

PICARRO

Systems for continuous, ambient monitoring of Ethylene Oxide -
Updates from the field

National Ambient Air Monitoring Conference

August 2022

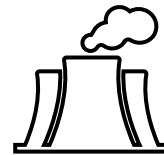
PRESENTATION OVERVIEW

1. What makes CRDS so special?
2. Monitoring systems & applications
3. New Ambient Air Monitoring System for EtO
4. Field Monitoring Data

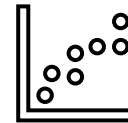
WHAT MAKES CRDS SO SPECIAL?



Real-Time, continuous measurements



No sample pretreatment, chromatographic separation, or complex peripherals



Specific & sensitive to a wide variety of compounds and applications



Turn-key, low operating costs, long-term stability

ETHYLENE OXIDE APPLICATIONS

How is Picarro
CRDS being
utilized?

Fenceline monitoring stations

Mobile monitoring surveys

Leak Detection & Repair (LDAR)

Continuous Emissions Monitoring (CEMS)

Indoor air quality

Fixed multi-point leak detection

Stack Testing



Real-Time Analyzers



Turnkey Systems



Mobile Solutions

NEW SYSTEM FOR CONTINUOUS, AMBIENT MONITORING

Ambient Air Monitoring System (AAMS)



Zero Reference
Module (ZRM) -
peripheral

Picarro G2920
Ambient EtO -
analyzer



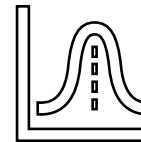
Proven Measurement Technology



Optimized for field conditions where
atmospheric and sample variability are found

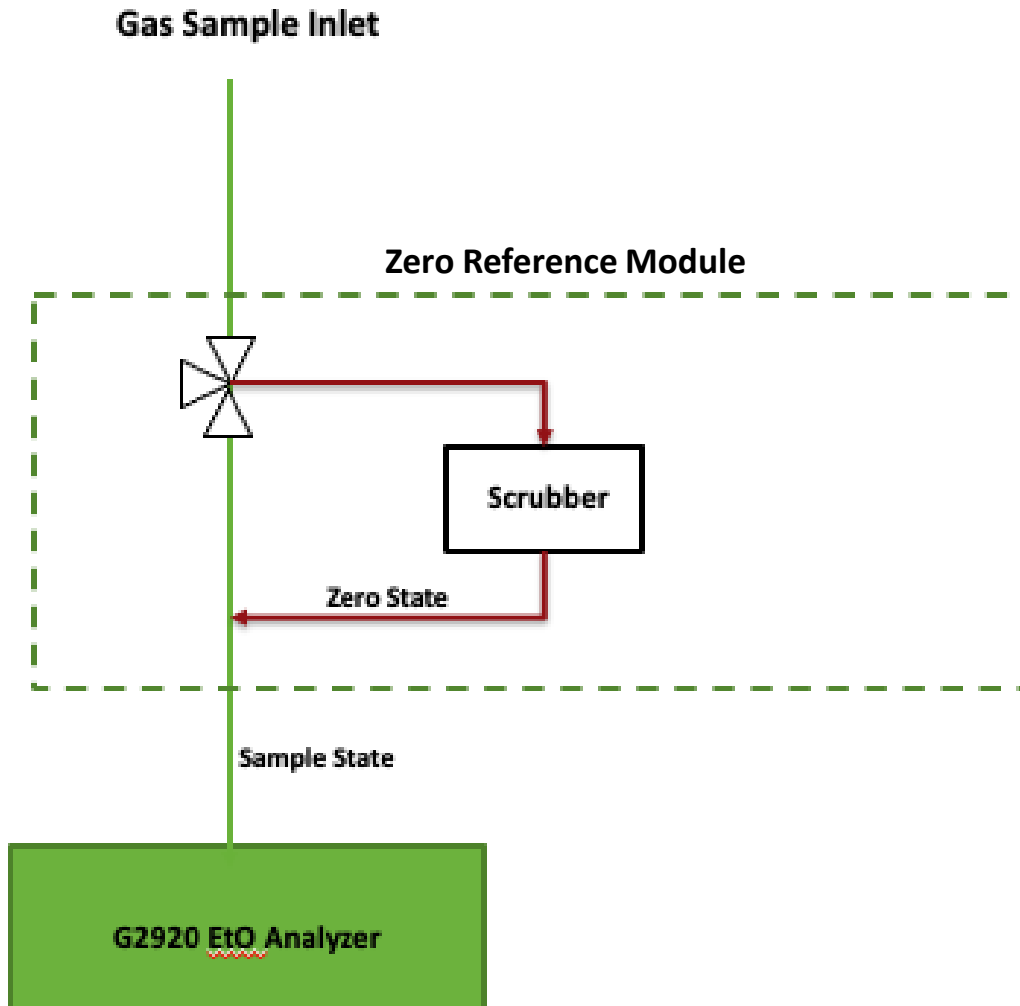


Turn-key, simple operation, hands-free
operation up to 1 year at facility fencelines
and community monitoring stations



Automated system health status, method
configuration, and highest data confidence

AAMS METHODOLOGY DESIGN

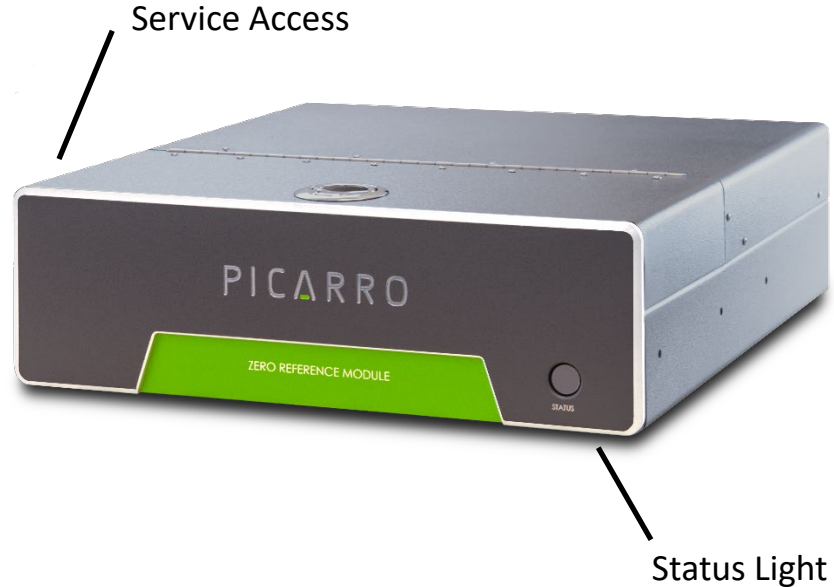


- Chemical scrubber (PAIAC) removes EtO but captures fine-scale variability
- The Zero State also captures any instrument related drift
- During the sample state, gas bypasses the scrubber and is sampled directly by the analyzer

In Summary:

- Zero state is measured
- Sample state is measured
- $\text{Sample} - \text{Zero} = \text{Corrected EtO}$

ZERO REFERENCE MODULE

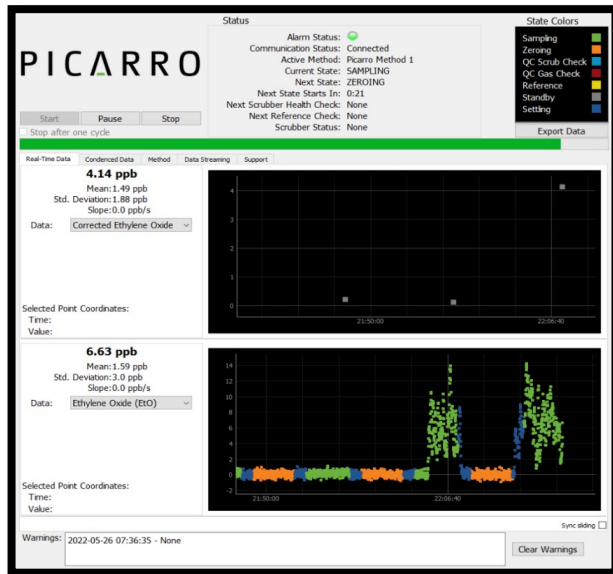


HARDWARE DESIGN

- Simple to deploy, operate, maintain
- Simple to determine operation of device and quality of data
- Scrubber is field serviceable
- Air-tight stainless steel Swagelok fittings
- Improves the three key areas for an improved Method Detection Limit (MDL)
 - Zero Drift
 - Precision
 - Fine scale variability
- Generates the highest level of confidence without sacrificing real-time performance and reliability

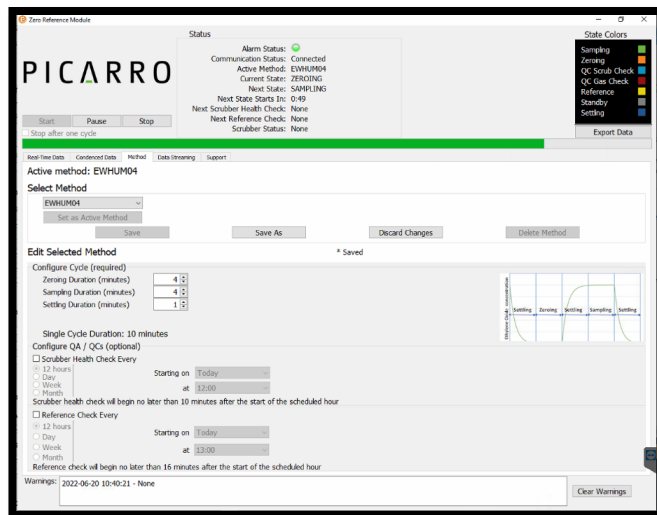


AAMS SOFTWARE

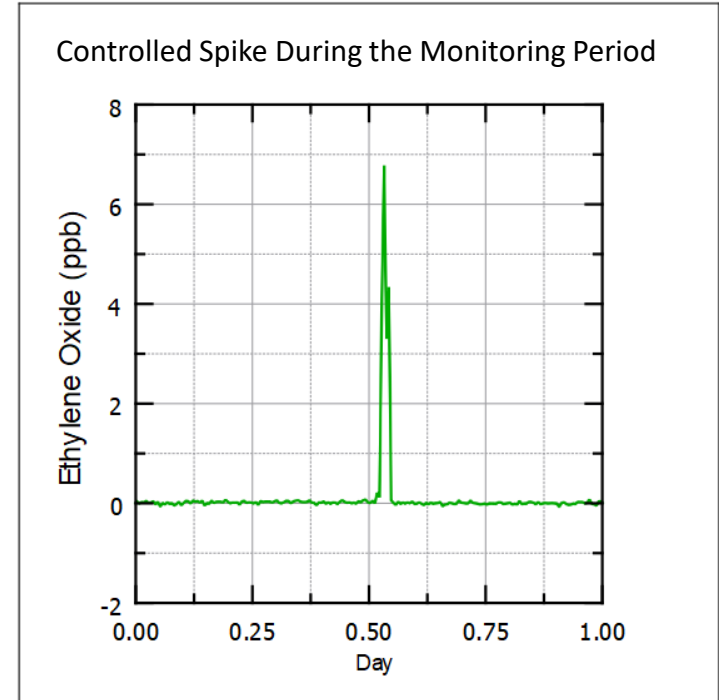
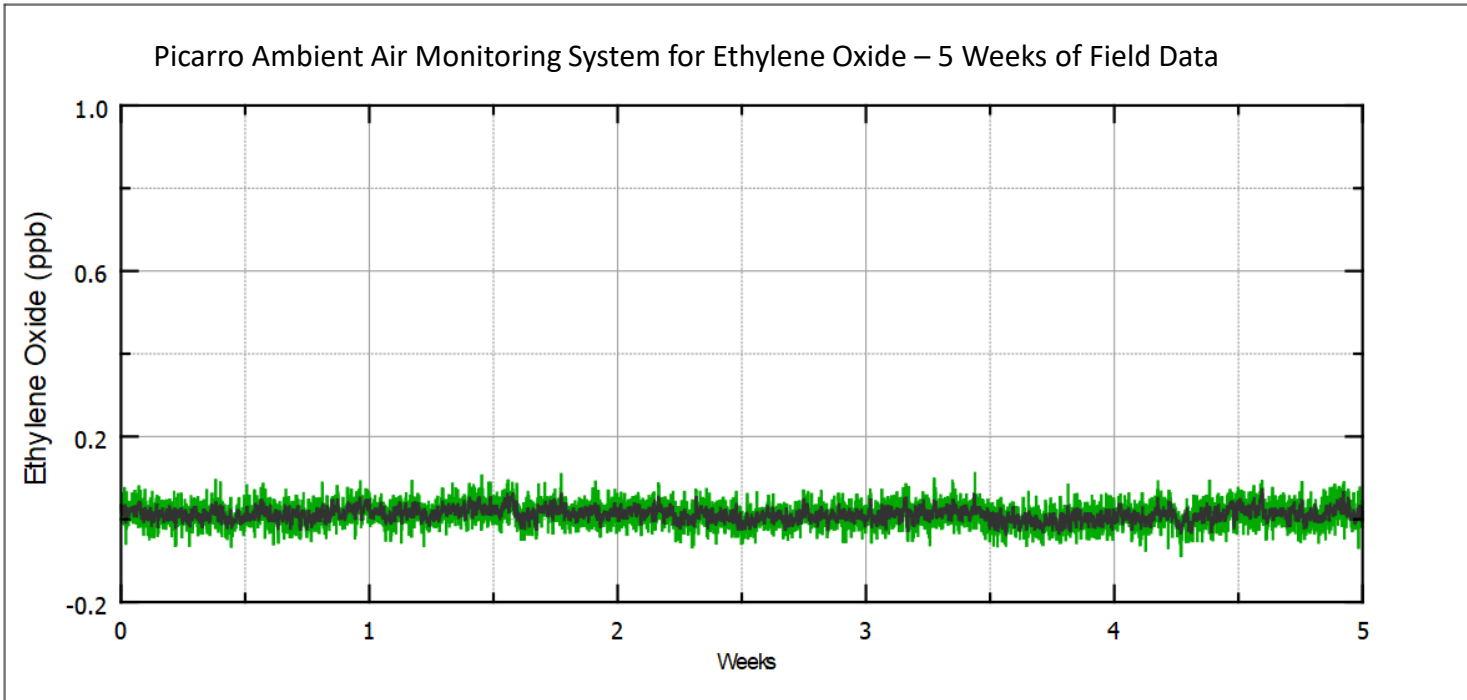


SOFTWARE FEATURES

- Centralize user experience in one place
- Multiple dataset export types with custom time periods (hours to months)
- Flexible data management of large datasets & compatibility with dataloggers
- System health tracking of individual components with notification
- Automated validation with gas standards
- Customizable method, zeroing frequency, and averaging times



FIELD MONITORING DATA



- Mean (10 min averages) = 6 ppt (0.011 $\mu\text{g}/\text{m}^3$)
- Standard Deviation
 - 1σ , 10 minute average (green) = 27 ppt (0.049 $\mu\text{g}/\text{m}^3$)
 - 1σ , 1 hour average (gray) = 14 ppt (0.025 $\mu\text{g}/\text{m}^3$)

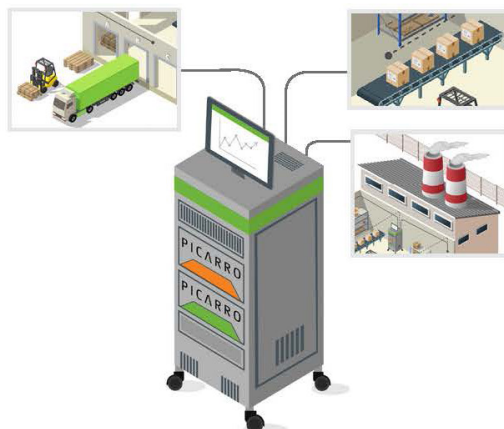
COMPREHENSIVE SYSTEMS & SOLUTIONS FOR EtO EMISSIONS REDUCTION

CEMs AND STACK TESTING SYSTEMS



- Report more accurate and representative emissions concentrations and mass rates
- Improve process understanding and optimization of emissions controls
- Real-time data with secure access, on-site or in the cloud
- Fully automated, continuous operation with minimal maintenance

INDOOR AIR QUALITY SYSTEMS



- Facility-wide coverage with multipoint sampling and alert indicators
- Improved workforce safety with fast event detection (seconds)
- Early detection and applications in Process Safety Management (PSM) & Risk Management Plans (RMP)
- Reduction of false positives and non-detects
- Fully automated, continuous operation with minimal maintenance

FENCELINE AND AMBIENT MONITORING SYSTEMS



- Detection of ppt, ppb and ppm fugitive emissions
- Support for mobile surveys (LDAR) and fixed deployments
- Proven expertise with 15+ years supporting international monitoring networks
- Fully automated, continuous operation with minimal maintenance
- Mobility application with backup power supplies (i.e. UPS)

THANK YOU – QUESTIONS?

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