NALCO Mobotec

Boiler MACT Hot Topic Hour

March 10, 2011

Boiler MACT

- Boiler MACT is:
  - MACT – Maximum Achievable Control Technology
  - Air Toxics
  - HAPS – NESHAP
  - CAA – 112
- Quick Rule Summary
- Synthetic Area Source (HCl reduction)
- Fuel Definitions/Issues
  - CISWI (RCRA fuels)
- Solutions
  - PM, CO, HCl, Hg, D/F
- Nalco Mobotec Solution Summary

Nalco Mobotec Focus

- Nalco Mobotec's Focus
  - Existing Sources
  - Major Sources
  - Solid Fuels (including CISWI)

- Boiler MACT
  - Regulates 188 HAPs, directly or via surrogates

- Major source
  - Greater than 10 tons per year of one HAP
  - Greater than 25 tpy of multiple HAPs

  - PM and CO are not HAPs

Simple Summary

- PM 0.039 lb/MMBtu
  - PM is a surrogate for non-Hg metals HAPs
  - ESPs can get there, but they must work well (99.X% removal)
- CO limits vary depending on unit type
  - CO is a surrogate for non-dioxin/furan organic HAPs
  - Tuning or combustion modifications will likely be sufficient
- HCl 0.035 lb/MMBtu (= 25 ppm @ 6% O_2 dry)
  - HCl is a surrogate for acid gas HAPs
  - Scrubbers will get them; otherwise, duct sorbent injection
- Hg 4.6 lb/TBtu
  - Hg is a HAP and is regulated directly due to bioaccumulation
  - Oxidizers and activated carbon
  - Fuel and backend dependent (survey equipment & stack temperature)
- Dioxin/Furan (D/F) limits vary depending on unit type
  - D/F are HAPs and are regulated directly due to bioaccumulation
  - Reachable with good combustion (will vary with CO)

Synthetic Area Source

- Area Source
  - Emits < 10 tons per year of any one HAP
  - Emits < 25 tons per year of multiple HAPs
- HCl is the only HAP that will commonly exceed 10 tpy
- **Synthetic Area Source:**
  - Install DSI to reduce HCl to potentially qualify as an Area Source
- Other HAPs that "might" be able to contribute to the 25 tpy limit:
  - Chlorine (Cl_2) – unlikely to reach 10 tpy for any boiler
  - Hydrogen fluoride (HF) – unlikely to reach 10 tpy for any boiler
  - VOC HAPs (only an issue for some combustion processes)
    - Acetaldehyde, Benzene, 1,3-Butadiene, Formaldehyde, Hexane
  - Metals – unlikely to reach 10 tpy for any boiler
    - Arsenic Compounds, Beryllium Compounds, Cadmium Compounds, Chromium Compounds, Cobalt Compounds, Lead Compounds, Manganese Compounds, Mercury Compounds, Nickel Compounds, Radionuclides, Selenium Compounds

Final Area Source Limits

Area (Minor) Source (not a major source)

Existing/ New	Fuel	Paticulate Matter (PM) [lb/MMBtu]	Hydrogen Chloride (HCl) [lb/MMBtu]	Mercury (Hg) [lb/TBtu]	Carbon Monoxide (CO) [ppm @7% O2]	Dioxin/Furans (Total TEQ) [ng/dscm]
Existing	Coal	--	--	4.8	400	--
Existing	Biomass	--	--	--	--	--
Existing	Oil	--	--	--	--	--
New	Coal	0.03 (0.42)	--	4.8	400	--
New	Biomass	0.03 (0.07)	--	--	--	--
New	Oil	0.03	--	--	--	--

Limits in (brackets) are for smaller units, < 30 MMBtu/hr

For even smaller units, < 10 MMBtu/hr, work practice standards apply

Note that everything (e.g., PM) may still be regulated by other regulations and/or permitting processes. There may be GACT requirements. Always check for overlapping regulations!

What is my fuel category? (Major Source)

- Fuel Categorization is by annual heat input basis

- Solid Fuel
  - Burns more than 10% solid fossil fuel (not solid waste!)
  - If it burns more than 10% biomass then it is “biomass fired”
    - Biomass boilers have organic HAP concerns (CO surrogate)
  - Otherwise it is “coal fired”; includes, but not limited to:
    - Coal
    - petroleum coke
    - tire derived fuel (TDF)

- Liquid
  - If < 10% “solid fuel” and > 10% liquid = “liquid fired”
  - Two categories: continental and non-continental

- Gas
  - If none of the above, then “gas fired”
  - Two categories: Gas 1 (NG & refinery gas) and Gas 2 (other)

More on Solid Fuels

- Traditional fossil fuels are still fuels
  - Coal
  - Oil
  - Natural gas
- Biomass fuels are:
  - Biomass or bio-based solid fuel means any solid biomass-based fuel that is not a solid waste
- Coal fired includes:
  - Coal
  - petroleum coke
  - tire derived fuel (TDF) – RCRA issues…
- Solid Waste
  - Solid wastes are burned in an incinerator (CISWI MACT)
  - Solid wastes are defined by RCRA
- Hazardous Waste
  - Something entirely different (and heavily regulated)

RCRA - Resource Conservation and Recovery Act

- Identification of Non-Hazardous Materials That Are Solid Waste

- This Resource Conservation and Recovery Act (RCRA) final rule identifies which non-hazardous secondary materials are, or are not, solid wastes when burned in combustion units. Under the rule:
  - Units that burn non-hazardous secondary materials that are solid waste under RCRA would be subject to the section 129 Clean Air Act (CAA) requirements
  - Units that burn non-hazardous secondary materials that are not solid waste under RCRA would be subject to the section 112 CAA requirements.

- In general, non-hazardous secondary materials burned in combustion units are identified as solid wastes unless:
  - The material is used as a fuel and remains within the control of the generator and it meets the legitimacy criteria;
  - The following materials have not been discarded in the first instance and meet the legitimacy criteria when used as a fuel:
    - scrap tires removed from vehicles and managed under an established tire collection program
    - resinated wood residuals;
  - The material is used as an ingredient in a manufacturing process that meets the legitimacy criteria;
  - The material has been sufficiently processed to produce a fuel or ingredient that meets the legitimacy criteria; or
  - Through a case-by-case petition process, it has been determined that material handled outside the control of the generator has not been discarded and is indistinguishable in all relevant aspects from a fuel product.

Final Major Source Limits

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Major Source (facility > 10 t/yr of a single or > 25 t/yr of 2 or more HAP)

Existing - New	Fuel	Firing Method	Paticulate Matter (PM) [lb/MMBtu]	Hydrogen Chloride (HCl) [lb/MMBtu]	Mercury (Hg) [lb/TBtu]	Carbon Monoxide (CO) [ppm @3% O2]	Dioxin - Furans (TEQ) [ng/dscm]
Existing	Coal	Stoker	0.039	0.035	4.6	270	0.003
Existing	Coal	Fluidized Bed	0.039	0.035	4.6	82	0.002
Existing	Coal	Pulverized	0.039	0.035	4.6	160	0.004
Existing	Biomass	Stoker	0.039	0.035	4.6	490	0.005
Existing	Biomass	Fluidized Bed	0.039	0.035	4.6	430	0.02
Existing	Biomass	Suspention (DO)	0.039	0.035	4.6	470	0.2
Existing	Biomass	Fuel Cells	0.039	0.035	4.6	690	4
Existing	Biomass	Suspention/Grate	0.039	0.035	4.6	3500	0.2
Existing	Liquid		0.0075	0.00033	3.5	10	4
Existing	Gas		0.043	0.0017	13	9	0.08
Existing	Liquid	Non-continental	0.0075	0.0003	0.78	160	4
New	Coal	Stoker	0.0011	0.0022	3.5	6	0.003
New	Coal	Fluidized Bed	0.0011	0.0022	3.5	18	0.002
New	Coal	Pulverized	0.0011	0.0022	3.5	12	0.003
New	Biomass	Stoker	0.0011	0.0022	3.5	160	0.005
New	Biomass	Fluidized Bed	0.0011	0.0022	3.5	260	0.02
New	Biomass	Suspention (DO)	0.0011	0.0022	3.5	470	0.2
New	Biomass	Fuel Cells	0.0011	0.0022	3.5	470	0.003
New	Biomass	Suspention/Grate	0.0011	0.0022	3.5	1500	0.2
New	Liquid		0.0013	0.0031	0.21	3	0.002
New	Gas		0.0067	0.0017	7.9	3	0.08
New	Liquid	Non-continental	0.0013	0.0032	0.78	51	0.002

Boiler MACT Solutions

- Summary of all solutions for each pollutant:
  - PM
  - CO
  - HCl
  - Hg
  - D/F
- Summary of the Nalco Mobotec solutions

PM Solutions

- Fabric Filters (Bag Houses) are the obvious 100% solution
  - However, many cold side ESPs will meet the regulations
- Wet ESPs are often discussed because of HAP co-benefit
  - Expensive and have not seen broad application
- Tuning & modifying marginal ESP units
  - Mods (new TR sets, larger plate separation, more fields)
  - Chemical additives to improve ash resistivity
  - Combustion modifications to reduce LOI and ash carry over
  - Fuel switch (e.g., lower ash fuel)
  - Derate (worse case)
- Beware that other "MACT Solutions" might affect the ESP
  - For example, trona injection for HCl capture.

CO Solutions

- Tuning, Tuning, Tuning
- Combustion Modifications
  - Burner modifications
  - Boosted OFA systems
- Fuel distribution
- CO catalysts will likely not be required
- Chemical additives
- Fuel switching or co-firing

HCl Solutions

- Desulphurization systems capture HCl as co-benefit
- Ultimate solution: WFGD (or DFGD, for now)
- Today's solution: Duct (or Dry) Sorbent Injection (DSI)
  - Trona
  - Sodium Bicarbonate
  - Hydrate
- Other chemical additives (duct or furnace)
  - Magnesium chemistries
  - Duct injection, furnace injection, or fuel additives
- Fuel switching or blending
- Wet ESPs too

Mercury Solutions

- Halogen Oxidizers
- Activated Carbon Injection
  - Can ruin ash sales and affect ESP performance
  - Beware of high SO_3 and high stack temperatures (!)
- Alkali injection
  - Usually as a co-benefit from other technologies
- Proprietary sorbents
  - Many in development for utility market
  - Goal is usually to preserve ash sales or multi-pollutant
- Co-benefit from acid gas reduction
  - Scrubbers (wet or dry) and DSI
  - Oxidizers augment Hg control
  - Watch out for water mercury regulations when using scrubbers

Dioxin / Furan Solutions

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- Activated Carbon Injection
  - With wet ESP for MSW incinerators
  - ACI for Boiler MACT will certainly work
- However, good combustion practices will likely be enough
  - D/F is primarily “grown” in the back pass
  - Eliminating precursors, reduces D/F formation
  - Focus on low CO
- Fuel management, fuel switching, or operational changes
  - Low Cl, high VM, NOx-impacts?
- Catalytic D/F reduction exists (Gore Remedia bags)
- Testing is very expensive
  - $3k - $5k per data point + 1 month turnaround
- Good news: test once and done
- Bad news: EPA reconsideration…

SUMMARY:
Nalco Mobotec Strategy

- Tune for CO and D/F
  - Install ROFA if more CO reduction is required (we will provide guarantees)
  - ACI if more D/F reduction required
- DSI for HCl
  - Trona, sodium bicarbonate, or hydrated lime
  - Can be demonstrated using portable equipment
- Oxidizers and carbon for Hg
  - Can be demonstrated using portable equipment
- PM
  - Test
  - Upgrade ESP if needed
  - Baghouse is the ultimate solution
- Demonstrations
  - We are currently heavily loaded doing demonstrations
  - Highly recommend setting up demonstrations before testing firms are booked
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