Particulate Emissions- Combustion Source Emissions Dependent on Test Method

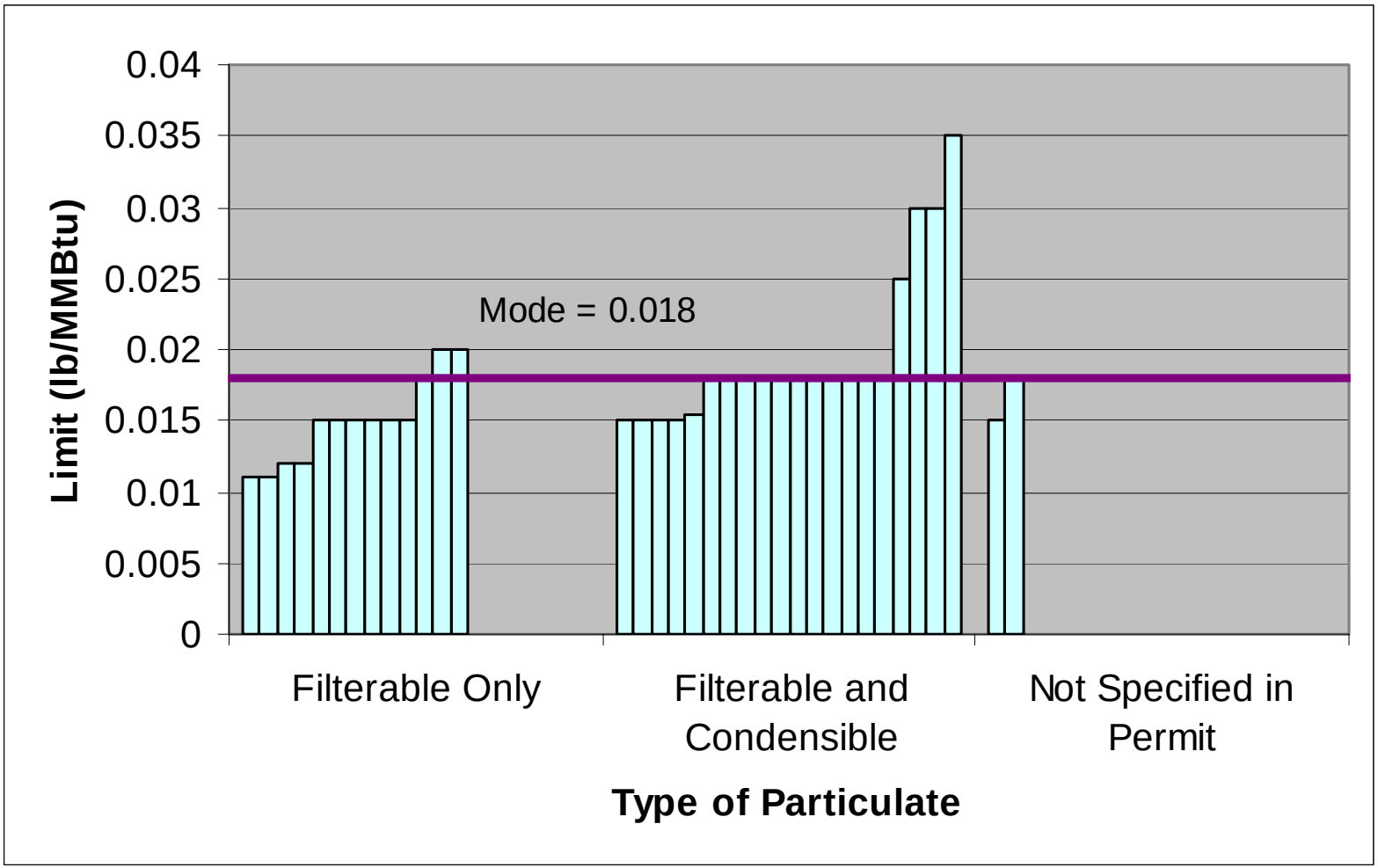
David Gaige and Robynn Andracsek
Burns & McDonnell

EUEC 2005

Recent BACT Determinations

- By definition, PM_{10} (and PM2.5) includes both the filterable and condensable particulate matter fractions.
- Many existing limits require only a filterable test, and are therefore only a filterable limit.
- The impinger, or “back half” of the sampling train is intended to capture condensable material.
- Applicable to combustion turbines also, but CTs are not addressed in this paper.

Recent PM10 BACT Limits



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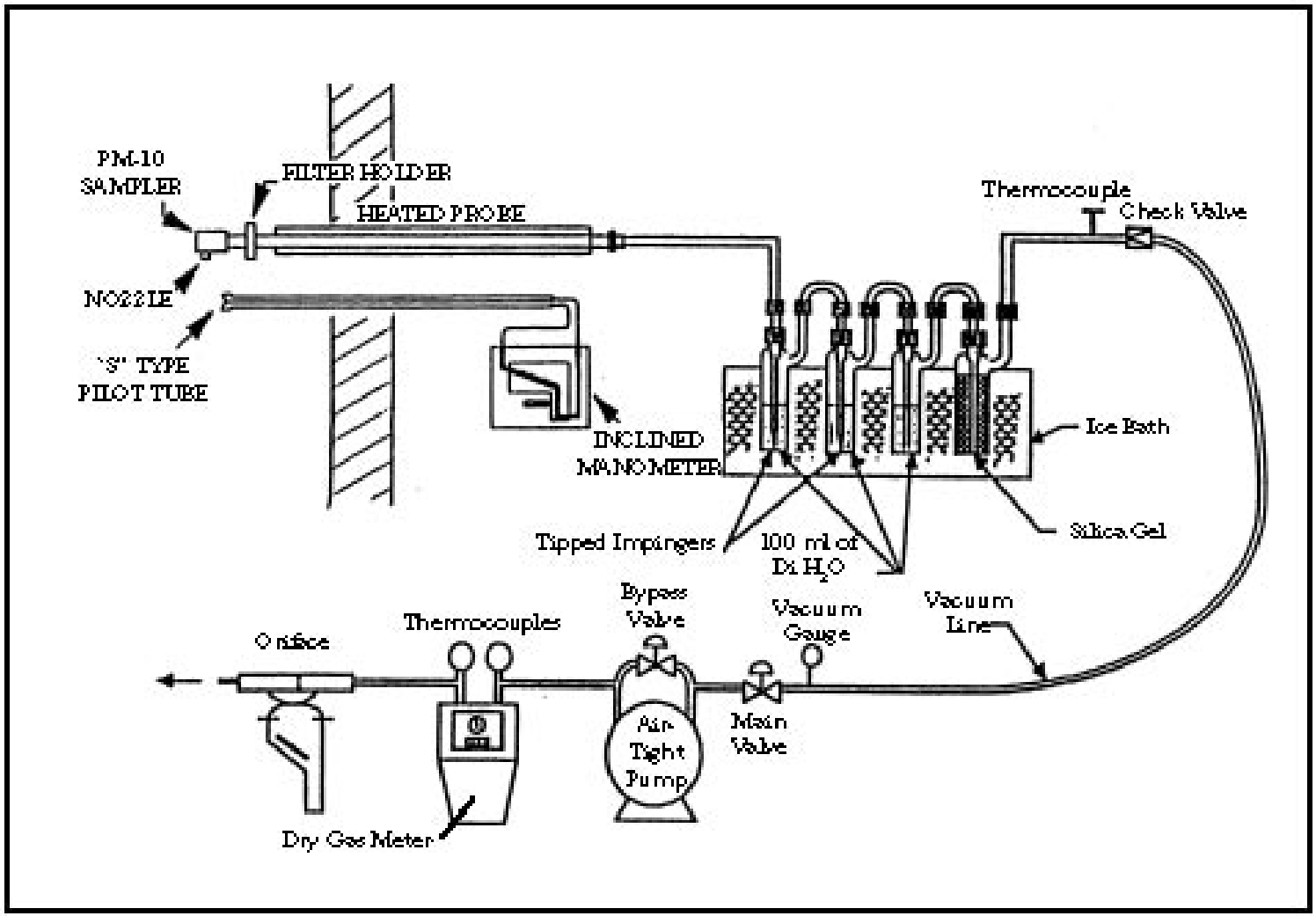
EPA Test Methods

Method	Particulate Size	Particulate Fraction
Method 5	Any size	Filterable
Method 201A	PM_{10} or smaller	Filterable
Method 202	PM_{10} or smaller	Condensible
State Methods	?	?

EPA Method 201/202 Sampling Train for PM_{10}



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Inherent Problems with Method 202

- "Artifacts"
  - Oxidation of SO_2 to SO_3 in the "back half" impinger
  - NH_3 slip from SNCR or SCR reacts in the impinger to form ammonium bisulfate NH_4HSO_4
  - Absorption of soluble NO_x components (e.g., N_2O_5)
- Created in the sampling system by the measurement technique itself

Inherent Problems with Method 202

- Known quantitative error in Method 202
- A substance which would be a gas is the atmosphere is erroneously converted to a particulate in the sampling train.
- These errors can amount to significant “false high” reporting of condensable PM_{10} in some cases

Possible Solutions (1)

- Nitrogen Purge
  - Removes the dissolved SO_2
  - May not eliminate the artifacts completely
  - Some SO_3 and SO_4 remain as well as ammonium chlorides
  - Even a small quantity of artifacts can yield non-complying test results since the limits are so tight

Possible Solutions (2)

- Controlled Condensate
  - New methods designed to simulate atmospheric dilution / condensation
  - H_2SO_4 and SO_3 acids condense; measured as condensible particulate
  - SO_2 will pass through and not be converted.
  - Not currently an approved EPA method

Precedents

- AES, Puerto Rico
- Prairie State, IL
- Springerville, AZ

AES Puerto Rico

- Draft permit limit: 0.015 lb/mmBtu, test Method 201A/202
- Final permit set a maximum limit of 0.05 lb/MMBtu if the limit of 0.15 lb/mmBtu could not be achieved
- Limit could not be reached
- Revised to 0.03 lb/mmBtu, 201A/202

Prairie State, IL

- Issued 1/14/05, 2 PC Boilers
- PM_{10} Limit
  - 0.035 lb/mmBtu, 201A/202
  - may be lowered to 0.018 after testing

Springerville

- PM defined as filterable portion only
- PM10 defined as filterable below 10 microns, plus condensable portion.
- Established limits:
  - PM – 0.015 lb/mmBTU, method 5
  - PM10 – 0.055 lb/mmBTU, method 201A/202

Filterable vs. Condensable PM_{10}

- What are unresolved issues?
  - Most APC equipment vendors will not guarantee condensable emissions.
  - State agencies are inconsistent regarding limits for PM_{10}
- How is the problem being addressed?
  - New test methods being developed for PM_{10} to avoid experiencing the Method 202 bias.
  - Permit limits for PM_{10} set with allowances for artifacts.

Emission Inventory Considerations

For Combustion source particulate emissions:

1. Recognize both filterable and condensible can be particulate.
2. Permit limits must be associated with the compliance test method.
3. Permit limits do not always represent actual emissions
4. Some test methods may overestimate emissions.
5. Factors may need to be developed to “adjust” emission estimates to equivalent values.

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Questions?