



**Heath Consultants Incorporated**  
**EPA Subpart W Compliance**  
**Leak Detection, Monitoring, Measurement**  
**and Calibration.**

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**Heath Consultants Incorporated**  
**Wednesday, October 23, 2013**

# Agenda

- Screening Methods & Technologies
- Measurement Requirements,  
Approach and Technologies
- Calibration Requirements

# Screening Methods

*How to detect leakage*

- **Gas Imaging Camera (Passive Infrared)**
- **Illuminated Infrared Laser Detector (Active Infrared)**
- **Method 21 using conventional Flame Ionization or Catalytic Oxidation, Thermal Conductivity.**

# Top 4 Required Direct Measurement Fugitive Sources

- Reciprocating Compressor Packing
- Blow Down Valves
- Unit Valves
- Scrubber Dump Valves

“Follow the vent line to insure you have the correct source”.



# Heath Approach to Leak Screening and Monitoring

➤ Significant Emission Sources should be screened with a Gas Imaging Camera or Method 21 Tool to determine if Direct Measurement is required.

➤ (Discuss technicalities of the rule in regard to blowdowns.)



# What does passive plume imaging look like



Source: Heath Consultants Incorporated

# Eye-C-Gas Imaging of Storage Tank Emissions – Leaking Scrubber Dump Valves

Scrubber Dump Valve Leakage through Condensate Storage Tank



Storage Tank Emissions



Source: Heath Consultants Incorporated

# Gas Imaging Video Recordings

Video recording of fugitive leaks detected by Heath Consultants using the Opgal Eye-C-Gas thermal infrared Gas imaging camera



# Screening Difficult to Reach Vent Stacks With Electronic Screeners (Method 21) – The Benefits.



# Leak Detection Instrumentation should be approached by application.

- The Gas Imaging Camera is the right Choice for Tanks, Blow down Stacks and Open Ended Lines.
- Use of the Illuminated Infrared Methane Laser Leak Detector is an ideal choice for connectors, flanges, Tube Fittings >1/2 inch & difficult to reach piping.



# Method 21 Screeners or Sniffers



Pump Driven CGI



Pump Driven Infrared  
Methane Detectors or  
Flame Ionization

## Picarro Solution: Drive, and Let the Atmosphere Carry The Methane to You!

•**TRIAGE:** figure out where the leaks are (and aren't) at a distance, without stopping the car



GPS + Fast,  
High  
Precision,  
Mobile CH<sub>4</sub>  
Measurements

•**LOCALIZE:** if you see a leak, use the wind to understand where the source of the gas is



Wind Field  
Awareness  
While Driving

•**ATTRIBUTE:** don't get confused by the cows!

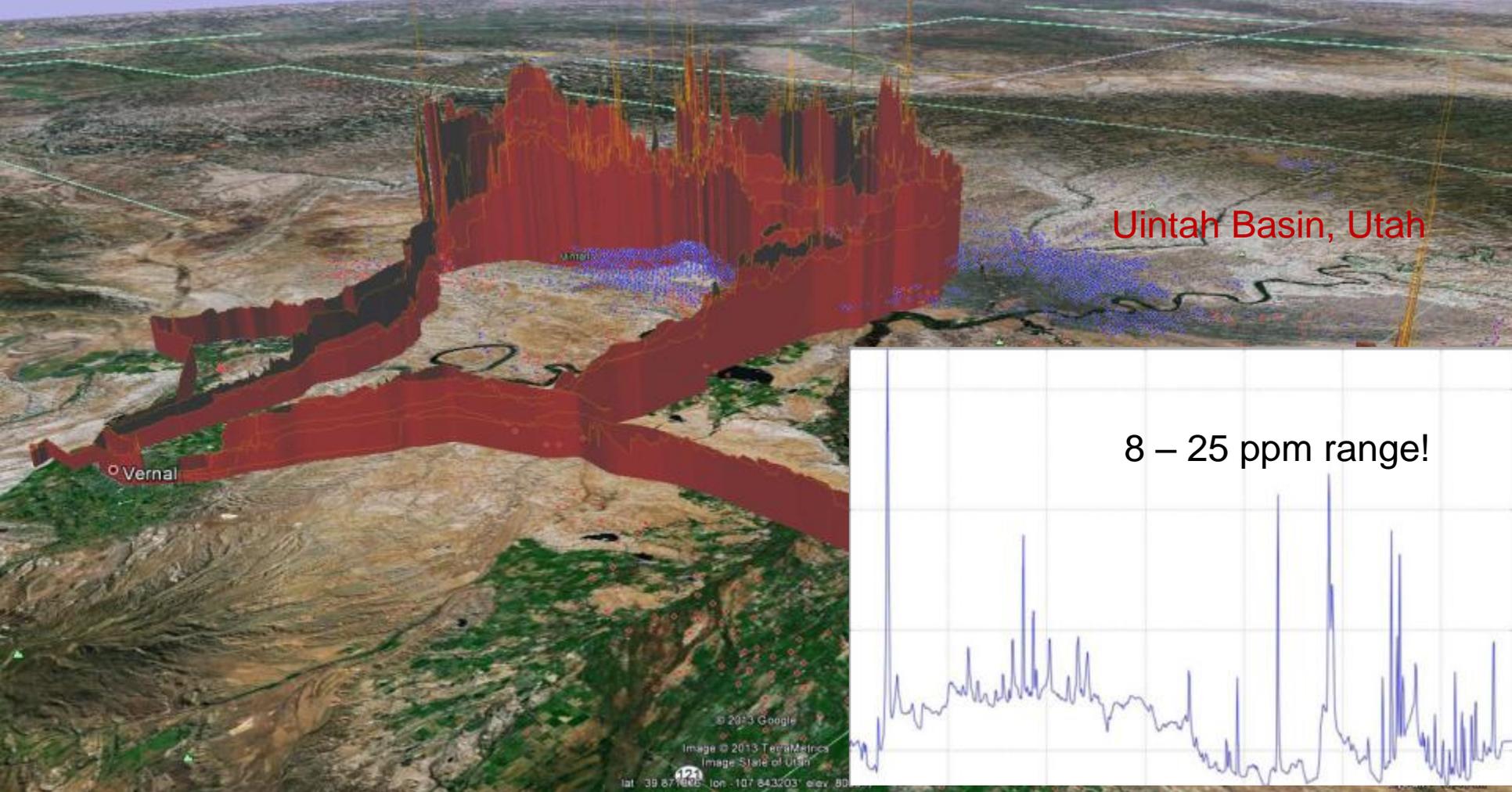


Mobile 13CH<sub>4</sub>  
Measurements

•**QUANTIFY:** concentration means (almost) nothing – the only thing that matters is emission rate



CH<sub>4</sub> Plume  
Scanner



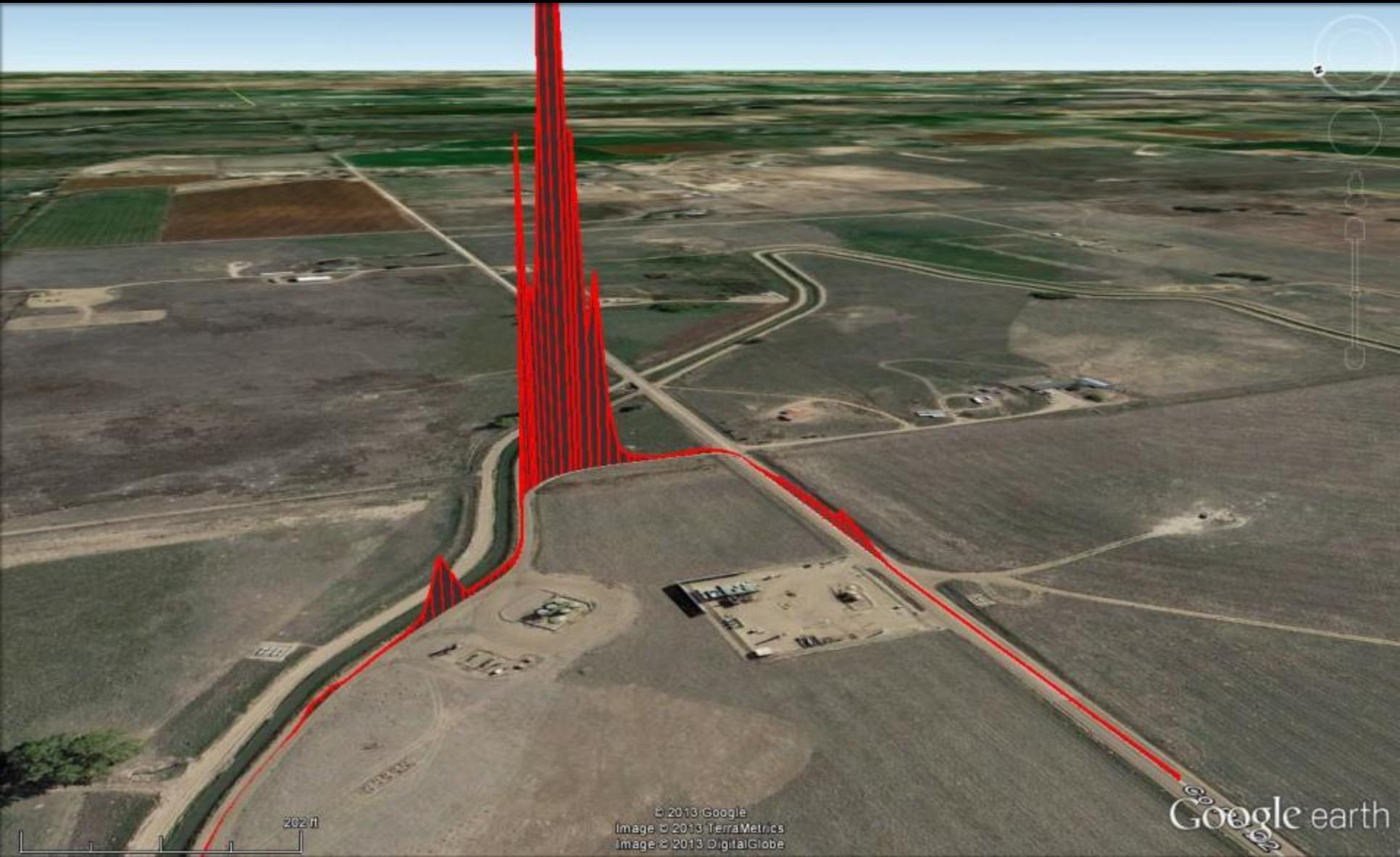
**Concentrations 3-5X above background levels over 100's of square miles ... all from natural gas extraction!**

**Lots and lots of individual emission sources**

# Example: Compressor Station in the Denver – Julesburg Basin



# 45 Second Drive Around Compressor Station Detects Multiple Methane Plumes



# Measurement Methods

- For leaks up to 10 cfm – Hi Flow Sampler  
10.5 cfm @ \$5/Mcf = \$27,594
- For leaks 10 – 240 cfm – Vent-Bag Method  
50 cfm @ \$5/Mcf = \$131,400  
100 cfm @ \$5/Mcf = \$262,800
- For leaks >180 cfm – Anemometer or Thermal Flow Meter
  - Used only on vertical open ended lines



# Hi Flow Sampler Applications



- **Advantages:**
- Total Leak Capture
- Measures Leak Rate Directly
- Accuracy of Calculated Leak Rate = +/- 5 % of reading
- Can Measure 30 components per hour
- Repair Decision Based on Leak Rate & Repair Costs

# Rod Packing Seals – They ARE leaking so skip screening and perform “Direct Measurement”



# Heath Approach to Measuring Rod Packings

➤ Rod Packing Measurements can only be done reliably with a Hi Flow Sampler.

➤ Measure Rod Packings for Total Volume outside of building

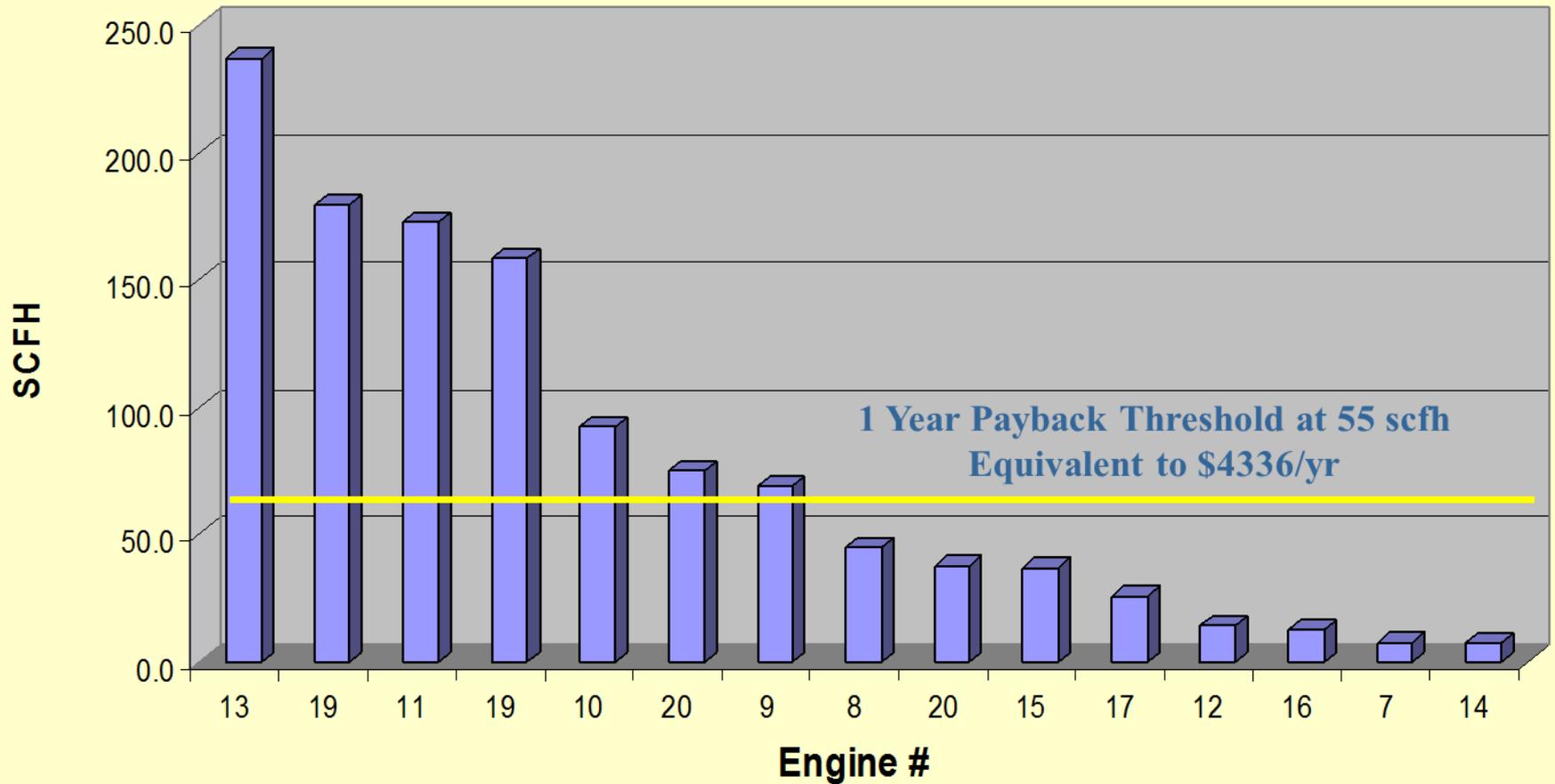
Or

➤ Measure Rod Packing Leak Rates at the compressor

➤ This task requires training, skill and experience.



## Rod Packing Leak Rates at Oklahoma Compressor Station



# 3 Cubic Foot Calibrated Vent Measurement Bag



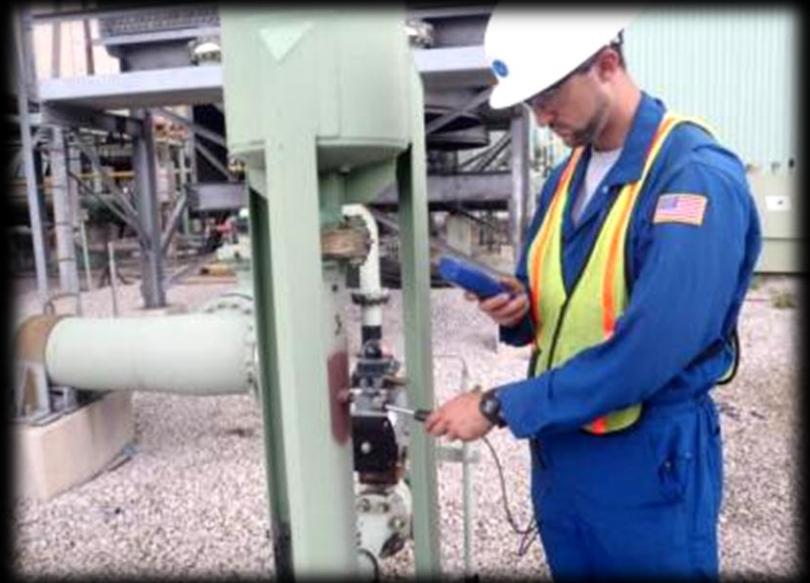


# Acoustic Leak Detection

- Estimate through-valve leakage
  - Ultrasonic measurement
  - Leak is  $>3.1$  scf per hour
  - Requires data on valve type, size, and differential pressure
  - Readings upstream and downstream of valve, and on valve body.
- Software estimates the leakage rate depending on decibel level.



# Other Alternatives to Vent Stack Measurements using an Anemometer.



# Calibration Requirements

- For Subpart w sources, flow meters, pressure gauges & composition analyzers calibrated per §98.3(i) & §98.234(b)
  - ASTM, ANSI, AGA, ASME, API, etc. methods
- §98.3(i) (General Provision) addresses calibration requirements for flow meters and other measurement devices
  - §98.3(i)(1)(i): All measurement devices must be calibrated according to one of the following:
    - Manufacturer's recommended procedures, or
    - An appropriate industry consensus standard, or
    - Method specified in a relevant subpart of this part
- Document calibration method(s) in the Monitoring Plan

# Instrument Calibration

- Initial calibration shall be conducted by the date that data collection is required to begin
- §98.3(i)(4)-(6) include permitted calibration exemptions
- Recalibration frequency specified in subpart or recommended by manufacturer industry consensus standard practice [§98.3(i)(1)(iii)(B)]
- Document calibration method(s) in the Monitoring Plan
- Consult checklists for a more detailed summary of requirements.



# Questions?



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