

# CEMS System Capabilities for the Hydrocarbon Processing Industry

## BACKGROUND

The hydrocarbon processing industry (HPI) has many potential sources of combustion gas emissions. These include process heaters, fluid catalytic crackers (FCC), power boilers and sulfur recovery units (SRU). The industry is unique because many emissions monitoring applications occur in areas classified as hazardous.

## MONITORING REQUIREMENTS

The primary federal regulations defining continuous emissions monitoring (CEM) requirements are found in 40 CFR 60 and 40 CFR 75. The latter is also known as the Clean Air Act Amendments (CAAA) of 1990. However, state and local agencies can impose additional, stricter requirements for monitoring and controlling pollutants.

These regulations may require monitoring sulfur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), opacity, a diluent [carbon dioxide (CO<sub>2</sub>) or oxygen (O<sub>2</sub>)] and stack flow. Furthermore, with the CAAA's requirements for NO<sub>x</sub> abatement, many facilities will install selective catalytic or non catalytic reduction (SCR or SNCR) units which utilize ammonia (NH<sub>3</sub>) to reduce NO<sub>x</sub> emissions. In these instances the regulatory agency may include NH<sub>3</sub> monitoring as part of the CEM requirements. In some areas of the country local agencies have also required the continuous monitoring of carbon monoxide (CO) and/or total hydrocarbons (THC).

## AREA REQUIREMENTS

Typical HPI CEMS may require installation in cabinets or shelters that are designed to meet NFPA 496 electrical requirements. In addition local electrical inspection and/ or approval may be required.

## A MODULAR SOLUTION

Rosemount Analytical offers a family of process analyzers and modular continuous emissions monitoring system (CEMS) designs to effectively meet the needs of HPI facilities.

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[www.EmersonProcess.com/RAIhome](http://www.EmersonProcess.com/RAIhome)



Rosemount Analytical is the only single-source supplier that:

- designs, engineers, and builds the CEMS
- manufactures the analyzers
- provides applications engineering
- offers a variety of ongoing maintenance contracts
- guarantees EPA certification

Rosemount Analytical's CEMS are designed, engineered and constructed at our ISO 9001-certified facilities. These systems range from pre-engineered, packaged systems, to complex engineered systems that measure multiple gases using data acquisition and handling systems.

## PROCESS ANALYZERS

The Rosemount Analytical family of process analyzers employs a variety of patented technologies to accurately monitor stack emissions at HPI facilities.

## Opacity/Dust Density Measurement

The OPM series offers a unique, patented system of glass liquid crystal windows (LCWs) that modulate the light beam without mechanical choppers or other moving parts greatly enhancing reliability. This feature, coupled with the use of a

single light source and detector, establishes the OPM Series as the only truly digital, solid-state transmissometer.

### **X-STREAM Enhanced General Purpose Analyzer (XEGP) for CO, CO<sub>2</sub>, and SO<sub>2</sub> Measurement, and Paramagnetic Oxygen Analysis**

The X-STREAM Enhanced series of gas analyzers features multi-channel analysis utilizing infrared, ultraviolet and visible (NDIR/UV/VIS) photometry, paramagnetic and electrochemical oxygen, and thermal conductivity sensor technologies.

X-STREAM analyzers can measure up to 4 components and the measuring principles may be ordered in various combinations. The physical benches can be installed in their own compartment separated from the electronics. A purge is added for handling corrosive and toxic gases to protect the electronics and to provide operator safety. Optional thermostatic control enables measuring lower sample gas concentrations and measurements at higher dew points.

### **NO/NO<sub>x</sub> Analysis**

The NGA 2000 CLD uses the chemiluminescence method of detection for NO<sub>x</sub>. The NGA 2000 CLD has user-selectable full-scale ranges from 0 - 10.0 ppm to 0 - 10,000 ppm. The Model 951 series analyzers use the chemiluminescent detection technique to monitor nitrogen oxides (NO/NO<sub>x</sub>) in stack gases for emissions monitoring. These analyzers offer a wide selection of full scale ranges from 10-10,000 ppm.

### **Hydrocarbon Analysis**

The NGA 2000 FID uses the flame ionization method of detection. The NGA 2000 FID has user-selectable, full-scale ranges from 0 - 1.0 ppm to 0 - 10%. The Model 400 hydrocarbon analyzer uses a flame ionization detector to determine the total hydrocarbon content of stack emissions. Utilizing a field-proven circuit design and a rapid response flow system, the analyzers accurately measure hydrocarbons over a wide selection of eight full scale ranges.

## **NGA 2000 MLT OXYGEN DETECTION METHODS**

### **Paramagnetic**

The determination of oxygen is based on measurement of the magnetic susceptibility of the sample gas. Oxygen is strongly paramagnetic, while other common gases are weakly diamagnetic. The detector used in the MLT is compact and has fast response and a wide dynamic range. The long-life cell is corrosion-resistant, heated and may be easily cleaned as it has rugged self-tensioning suspension and uses a welded, non-glued construction.

### **Electrochemical/Galvanic Cell**

When sample gas is passed over a selective gas diffusion membrane, the oxygen present diffuses into an electrolyte. The oxygen is absorbed and is reduced to water. Lead oxide is developed at the anode. Electrons generated at the anode flow to the cathode of the cell producing a current that is proportional to the oxygen concentration. The principle offers a cost-effective analysis with negligible interference, ease of maintenance and immunity from vibration.

### **Data Acquisition and Handling System (DAHS)**

Rosemount Analytical's CEMS use third-party data acquisition and handling systems that provide superior data handling and display functions. The extensive, real-time and instantaneous data available in the system, coupled with operator interface capabilities, make it a valuable operations tool, providing information for avoiding excess emissions and reducing out-of-compliance occurrences.

## **CONCLUSION**

HPI facilities present a unique set of requirements for compliance monitoring. Typically, federal regulations require these facilities to monitor SO<sub>2</sub>, NO<sub>x</sub>, opacity, CO<sub>2</sub>, O<sub>2</sub> and flow. Other agencies may also require monitoring of CO, THC, and NH<sub>3</sub>. In addition HPI CEMS may require compliance with hazardous area requirements. Rosemount Analytical's CEMS can be designed specifically for each HPI facility, utilizing field-proven analyzer technology for accurate, cost-effective compliance solutions.