Acceptance Testing:

Air Monitoring Equipment Expectations

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Ventura County Air Pollution Control District

Presentation Overview

What is Agency Acceptance Testing

Regulatory Citations and Guidance

In Practice – VCAPCD Lab Configuration

Best Practices and Common Issues

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About This Presentation

- The large and diverse regulatory air monitoring community in California can make consistency in practices a challenge but lends itself to innovative ideas and being a leader in instrument performance testing and operation.
- There is not a ‘one-size-fits-all’ agency approach to acceptance testing practices and test apparatus. This presentation provides examples based on VCAPCD experiences and practices.

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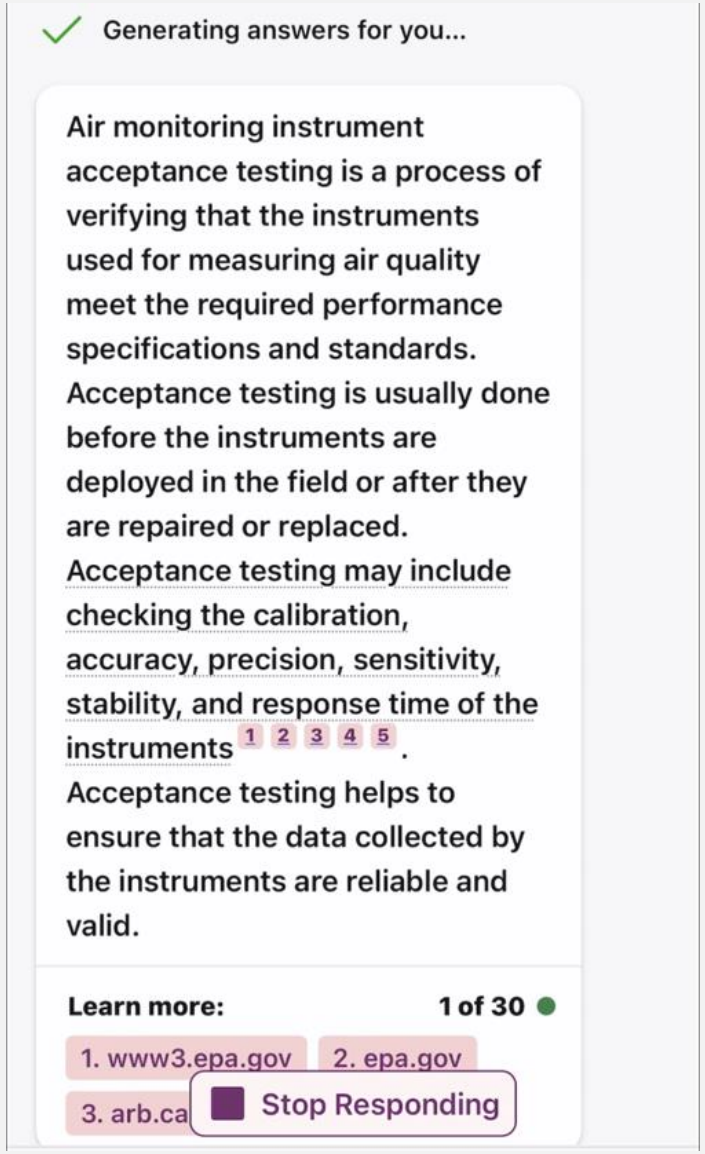
Acceptance Testing: What? And Why?

- Internet search 2.0 “AI Chat”… it’s a starting point.
  - New or to confirm repair results.
  - Conducted before field deployment.
  - Includes a variety of tests and observations.
  - Verify instrument meets required performance specifications.
- Helps ensure high quality ambient data: comparable, reliable, and valid.



“What is air monitoring instrument acceptance testing” prompt. (Microsoft Bing, 10 October 2023).

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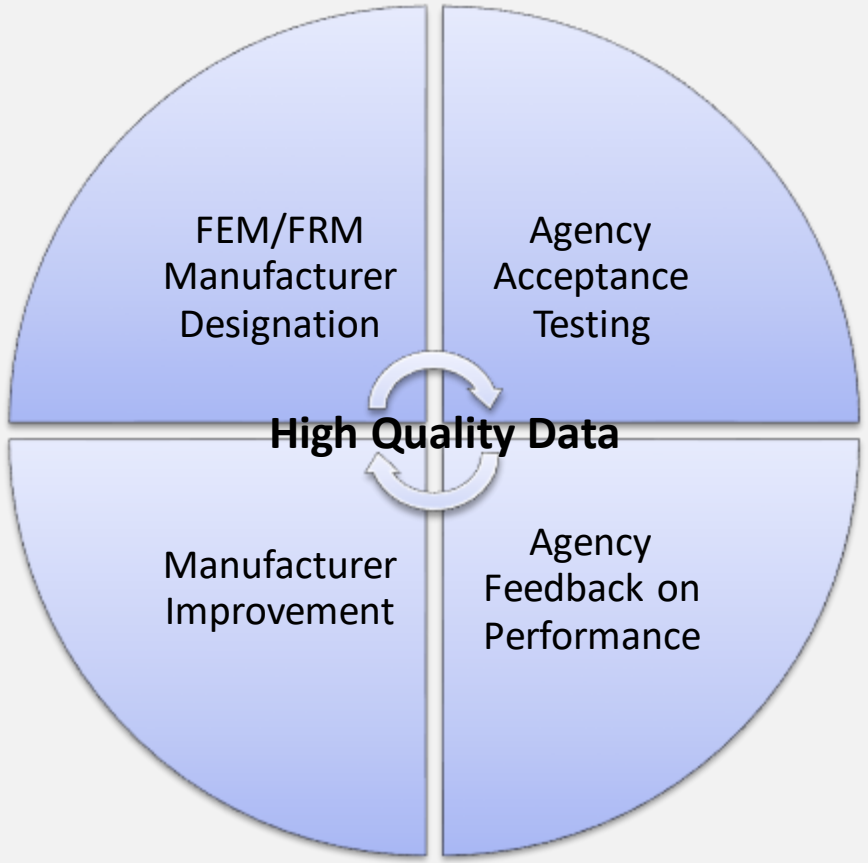
Acceptance Testing: Performance Lifecycle

- Instruments with FEM/FRM designation must submit proof of performance specifications in 40 CFR Part 53.
- However, designation does not imply an individual new instrument or model is ‘field ready’ and free from technical issues.
- Critical feedback relationship between manufacturers and end users to constantly improve real-world operation and performance.



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Key Terms/Concepts in CFR Part 53

Noise: Spontaneous, short duration deviations in measurements that are not caused by input concentration changes.

Zero drift: The change in measurement response to zero pollutant concentration over periods of continuous unadjusted operation.

Span drift: The percent change in measurement response to an up-scale pollutant concentration over periods of continuous unadjusted operation.

Lag time: The time interval between a step change in input concentration and the first observable corresponding change in measurement response.

Rise time: The time interval between initial measurement response and 95 percent of final response after a step increase in input concentration.

Fall time: The time interval between initial measurement response and 95 percent of final response after a step decrease in input concentration.

Precision: Variation of repeated measurements of the same pollutant concentration.

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Agency Regulatory Obligations

- QA Handbook Volume II:
  - Acceptance testing recommendations:
    - At office or lab facility.
    - Take days or ideally weeks.
    - Document initial calibration, multi point verifications, and a series of daily subsequent Zero/Span/One Point QC checks to verify precision and drift.
- A more detailed explanation of individual agency acceptance testing process should be described in agency SOP.

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Regulatory Framework and Agency Role Summary

- Manufacturers must apply and submit documentation that measurement platforms meet FEM/FRM specifications.
  - This ***does not*** preclude individual or systemic instrument performance issues which can be more prevalent when new models, hardware, and software are initially released.
- CFR condition for a manufacturer to maintain a FEM/FRM designation any monitor sold as such must : *"function within the limits of the performance specifications… for at least 1 year after delivery and acceptance when maintained and operated in accordance with the manual".*
- Following regulatory and operating procedure guidelines and best practice it is critical that agencies perform instrument evaluation before use collecting regulatory data to prevent data quality issues and failures.

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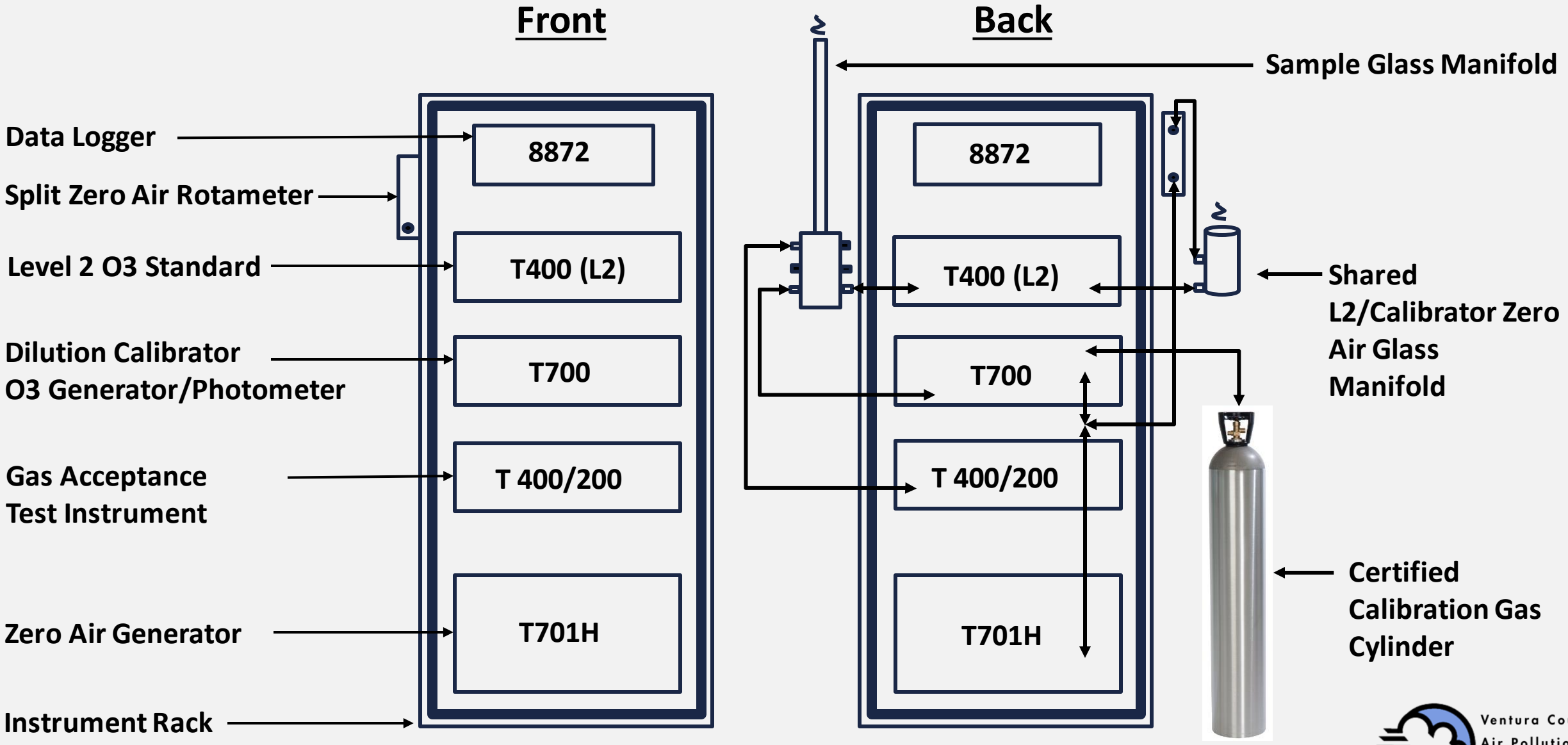
VCAPCD Basic Workshop Test Rack Diagram



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Best Practices

- Establish test environment that mimics network design.
  - Use certified equipment (Gas Cylinder, Flow Standards, O3 Standards).
  - Network instruments with fully configured data logger to document testing and run automated testing when practicable.
- Simulate field operation for all parameters and functionality.
- Collect 'Meta-Data' from instruments to assist with troubleshooting and feedback for manufacturer.
- Do not wait! Test new equipment ASAP.
  - Identify and address problems before you need to rely on the instrument in your network.
  - Take advantage of standard one year warranty timeframe.

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Common Issues

- Pneumatics
  - Improper connection or assembly.
- Factory calibration
  - Does not meet lab/regulatory standards.
  - Calibration coefficients out of specifications.
- Software and firmware.
  - Registers that do not report data. Or incorrect values.
  - Firmware out of date and in need of updating.
- Faulty components
  - Measurement stability and/or response time.
  - Failure within one year or less of operation. Lamps, pumps, valves, scrubbers, motors, pressure/temperature/flow sensors.
- Compatibility with existing data logging and data transfer scheme.

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Thank you!
Questions?

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