Stack Testing 101:
Fundamentals of Stack Testing

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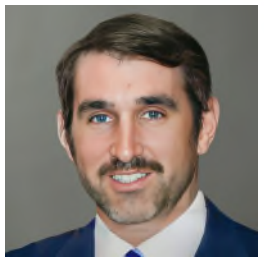


MONTROSE ENVIRONMENTAL

Overview

Session Goals:

To demystify stack testing

- What is stack testing?
- Why it matters
- Major types of stack tests
- Core EPA Methods
- The testing lifecycle

To connect technical and human perspectives.

- The people behind the process
- Collaboration and Communication
- The outcome of a stack test

What is ‘Stack Testing’?

- Direct measurement of pollutants from industrial exhausts.
- Core objectives: compliance verification, emissions characterization, and/or operational improvement.
- Stack testing = the 'truth serum' of emissions levels. Actual data, not engineering calculations.
- Accurate data supports regulators, operators, and public trust.

Why Does Stack Testing Matter?

- Ground truth of Clean Air Act compliance.
- Impacts: permits, enforcement, and operations.
- Shared goal: accurate, defensible data for safe, efficient, compliant operations.

Major Types of Stack Tests

Compliance Testing

- Regulatory or permit-based (Title V, MACT, NSPS).

RATA

- Certification and QA/QC for CEMS systems.

Engineering / Diagnostic Testing

- Process evaluation and optimization.

Compliance = 'must do'; Engineering = 'strategic opportunity.'

Core EPA “Wet” Methods & What they Measure

- Method 1: Traverse Points (Where in the stack we make the measurements)
- Method 2: Velocity (Flowrate of the gas in the stack)
- Method 3: Molecular Weight
- Method 4: Moisture content (To correct wet ⇔ dry)
- Method 5: Particulate Matter (PM)
- Method 23: Dioxins/furans
- Method 26A: Hydrogen Halide and Halogen - (like HCl/Cl_2)
- Method 29: Metals
- Method 202: Condensable PM (PM that forms in the atmosphere after being emitted from the source as a gas)

Some PM Test Methods

EPA Method 5: Filterable particulate matter (FPM) isokinetic test method using out of stack filter in a temperature controlled 222-273 °F 'hot-box'.

EPA Method 5B: Same sampling train as Method 5, 'hot-box' is 320 °F and lab baking of sample is carried out at higher temperature

EPA Method 5F: Filter is extracted with water and portion analyzed for sulfate content. Remaining aliquot treated w/ NH_4 and resultant $(NH_4)_2SO_4$ subtracted from FPM weight.

EPA Method 5I: Similar setup to Method 5 except designed for low level FPM using lightweight smaller filter holder and weighing entire assembly.

EPA Method 17: In-stack filter holder determining FPM at stack conditions

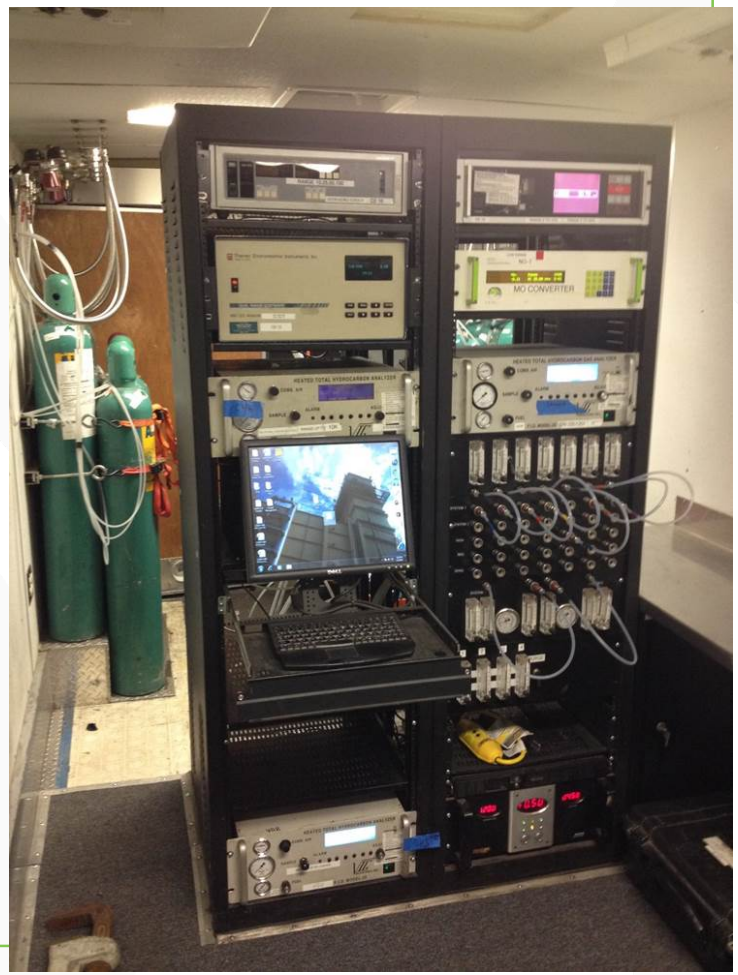
EPA Method 201A: In-stack FPM determination using cyclones and M12 type filter for size fractions of > 10 µm, 10-2.5 µm, and <2.5 µm.

EPA Method 202: Condensable particulate matter (CPM) test method of PM that is gaseous at stack conditions but condenses in the plume.

OTM-37: Measurement of direct PM_{10} and $PM_{2.5}$ using dilution sampling.

Core EPA “Instrumental” Methods (CEMS)

- Method 3A: Oxygen and Carbon Dioxide Concentrations - Instrumental
- Method 6C: Sulfur Dioxide - Instrumental Analyzer Procedure
- Method 7E: Nitrogen Oxide - Instrumental Analyzer
- Method 10: Carbon Monoxide - Instrumental Analyzer
- Method 25A: Gaseous Organic Concentration - Flame Ionization



The Testing Lifecycle

Pre-Test Events

- Creating a test plan
- Safety Planning
- Site Access
- Client Site Support

Testing Events

- Equipment mobilization & set up
- Sampling
- Analysis of results (real-time)
- Tear-down & demobilization

Post-Test Events

- Analysis of results
- gravimetric, wet chemistry, etc.
- Data entry
- Writing the test report

The People Behind the Process (not a comprehensive list)

The Facility/Source Owner

- Environmental Representative
- Safety Group Representative
- Procurement Representative
- Operations
- Instrumentation & Electrical

Regulators

- Permit Approval
- Test Plan Approval
- Test Observation
- Test report review and approval

Source Testing Company

- Sales Representative
- Legal (contacts) Team Members
- Test Plan Writer
- Logistics/Oversight Manager
- Field Personnel
- Finance
- Test Report Writer

Other

- Consultants
- Environmental Laboratory
- Law Firms

Ideal Project Timeline

Stakeholders in a Successful Source Test:

Facility / Source 

Regulatory Agency 

Source Tester 

90 - 30 days prior*

30-60 days post

Collaboration & Communication

- Communication fosters effective coordination across phases prevents invalid data.
- Common causes of failure: miscommunication and unclear roles.
- Best practices: early planning, clear communication, and transparency.
- Success depends on teamwork between facility, testers, and regulators.

The Outcome

Public Facing outcomes

- The air our community breathes is verified to be alligned governmental standards designed to protect public health.
- Conformance to ESG, sustainability, and public health commitments.

Compliance

- Valid data = compliance, efficiency, sustainability. Allows continued operation without enforcement intervention.
- Testing is both proof of compliance and a tool for improvement.
- Emissions Inventories

Future Regulations

- Data Feeds ERT/CEDRI Data pools
- Subparts are continuously updated using previous stack test data as well as ICR

Thank you for your Time!

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Q & A

Acronyms

- NSPS – New Source Performance Standards

https://www.epa.gov/stationary-sources-air-pollution/new-source-performance-standards

- MACT – Maximum Achievable Control Technology
- BACT – Best Available Control Technology
- ICR – Information Collection Request
- Title V Permit – A comprehensive Federal Permit for major sources of air pollution
- ERT – Electronic Reporting Tool (EPA)
- CEDRI - Compliance and Emissions Data Reporting Interface (EPA)
- ICR – Information Collection Request (EPA)
- ESG - Environmental, Social, and Governance