

2017 CARB PQAQO Training

Verifying Zero Air Sources in an Ambient Air Gaseous Monitoring Network



Yousaf Hameed, MPA

Air Quality Monitoring Supervisor

Clark County

Department of Air Quality (DAQ)



CLARK COUNTY • DEPARTMENT OF AIR QUALITY

Introduction

Quality Data: proper instrument operation:

Calibration

- Good quality zero air is important
- Lower level measurements and upscale regression

Clean/reliable zero air is a must

- How do we verify zero air sources?



Zero Air Systems

Cylinders Considerations

- Vendor Certifications Available
- Purity Level Issues



CERTIFICATE OF ANALYSIS

Grade of Product: ULTRA ZERO

Part Number:	AI UZ300	Reference Number:	14-400283283-1
Cylinder Number:	4764451Y	Cylinder Volume:	312.0 CF
Laboratory:	103 - Los Angeles (SAP) - CA	Cylinder Pressure:	2640 PSIG
Analysis Date:	Nov 12, 2013	Valve Outlet:	590
Lot Number:	14-400283283-1		

ANALYTICAL RESULTS

Component	Requested Purity	Certified Concentration
AIR		
CO + CO ₂	< 1.0 PPM	< 0.2 PPM
THC	< 0.1 PPM	< 0.1 PPM
Percent Oxygen	20-22 %	20.86 %
Moisture	< 2.0 PPM	0.5 PPM

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

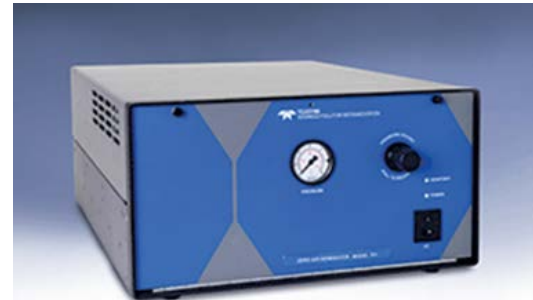
Zero Air Systems (contd.)

ZAG Considerations

- Continuous Supply of Zero Air
- No Factory Certifications (from most vendors)

ZAG Break Through

- When High Pollutant Level In – Scrubbing Efficiency
- Potentially Effected (not clean) Output
- Teledyne API Paper



EPA Efforts

EPA Requirements

Rules and guidance are sparse

Local initiatives

QA Workgroup is developing guidance

**Quality Assurance
Handbook for Air
Pollution Measurement
Systems**

Volume II

**Ambient Air Quality
Monitoring Program**

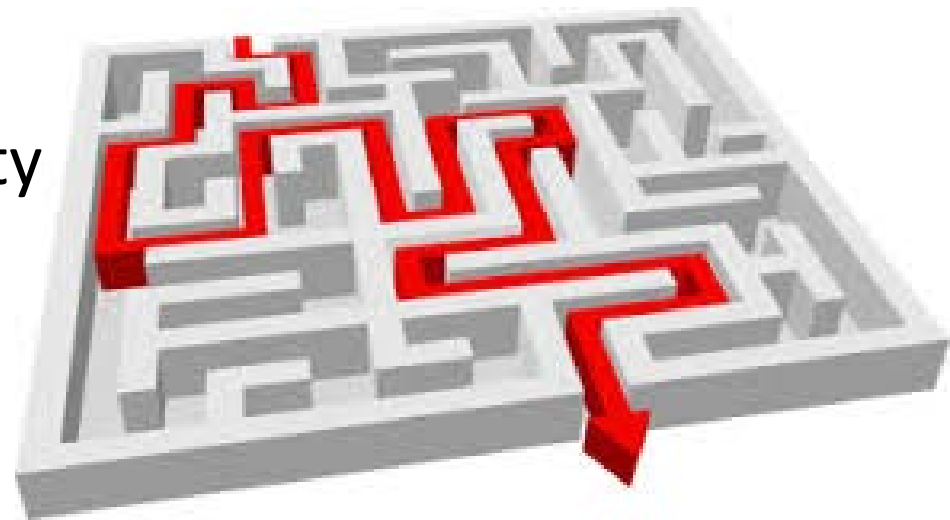
Developing a Local Procedure

Technical Challenges

Iterative Process

Some Issues (along the way):

- Measuring below Lower Detectable Limit (**LDL**)
- Response time / stability
- Flow rate and pressure
- Reliability and repeatability



Procedural Approach

First Iteration

Certified Zero Air Cylinder

- Sequenced with a series of scrubbers (for cleaning and drying)
- System was a standard



Procedural Approach (contd.)

Standard response compared against field ZAG
(legacy procedure)

Note: Instrument's front panel used for readout

- Obtain Difference: $\text{Diff} = \text{Std}_z - \text{ZAG}_z$
- Within tolerances? Yes, then good.

Instrument	Units	Allowable Tolerance
Ozone	ppb	± 1
Carbon Monoxide	ppm	± 0.1
Oxides of Nitrogen	ppb	± 1
Sulfur Dioxide	ppb	± 1

Procedural Approach (updated)

Difficulties with existing procedure

- Time for an update

Certified ZAG



Solved problems:

- Instrument stability, moisture, pressure, and flow issues.

Vendor ZAG Certification



TEST/QC 1001, 1001P, 1010, 2020

PROJECT NUMBER: SP4517 **SERIAL NUMBER:** 04671214F

MODEL NUMBER: M2020

OPTIONS:

<input type="checkbox"/> 1001-06 Line Voltage, 196-240 VAC	<input type="checkbox"/> 2020-06 Line Voltage, 196-240 VAC
<input type="checkbox"/> 1001-08 CO Catalytic Oxidizer	<input checked="" type="checkbox"/> 2020-08 CO Catalytic Oxidizer
<input type="checkbox"/> 1001-04 Output Flow Meter	
<input type="checkbox"/> 1001-12 Internal Methane Oxidizer	
<input type="checkbox"/> 1001P-06 Line Voltage, 196-240 VAC	
<input type="checkbox"/> 1001P-08 CO Catalytic Oxidizer	
<input type="checkbox"/> 1001P-10 Internal Methane Oxidizer	

199552

PNEUMATIC TEST:

LEAK TEST

OUTLET PRESSURE GAUGE CAL

PRESSURE RELIEF VALVE ADJUSTED

ELECTRICAL TEST:

BURN-IN # HRS 2

TEMP. CTRL. PROGRAMMED

TIMING ADJUSTED

REMOTE START VERIFICATION

CONTACT CLOSURE VERIFY

S1-1 CONFIGURATION: ON _____

S1-2 CONFIGURATION: ON _____

GAS TEST		OUTPUT
NOX	< 1	PPB
NO	< 1	PPB
NO2	< 1	PPB
O3	< 1	PPB
SO2	< 1	PPB
H2S	< 1	PPB
CO	< 0.1	PPM

NOTES:

QA SIGNATURE: **DATE:** 12/30/14

Certificate Specification Questions

Vendor Commitment

Costs Approximately \$500

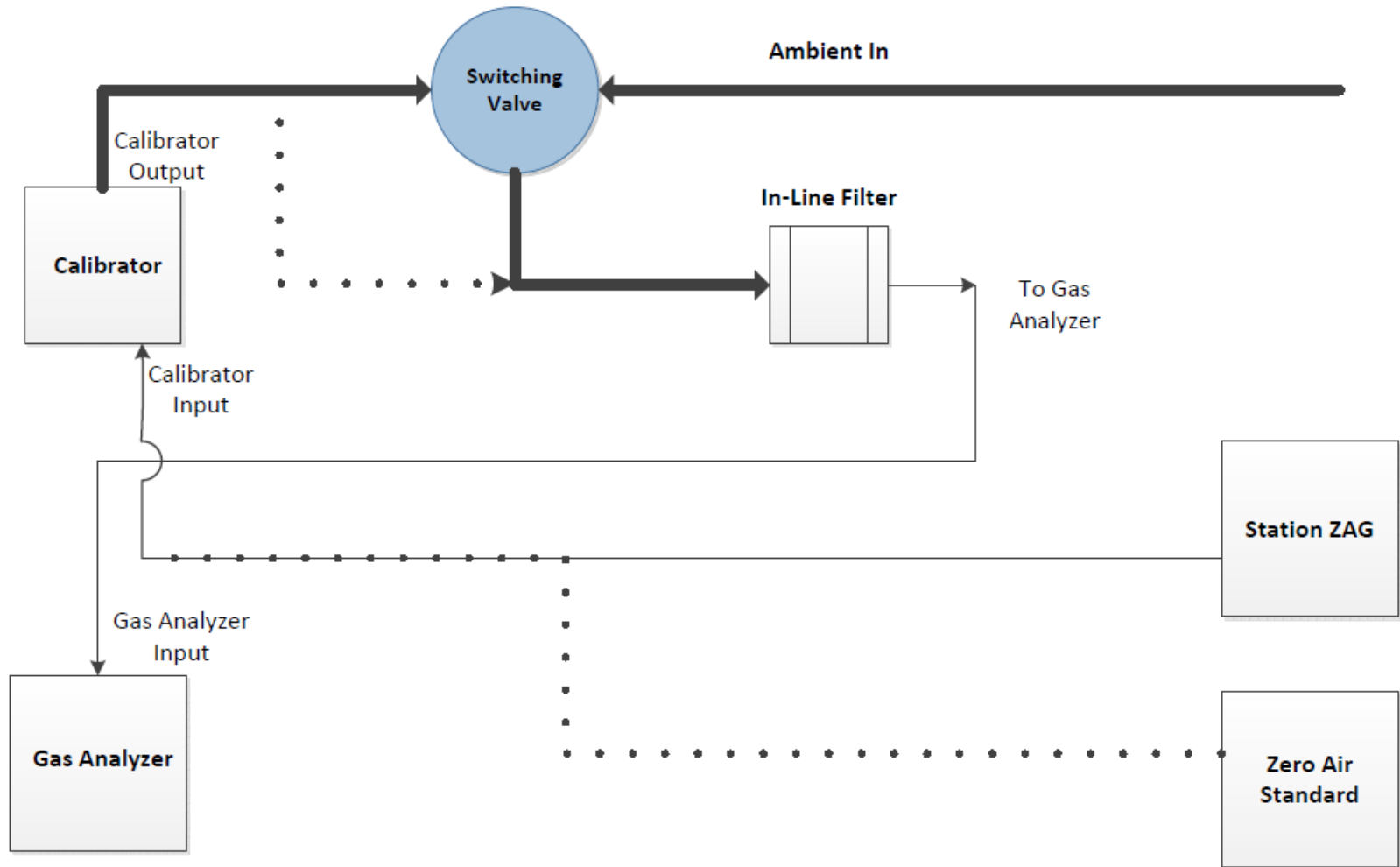


Methods (Zero Air Verification)

1. Run zero air from standard to measurement instrument
 2. Adjust analyzer zero coefficient (Calibrate)
 3. Run zero air from field ZAG to measurement instrument
 - Test reading is taken
 4. If within tolerance, then test passes
- *Note: Difference measurement between the standard and field ZAG is not needed*

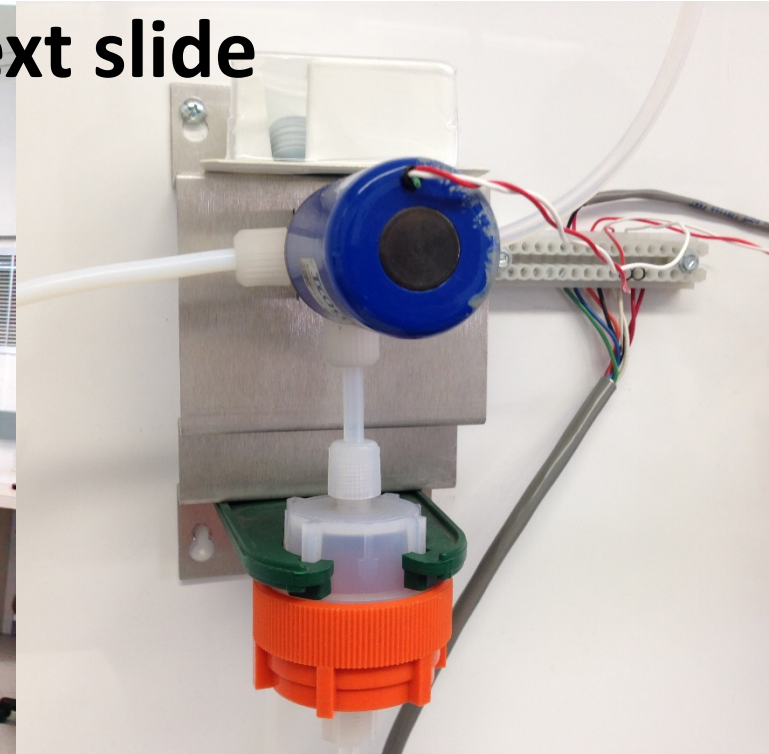


Diagram

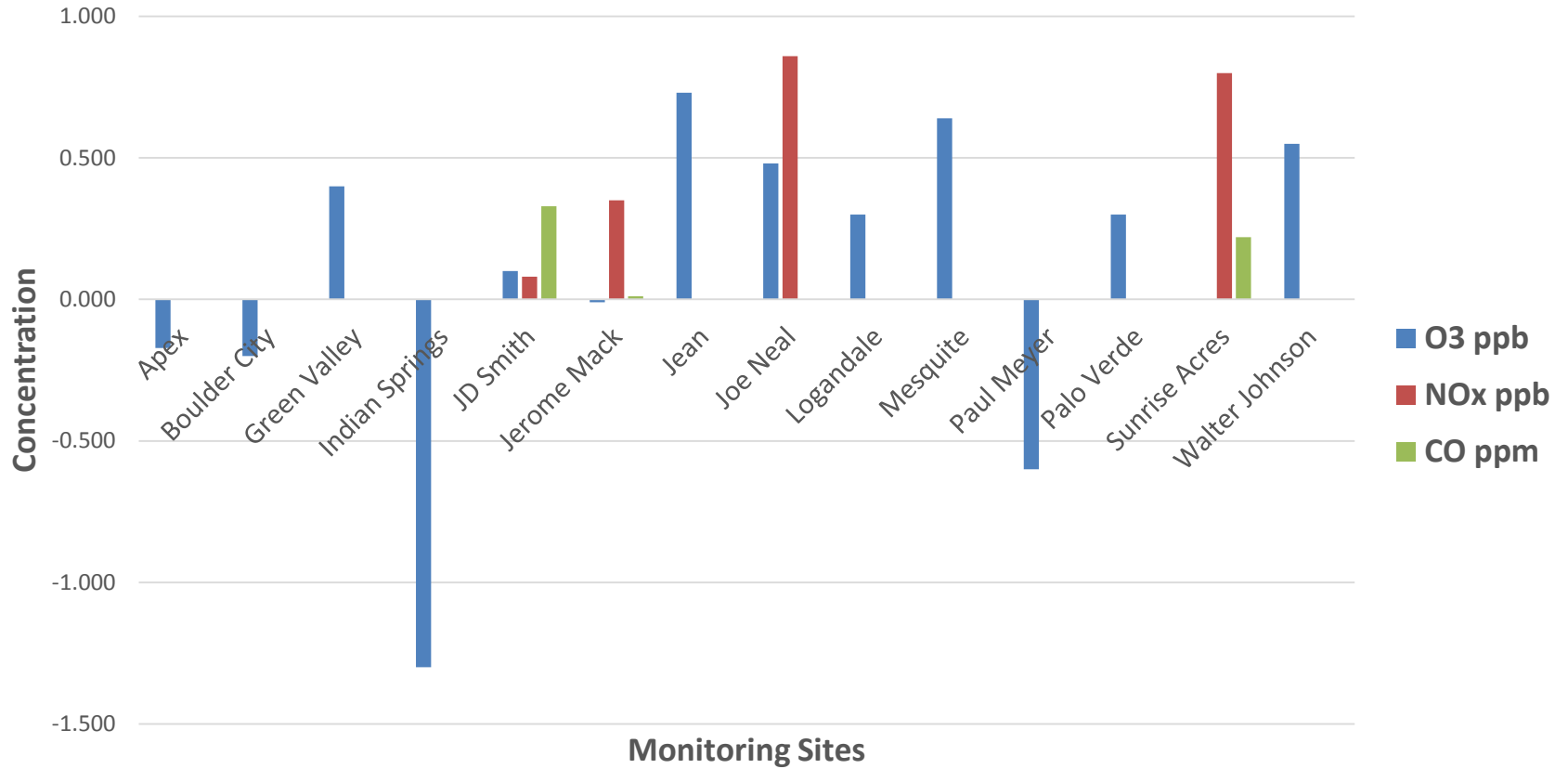


Information About Data

- Annual testing of all the field ZAGs
 - More often in some cases
- Test for each parameter being measured
- 2015 Testing: data set on next slide



2015 Zero Air Testing Results



[Table 1. Allowable Tolerance.](#)

	SO ₂		O ₃	CO		NO ₂	NO _y
	Ambient Range	Trace Range	Ambient Range	Ambient Range	Trace Range	Ambient Range	Trace Range
1% of Range	2.0 ppb	1.0 ppb	5.0 ppb	0.4 ppm ¹	50 ppb	5.0 ppb	2.0 ppb

¹CO tolerance is not based on percent full scale; see lower detectable limit in Table B-1 to Subpart B of 40 Part 53 and 40 CFR 53.23(c).

Summary

Revised and improved testing design

- Testing is now more stable
- Instrument response time improvements
- Greater control: moisture, pressure, flow
- Data quality

Agency (State, Local, EPA) Efforts

- Standardization and more consistent results
- National scale
- Data comparability

Quality Management

- Continuous improvement – more work?



Acknowledgements

US EPA

San Diego APCD

- Break Out Session

Clark County Staff



References

Teledyne API – Engineering Report (ENG-016): M701H Zero Air Characterization Report (October 29, 2008).

U.S. Government Publishing Office; Electronic Code of Federal Regulations: Title 40, Part 53: Table B-1 to Subpart of Part 53—Performance Limit specifications for Automated Methods. See <http://www.ecfr.gov/cgi-bin/text-idx?SID=69e22778299ed5e4eedf739c689b568f&mc=true&node=pt40.6.53&rgn=div5> (accessed May 5, 2016).

United States Environmental Protection Agency; Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Quality Monitoring Program. See <http://www3.epa.gov/ttnamti1/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf> (accessed May 5, 2016).

Any Questions?



Contact: Yousaf Hameed, MPA
Air Quality Monitoring Supervisor
Clark County
Department of Air Quality
Direct: (702) 455-1664
Email: Hameed@ClarkCountyNV.gov

