Randy Lam
AQIS I (Station Operations)
South Coast Air Quality Management District
THE STATION OPERATOR

“What is your son doing for work these days?”

My dad: “He’s a driver.”

We drive

A lot
“HOW DO YOU FEEL ABOUT DRIVING?”
SCAQMD > LAX: 40 miles
LAX > Santa Clarita: 37 miles
Santa Clarita > SCAQMD: 60 miles
Total: 137 miles on a sample collection day

So yeah, my dad isn’t exactly wrong about what I do one day of week

BUT driving isn’t the only thing we do!
What do you think a station operator does?
The South Coast Air Quality Management District divides the jobs of our Air Quality Instrument Specialists into three distinct categories:
- Operations
- Repair
- Calibrations

Most other AQMD's have operators conduct basic operations as well as repairs.

Station Operators at the SCAQMD have multiple stations.
AN OVERVIEW OF DUTIES

1. Monitor/Maintain gaseous instruments at stations <- Field
2. Collect samples from the field & submit to lab <- Field
3. Document irregularities with sampling/data <- Field
4. *Level 1 QC for data that eventually goes into AQS <- Office

*New for the SCAQMD!
ROUTINE OFFICE PROCEDURES: DAILY CHECKS

At the office:

- Review previous 24-hr data (minute and hourly), looking for:
  - Missing data (power failures, communications failures, etc.)
  - Flags /errors (equipment malfunctions)
  - High / low values (real or not)
  - Extreme values (e.g. over range values, negative values)
  - Unusual changes in values
  - Autocal results
**DAILY PC ACROSS THE SOUTH COAST**

- What’s going on here?
- This is generally where the operator starts his/her day
- If you were an operator, what do you do?
**INSTRUMENT HEALTH**

We use these snapshots to keep an eye on instrument health and data validity.

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MORE TOOLS TO MONITOR HEALTH OF INSTRUMENTS

It's important to know what's typical at your sites so notice when things are a-typical
AT THE STATION
Routine Procedures: Site Check

- Upon arriving at monitoring site:
  - Note outside conditions
    - Weather conditions, trees, shelter condition, potential sources, pests, anything abnormal
    - E.g.: construction activity, fires nearby could interfere with measurements or even contaminate instruments and sample lines.
Is there anything here that could be affecting the data?

Some things cannot be seen from the numbers alone.
This is going on less than 0.5 miles upwind from one of my stations
Could anybody guess why it is important to have boots on the ground for this instrument?
ROUTINE PROCEDURES: SITE CHECK

Check for obvious issues:

- Instruments and computers in fault conditions/crashed
- Gas lines disconnected, probes damaged
- Damaged meteorological equipment
  - Do instantaneous values in logger match what your eyes see?
- Incorrect clocks and/or timers, ensure actual time is correct
Gas Instruments: Preventive Maintenance

- Preventive maintenance:
  - Prevents downtime and costly repairs
  - Increases data capture
  - An ongoing element of quality control
  - Incorporate into the daily routine
THE INSTRUMENT RACK
South Coast Air Quality Management District
Monthly Maintenance Report
Thermo 421 NO/NO2/NOX Analyzer

Location: WSLA
Month & Year: NOV 2018
Station #: 76071
Technician: D. Blank
Instrument Serial #: CM08760045
AGMS Property #: 0016734

<table>
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<th>DATE</th>
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<th>11/7</th>
<th>11/8</th>
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DATE: 11/6, 11/7, 11/8, 11/9, 11/10
TIME: 1:00, 1:20, 1:40

Alarm

NO BKGN (Zero): 11.1, 10.9, 11.1, 12.6
NOX BKGN (Zero): 11.1, 11.1, 11.5, 14.0
NO CODF (Span): 1.150, 1.150, 1.050, 1.210
NO2 COEF (Span): 1.000, 1.000, 1.000, 1.000
NOX COEF (Span): 1.000, 1.000, 1.000, 1.000

Monthly: Perform Analog Output Test

Digital

Telemetry

CHESSEL

DATE: 11/6, 11/7, 11/8

Comments:
11/6: Alarm Pressure
11/7: NO, NOX, Adjusted pressure alarm from 11/6 205 to 285 mV

Calibration Date: 7/15/18
Thermo 421 NO/NOX manual sheet.xls

Reviewed BY ______________________
<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ACTION</th>
<th>WHY</th>
<th>WHEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumps</td>
<td>Rebuild or replace</td>
<td>Wear on diaphragms, vanes, seals, and bearings causes low/unstable vacuum</td>
<td>When test values indicate deviation from acceptable range and/or on a PM schedule. (Check instrument manuals or SOP’s for recommended schedule.)</td>
</tr>
<tr>
<td>Lamps</td>
<td>Adjust lamp position, drive voltage, and/or detector gain. Or replace.</td>
<td>Output decreases over time</td>
<td>*At the South Coast AQMD these tasks are generally carried out by the AQIS II (repair/calibration unit)</td>
</tr>
<tr>
<td>Optics</td>
<td>Clean and/or replace windows and optical filters</td>
<td>Clouding and pitting causes excessive noise, zero/span drift, low response</td>
<td>*At the South Coast AQMD these tasks are generally carried out by the AQIS II (repair/calibration unit)</td>
</tr>
<tr>
<td>Chemicals &amp; scrubbers</td>
<td>Replace</td>
<td>Due to depletion of reagent or lack of scrubbing effectiveness</td>
<td>*At the South Coast AQMD these tasks are generally carried out by the AQIS II (repair/calibration unit)</td>
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<tr>
<td>Critical Orifices</td>
<td>Replace orifice and associated O-rings and sintered filters</td>
<td>Critical orifices will occasionally clog up causing reduction in flow, zero/span drift, high or low response</td>
<td>*At the South Coast AQMD these tasks are generally carried out by the AQIS II (repair/calibration unit)</td>
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</table>
FLOW CHECKS!

- Flow checks once a month on samplers (SSI, TSP, BAM, Partisol 2025i, etc.)
- Leak checks + cleanings on certain instruments bi-monthly (BAM1020)
- These regular flow checks help us maintain a higher data capture rate if we find something is amiss
It's important for an operator to catch these little things because they can have an effect on what actually goes through the cyclone.
THE DATA IS ONLY AS GOOD AS THE EQUIPMENT

- Ensure validity of flow checks
- Maintain the integrity of sampling instruments
- Observations from the field to help put irregular data into context
What if a given sample looks much different than what is typical for a given site?

Lab tech: ???

The people at the lab would have no idea without the operator comments

<table>
<thead>
<tr>
<th>Field Operator Use</th>
<th>Laboratory Use</th>
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<tbody>
<tr>
<td>Station #</td>
<td>Final Weight (gm)</td>
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<tr>
<td>Location:</td>
<td>Tare Weight (gm)</td>
</tr>
<tr>
<td>Sampler #</td>
<td>Sample Weight (gm)</td>
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<tr>
<td>Filter #</td>
<td>Total Particulates, ug/M³</td>
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<tr>
<td>Sample Date</td>
<td>Sample Receive Date:</td>
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<tr>
<td>Start Time:</td>
<td>Sample Received By:</td>
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<tr>
<td>Elapsed Time:</td>
<td>Sample Weigh Date:</td>
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<tr>
<td>Average Flow:</td>
<td>Sample Weighed By:</td>
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**Data QC Check (Explain if Fail)**

Pass [x] Fail [ ]

Removed from Sampler: 3/13/19
Calibration Date: 10/31/18
Seasonal Setpoint: 41

Remarks: Light drizzle during install. Clear sky during removal. Large excavation occurring 505 ft SW of station. Branches found in lower compartment of sampler (non-sampling area) - possibly birds nest.

*Indicate Data QC issues & unusual activities including weather, sampling condition, etc.*
1. What would you think if there were no comments on the chain of custody?

2. How would you process these samples if you knew there was a fire going on during one of these sampling days?

3. How would you process these samples if you were told the instrument ran twice as long as the FRM time?

4. The samples are treated differently depending on the observations of the operator.

5. Therefore it is important that operators are consistent in their observations and documentation.
THE LOGBOOK

- Record notable things in logbook & downtime log (helpful for data review later on)
- Most questions about data happen several months/years after the event has occurred
- Keeps your memory out of your body and recorded onto something that won’t get cleared
VERY important for Level 2 & Level 3 QC to get a feel for what is going on at the station

<table>
<thead>
<tr>
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<th>Pollutant</th>
<th>Event</th>
<th>Date &amp; Time</th>
<th>COMMENTS</th>
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QC: For Data Validation use only
Pollutant: All Gas, O3, CO, NO2, H2S, NOx, BAM, TEM, TSP, SS, PM2.5, SASS or Meteorological
Event: Maintenance, Calibration, Repair, Instrument Failure or Lost Sample

Date and Time: The time the event began or data became suspect.
Comments: Please note thoroughly, specific data related to event and the resolution
Routine Procedures: Going Off Line

Maintenance/Repairs/Calibrations/Audits

- Document periods when instruments are offline

- You can be off-line for up to 15 minutes per hour without “losing” the hour
  - If possible, minimize periods of lost data by going offline in the last 15 minutes of the hour and going back online before the 15 minutes past the hour
  - Take the respective channel(s) offline at the data logger
Air monitoring station site documentation includes:

- Instrument logs
- Instrument manuals
- Instrument QC check sheets
- Station log book(s)
- Instrument calibration reports
- SOPs
- Technical bulletins
- AQS (AMP390) / ARB Site reports

All should be on-site and available to auditors!
A DAY IN THE LIFE OF THE OPERATOR

**Work in the office:**
- Level 1 QC Review
- Monitor data trends/abnormalities
- Check-ups instrument health

**Work in the field:**
- Gas instrument maintenance
- Sample collection & maintenance
- Site Checks (everything ok? Siting criteria being met? Safety? Special events?)
- Flow Checks (Once/month to ensure validity of data)
- Maintenance (Cleanings, preventive maintenance, repairs, etc.)
It is important to expect the unexpected. Systems go down and instruments fail that require fixing. We have to be flexible because there is no fixed schedule.

Sometimes we fight fires, and sometimes we clean toilets. Sometimes we vacuum and garden.
In general, what is the purpose of a station operator?

What are some important things to notice as a station operator?

What are the primary duties of the station operator?

What is in jeopardy if the station operator does not notice the details?

The data may not reflect reality and the end user would find out after it’s too late (if at all)
QUESTIONS/COMMENTS?

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South Coast AQMD
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