CASE STUDY ON CLEAN AIR ACT COMPLIANCE AND A PRAGMATIC APPROACH TO AMBIENT AIR DATA QUALITY ASSURANCE

presented by Andres Quijano and Max Greene
CLEAN AIR ACT OVERVIEW

National Ambient Air Quality Standards (NAAQS)
State Implementation Plans (SIPs)
New Source Performance Standards (NSPS)
Prevention of Significant Deterioration (PSD)
Non-attainment New Source Review (NSR)
PSD & NSR require permits for “construction” of major source of air pollution.

“Construction” includes “modification.”

“Modification” includes:

“All physical change in, or change in the method of operation of, a stationary source which increases the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted.”
Pre-1977 sources exempt from PSD/NSR permitting until “modification” occurs.

EPA regulations exclude “routine maintenance, repair and replacement” from “modification.”

Midwestern power plant operators claimed all changes to pre-1977 plants were “routine maintenance, repair and replacement.”

The result: emissions from these plants generated ozone, which was transported from the midwest to non-attainment states in the northeast.
States (including Rhode Island) and others sued under the Clean Air Act.

Operator data showed that the plants’ changes were likely “modifications” requiring permits.

The result: a settlement worth over $4.6 billion, a significant reduction in emissions from the plants, and ozone improvement in the northeast.

Data were key to identifying the path to compliance with the Clean Air Act.
HOW CAN WE TRUST THE DATA

Is it traceable to a reference method?
Repeatability / Traceability

Is it traceable to a reference standard?
Accuracy
OPERATION DATA
SIX AREAS OF ANY QUALITY SYSTEM

Station Log
Calibration Certificates
Maintenance Schedule
Maintenance Task
Station Setup
# Calibration Certificates

**Calibration Reference Method**

<table>
<thead>
<tr>
<th>Calibration Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Calibrator Model</strong></td>
</tr>
<tr>
<td><strong>ID/Serial #</strong></td>
</tr>
<tr>
<td><strong>Transfer Standard</strong></td>
</tr>
<tr>
<td><strong>ID/Serial #</strong></td>
</tr>
<tr>
<td><strong>Instrument Units</strong></td>
</tr>
</tbody>
</table>
# CALIBRATION CERTIFICATES

Pre and Post Calibration Data

## Single Point Calibration

<table>
<thead>
<tr>
<th>Initial Span Instrument Gain</th>
<th>0.971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial O3 Offset (ppb)</td>
<td>0</td>
</tr>
</tbody>
</table>

| Full Scale (ppb) | 500 |

## Pre calibration Check

<table>
<thead>
<tr>
<th>Calibration Point</th>
<th>Transfer Std Reading Avg (ppb)</th>
<th>Instrument Under Test Reading Avg (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-0.6</td>
<td>-0.2</td>
</tr>
<tr>
<td>80%FS</td>
<td>431.7</td>
<td>433.5</td>
</tr>
</tbody>
</table>

## Post calibration Check

| 80%FS             | 434.6                          | 433.8                                  |
| 0                 | -0.4                           | -0.2                                   |

<table>
<thead>
<tr>
<th>Final Span Instrument Gain</th>
<th>0.971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final O3 Offset (ppb)</td>
<td>0</td>
</tr>
</tbody>
</table>

| PASS/FAIL | PASS |

Note: Post calibration check shall be within 2% of transfer standard readings
CALIBRATION CERTIFICATES

Pass Fail Criteria

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Square value</td>
<td>1.0000</td>
</tr>
<tr>
<td>Slope</td>
<td>0.9962</td>
</tr>
<tr>
<td>Standard error about y = x (% FS)</td>
<td>0.1%</td>
</tr>
<tr>
<td>Uncertainty due to non-linearity, at 95% confidence (% FS)</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Note: Uncertainty due to non-linearity, at 95% confidence, shall have maximum value 1.8% of FS

PASS/FAIL  PASS

internal ozone generator calibration performed
# Maintenance Task

## Check List

<table>
<thead>
<tr>
<th>Customer</th>
<th>Elevation</th>
<th>Latitude</th>
<th>Site Contact</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check sensor readings match expected ambient conditions</td>
</tr>
<tr>
<td>Check operation of aspirated shield fan</td>
</tr>
<tr>
<td>Verify readings against a NIST certified sensor</td>
</tr>
<tr>
<td>Clean Stevensons screen</td>
</tr>
<tr>
<td>Clean sensor bead with distilled water and lintless cloth</td>
</tr>
<tr>
<td>Clean aspiration shield</td>
</tr>
<tr>
<td>Verify readings against a NIST certified sensor across 10 points</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BAM 1020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform Self Test</td>
</tr>
<tr>
<td>Clean Capstan shaft and pinch rollers</td>
</tr>
<tr>
<td>Perform Leak check and flow audit. Initiate corrective action if necessary</td>
</tr>
</tbody>
</table>

✔ - Completed, X - Not required
## Maintenance Schedule

<table>
<thead>
<tr>
<th>Schedule Date</th>
<th>Completed Date</th>
<th>Type of Maintenance</th>
<th>Comments / Completed By</th>
</tr>
</thead>
</table>

Station Schedule

Station Location: 

Station Name: 

Schedule Date | Completed Date | Type of Visit | Comments / Completed By
---|---|---|---

Page: Courtesy of American Ecotech LLC - Andres Gutierrez 425 829 7130
STATION SETUP
REVIEW OFTEN, INTERNAL AUDITING

Data Collection

Data Reporting

Data Calculations

Data Validation
INSTANTANEOUS WIND ROSE
REAL TIME ALARMS

Station 2: PM10
1 μg/m³ (3hr RA)
2 μg/m³ (3hr RA)

μg/m³

0 20 40 60 80 100 120 140 160 180 200

12 μg/m³
00:01 - 21:15

Station 6: PM10
35 μg/m³
36 μg/m³ (3hr RA)

μg/m³

0 20 40 60 80 100 120 140 160 180 200

36 μg/m³
00:00 - 21:15
Avg

Station 8: PM10
56 μg/m³
46 μg/m³ (3hr RA)

μg/m³

0 20 40 60 80 100 120 140 160 180 200

36 μg/m³
00:00 - 21:15
Avg

Station 13: PM10
118 μg/m³
117 μg/m³ (3hr RA)

μg/m³

0 20 40 60 80 100 120 140 160 180 200

118 μg/m³
00:00 - 21:15
Avg

Station 15: PM10
42 μg/m³
50 μg/m³ (3hr RA)

μg/m³

0 20 40 60 80 100 120 140 160 180 200

36 μg/m³
00:00 - 21:15
Avg

WS: 1.4 m/s
PM10: 113 μg/m³
DATA REVIEW AND REPORTS

• Review as often as possible
• Document everything you know when you know it
• Produce a report that has uncertainty calculation methods location and conditions make sure any exceptions are also documented
QUESTIONS?

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