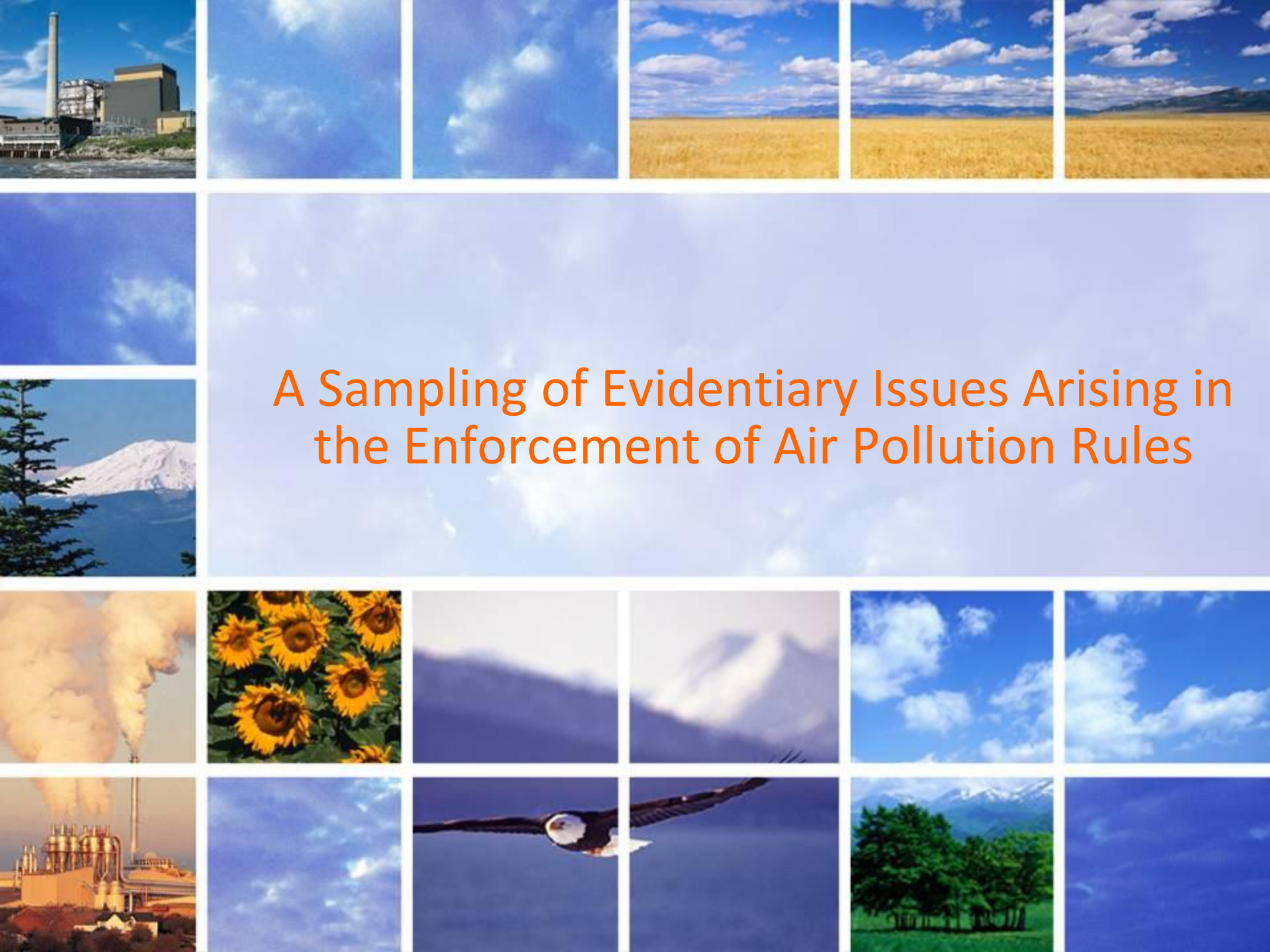


A Sampling of Evidentiary Issues Arising in the Enforcement of Air Pollution Rules

Overview of this Presentation

- Proving Violation of Emission Limits
  - Admissions
  - Parametric (emission factors)
  - Detected (FLIR)
  - Speciated/Quantified
  - Modeled
- Proving the Harm from Violations
  - Modeling Fate and Transport
  - Modeling Impact

Three Important Legal Issues

- What Proves a Violation?
  - The Credible Evidence Rule.
- Is the Offered "Proof" Worthy of Consideration?
  - *Daubert* and ensuring that "Scientific Evidence" is in fact scientific.
- Limits on the Manner of Presentation of Evidence.

Establishing a Violation







Self-Reporting
(This One is Easy)

- Some Rules Require Notice to EPA that the Source has Exceeded Regulatory Limits (e.g. Title V)

- Enforcement Policies Encourage Voluntary (e.g. Self-Report = Lower Penalty)







Examples of Compliance Standards or Demonstrations Specified in Regulations

- Continuous Emission Monitors (CEMS)
- Stack Tests
- Parametric Measurements
- Visual Opacity Evaluations (Method 9)

Example of Parametric Monitoring

- Parametric standard for can coating plant's thermal and catalytic oxidizers under NESHAP,

  Destruction of VOCs standard for thermal and catalytic oxidizers at a can coating plant. Compliance is shown by operating above a minimum temperature for the thermal oxidizer and by demonstrating the appropriate differential between inlet and outlet gas temperature to assure the catalyst is working in the catalytic oxidizer.

Emission Factors Can be Used with Parametric Measures

- An **emissions factor** is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., kilograms of particulate emitted per megagram of coal burned). Such factors facilitate estimation of emissions from various sources of air pollution.

- The general equation for emissions estimation is: E = A x EF x (1-ER/100)
- where:
- E = emissions;
- A = activity rate;
- EF = emission factor, and
- ER =overall emission reduction efficiency, %

- **AP-42, *Compilation of Air Pollutant Emission Factors***, has been published since 1972 as the primary compilation of EPA's emission factor information. It contains emission factors and process information for more than 200 air pollution source categories. A source category is a specific industry sector or group of similar emitting sources. The emission factors have been developed and compiled from source test data, material balance studies, and engineering estimates. The routinely updated factors are available in ***Volume I, Stationary Point and Area Sources***.
- *www.epa.gov/ttnchie1/ap42/*

But What if a Source Does Not Conduct its Own Monitoring as Required by the Regulations?







The Credible Evidence Rule

- Statutory and Historic Background
- Regulatory Changes

13

Background

- 1970 Clean Air Act: Test Methods used to demonstrate compliance with regulations
- General provisions of parts 60 and 61:
  - Compliance determined in accordance with performance tests

14

Early Court interpretations

- Portland Cement Assoc. v. Ruckelshaus (1973)
  - Method used for compliance must be same as method used to set standard
- *Donner Hanna Coke v. Costle (1979)*
  - The use of a non-reference method was "arbitrary and capricious" in conducting enforcement actions
- *U.S. v. Kaiser Steel (1984)*
  - The use of the applicable test method was the exclusive method available to determine compliance with a regulation

15

Changes by the 1990 Clean Air Act Amendments

- **Section 103(a)** An enforcement action may be based on "any information available"

- **Section 113(e)(1)** (Penalty calculation) the duration of a violation is established by "any credible evidence", including evidence other than that in the applicable test method.

16

The Credible Evidence Rule

(g) For the purpose of . . .establishing whether or not a person has violated or is in violation of any standard in this part, nothing in this part shall preclude the use, including the exclusive use, of any credible evidence or information, relevant to whether a source would have been in compliance with applicable requirements if the appropriate performance or compliance test or procedure had been performed.

Applications of the Credible Evidence Rule in Enforcement

- **Sierra Club v. Public Service Co. of Colorado**
  - SC alleged: PSC's Hayden power plant violated the 20% opacity limit 19,000+ times in 5 years.
  - PSC argued: only Method 9 observations can establish ongoing violations, not COMS data.
  - Court found: SIP does not limit citizens to a specific method in proving a violation, and that COMS data/reports were undisputed evidence of ongoing opacity violations

18

One Important Boundary on What Evidence is Credible?







Daubert v. Merrell Dow Pharmaceuticals, Inc.
509 U.S. 579 (1993)

- This case interpreted how to properly determine the admissibility of an expert's testimony under FRE 702.
- The Supreme Court found:
  - The district court is the "gatekeeper" that decides whether to admit an expert's testimony.
  - Expert testimony must be both *reliable* (resting on a reliable foundation) and *relevant* to the issues at hand.
  - A court examining whether to admit expert testimony must determine whether it is based on scientifically sound methodology that can properly be applied to the facts at issue.
  - The Court outlined factors to consider in a "flexible inquiry" to determine the *reliability* of expert testimony – no one factor is determinative, and other information may be considered as well.

Daubert v. Merrell Dow Pharmaceuticals, Inc.
509 U.S. 579 (1993)

The *Daubert* factors:

1. Whether the theory or technique has been tested;
2. Whether the theory or technique has been subject to peer review;
3. The error rate, and the existence of standards controlling operation;
4. Whether the theory or technique has widespread acceptance in the relevant community.

Kumho Tire Co. v. Carmichael
526 U.S. 137 (1999)

- The Supreme Court clarified that the *Daubert* factors apply to the testimony of technical experts, such as engineers – not just to testimony from scientists.

- The relevant factors may vary depending on the type of expert.

Federal Rule of Evidence 702

(as revised in Dec. 2011):

"A witness who is qualified as an expert by knowledge,
skill, experience, training, or education may testify in the
form of an opinion or otherwise if:

(a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

(b) the testimony is based on sufficient facts or data;

(c) the testimony is the product of reliable principles and methods; and

(d) the expert has reliably applied the principles and methods to the facts of the case."

New Investigation Techniques Raise New Evidentiary Issues







Is it a Tool for Investigators or is it Evidence?

- Hand held detectors
  - Sensitive to 1 ppb
  - Measured concentrations are real-time
  - General VOCs, or benzene or butadiene-specific
- Alert inspectors to presence of…
  - Emissions from storage tanks, wastewater, etc
  - Equipment leaks
- For LDAR, PIDs can detect process equipment leaks tens of feet away for further identification using FLIR cameras and TVAs


FISHER

IR Camera: Is Seeing Believing?

- Hydrocarbons absorb and emit infrared energy at specific wavelengths within the IR spectrum

- Camera sees IR energy, but has a filter to allow only IR energy in the 3.3 – 3.5 µm wavelength band to be detected

- Hydrocarbons that absorb IR energy in that range will be detected and imaged as a visible plume

Common chemicals detectable by the camera

- Benzene
- Butane
- Ethane
- Ethanol
- Ethylbenzene
- Heptane
- Hexane
- Methane
- Methanol
- Octane
- Pentane
- Propane
- Propylene
- Toluene
- Xylene

Examples From Real Inspections

- Compressor distance piece oil sump at a natural gas compressor station
  - Distance piece is designed to prevent lubricating oil from leaking into the compressor cylinder.
  - Distance piece also acts as a process gas leakage control device
  - In this case, compressed gas was leaking passed the packing rings and carried over into the oil sump

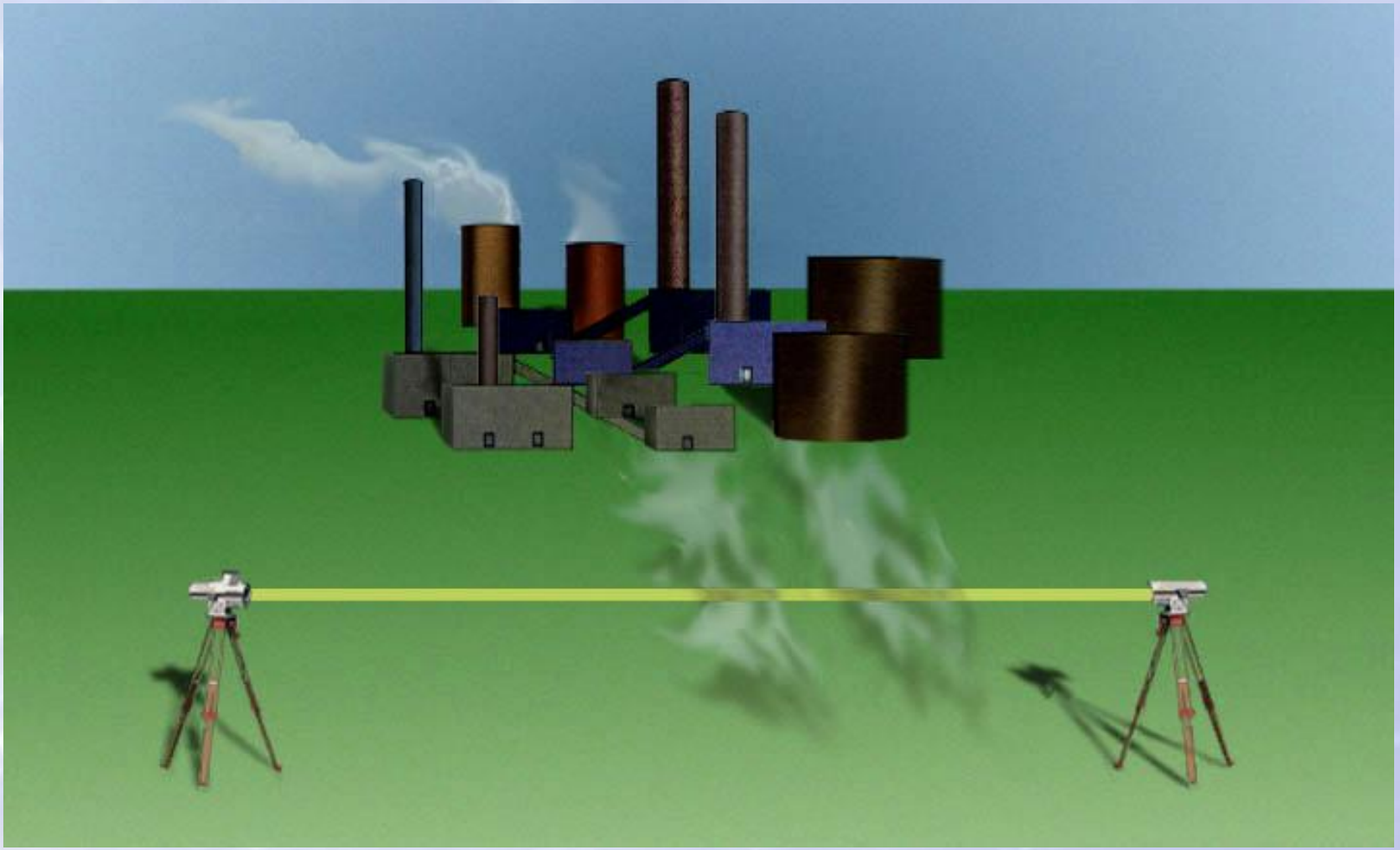
Examples From Real Inspections

Storage vessel bleeder vents must be closed at all times unless the tank roof is being landed or floated off the leg supports

Examples From Real Inspections

- Refinery Flare
  - Excess steam = incomplete combustion of hydrocarbons

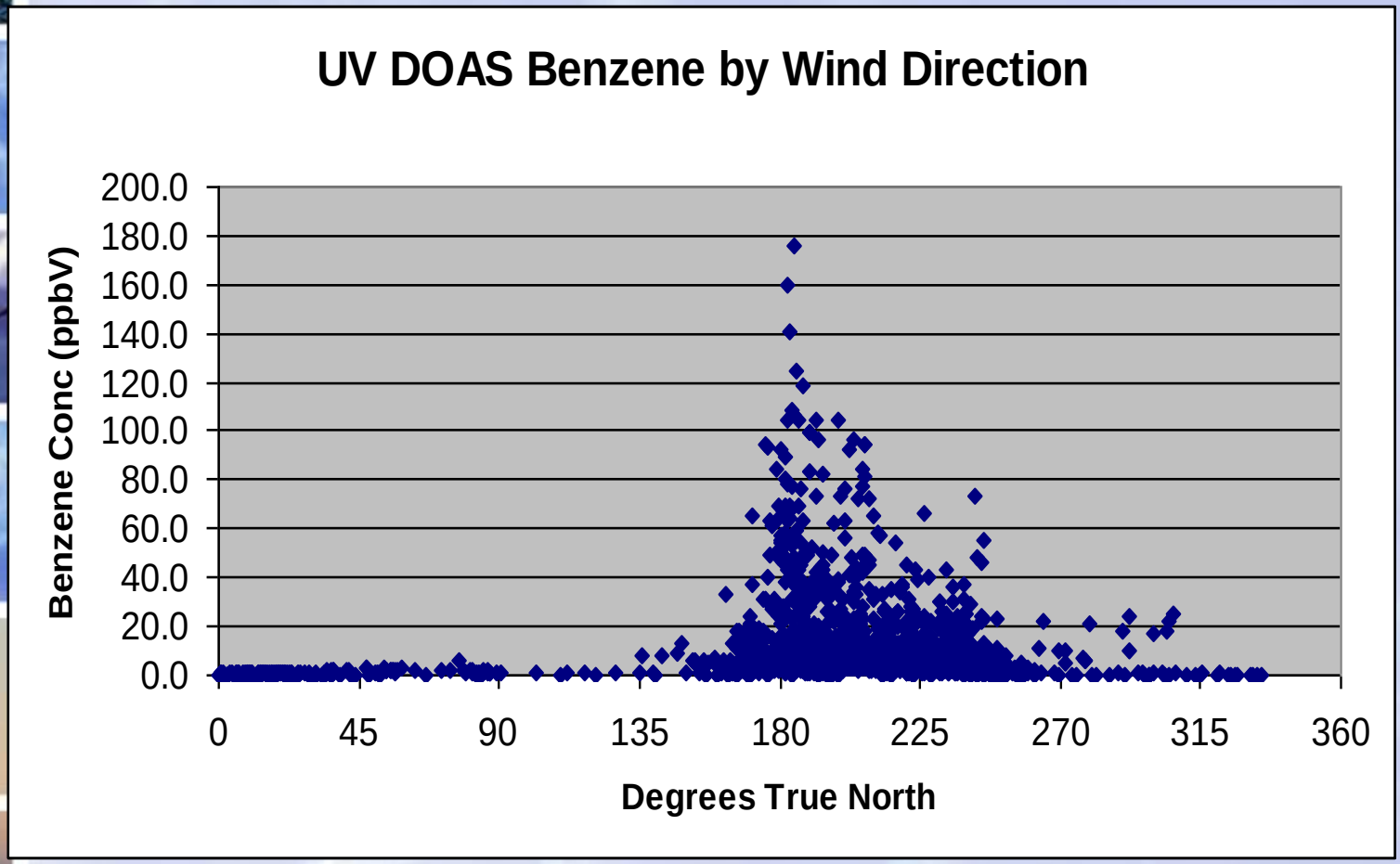
Ultraviolet Differential Absorption Spectroscopy (UV DOAS): Evidence of Exactly What is in the Air, and its concentration, but not how much.



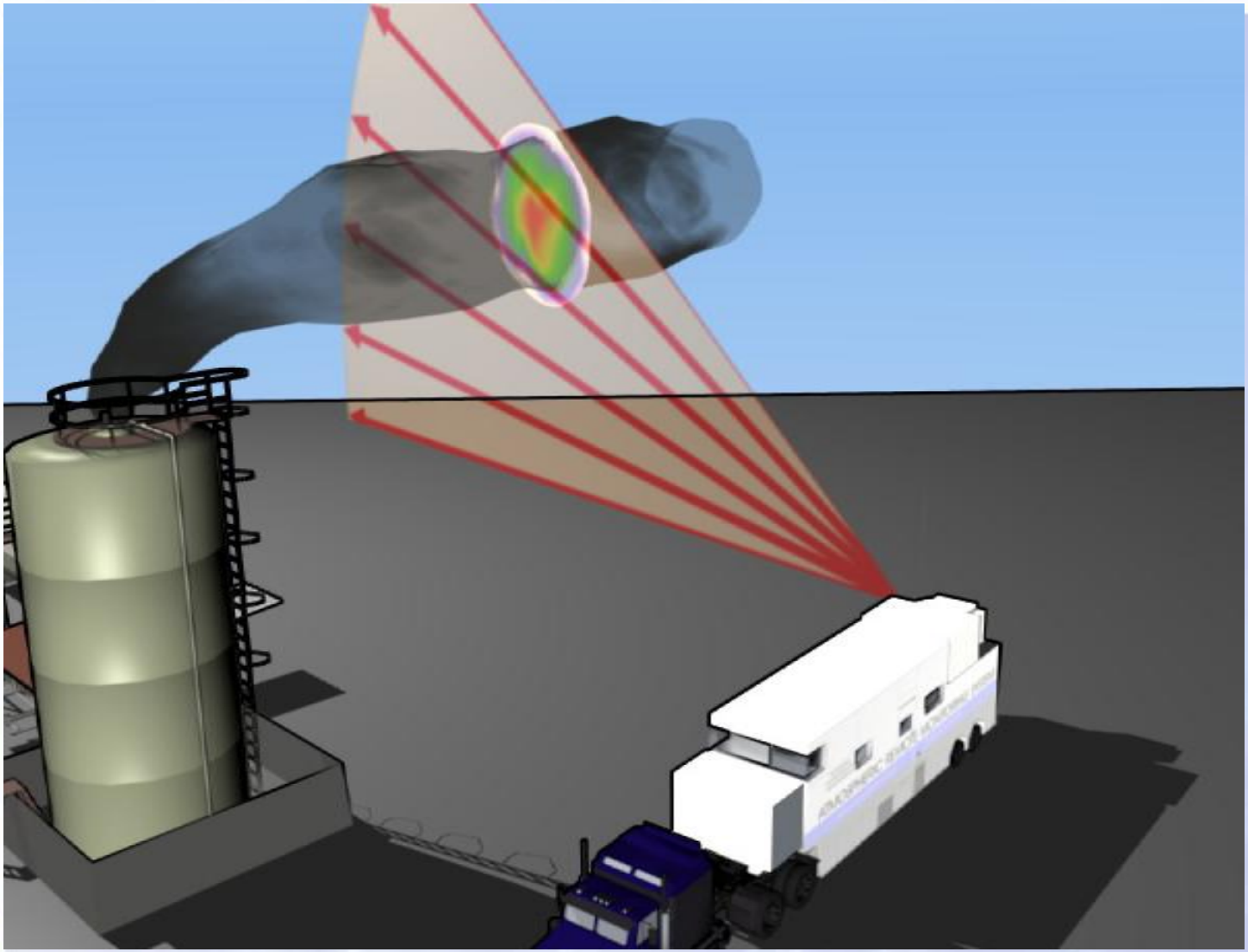
UV DOAS At Tonawanda Coke Corp.

April 2009

TCC UV DOAS Data: Benzene Came From TCC's Direction

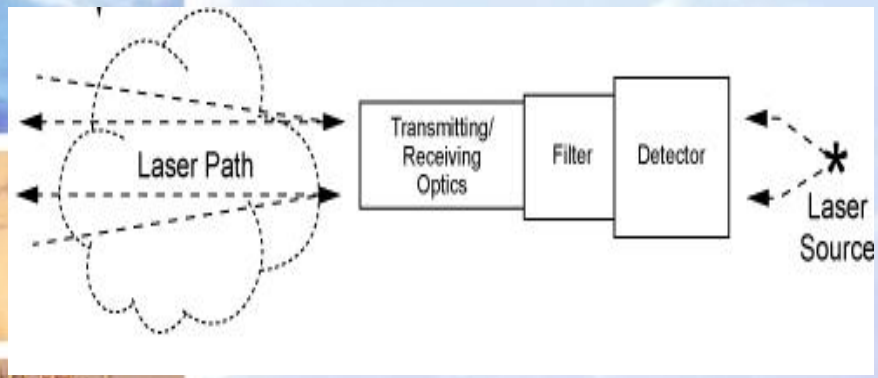


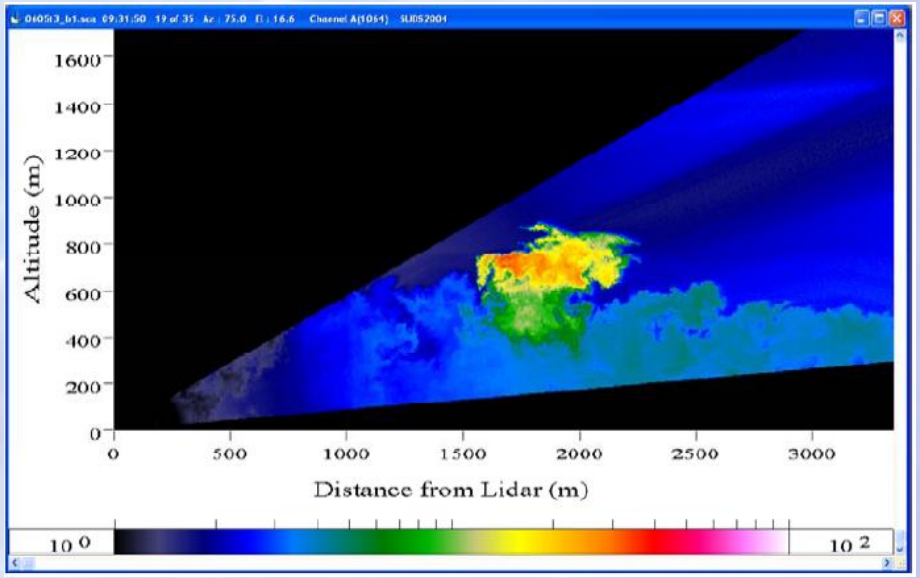
Differential Absorption Light Detection and Ranging (DIAL): What and How Much?



Differential Absorption Light Detection and Ranging (DIAL)

- Two lasers, one within the bandwidth of absorption, and one that is outside the bandwidth of absorption.
- The instrument then takes measurements of the amount of light that is back-scattered or reflected off dust particles in the air and subtracts out the difference between the reflected light from the non-absorbed laser and the reflected light from the absorbed laser to determine chemical concentrations.





Measuring VOC and Benzene Emissions with DIAL

- DIAL: Differential absorption lidar, uses an IR laser to measure VOC and a UV laser to measure benzene.
- Lasers measure the absorption profile across an elevated path to obtain concentration profile.
- Wind speed sensors are used to measure the wind profile.
- VOC and benzene mass emission rates are calculated from the product of gas concentrations and the wind velocity component perpendicular to the DIAL measurement plane.

36



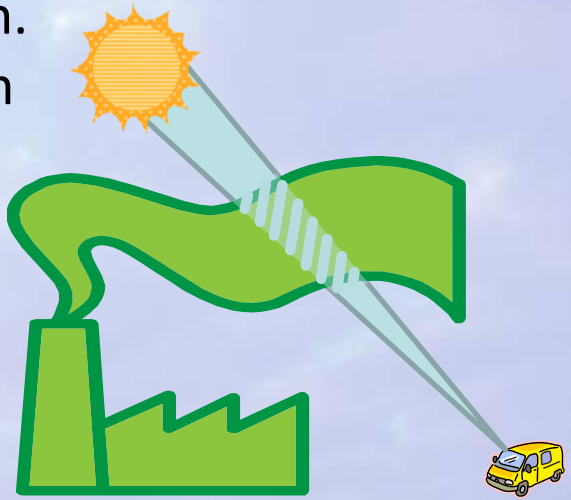




A Hypothetical Example Analysis of the Admissibility of Expert Evidence Based on a Cutting Edge Investigatory Technique

Applying *Daubert* to a New Technology: SOF

- What is Solar Occultation Flux (SOF)?
  - A measurement method that can determine the presence of a plume that contains certain compounds, and, if the source of the plume is identified, the emissions rate of the plume from the source.
  - Using the sun as a light source, a vehicle with FTIR spectrometry equipment takes measurements while being driven around a source. These measurements show a plume's location and the mass of the plume's cross-section.
  - The emissions rate of the compound from the source is calculated using 1) the spectrometry measurements 2) wind speed and direction at the time of the measurements, and 3) the slant angle of the sun and the plume/source relative to the vehicle.



Applying *Daubert* to a New Technology: SOF

- *Daubert* Factor 1: Has this technique been tested?
  - The components of the SOF methodology are all based on well-established, well-tested, widely-accepted principles. Some of these components include:
    - Using FTIR spectrometry to determine which compounds are present in a plume
    - Calculating an emissions rate based on mass and a wind vector
- *Daubert* Factor 2: Is the technique peer reviewed?
  - At least one peer-reviewed article has been published on SOF.
  - The individual calculations that make up the methodology are so well-established that they appear in textbooks.

Applying *Daubert* to a New Technology: SOF

- *Daubert* Factor 3: The error rate, and the existence of standards controlling operation
  - Error in SOF is primarily attributable to uncertainty regarding wind speed at plume elevation.
    - Swedish reports (generally not peer reviewed) have estimated error rate at about 35%, but acknowledge there is uncertainty with respect to the wind speed estimate.
    - Existing SOF equipment measures wind speed and direction at near-ground level and extrapolates from this the wind speed at the source height using a standard wind speed profile equation. In several U.S. studies the wind speed at altitude has been measured using GPS-equipped balloons to reduce (but not eliminate) uncertainty.
    - Error rate could be greatly reduced by directly measuring wind speed and direction at the source height at the time spectrometry readings are taken. Some error attributable to wind would remain, based largely on uncertainty as to plume height.
  - *How a court might treat error rate for SOF:* Error rate may be more relevant to the weight testimony should be given than its admissibility. A court is likely to admit SOF for finding emissions that greatly exceed allowable thresholds (ex: beyond the margin of error). SOF may not be admissible if the permitted emissions are within or close to the uncertainty boundaries of the measured emission rates .







Applying *Daubert* to a New Technology: SOF

- *Daubert* Factor 4: Widespread Acceptance?
  - The individual principles that make up the SOF methodology are very well-established and widely accepted.
  - The method as a combined whole is widely accepted within the narrow community where it is currently used. SOF is primarily used now in Sweden and other European countries but has been used several times in the Houston Ship Channel.







Applying *Daubert* to a New Technology: SOF

- *Reliably applying the method*: SOF must be conducted properly.
- For example:
  - SOF must be used on days with full sun.
  - SOF is best used in the middle of the day, when the sun is high in the sky and unlikely to be obstructed by buildings/structures.
  - SOF is best used on days with low humidity (as water vapor can interfere with mass measurements).
  - SOF must be used on days with transport winds – not with no/low or variable winds.
  - The driving route must intersect the plume in order to allow calculation of the mass and emissions rate for the whole plume.
  - If the goal is to measure emissions rate, knowledge of the specific source location is important.

Animation Useful to the Trier of Fact or Unduly Prejudicial?

- Federal Rules of Evidence 401 – 403
  - Relevant
  - Material
  - Competent
  - Fair

Play Model Simulation