



PRU Lewisburg, WV, USA. Product Management

Monitoring of trace of Benzene and 1,3 Butadiene with Process Gas Chromatography PGC5000 Series

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Definitions

Process Gas Chromatography

- Designed for installation and operation on-line with a process stream
- Continuously and automatically analyzes a flowing process stream
 - Obtains analytical results with the speed of response comparable to the process change
 - Process monitoring and control
 - Air monitoring



Why is gas chromatography the most popular process analytical technique for air monitoring?

- Combines

Sensitivity Flexibility Reliability

- Simple in principle and application
- Most robust and field proven process analyzer technology
- Provides complete compositional analysis
- Allows sensitivity at low ppb level
- No interferences with other VOCs

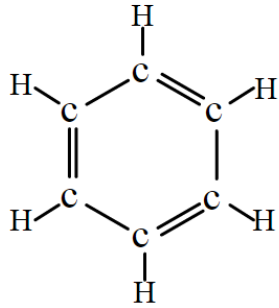
Does ABB have an analyser to measure Benzene and 1,3 Butadiene as VOCs? Absolutely

- The PGC5000B Class Smart Oven™

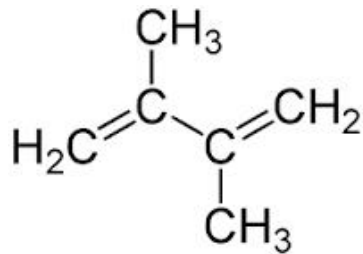


- Based on the field-proven Model 3100 and PGC2000 Process Gas Chromatographs
- Employs FID detection and gas chromatography for determination of ppb level of Benzene and 1,3 Butadiene

Why monitor Butadiene and Benzene?



- Benzene
- CAS 71-43-2



- 1,3 - Butadiene
- CAS 106-99-0



- Flammable, volatile, carcinogen components
- Both belong to VOCs family
- Position N°1 and N°2 as high priority VOC's from air emission assessment
- U.S. OSHA and E.U. Directive 2004/37/EC: max 1 ppm of benzene in air based on 8 hr average as current permissible workspace exposure.
- U.S. OSHA Permissible Exposure Limit: 1 ppm for 1,3 Butadiene

The PGC5000 Series Analyzer System for VOCs

- **PGC5000A Master Controller**

- Improves “Ease of Use” with a new graphics based HMI
- Communication interfaces: Ethernet, OPC, MODBUS, 4-20mA analogs, VistaNET^{2.0} compatible
- Supports up to 4 Smart Ovens[™]

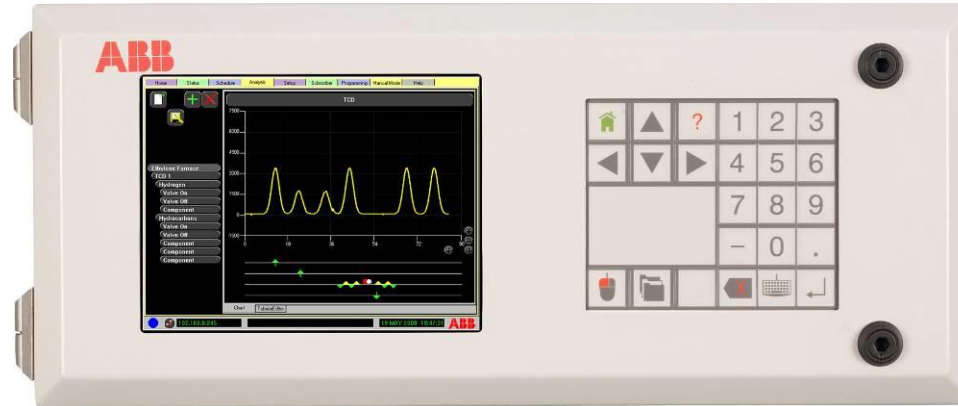


***Reduce shelter, installation,
and maintenance costs***

- **PGC5000B Smart Oven[™]**

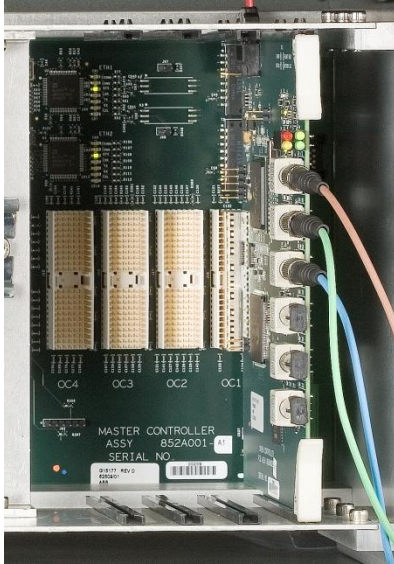
- Targets for VOC's analysis
- Maximum application flexibility
- High gain FID detection mode

PGC5000A Master Controller



- Graphical Driven HMI with standard keypad and mouse touch pad
 - 10.4 inch Super VGA True color picture to create a modern user environment for PGC
 - Graphical user interface for superior interaction with the analyzer system
 - Color LCD allows for high level indication of events and status changes in the analyzer system
 - Graphical representation of each process stream's analysis with local chromatogram overlay

PGC5000A – Multiple Smart Oven™ System



- Up to 4-PGC5000B
 - Multiple ovens positioning is a perfect design for air monitoring
 - Multiple ovens for parallel stream measurement
 - Hot redundancy and Analysis back up
 - Reduce analyzer shelter footprint and cost ~18%
 - Additional customer benefits over life cycle of GC

PGC5000B Smart Oven™



- Solenoid Valves for stream selection
 - 10 internal Air Switching Valves
 - Optional External I/O enclosure with up to 64 stream solenoid outputs
- Detectors
 - High Gain Mode FID (Flame Ionization Detector)
- DTC
 - Up to 6 digital temperature zones and 0.1 °C stability
- EPC
 - Up to 5 electronic pressure zones for maximum Colum flow control and ± 0.05 psig repeatability
- Airless Oven Module compatible

Analytical Section

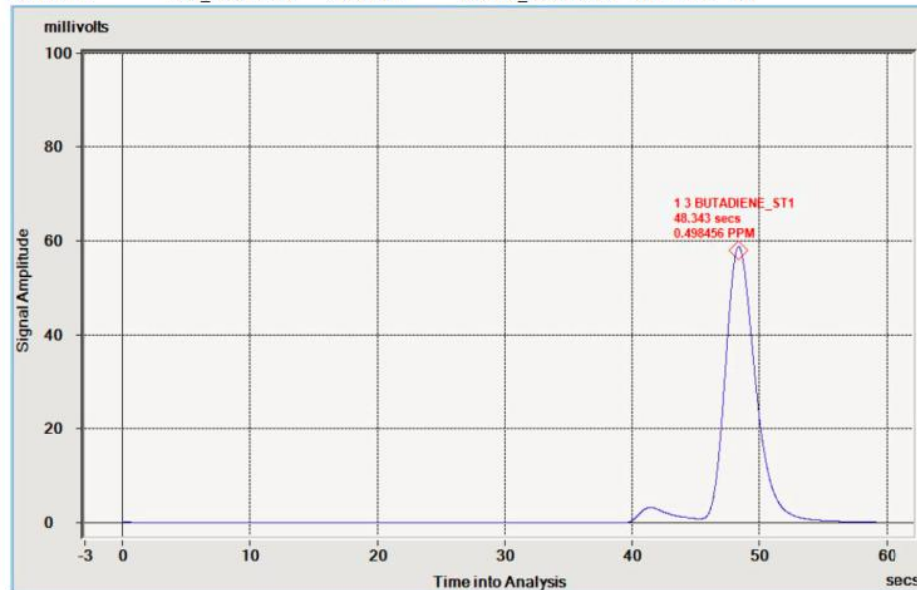
Application

- Benzene and 1,3 Butadiene measured off of two separated injections and dedicated column trains for enhanced separation and fastest cycle time

Cycle Time

- Typical 60 - 90 sec in case of 1,3 Butadiene and Benzene in Ambient Air

ANALYZER NAME AT-4000-01 STREAM NAME Stream 1 INJECT TIME 10/22/2012 1:06:41 PM
SCHEDULE SCH_716505-390 ANALYSIS ANLYS_716505-390 CYCLETIME 60



Analytical Section

Analytical Valves

Rotary with optional purged housing for maximum sample insulation and representativeness

Columns

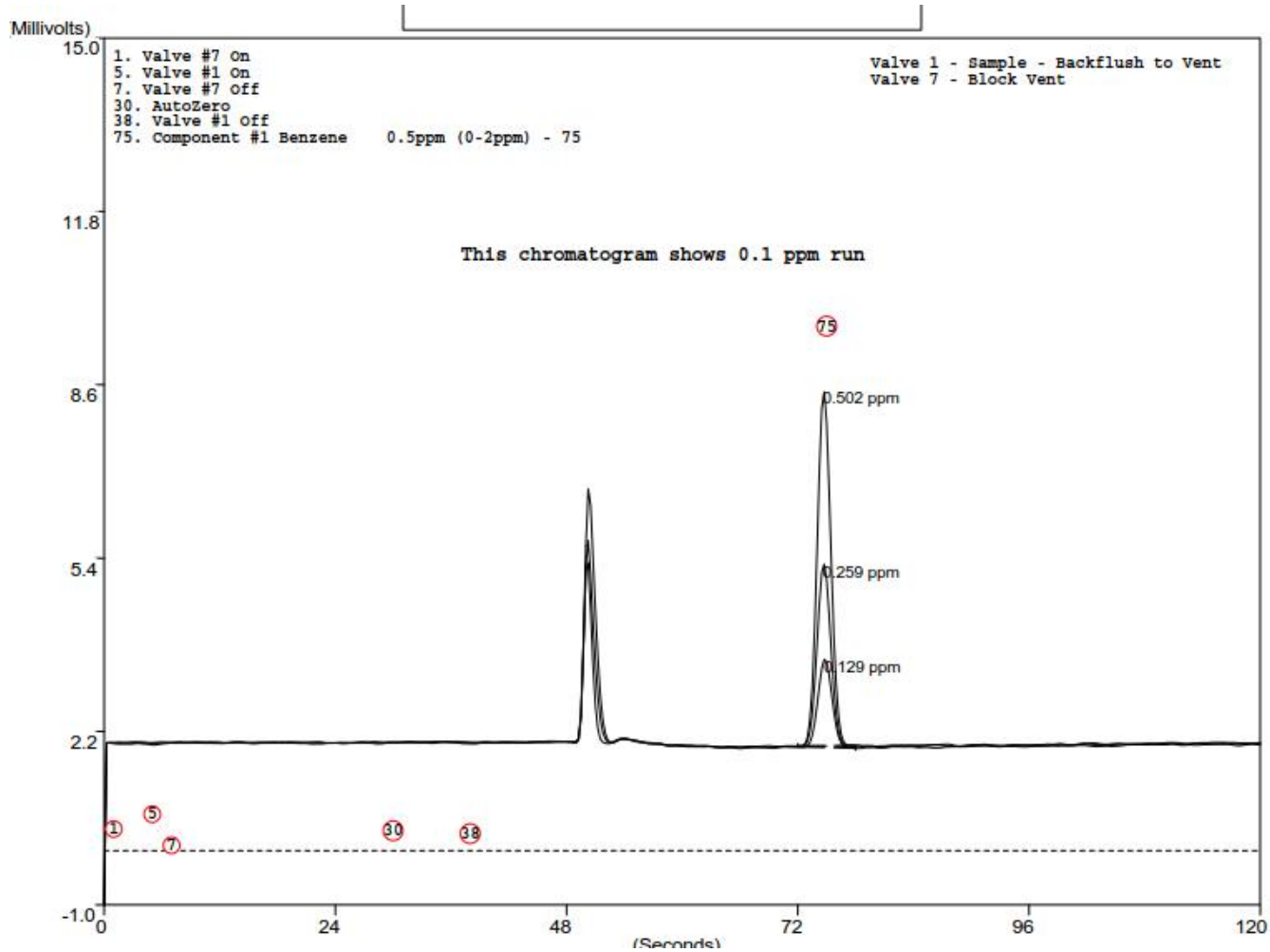
Chemically treated capillary columns

Detector

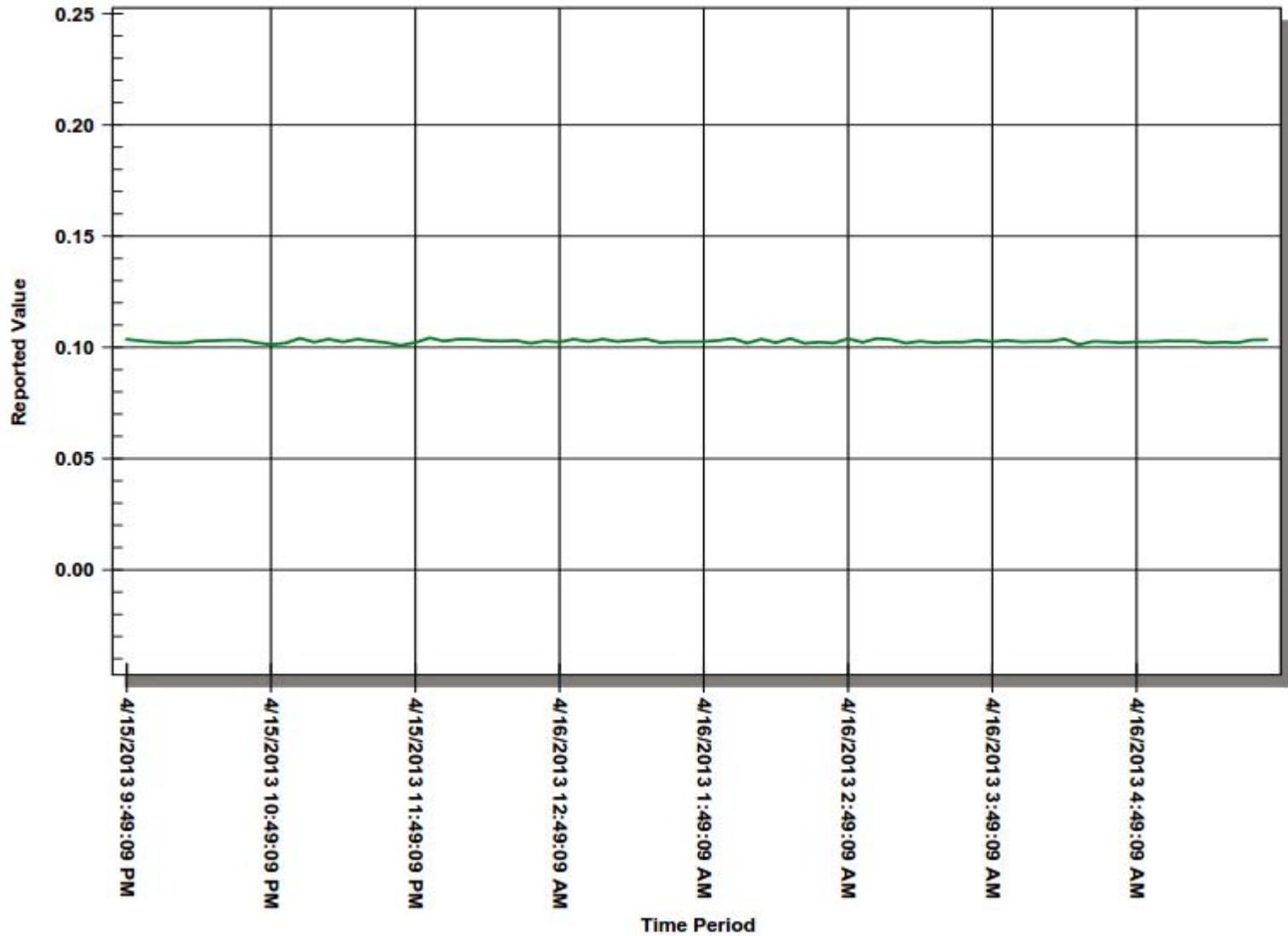
- High Gain Mode FID (Flame Ionization Detector)
- Less than 50 ppb MDL, (Application depending)



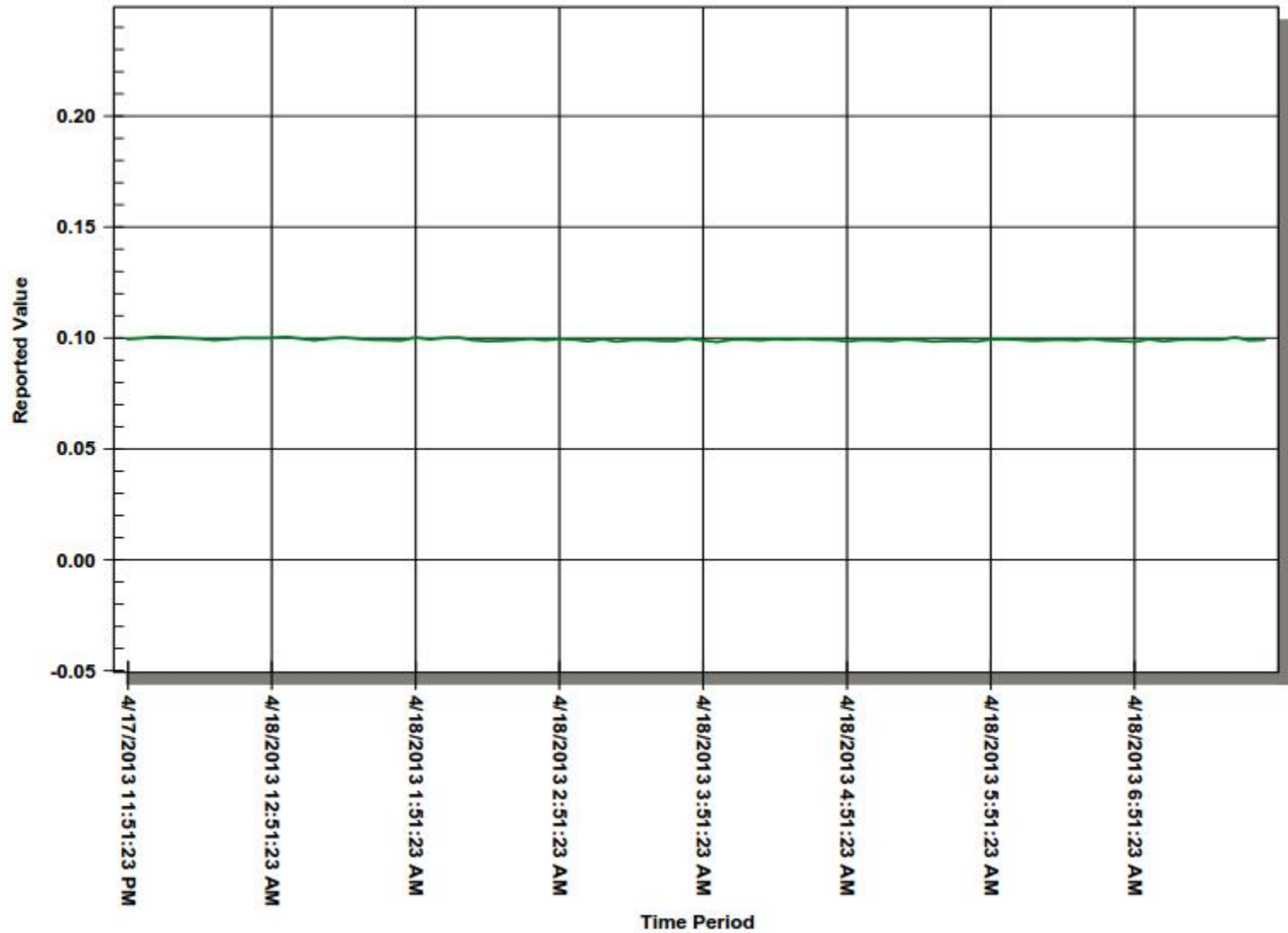
Overlay @ multiple concentration levels Benzene from 129 ppb up to 502 ppb



8 hr stability chart Benzene @ 102 ppb



8 hr stability chart 1,3 Butadiene @ 98 ppb



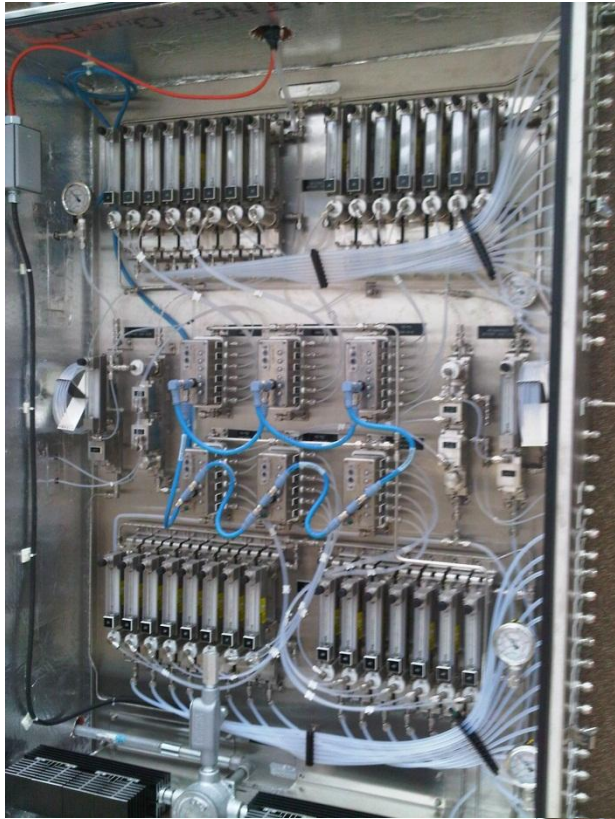
Serviceability



- Analyzer Maintenance
 - All hardware component access points are from the front of the analyzer
 - Easily removed doors promote open access into the oven electronics
 - Optimized for maximum analytical capability with minimal hardware

Field Applications Air Monitoring

NeSSI Generation 2 System



- **Ambient Air Monitoring System**
 - 141 streams total
- **End User Value**
 - 3 fiber optic cable runs instead of 141 stainless steel pneumatic signal lines with
 - Digital stream switching valve communication with PGC for inclusion in method and alarms

Critical Data Reporting

SHS Status and Health, Analyzer Sample Flow

The screenshot shows the RemoteClient software interface. The main display area is titled 'Bypass Loop' and shows the following data:

SERIAL #	PART #
NA	8512019-1

MODULE ID	NAME
1	Bypass Loop

ACTUAL		DMT DIFFERENTIAL	PRESSURE	
VOLUME FLOW	TEMPERATURE (C)	PRESSURE	INLET	PRESSURE
0.00	0.00	0.00	0.00	0.00

LIMITS		LOW	HIGH	HIGH HIGH
LOW LOW	VOLUME FLOW	TEMPERATURE (C)	PRESSURE INLET	LOOP DIFF PRESSURE
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

The interface also includes a navigation menu on the left with options like File Management, Components, Streams, Master Controller, Oven 1, Shs1, DVM 1, IQO Ctrl 3, Flow Sys 1, ATM Ref Vent, and Bypass Loop. The status bar at the bottom shows the IP address 192.168.0.40, the date and time 22 SEP 2010 15:11:20, and the ABB logo.

Bypass Filter Health Monitoring

- ΔP across bypass filter monitored to indicate and alarm on filter blockage
- Low, low-low, high and high-high alarms for this value can be set and are available remotely via OPC

Analyzer Sample Flow

- DMT directly measures the flow of sample to the analyzer
- Displayed on the PGC5000 UI and can be monitored to indicate a potential low flow condition
- Low, low-low, high and high-high alarms for this value can be set and are available remotely via OPC

Power and productivity
for a better world™

