

Laser Gas Analysis for Power Plant Control Application

System Description

Atmosphere Recovery, Inc. (ARI) is pleased to introduce the first and only combustion monitoring and control system that allows coal-fired and multi-fuel power plants to optimize burner air-fuel ratio in real-time. The system combines ARI's rugged 9-gas Laser Gas Analyzer (LGA) and Controller together with a specially designed, multi-location gas sampling system tolerant of combustion product acids, high water content and fly ash. When connected to the plant's DCS system, this combination allows direct measurement of all significant gas constituents and contaminants in or directly downstream of the combustion area. It also allows nearly immediate adjustment of air and fuel feed control hardware to optimize plant operation. Gases typically monitored by the LGA in these applications include CO, CO₂, O₂, N₂, H₂O, NO, NO₂, and SO₂ and one additional gas, typically NH₃ or SO₃.

The system comes complete in a sealed NEMA 4 enclosure with cooling that enables operation to over 130°F. The heart of the system is ARI's Laser Gas Analyzer Detector Module that uses the principles of Raman spectroscopy to simultaneously identify and quantify multiple gaseous compounds. The detector connects to an integrated sampling system and can access up to 16 individual gas-sampling ports via a specialized valve manifold, tubing and filtration system. This system is user programmable through the built-in computer and communication system.

The sampling system also includes ARI's multi-port clean and purge system that allows analysis of gas in one sample line while simultaneously preparing the remaining lines for rapid sampling. This technology shortens the time between each gas measurement and keeps the sample lines clear. This is critically important while using low quality, high sulfur fuels that generate gas streams with significant fly ash content. A fully integrated tube heating system is also available to control sample tube temperature.

“Optimize Fossil Fuel Power Plant Combustion Processes”



Coal Combustion Gas Analyzer Data Screen



Features

Analyzer System

- Nine different gas compounds are measured – “standard” gases as well as many optional ones
- Sample all gases from 4, 8, 12, or 16 different locations (i.e., sample ports)
- Fully automatic calibration
- Analyzer response time as short as 1 second
- Gas concentration ranges typically 0 to 100% by volume
- Accuracy 0.5% full scale dependant on calibration gas blend accuracy
- Repeatability to 0.2% of full scale or better
- Built in PC and HMI plus
- Remote data access and PLC/DCS communication options
- NEMA 4, thermally controlled enclosure

Sample System

- Low sample flow rate of 250 ml/min
- All stainless steel with no fittings
- Sampling distance to 200 feet
- Quick change sample gas filters for each sample port
- Automatic sample line cleaning

Optional Heat Trace Control System

- Minimizes sample gas condensation or freezing
- Integrated temperature controller

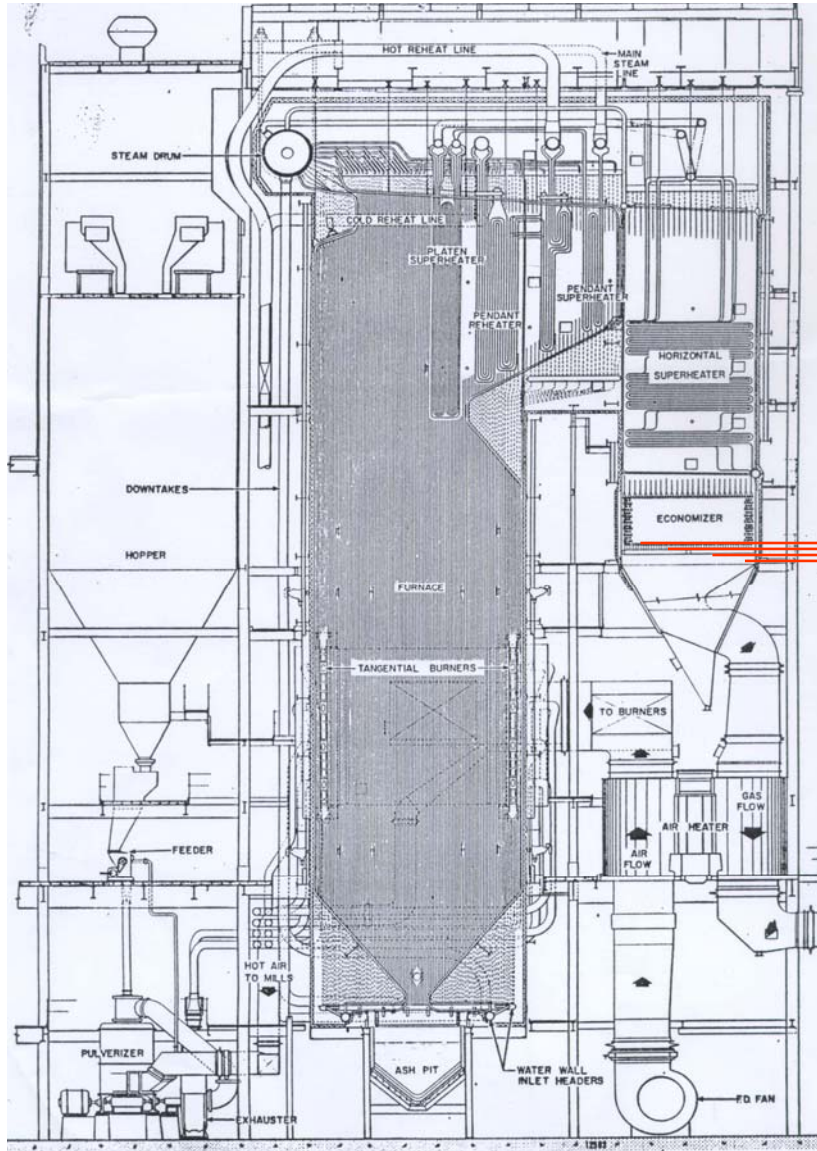
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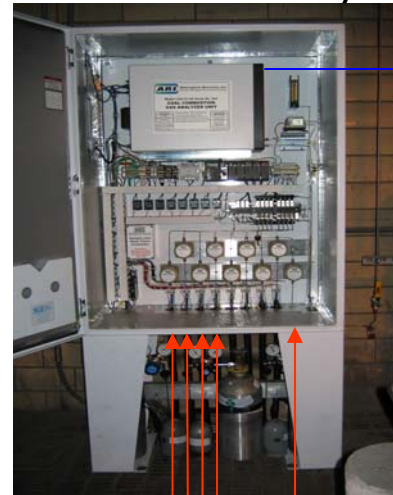
ATMOSPHERE RECOVERY, INC.
Precision Management of Process Gases

Typical Coal Plant Installation Schematic



Typical Coal Plant

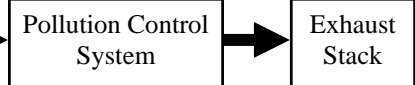
Coal Combustion Gas Analyzer



Heated gas sample tubes
(up to 200 ft., 4 per plant)

Plant air or nitrogen
for back-flush

Data via Ethernet to DCS
Through Built-in OPC Server/
Client or Optional Protocol



A multi-gas, multi-port monitoring system

With a standard 8 port unit (shown above), a utility can measure *nine different gases* from all four corners of two smaller units or all eight corners of a single tangentially fired boiler.

General Specifications

Physical Dimensions
8-16 port analyzer

NEMA 4 enclosure with cooling
40" x 36" x 12" to 80" x 72" x 12"

Power

120/230v , 7/3.5 amp, 50/60 Hz ,
1 phase

Gas sensor

Raman scattering Inter-cavity
Spectroscopy using a Helium-Neon
laser

Standard gases

CO, CO₂, O₂, N₂, H₂O, NO, NO₂,
SO₂, (over 100 additional gases
are available)

Detection range
Repeatability

0-100% by volume
0.2% of full scale

Typical resolution

0.1% of full scale

Typical accuracy

+/-0.5% of full scale

Sample flow rate

200-800 ml/min

Typical response time

1-15 sec (distance dependant)

Control computer

Windows based PC

Interfaces available

Touch screen, Keyboard, mouse,
printer, RS232 (2), USB, 10/100
MPS network

Sampling system

Integrated 8, 12, or 16 port
multiplexed valving system with
pre-purge and back-flush

Options

Proprietary liquid cleaning system
Sample line heat trace control