Continuous Particulate Matter Emission Monitoring Using PM CEMs

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Source Testing in the New Regulatory World

Craig Clapsaddle

Topics to Cover Today

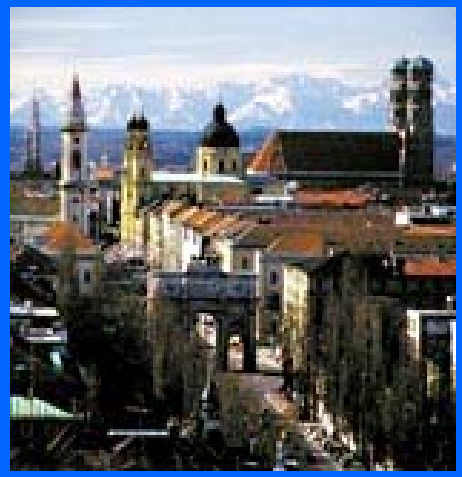
- Why are PM CEMs important
- Historical development/use of PM CEMs
- Types of PM CEMs
- Advantages/disadvantages
- PS-11 and Procedure 2

Why are PM CEMs Important?

- Opacity correlates poorly to PM emissions
  - No less than 14 NSPS have opacity monitoring
  - All States have opacity monitoring
  - PM CEMs can address the shortfalls of COMs
- Title V CAM plans
- Scrubbed stack PM monitoring
- New coal-fired power plant permits
- Technology now available to measure PM emissions in units of the standard

Historical Perspective

- 1964 – German Federal Law for Citizens
  - Continuous PM monitoring of industrial plants
  - No monitors were yet available
  - Started monitor development and field study
- 1974 – German Federal Law of Env. Protection
- 1983 – German power plants
- 1990 – German waste incinerators



Historical Perspective (B)

- 1970's U.S. EPA does several correlation studies
- 1975 – EPA Promulgates PS-1 for opacity
- 1976-77 – University of Windsor field study
  - 2 opacity monitors
  - 1 light scatter monitor
  - 1 charge transfer monitor
  - 1 beta gauge monitor

- 1980 – Last EPA funded study on PM mass conc monitor

Historical Perspective (C)

- 1995 – EPA OSWER begins looking at PM CEMs for HWC MACT
  - 3 field evaluations
  - Proposed PS-11 in April 1996

- 1997 – EPA OSWER NODA
  - Second proposed PS-11 in Dec. 1997

Historical Perspective (D)

- 1999 – EPA OAQPS EMC does field study

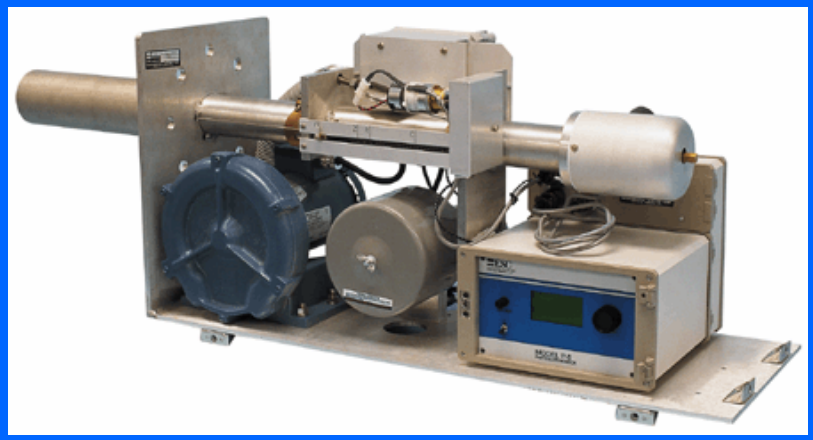
- 2001 – EPA reproposes PS-11 in Dec.
- 2002 – Comments and public hearing
- Promulgate a final PS-11 and Procedure 2?

Types of PM CEMs

- Light scatter
  - Forward, side, backward
- Beta Attenuation
- Probe Electrification (charge transfer)
- Light Extinction (opacity)
- Optical Scintillation

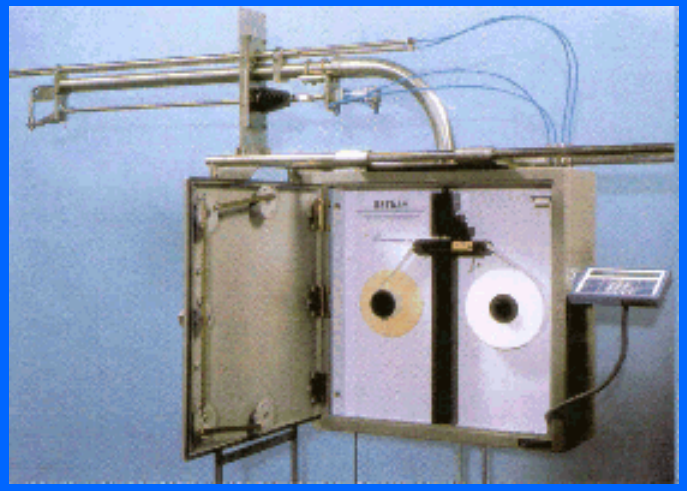
Light Scatter PM CEMs

- Sigrist KTNR & CTNR
- Durag DR-300-40
- ESC P5
- Sick RM210, FW 100, FWE 200
- Grimm Technology 6300
- ML 300L



Beta Attenuation PM CEMs

- MSI BetaGuard PM
- Durag F904K
- Environment S.A. 5M

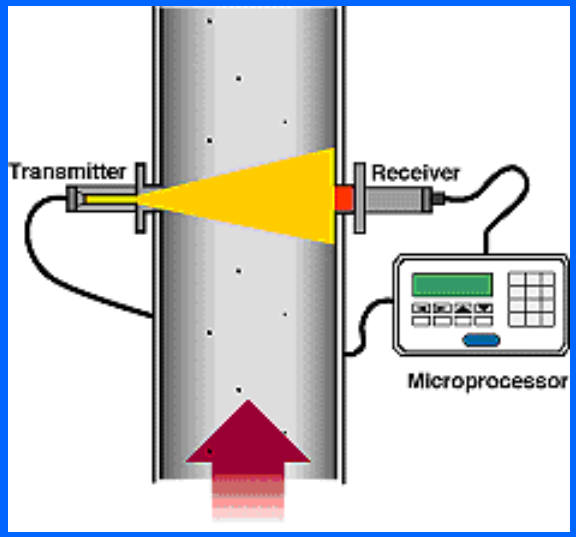


Probe Electrification

- PCME DustAlert
- Auburn Triboguard
- Codel StakGard

Optical Scintillation

- BHA CPM 5000
- PCME Scintilla SC600



Opacity

- Land Combustion 4500
- Durag DR-280 and 290
- KVB Enertec MIP
- ML/USI 560
- Rosemount OPM 2000R
- Phoenix OPAC 20/20
- Sick OMD41
- TECO 440

Light Scatter Adv./Disadv.

- Low price $10-15,000
- Easy to install
- Low maintenance
- Sensitive to low PM concentration
- Effective after FF or multi-stage APC
- Measures secondary properties of PM
- Adversely affected by
  - Particle size, density, shape change
- IR light better than visible light
- Measures liquid drops as PM; can't be used after a scrubber

Beta Attenuation Adv./Disadv.

- Direct measure of PM concentration
- Not affected by particle characteristic changes
- Designed to work in wet stack applications
- More difficult to install
- Expensive $60-90,000
- Higher cost of ownership
- Sample extraction and transport

Probe Electrification Adv./Disadv.

- Inexpensive $5 – 10,000
- Simple to install
- Sensitive to low PM concentration
- Effective as bag leak detectors
- Adversely affected by
  - Particle charge (not after an ESP)
  - Particle size and velocity changes
- Measures liquid drops as PM

Opacity Adv./Disadv.

- 10,000+ already installed

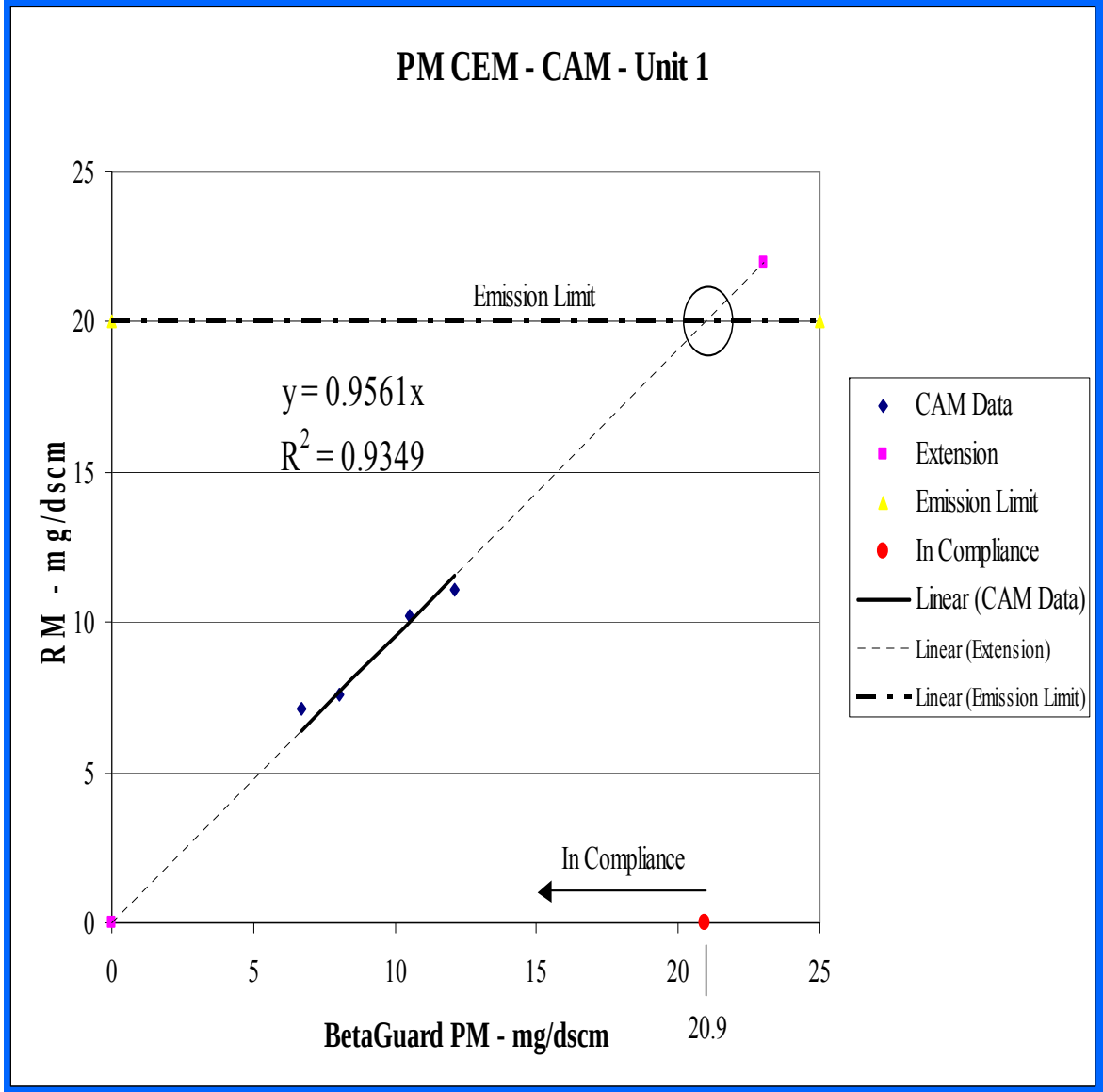
- Measures attenuation of light
- Adversely affected by
  - Particle size, shape, density changes
- Measures liquid drops as PM
- Not sensitive to low PM concentration
- Cost more than a light scatter PM CEM
- Correlation to mass conc. not linear

Optical Scintillation Adv./Disadv.

- Low price $10,000
- Easy to install
- Low maintenance

- Not sensitive to low PM concentration
- Doesn't detect particles < ~ 2μm
- Adversely affected by particle density change
- Measures liquid drops as PM

Title V – CAM for PM



Advantages of a PM CEM for CAM

- Most flexibility for process and control equipment operation
- A direct measure of pollutant of interest
- Measures real not probable excess emissions
- Can be upgraded from CAM to continuous compliance monitoring

PS-11

- Gives guidelines for selecting a PM CEM
- Gives installation location guidance
- Gives procedures for certifying a PM CEM
- Gives minimum performance limits
- Gives example calculations
- Will allow States and Regions to use better monitoring of PM emissions than opacity

Procedure 2

- Gives ongoing QC procedures for PM CEM
- Daily drift checks
- Quarterly audits (ACA and SVA)
- Annual check of correlation (RRA)
- Procedure for full verification of correlation (RCA)