia exposure, in the event of a leak along the NH<sub>3</sub> storage and delivery route. Ammonia is highly toxic, even in small amounts.

#### SCR Installation Options

SCR units can be installed in various places in the flue gas stream. The two types most commonly used are High Dust Systems (for most applications, including combined heat and power and cogeneration plants) and Tail-End Systems (used when there is not enough space for a High Dust System, or when flue gas contents may interfere with the catalyst). Low Dust Systems are most common in gas turbine combined cycle plants (which use exhaust heat for a secondary process, such as water heating or steam production) and waste incineration plants; choice of arrangement depends on the composition and properties of the flue gas, as well as the amount of space available.

The following OSHA Standards may be applicable for your plant's SCR system: 1910.111, Storage and Handling of Anhydrous Ammonia and 1910.119, Process Safety Management of Highly Hazardous Chemicals. Consult your safety officer for more information.

#### Instruments

NH<sub>3</sub> Ultima Gas Monitor, Ultima Plus Gas Monitor, Chillgard RT Infrared Refrigerant Gas Monitor

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Note: This Data Sheet contains only a general description of the product shown. While uses and performance capabilities are described, under no circumstances should the product be used except by qualified, trained personnel, and not until the instructions, labels or other literature accompanying the product have been carefully read and understood and the precautions therein set forth followed. Only they contain the complete and detailed information concerning this product.

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## Gas Monitoring in the Power Generation Industry



# Gas Monitoring in the Power Generation Industry

There are several areas in power generation plants where gas detection instrumentation should be used. These range from fuel (coal or natural gas) delivery and purification to stack emissions, from toxic gas and oxygen sensors to combustible gas monitors. Reasons for monitoring include EPA regulation compliance, worker safety and property protection from explosive hazards.

Monitoring needs at coal-fired plants, natural gas-fueled plants and gas turbine power plants, including newer cogeneration, or combined heat and power (CHP) facilities, are basically similar.

## Coal-Fired Power Plant

No.	Location	Description	Type of Monitoring	Hazard	Instrument(s)
1	Coal storage and transportation areas (underground bunkers, tunnels, silos, conveyor belts)		Low-level carbon monoxide (CO) monitoring	Coal dust is highly flammable. Low ppm CO is the first indicator of combustion.	Ultima® Gas Monitor
2	Stoker	Elevated grate on which coal is burned			
3	Coal Pulverizers	Crush coal into fine dust	Oxygen (O2) monitoring in inerted pulverizers  Combustible gas, oxygen, carbon monoxide and hydrogen sulfide (H2S) monitoring	Low-level oxygen indicates insufficient inerting  Flammable chemicals are used for maintenance work	Ultima Gas Monitor  Ultima Gas Monitor with relays; Toxgard® II Monitor
4	Boiler	Closed vessel in which water is heated and converted into steam	Combustible gas, oxygen, carbon monoxide and hydrogen sulfide (H2S) monitoring in walkways and chambers	Flammable chemicals are used for maintenance work	Ultima Gas Monitor with relays; Toxgard II Monitor
5	Coal Ash	Collects in hoppers below furnace			
6	Air Preheater				
7	Electrostatic Precipitator	Filters waste gases			
8	Selective Catalytic Reduction (SCR) System	(see overleaf)	Low ppm ammonia (NH3) monitoring for worker safety and emission control	Ammonia gas is hazardous to workers	Ultima Gas Monitor Chemgard™ Gas Monitor
9	Smokestack	Releases filtered waste gases			
10	Turbine	Receives pressurized steam and uses it to create mechanical energy	Hydrogen (H2) Leak Detection Monitoring in turbine compartment (a confined space)	Explosive hazard	Ultima combustible; if low-ppm H2 monitoring use Ultima electrochemical
11	Condensers/Water Treatment (penstocks, pipe lines, tanks, cooling towers, evaporators)	Cools turbine steam and condenses it into water, discharged to cooling towers	Chlorine (Cl2) and ammonia (NH3) low-level leak detection monitoring	Chlorine and ammonia gases are hazardous to workers	Ultima Gas Monitor Toxgard II Monitor Chemgard Gas Monitor
12	Transformers	Steps up voltage			
13	Cooling Towers	Emit water vapor clouds to condensers to cool hot air			
14	Generator	Converts mechanical energy into electrical energy			
15	High-Voltage Power Lines	Transports electricity to transmission stations			

## Additional Monitoring at Natural Gas-Fueled, Gas Turbine, Cogeneration and Other Power Plants

Along natural gas storage and transport path, (pipelines, metering room, battery room)	Natural gas leak detection monitoring	Explosive hazard	Ultima IR; Ultima combustible
Battery Storage Areas	Hydrogen Monitoring	Explosive hazard	ppm Ultima Monitor
Hydrolysis Plants	Hydrogen Leak Detection Monitoring	Explosive hazard	ppm Ultima Monitor

