



# Stack Testing Mass Emissions Parameters

Presented by Mike O'Brien and Levi Richardson

– GAS, Inc.

# About Us

- Nationwide Emissions Testing and LDAR services
- Local presence in Colorado
- Family owned and operated with over 20 years experience



# What are we here to talk about?

- Parameters when Measuring Mass Emissions
- CDPHE guidance
- Address any confusion out there
- Q & A (Interactive discussion)



# Methods for Measuring Mass Emissions.

- Method 2 (Volumetric Flow Rate via outlet)
  - “Post Combustion”
- Method 19 (Fuel reading via inlet)
  - “Pre Combustion”



# Mass Emissions Measuring

## Method 2

$$V_s = K_p C_p \sqrt{\Delta P_{avg}} \sqrt{\frac{T_{s(abs)}}{P_s M_s}}$$

- Average stack gas velocity (ft/sec)
  - $\Delta p$  average
    - Average of pitot tube readings taken in accordance with EPA Method 1
  - Molecular weight of stack gas
  - Barometric pressure at the site

# Mass Emissions Measuring

## Method 2

$$Q = 3600(1 - B_{ws})V_sA \left[ \frac{T_{std}P_s}{T_{s(abs)}P_{std}} \right]$$

- Now that we have average stack gas velocity - it becomes a key variable in calculating the stack gas flow rate. Others include:
  - Moisture in gas stream
  - Stack diameter
  - Temperature measured from within the stack

# Mass Emissions Measuring

Method 19

$$F_d = \frac{K(K_{hd}\%H + K_c\%C + K_s\%S + K_n\%N - K_o\%O)}{GCV}$$

- Fd – This is derived from Method 19
  - Fuel specific oxygen-based F Factor
- When determining the Fd: Per EPA Method 19 FAQ: “We do not sanction the use of the default F-factor for fuels published in Method 19, Table 19-2, for emissions flow rate calculation.

# Mass Emissions Measuring

## Method 19

$$Q_s = Fd(H)(20.9 / (20.9 - O_2))$$

- The three key components for this equation are Fd, Heat Input, and Oxygen
  - We already established our Fd from the Method 19 calculation
- (H) = The heat input rate = fuel feed rate in cubic feet per minute \* the fuel heat content of the gas as 10<sup>6</sup>
  - This requires both the fuel analysis and the fuel meter
  - Obstacles and Hurdles



# CDPHE Guidance

Agencies guidance for determining mass emissions for compliance testing – not portable analyzer

- If EPA Methods 1-4 are not to be utilized for compliance testing; then Method 19 can be used; but with stipulations
- At least one run utilizing Methods 1-4 alongside Method 19
  - Results must agree within 10%

# CDPHE Guidance

Agencies guidance for determining mass emissions for compliance testing

- Calibrated fuel meter must be used; calibration within last 180 days
- Fuel sample of fuel burned for testing
- Expectation is that the use of Method 19 meet the above quality assurance procedures



# Questions

# Resources

From EPA Method 19 FAQ page

- [www.epa.gov/sites/production/files/2016-08/documents/method19\\_faq.pdf](http://www.epa.gov/sites/production/files/2016-08/documents/method19_faq.pdf)
- [www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr60\\_main\\_02.tpl](http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr60_main_02.tpl)
- [https://www.colorado.gov/pacific/sites/default/files/AP\\_Compliance-Test-Manual.pdf](https://www.colorado.gov/pacific/sites/default/files/AP_Compliance-Test-Manual.pdf)



# Thank You.



Mike O'Brien



781 - 706 - 9185



mikeobrien@gasinc.us



www.gasinc.us