MONTROSE
AIR QUALITY SERVICES

THE NATION'S LARGEST PROVIDER OF EMISSIONS TESTING SERVICES.

Preparing For and Understanding Your Annual RATA

September, 2018

Preparing For Your Annual RATA

MONTROSE AIR QUALITY SERVICES

Goals:

- Get it done safely
- Get it done correctly
- Get it done on the first attempt

Overview

- Definition of RATA
  - Calculations
  - Limits
  - Bias Adjustment Factors
- Roles and Responsibilities
- Common Causes of Error/Areas to Focus Prior to RATA
- Summary

Overview

1. This presentation is general in nature and is intended to cover basic EPA RATA principles.

2. RATAs take many different forms and scopes of work. Variables to consider:

- Regulations (Part 60 Performance Specs, Part 75, State, County)
- Permit Conditions
- Local Regulatory Requirements
- Pollutants Measured
- Expected Concentrations
- Source/Fuel Type
- Units of Measurement (concentration and/or mass emissions, wet/dry)
- Reference Methods, Test Duration, Timing

RATA IS……

- Relative Accuracy Test Audit (RATA)
- Comparison of Continuous Emission Monitoring System (CEMS) Data To Reference Method (RM) Data
  - EPA Methods 3A, 6C, 7E, 10 (O_2, CO_2, SO_2, NO_x, CO by Instruments)
  - Methods 1-4 or 19 (Stack Flow)
- A Minimum of Nine (9) Reference Method Runs

RATA IS.....

Relative Accuracy is the absolute mean difference between the CEMS and the reference method (RM), plus the 2.5% error confidence coefficient of a series of tests, divided by the mean of the RM tests or the applicable emission standard.

RATA IS……

$$RA = \frac{|\bar{d}| + |CC|}{\bar{RM}} \times 100\%$$

- RA = Relative Accuracy
- |d| = Absolute value of mean difference (CEMS – RM)
- RM = Average Reference Method Value
- CC = Confidence Coefficient

RATA IS……

- CC = Confidence Coefficient

$$CC = t_{0.975} \times \frac{S_d}{\sqrt{n}}$$

  - $t_{0.975}$ = Function of number of runs
    - As n increases, $t_{0.975}$ decreases
  - S_d = Standard deviation of differences
  - n = Number of valid runs

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RELATIVE ACCURACY AND BIAS CALCULATION
NO_x CONCENTRATION

Station: Generic Power Plant
Unit: 1
Date: 9/1/16
Performed By: MM, GB, DA

Facility ID: XXXXXXX
Device ID: DYY
Parameter: NO_x
Units: ppm

Test	Date	Start Time	End Time	RM NO_x ppm	CEMS NO_x ppm	Difference NO_x ppm	Valid Run (1=yes, 0=no)
1	9/1/16	8:24	9:02	1.87	1.90	-0.03	1
2	9/1/16	9:08	9:46	1.93	1.97	-0.04	1
3	9/1/16	9:52	10:30	1.94	1.97	-0.03	1
4	9/1/16	10:40	11:18	2.00	1.96	0.04	1
5	9/1/16	11:24	12:02	2.00	1.99	0.01	1
6	9/1/16	12:08	12:46	1.85	1.97	-0.12	1
7	9/1/16	12:56	13:34	1.88	1.97	-0.09	1
8	9/1/16	13:40	14:18	1.92	1.98	-0.06	1
9	9/1/16	14:24	15:02	1.91	1.99	-0.08	1
10							0
11							0
12							0
Average				1.92	1.97	-0.04	

Ref. Method Average:	1.92	ppm	Limit
Average Difference:	-0.04	ppm	
Number of Tests:	9		
Standard Deviation:	0.05	ppm	
t Value:	2.306		
Confidence Coefficient:	0.04	ppm	
|d| + CC:	0.08	ppm	
Relative Accuracy:	4.3	%	20%
Test Condition:	50	MW	

RELATIVE ACCURACY: LIMITS

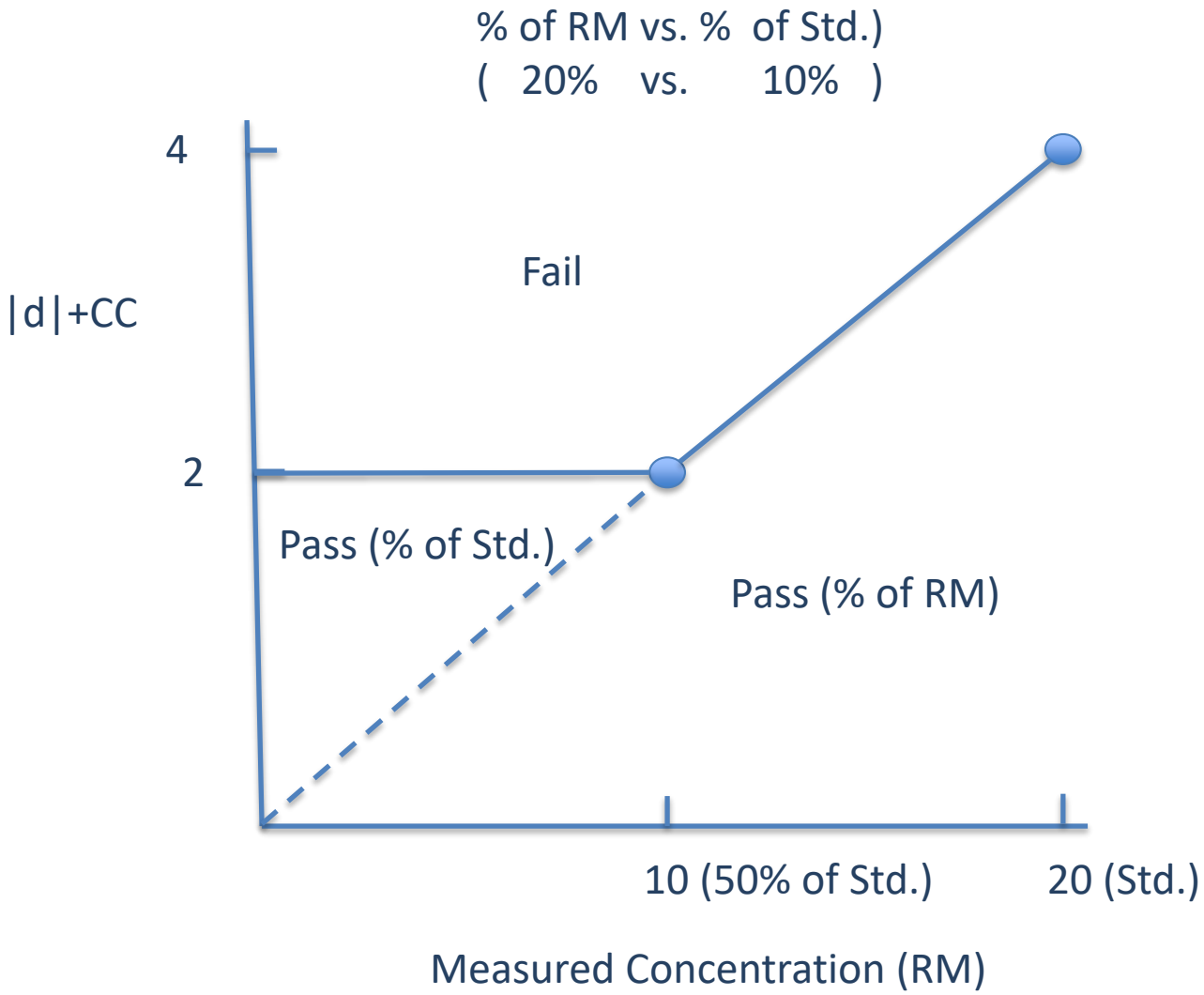
1. Part 60, Appendix B, Performance Specification 2
    1. 20% of Reference Method
    2. 10% of Performance Standard
    3. Varies by Performance Specification
2. Part 75
    1. NO_x lb/MMBtu – 10% (7.5% Annual Incentive)

RATA IS……

$$RA = \frac{|\bar{d}| + |CC|}{Standard} \times 100\%$$

- RA = Relative Accuracy
- |d| = Absolute value of mean difference (CEMS – RM)
- CC = Confidence Coefficient
- Standard = Emission Standard (Limit)
- Typically applies if emissions are less than 50% of the permit limit

RATA IS……



RATA IS……

$$RA = \left|\bar{d}\right| + \left|CC\right|$$

$$RA = \left|\bar{d}\right|$$

- RA = Relative Accuracy
- |d| = Absolute value of mean difference (CEMS – RM)
- CC = Confidence Coefficient

RELATIVE ACCURACY: ABSOLUTE VALUE LIMITS

1. 40 CFR Part 60, Appendix B Performance Specifications
    1. CO: 5 ppm (PS 4A and 4B)
    2. O_2 and CO_2: 1% (PS3)
2. Part 75
    1. 0.02 lb/MMBtu – Pass
    2. 0.015 lb/MMBtu – Annual Incentive

BIAS TEST

1. Part 75
2. Purpose: To prevent the CEMS from under-reporting emissions
3. Solution = Bias Adjustment Factor (BAF)
4. NO_x lb/MMBtu
5. Applies to all CEMS data after the RATA, until the next RATA

BIAS TEST (continued)

1. CEMS ≥ RM
   a. BAF = 1.000
2. CEMS < RM but |d| < CC
   a. Passes Bias Test and BAF = 1.000
3. CEMS < RM and |d| > CC
   a. Fails Bias Test, **BAF = 1 + |d|/RM**
4. BAF never less than 1.000
5. Maximum BAF for Part 75 = 1.111

RATA IS NOT.....

- A Compliance Test
  - NOT Directly Concerned With Emission Levels
  - Not Exempt From Emission Limits During The RATA
- Nine or More Individual Tests
  - There Is No "Pass/Fail" Criteria For Each Individual Run

Roles

- Site
  - Regulatory Affairs Lead
  - Plant Maintenance Staff
  - CEMS Maintenance Staff
  - Operations
- Source Test Contractor
- Regulatory Agency

Roles: Site Regulatory Affairs

- Planning
  - Timing
  - Contractor Selection
    - Air Emission Test Body (AETB) conforms to ASTM D7036
    - Local Certification: SCAQMD LAP, CARB Independent Contractor Program
  - Scheduling
  - Coordinate with Operations/Maintenance
  - Agency Notification

Roles: Site Operations

- Process Operations
  - Maintain Compliance
  - Maintain Minimum Concentrations
    - >10% of Facility CEMS Range
    - >20% of Reference Method Range
  - Steady Operation
  - Notify tester if changes are necessary during RATA

Roles: Site Operations (cont.)

- 40 CFR Part 60
  - Greater than 50% load
- 40 CFR Part 75
  - Breaks load range into 3 ranges
    - RATA in "most frequently" used range or 2nd "most frequently" used range
    - Based on previous four operating quarters

Roles: Site - Plant Maintenance

- Safety
  - Site Access
  - Site Specific Safety Training
  - PPE Requirements
  - Job Hazard Analysis

Roles: Site - Plant Maintenance

- Reference Method Sample Location
- The owner or operator of an affected facility shall provide, or cause to be provided, performance testing facilities as follows:
  1. Sampling ports adequate for test methods applicable to such facility.
  2. Safe sampling platform(s).
  3. Safe access to sampling platform(s).
  4. Utilities for sampling and testing equipment. (40 CFR 60.8)

Roles: Site - Plant Maintenance

- CEMS Probe Location
  - All continuous monitoring systems or monitoring devices shall be installed such that representative measurements of emissions or process parameters from the affected facility are obtained. (40 CFR 60.13)
- Reference Method
  - Select traverse points that assure acquisition of representative samples over the stack or duct cross section.
    - Establish a "measurement line" that passes through the centroidal area and in the direction of any expected stratification. (40 CFR 60, App. B)
    - Stratification Checks/Multi-point sampling
      - Part 60/Part 75

Roles: Site - Plant Maintenance

- Utilities/Power
  - 110 VAC
    - Separate Circuits for Reference Method Mobile Lab and at Stack Platform
  - 480 VAC
    - If RM Laboratory has transformer
    - Most reliable if available
  - Lighting at sample location

Roles: Site - CEMS Maintenance

- CEMS Maintenance
- CEMS Calibration
  - Tolerance more important on RATA day
  - Zero Calibration can be more important than Span Calibration
- CEMS Operation
  - BAF Set To 1.000 (or not included in 1-minute data)
  - Normal – "Hands Off"
  - No calibrations during tests
- CEMS Data Generation
  - CEMS Data File for Each run
    - Match Clocks
    - 1-Minute Data
  - CEMS QA Data

Roles: Source Tester

- No Conflict of Interest (CARB, SCAQMD)
- Have Appropriate Credentials (ASTM D7036 AETB, CARB ICAP, SCAQMD LAP,)
- Prepare Test Plan
- Know Test Methods/Regulations
- Generate Valid, Accurate Reference Method Data
- Receive CEMS Data from Source
- Reduce Data to common units/time
- Compare Results
- Prepare Report

Roles: Regulatory Agency

- Approve Protocols
- Witness Tests
- Review Reports

Why RATAs Are Not Successful

"But It Passed Cal This Morning!"

Why RATAs are Unsuccessful

- Facility CEMS
  - Stratification/Sample Location
  - Sample System
    - Components not included in daily calibration
    - Scrubbing
  - Analyzers
    - Calibration Tolerance
    - NO_2 Converter Efficiency
    - Linearity
    - Interferences

Why RATAs are Unsuccessful

- Facility CEMS (continued)
  - Calibration Gases
  - Fuel Meter
  - Fuel Properties
  - Stack Flow Meter
- Unit Operations

Why RATAs are Unsuccessful

- Reference Method
  - Calibration Gases
  - Sample Location
  - Manual Stack Flow Methods
  - Scrubbing/Interferences

Summary

- Preparation
- Communication
- Pay Attention to Details

Additional Services

- Compliance Tests
- Temporary CEMS
- Engineering/Diagnostic Tests
- Fenceline Monitoring
- Ambient Monitoring
- Leak Detection and Repair (LDAR)
- Regulatory Consulting Services
- Laboratory Analysis (Enthalpy)

Questions?

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