BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Lessons Learned During BAAQMD Required Refinery Fence Line Monitoring Program Development – Available Technology & Data Quality System Update

Refinery and Chemical Industry Emissions Symposium

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Introduction

- BAAQMD Fence-line monitoring program development history
- Fence-line monitoring program requirements
- Types of monitoring and considerations
- Quality Assurance/Quality Control (QA/QC) elements
- Experiences and lessons learned
- Status and next steps on fence-line monitoring program implementation
- Questions

Fence-line Program History – How did we get here?

- Chevron Richmond Refinery Fire – August 2012
- BAAQMD Convened Refinery Air Monitoring "Expert Panel"
  - Technologies
  - Methodologies
  - Tools
- Commissioned Desert Research Institute (DRI) Report
  - Starting Point for "Expert Panel"
  - Provide Air Quality Information for Refinery Communities
  - Gather Air Quality Data to Evaluate Health Impacts
  - Track Temporal Air Quality Changes and Trends
- Reg. 12, Rule 15 – Petroleum Refining Emissions Tracking
- *Air Monitoring Guidelines for Petroleum Refineries*

Fence-line Program History – Continued

- “Expert Panel” Report of Recommendations
  - Open Path Monitoring at Refinery Fence-line
  - Representative Compounds
  - Near Ambient Background Levels of Detection
  - Time Resolution of 5-Minutes
  - Near Real Time Public Data Display
  - Defined QA/QC Parameters
  - Data Context Provided to Enhance Public Understanding

Fence-line Monitoring Program Requirements

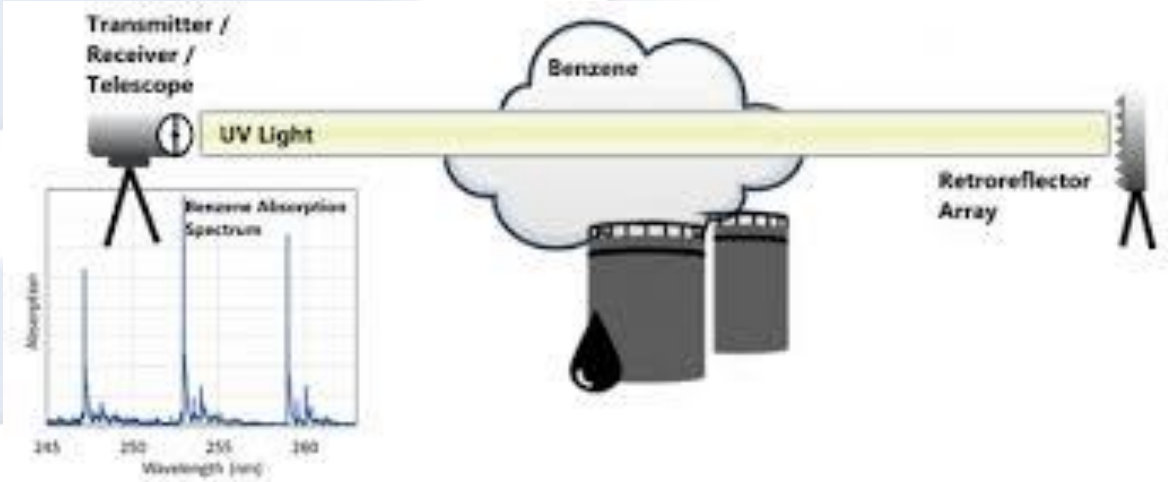
- "Expert Panel" Report Recommendations Incorporated Into BAAQMD *Air Monitoring Guidelines for Petroleum Refineries*
  http://www.baaqmd.gov/~/media/files/planning-and-research/public-hearings/2016/9-14-and-12-15/042016-hearing/1215-amg-041416-pdf.pdf?la=en

- Benzene, Toluene, Ethyl Benzene, Xylenes (BTEX) and H_2S Required

- SO_2, Alkanes (or Other Organic Compound Indicators), 1, 3-Butadiene and NH_3 Must Be Considered

    - Refineries Must Provide Acceptable Rationale to Exclude

- Open Path Technologies Required Unless Determined to Be Infeasible – Program Flexibility (Not a "One Size Fits All" approach)



Fence-line Monitoring Program Requirements - Continued

- BAAQMD Approved Monitoring Plan Detailing the Network and Program Design
- BAAQMD Approved Quality Assurance Project Plan (QAPP)
- Data Completeness of 75% Hourly Basis; 90% Quarterly Basis – Enforceable Condition
- Meteorological Measurements to Support Instrument Interference and Data Exclusion
- Ongoing Data Validation Parameters Included for Quarterly Report Approval
- Data Available to BAAQMD in Approved Format
- 5-Minute Public Data Display Must Provide a Means for Feedback and Comment to Foster Improvement

Types of Fence-line Monitoring Instrumentation Employed

- Open Path Monitoring Being Installed or Evaluated by Refineries
  - Open Path Ultraviolet Differential Optical Absorption Spectroscopy (UV-DOAS)
  - Open Path Fourier Transform Infrared Spectroscopy (OP-FTIR)
  - Open Path Tunable Diode Laser (TDL)
- Other Measurement Technologies and Methods Being Employed Along Fence-lines
  - Single Point Extractive FTIR
  - Passive Tube Sampling
  - Extractive Gas Chromatography
  - Fixed Site Sampling

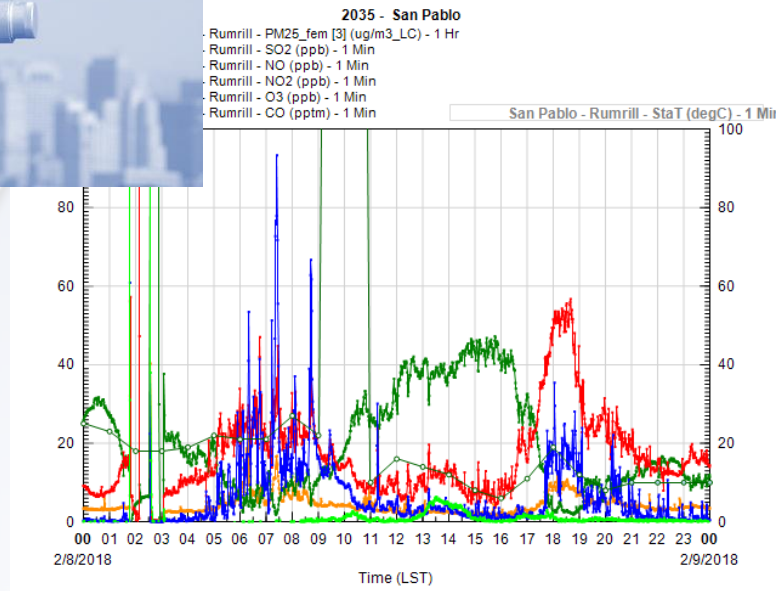
Community Ambient Air Monitoring Systems

- Established and operated by the Air District based on current Air District guidelines
- Required by Assembly Bill 1647 in addition to fence-line monitoring
- Compounds monitored:
  - Organic compounds (alkanes, aromatics, polycyclic aromatic hydrocarbons (PAH))
  - NO_2
  - CO
  - PM
  - H_2S
- Targeting community locations impacted by refinery emissions to provide additional information

Fence-line Air Measurement Considerations

Levels of air pollution in a community are affected by:

- Natural background
- Emissions from a combination of common (cars, home heating, restaurants, etc.) and unique sources (refineries, cement plants, etc.)
- Transport from other areas in the air basin and outside the air basin
- Meteorology (RH, winds, temperature, etc.)
- Chemical reactions
- Topography
- Path integrated concentrations (ppb-m)



Factors that Affect Fence-line and Ambient Monitor Siting (Representativeness)

- Location and obstructions
- Source contributions and distance from those sources
- Meteorological conditions over time, including prevailing wind speed and direction
- Topography – Is the path representative?
- Ambient air chemical composition (interferences)
- Specific pollutants of concern and technological limitations

Other Siting Considerations

- Ability to remain in the monitoring location for long periods of time (years to decades)
- Power
- Security
- Access
- Permitting

Fence-line QA/QC Program Elements

- Open Path Monitoring QA/QC Metrics
  - Light Signal Intensity
  - Zero and Upscale Response Test, Calibration, Linear Response
  - Bump Testing (Flow Through or Fixed Cell?)
  - Communication, Data Logging and Website Display
  - Background Acquisition and Verification
  - Routine Inspection (Optics, Alignment, Path Length, Insects, etc.)
  - Surrogate Measurement to Validate Instrument Response
- Fixed Site Instrumentation and Sampling
  - Zero and Upscale Response Test, Calibration, Linearity
  - Sample Collection, Chain of Custody, SOP
  - Communication, Data Logging and Website Display

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- Existing fence-line monitoring systems may not represent current technological advancements requiring upgrade
- Incentivize regular inspection and ongoing data validation – set parameters for data exclusion when validation fails

Fence-Line Monitoring Program Status and Next Steps

- Fence-line systems were targeted to be operational in June 2019 unless there were obstacles beyond the refineries control
- Some extensions were granted due to delays beyond the refineries control (permitting, power)
- Monitoring Plans have been approved
- Currently reviewing revised QAPP documents
- Continue to monitor Tunable Diode Laser (TDL) H_2S technology development

Ensuring Proper Performance

- Working with manufacturers and facilities to address needs and technical issues related to implementation (H_2S, data validation, calibration frequencies, reporting, etc.)
- Working with refineries to define operational parameters and quality objectives for incorporation into QAPP's

ONLINE SEMINAR
Tuesday, Nov. 12
11am - 5pm PST

Overview of Auditing Procedures of
FENCELINE AIR MONITORING TECHNOLOGIES
Using ISO Standards from a Regulatory Perspective

This online seminar will present an overview of how ISO 17025 can be used by regulators to ensure that fenceline air monitoring programs can meet regulatory goals for data quality.

Topics will cover:

- High Level Overview of Open-path Technologies
- Auditing Operational Performance
- Auditing Management System
- Case Study: Implementing an ISO 17025 at an Oil Refinery
- Logistics (Costs & Timelines)

Hosted by the Bay Area Air Quality Management District, California Air Resources Board, and Argos Scientific.

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Register at https://attendee.gotowebinar.com/register/6250453525937579277

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Abstracts are due November 22, 2019 at www.awma.org/ACE2020authors.

Questions?

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