Boiler MACT
Floor Setting Options

March 3, 2009

Timothy Hunt, AF&PA

CIBO Quarterly Meeting

AF&PA®

Floor Setting Approaches

- Old approach
  - “Worst of the best” performing control technology
  - No longer viable!
- New approach
  - Limits based on performance of units with the lowest observed emission rates
  - Top 12% in each subcategory
  - Medical Waste MACT method
  - Limits needed even when MACT floor is “no control”

Possible subcategories

- EPA leaning towards:
  - 4 fuel types (gaseous, liquid, coal, biomass/ non-coal)
    - What happens with mixtures?
  - 2 sizes (large, small; cutoff at 10×10^6 Btu/hr)
  - Limited use
- More subcategories better
  - Similar units compared – avoid boiler replacement
  - Boiler design appears key – e.g., avoid fluidized bed units driving limits

Details for Floor Setting

- Pollutant-by-pollutant (Hg, HCl, PM as surrogate for metals, CO as surrogate for organic HAPs)
- Consider only emission test data from units in the lowest 12% of units with test data
  - Testing plan also focused on best performers
- Address variability using standard deviation of individual runs in the test data for the lowest 12% at the 99.9% upper confidence level:
  - Limit = $avg_{lowest\ 12\%} + 3.09*st.\ dev_{lowest\ 12\%}$

Possible Limits using "Med Waste" Methodology

- Reported emission test results for the lowest 12% in EPA's preliminary subcategories are ***loooow*** for HCl, Hg, CO and PM (filterable; Method 5 front-half)
- The 99.9% upper confidence level results in limits that are 2 to 6 times the average of the lowest 12% - still a ***loooow*** number
  - Factor of 10 to 100 times lower than before!

Characteristics of Boilers in Lowest 12%

- Usually a single (compliance) test result
  - Does not reflect
    - swinging or low load conditions
    - startup/shutdown/malfunction conditions
    - variations in fuel characteristics and mix
    - fluctuations in control device performance
    - test method variability
  - Units with multiple tests generally not in lowest 12%
  - CO short term tests of little value

Caveats

- Entries in EPA data base unchecked except for the most obvious errors – unit conversion issues possible
- Examples for boilers burning biomass are only for pulp & paper mill boilers and test results that are in the EPA data base
- Coal examples include test results in the data base for all coal boilers, not just pulp & paper mill boilers
- *Note*: Thanks to NCASI's John Pinkerton

Derivation of "Med Waste" Floors for Biomass P&P Units

Biomass/ P&P (all units)	PM lb/10^6Btu	HCl lb/10^6Btu	Hg lb/10^{12}Btu	CO lb/10^6Btu
N with tests	123 (279)	61 (123)	64 (122)	44 (165)
Average	0.058 (0.1)	0.017 (0.024)	1.96 (2.1)	0.38 (.93)
Average lowest 12%	0.0034 (0.0025)	0.00026 (.00015)	0.10 (0.13)	0.019 (0.037)
99.9% UCL	0.0092 (0.0053)	0.00064 (0.00045)	0.34 (0.45)	0.055 (0.093)

The Good, the Bad, the Ugly

Biomass	PM lb/10^6Btu	HCl lb/10^6Btu	Hg lb/10^{12}Btu	CO lb/10^6Btu
Vacated MACT Limit Solid Fuels	0.07	0.09	9	none
NACAA Suggested Limit for Biomass	0.01 - 0.02	0.006 – 0.012	2.5 – 4.5	0.1 – 0.15
99.9% UCL from database	0.009	0.00064	0.34	0.055

Derivation of “Med Waste” Floors for Coal Units

Coal/ All sectors	PM lb/10^6Btu	HCl lb/10^6Btu	Hg lb/10^{12}Btu	CO lb/10^6Btu
N with tests	205	160	121	49
Average	0.057	0.083	4.2	0.19
Average lowest 12%	0.0017	0.0022	0.37	0.0057
99.9% UCL	0.014	0.0095	1.3	0.018

The Good, the Bad, the Ugly – Take II

Coal	PM lb/10^6Btu	HCl lb/10^6Btu	Hg lb/10^{12}Btu	CO lb/10^6Btu
Vacated MACT Limit Solid Fuels	0.07	0.09	9	none
NACAA Suggested Limit for Coal	0.008 - 0.012	0.015 – 0.03	4.5–7.5, 90% red.	0.025 – 0.4
99.9% UCL from database	0.014	0.0095	1.3	0.018

Avoiding the "Uber" Facility MACT Floor

- Med Waste comments criticized EPA for "cherry picking" data – best of the best, theoretical composite
  - No facility exists that meets all HAP limits
- Instead create a "pool" of ALL best performers for all four HAPs
  - Mix top 12% data with available test data for that HAP from other top performers of the other HAPs
  - Calculate average emissions for each HAP and apply variability factor (maybe less adjustment since more diverse to begin with)

All-Round Honor Roll Analogy

- How to define the best all round (renaissance) high school students in math, English, music and soccer?
- Med Waste would say perform at 94th percentile in each area - no one A+ in each “subject”
- “4-P MACT Pool” says take top math students, English students, etc and set performance benchmarks so most in group can be on the Honor Roll

“4-P MACT Pool” Approach: Biomass Units

Biomass/P&P	PM lb/10^6Btu	HCl lb/10^6Btu	Hg lb/10^{12}Btu	CO lb/10^6Btu
No. of Boilers with tests	32	26	23	16
Average Emissions	0.018	0.016	1.6	0.27
99.9% UCL*	0.1	0.11	11.7	2.2
Vacated solid fuel limits	0.07	0.09	9	none
Ratio 99.9%UCL/avg (variability)	5.6	6.9	7.3	8.1

Two other 4-P approaches: P&P biomass units

1. Use units with HAP test data for all four HAPs then calculate top 12% for each HAP in turn
   - very low limits
2. Use only units with data for all four HAPs and then "optimized" to single HAP (e.g., PM)
   - Stringent PM, better limits for other 3 HAPs
   - Optimize for other HAPs?
   - Do for coal, etc?
   - Wait for EPA reaction?

4-P and tests for all 4 HAPs: biomass pulp and paper

P&P burning biomass	PM lb/10^6Btu	HCl lb/10^6Btu	Hg lb/10^{12}Btu	CO lb/10^6Btu
Averages for 18 boilers with tests for all 4 pollutants	0.071	0.019	1.74	0.45
Averages for lowest 5 of these 18	0.0028	0.0003	0.16	0.022
Average + 3 SD of runs for lowest 5	0.008	0.0007	0.6	0.078
Vacated solid fuel limits	0.07	0.09	9	none

4-P “optimized” to PM limit

P&P burning any biomass	PM lb/10^6Btu	HCl lb/10^6Btu	Hg lb/10^{12}Btu	CO lb/10^6Btu
Averages for the 123 boilers with PM tests	0.058	0.017 (64 boilers)	2.04 (62 boilers)	0.39 (41 boilers)
Averages for the Lowest 15 for PM	0.0034	0.027 (10 boilers)	2.14 (8 boilers)	0.14 (7 boilers)
Average + 3 SD of avgs.	0.007	0.13	13.3	0.51
Vacated solid fuel limits	0.07	0.09	9	none

What's Next?

- Develop legal arguments
  - may need to adjust variability factor (3 vs 2 SD) to exclude some "top performers"
  - Other incites
- Consider more subcategories – sufficient data?
  - boiler type for biomass units – at least for CO
  - Intermediate size: 10 to 100 MM Btu?
  - Sector only – forest product?
- Alternative ways to consider variability
  - HAP testing will provide new data that could help or hurt
    - Include units with wide spread of performance in floor?
  - Eliminate compliance tests from floor? How identify?
- Engage EPA – define boundaries of alternative approaches

Questions

- Great opportunities to work together with CIBO
- And DIE together!

tim_hunt@afandpa.org

202-463-2588