



SS2100 ACETYLENE MEASUREMENT IN PURE ETHYLENE

Product Code 549111

KEY FEATURES

- Extremely fast analysis time – 1 second updates possible
- No consumables – Low Cost of Ownership
- No routine service needed
- High resolution laser-based measurement eliminates errors due to interferences
- Reliable Tunable Diode Laser lasts years

Ethylene is one of the most important feedstocks for the petrochemical industry. Since it is used in the manufacture of a wide range of compounds, Ethylene has very stringent purity specifications especially for Polymer Grade Ethylene as Acetylene poisons polyethylene catalysts. Sample points for Acetylene in Polymer Grade Ethylene are either in the Ethylene plant product or in a Polyethylene plant feed. Large quantities of Ethylene are transported via pipelines and stored in underground salt caverns. In both cases the purity of the Ethylene must be verified at the point of custody transfer.

ACETYLENE CONTROL AND REDUCTION

It is not practical to remove Acetylene from Ethylene by distillation. Acetylene reduction is done in an Acetylene Converter Unit. Acetylene Converter Units consists of a series of reactors or a single vessel with multiple beds of catalyst that reacts the Acetylene with hydrogen to form Ethylene. Reduction of low ppm Acetylene concentrations inevitably reacts some of the Ethylene to Ethane, resulting in a loss of product, so it is critical to keep Acetylene contamination out of Ethylene once the initial Acetylene reduction is complete.

TRADITIONAL MEASUREMENT SOLUTIONS

On-line gas chromatographs have been the traditional method for monitoring the levels of Acetylene in Polymer Grade Ethylene. Unfortunately, even with the latest in chromatography techniques, the analysis can take 2 - 4 minutes between measurement updates. Due to the very short residence times in Ethylene feed storage vessels and the desired to measure Ethylene in flowing pipelines, this delay in measurements can easily lead to excursions in concentrations before it is detected.



Low Density Polyethylene Production Process (Antwerp Polymers Plant)

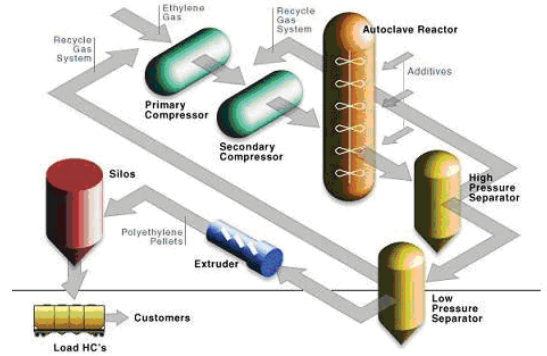
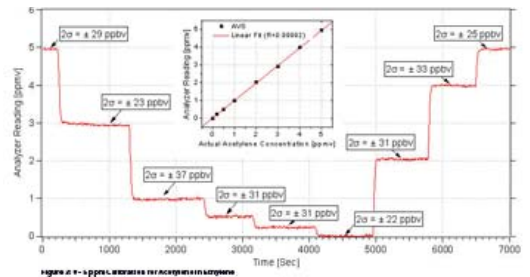


Figure 2: Typical Low Density Polyethylene process

SPECTRASENSORS' SOLUTION

The SpectraSensors SS2100 is the ideal solution for Ethylene purity applications. The use of Tunable Diode Laser technology means that analysis results can be updated every second. Furthermore, the high resolution that is inherent to the laser eliminates errors due to interferences that have hampered other spectrometric approaches. Also, the non-contact nature of the measurement with no moving parts in the analyzer means that the analyzer is simple to operate, has no consumable parts and no routine maintenance is needed. See Fig. 3 for typical calibration performance.

In addition to Acetylene, water, another important purity measurement can be made using TDL analysis.



SS2100 Acetylene Analyzer

SPECIFICATIONS

Application Data

Target Components	Acetylene in Pure Ethylene (Product or Feed)
Typical Measurement Ranges	0-5ppm*
Typical Precision	±0.1ppm
Measurement Response Time	1 to ~60 seconds*
Principle of Measurement	Tunable Diode Laser Absorption Spectroscopy Non-differential
Environmental Temperature Range	-20° to 50° C (-4° to 122° F) -10° to 60° C (14° to 140° F) <i>optional</i>
Sample Inlet Pressure	70kPag (10 PSIG) typical 210kPag (30 PSIG) maximum
Sample Cell Temperature Range	Maintain at 50° C ±2° C
Maximum Cell Pressure	70kPag (10 PSIG)
Sample Flow Rate	3-4 L/min (6.4 to 8.5 scfh)*
Recommended Validation	Certified blend of C ₂ H ₂ in Nitrogen balance



Electrical Data

Power	100-240 VAC, 50-60 Hz standard
Max Current	Controller: 1A @ 120 VAC
Controller to Cell Cable Length	1m standard (3m, 5m & 10m available optionally)
Communication	Current Loop Output 4-20 mA Isolated, 1200 ohms @ 24 VDC max load. Serial: ASCII Text RS232C standard, Modbus RS232C
Digital Outputs	Four (4) 12 VDC for valve operations: Scrubber (if required), Process/Val, Val 1, Val 2 5 SPDT (Form C) Dry Contacts: Common Fault, Val 1 Active, Val 2 Active, Val Fail, One user assignable DO to standard alarms
LCD Display	Concentration, Cell Pressure and Temperature, Diagnostic Data

Physical

Controller Enclosure	NEMA 4X – 304 stainless steel <i>standard</i>
Controller Dimensions	343 mm H x 305 mm W x 165 mm D (13.5" H x 12" W x 6 7/16" D)*
Weight Approximately	13.1 Kg (28.6 lbs)*
Sample Cell Dimensions	28m cell, 559 mm H x 127 mm W (22"H x 5"W)
Sample Cell Construction	316L Series Polished Stainless Steel Standard SilcoNert® coated
Number of Sample Cells	1 (Single Channel SS2100) or 2 (Dual Channel SS2100)
Dimensions with Sample System	1678 mm H x 613 mm W x 427 mm D (66" H x 24-1/8" W x 16-13/16" D)
Weight with Sample System	68 Kg (150lbs)

Area Classification

Certification	CSA Certified for Class I, Div. 2, Groups ABCD T3C Ex II 2G Ex d IIB+H2 T5; Tamb : -20 ÷ +60 °C
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* Application specific; consult factory.

TYPICAL BACKGROUND STREAM COMPOSITION

Component	Unit	Typical Concentration	Min for Application	Max for Application
Ethylene (C ₂ H ₄)	Mole%	99.95	99.9	100
Acetylene (C ₂ H ₂)	ppmw	<1	0	5
Water	ppmw	<1	0	5
Carbon Monoxide (CO)	ppmw	0.5	0	3
Carbon Dioxide (CO ₂)	ppmw	<1	0	5
Hydrogen (H ₂)	ppmw	<1	0	5
"Light Inerts" (C ₁ +C ₂ +N ₂)	ppmw	100-200	0	1000
Propylene (C ₂ H ₆)+	ppmw	3000	0	10
Total	Mole%			

ANALYZER

The Analyzer consists of the electronic controller, cell, and 1m long interconnecting cable (standard). Interconnecting cable lengths of 3m, 5m and 10m are also available for mounting the controller remotely, for example, with the controller mounted inside an analyzer shelter and the cell and sample system outside the shelter. The sample conditioning system and/or cell enclosure must maintain the sample and cell at a constant temperature (generally 50 °C +/- 0.2°C) that is above the hydrocarbon and moisture dew points of the process stream. The sample flow, sample pressure, and temperature specifications listed above must be maintained at all times. Any departure from these specifications must be approved by SpectraSensors.

RELAY CONTROL AND COMMUNICATIONS

All SS2100 Process Analyzers are supplied with 9 relays:

- o Four (4) are 12 VDC powered and provided for driving switching valves associated with Process, Validation 1 and Validation 2 and a scrubber (for differential systems only).
- o Five (5) SPDT (Form C) dry contact digital outputs are provided for common fault, Val 1 active, Val 2 Active, Validation Fail, and one (1) user-assignable DO to any standard alarm, such as high concentration, high cell pressure, low cell temperature, high cell temperature, low sample flow, etc. depending on the application.

Data Output is via 4-20 mA Isolated Analog Output.

Serial Communication via Modbus protocol is provided. See Modbus specifications for details.

MEASUREMENT SOLUTION

Proper sample conditioning is essential to an accurate and reliable measurement. SpectraSensors provides standard and custom-engineered Measurement Solutions for all applications. Standard features include:

Inlet Pressure Relief Valve	Automatic Valve for Validation Gases
Inlet and Outlet Shut-off Valves	Cell Flow Rotameter and Control Valve
Sample Filter	Outlet Pressure Gauge
Sample Bypass Pressure Gauge	Cell Outlet Non-return Valve
Bypass Flow Rotameter and Control Valve	