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CIBO Quarterly Meeting

Crystal City, VA ♦ March 11, 2020

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"Recent" History of 40 CFR 63 Subpart DDDDD

- On March 21, 2011, the EPA established final emission standards for industrial, commercial, and institutional (ICI) boilers and process heaters at major sources to meet hazardous air pollutant (HAP) standards reflecting the application of maximum achievable control technology (MACT)—the Boiler MACT (76 FR 15608).

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CO Limits

HAP/Fuel	Proposal	2011	2013+R	2020	Factor Better	Proposal	2011	2013+R	2020	Factor Better	Units
	Existing Boilers					New Boilers					
CO Biomass Wet Stoker/Sloped Grate/Other	560	490	1500	1020	0.7	560	160	620	610	1.0	ppm at 3%O2
CO Biomass Kiln-Dried Stoker/Sloped Grate/Other	560	490	460	460	1.0		160	460	460	1.0	ppm at 3%O2
CO Biomass FB	250	430	470	210	0.4	40	260	230	210	0.9	ppm at 3%O2
CO Biomass Dutch/Pile	1010	470	770	770	1.0	1010	470	330	330	0.7	ppm at 3%O2
CO Biomass Suspension Burner	1010	470	2400	2400	1.0	NA	NA	2400	2400	NA	ppm at 3%O2
CO Biomass Fuel Cell	270	690	1100	1100	1.0	270	470	910	910	1.0	ppm at 3%O2
CO Biomass Hybrid Suspension/ Grate	NA	3500	3500	3500	1.0	NA	1500	1100	180	0.2	ppm at 3%O2
CO Coal pulverized	90	160	130	130	1.0	90	12	130	130	1.0	ppm at 3%O2
CO Coal stoker	50	270	160	160	1.0	7	6	130	130	1.0	ppm at 3%O2
CO Coal FB	30	82	130	130	1.0	30	18	130	130	1.0	ppm at 3%O2
CO Coal FBHE			140	140	1.0			140	140	1.0	ppm at 3%O2
CO Oil - Heavy	1	10	130	130	1.0	1	3	130	130	1.0	ppm at 3%O2
CO Oil - Light	1	10	130	130	1.0	1	3	130	130	1.0	ppm at 3%O2
CO Oil non-continental	1	160	130	130	1.0	1	51	130	130	1.0	ppm at 3%O2
CO Gas2	1	9	130	130	1.0	1	3	130	130	1.0	ppm at 3%O2

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"Recent" History of 40 CFR 63 Subpart DDDDD

- On January 31, 2013, the EPA promulgated amendments to the Boiler MACT (78 FR 7138).
  - In the January 2013 amendments to the Boiler MACT, the EPA established a CO emission limit for certain subcategories at a level of 130 ppm, based on an analysis of CO levels and associated organic HAP emission reductions.

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"Recent" History of 40 CFR 63 Subpart DDDDD

- Following the promulgation of the 2013 amendments, the EPA received 13 petitions for reconsideration that identified certain issues that petitioners claimed warranted further opportunity for public comment.
  - The EPA received petitions dated March 28, 2013, from New Hope Power Company (NHPC) and the Sugar Cane Growers Cooperative of Florida.
  - The EPA received a petition dated March 29, 2013, from the Eastman Chemical Company (Eastman).
  - The EPA received petitions dated April 1, 2013, from Earthjustice, on behalf of Sierra Club, Clean Air Council, Partnership for Policy Integrity, Louisiana Environmental Action Network, and Environmental Integrity Project (hereinafter referred to as Sierra Club); American Forest and Paper Association on behalf of American Wood Council, National Association of Manufacturers, Biomass Power Association, Corn Refiners Association, National Oilseed Processors Association, Rubber Manufacturers Association, Southeastern Lumber Manufacturers Association, and U.S. Chamber of Commerce (hereinafter referred to as AF&PA); the Florida Sugar Industry (FSI); Council of Industrial Boiler Owners, American Municipal Power, Inc., and American Chemistry Council (hereinafter referred to as CIBO/ACC); American Petroleum Institute (API); and the Utility Air Regulatory Group (UARG) which also submitted a supplemental petition on July 3, 2013.
  - The EPA received a petition dated July 2, 2013, from the Natural Environmental Development Association's Clean Air Project (NEDACAP) and CIBO.
  - The EPA received revised petitions from CIBO/ ACC on July 1, 2014, and on July 11, 2014, from Eastman. Both of these were revised to withdraw one of the issues raised in their initial submittal.

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"Recent" History of 40 CFR 63 Subpart DDDDD

- In response to the petitions, the EPA reconsidered and requested comment on several provisions of the January 31, 2013, final amendments to the Boiler MACT. The EPA published a proposed notice of reconsideration in the Federal Register on January 21, 2015 (80 FR 3090).
- EPA finalized the reconsideration on November 20, 2015 (80 FR 72790)

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CO Limits at 130 PPM Retained!

- After consideration of the comments received, the EPA maintained a minimum level of 130 ppm CO at 3-percent O2.
- The issue of whether or not CO is an appropriate surrogate for formaldehyde (the representative organic HAP in boiler emissions), or non-dioxin organic HAP in general, was outside the scope of the 2015 reconsideration, since the reconsideration solicited comment only on the CO limits established at 130 ppm, not on the broader issue of using CO as a surrogate for organic HAP.

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Summary of the final 2015 Action

- Definition of startup and shutdown periods and the work practices that apply during such periods
- Revised CO limits based on a minimum CO level of 130 ppm
- PM CPMS
- Technical Corrections and Clarifications
  - Opacity is an Operating Parameter
  - CO monitoring and moisture Corrections
  - Affirmative defense for violation of emission standards during malfunction
  - Definition of coal
  - Other corrections and clarifications
- Other actions taken
  - Petitioners' comments impacted by technical corrections
  - Petitions related to ongoing litigation
  - Other petitions

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Boiler MACT Today

- EPA is currently revising the National Emission Standards for Hazardous Air Pollutants ("NESHAP") for Industrial, Commercial, and Institutional Boilers and Process Heaters ("Boiler MACT") at 40 CFR Part 63, Subpart DDDDD.
- In the Boiler MACT, subject sources must comply with a carbon monoxide ("CO") emission limit of at least 130 parts per million (ppm), which serves as a surrogate for non-dioxin organic hazardous air pollutants ("HAP") emissions.
- Two decisions by the U.S. Court of Appeals for the District of Columbia Circuit ("D.C. Circuit") in recent years impact the Boiler MACT in general, and the CO emission limit in particular.

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U.S. Sugar - 2016 Case

- In U.S. Sugar Corp. v. EPA, 830 F.3d 579 (D.C. Cir. 2016), the D.C. Circuit rejected environmental petitioners' argument that EPA's decision to use CO as a surrogate for non-dioxin organic HAPs was arbitrary and capricious.
- The court reached this decision on the basis of an apparent breakdown of the correlation between CO and organic HAP below 130 ppm CO.

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CO as an Organic HAP Surrogate

- Excerpt from the DC Circuit Court's opinion (in US Sugar):
- "We reject, however, the Environmental Petitioners' other argument that combustion-related issues preclude the EPA from using CO as a surrogate for non-dioxin/furan organic HAPs."
- "The Petitioners contend that the EPA's decision to use CO was arbitrary because record evidence demonstrated a breakdown in the correlation between CO and organic HAP emissions at CO emission levels below 130 parts per million (ppm). But the EPA explained that this apparent breakdown was most likely caused by the difficulty of measuring the regulated HAP at such extremely low emission levels, rather than by a flaw in the correlation between CO and organic HAPs."
- "This is precisely the sort of scientific judgment to which we must defer and accordingly, we do so on this point. The Environmental Petitioners fail to provide any reason to believe that organic HAP emissions can, in fact, be accurately measured at such low levels. And the Agency's explanation also addresses why the EPA discounted record evidence regarding extremely high burn temperatures that demonstrated a potential breakdown in the CO and organic HAP relationship as HAP emissions approached zero."

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CO as an Organic HAP Surrogate

- HOWEVER, at the same time, the court held that EPA failed to explain the appropriateness of CO as an organic HAP surrogate adequately because it had not addressed comments about the availability of alternative control technologies or methods to regulate HAP emissions without reducing CO emissions, or vice versa, and remanded to the agency to explain its decision accordingly. See excerpt from the court's opinion below.
- "The EPA may use a surrogate to regulate HAPs under section 7412 where "reasonable." To be reasonable, the emission standard set for the surrogate must reflect what the best source or best 12 per cent of sources in the relevant subcategory achieved with regard to the HAP. This requires the surrogate's emissions to share a close relationship with the emissions of the HAP."
- "One crucial factor we have identified for determining whether that close relationship exists is the availability of alternative control technologies. These technologies regulate the HAP without impacting a surrogate's emissions, or regulate the surrogate without impacting the HAP. As we have explained, the importance of this factor to our reasonableness analysis is clear:
  - **If EPA looks only to [the surrogate], but HAPs are reduced [in another] way that does not reduce [the surrogate], the best achieving sources, and what they can achieve with respect to HAPs, might not be properly identified."**

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CO as an Organic HAP Surrogate

- "The EPA proposed using CO as a surrogate because:
  - The lowest possible CO emissions resulted in the lowest possible HAP emissions, and
  - The same combustion and oxidation control methods reduce both types of emissions."
- "But, during notice and comment, the EPA failed to directly consider and respond to several comments that introduced evidence suggesting that other control technologies and methods could be effectively used to reduce HAP emissions without also impacting CO emissions, or vice versa."
- "The EPA ultimately decided to use CO as a surrogate for all non-dioxin/furan organic HAPs in its final rule without ever addressing whether such alternative control technologies and methods might be used to lower organic HAP emissions further. Instead, the Agency responded by doubling down on its assertion that both CO and organic HAP emissions were the product of poor combustion and, as a result, optimal combustion would minimize the emissions of both CO and non-dioxin/furan organic HAPs."
- "But this response was no response at all to the substantial concerns raised in the comments that other variables might also affect emissions."

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Sierra Club – 2018 Case

- The D.C. Circuit again reviewed challenges to the Boiler MACT and its CO limit in Sierra Club v. EPA, 884 F.3d 1185 (D.C. Cir. 2018), this time considering EPA's decision to set 130 ppm as the limit.
- The court held that EPA's decision to set the 130 ppm CO limit as the MACT floor for certain subcategories was arbitrary and capricious because the agency had not supported the necessary conclusion that no further reduction in organic HAP emissions occurs after CO emissions are reduced below 130 ppm.
- To conclude that CO limits below 130 ppm would not result in further organic HAP emissions reductions, EPA relied on data showing increased formaldehyde emissions (the only organic HAP for which EPA had data) at CO emissions below 130 ppm.
- The court rejected EPA's reliance on the data for this purpose because the agency had already dismissed those same formaldehyde data as unreliable in defending the appropriateness of CO as an organic HAP surrogate, finding the increased formaldehyde emissions were due to difficulties in measuring organic HAP emissions at such low levels and not an actual increase.

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Key Excerpts - 2018 Sierra Club Case

- "U.S. Sugar did not address EPA's decision, in light of its general reliance on CO as a surrogate for a group of organic HAPs, to establish the 130 ppm lower bound."
- "Our U.S. Sugar remand left all of EPA's CO-based limits intact pending their further consideration, and did not address the levels at which any particular limits were set, only the decision to measure the limits on organic HAP emissions in terms of CO levels."
- "We therefore have yet to consider Sierra Club's more specific challenges to the 130 ppm limits, and we do so here."
- Treating CO as generally a suitable surrogate for organic HAPs, per U.S. Sugar, it remains for us to determine whether EPA's decision in 2013 (reaffirmed in 2015) to loosen the 2011 rule's most stringent CO floors was reasonable and consistent with the Act.

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Key Excerpts - 2018 Sierra Club Case

- "When settling on the revised 130 ppm floors in 2013, EPA explained that it had set out to determine "whether there is a minimum CO level for boilers and process heaters below which there is no further benefit in organic HAP reduction/destruction."
- "To make that assessment, the agency looked to data showing the relationship between varying levels of CO emissions and corresponding emissions of formaldehyde—the only organic HAP for which it had such data."
- "On their face, however, those data did not show complete destruction of formaldehyde (or a leveling-off of emissions) as CO dropped below 130 ppm. Nor did the data show continuation at those low levels of the correlation on which EPA's use of CO as a surrogate was based. Instead, "[a]t levels lower than 150 ppm, the mean levels of formaldehyde appear[ed] to increase, as d[id] the overall maximum value and variability in formaldehyde emissions."

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Key Excerpts - 2018 Sierra Club Case

- EPA was "aware of no reason why" the otherwise strong correlation between lower CO emissions and lower formaldehyde emissions would suddenly invert.
- The Agency accordingly determined the data were untrustworthy and that they did not reflect an actual increase in formaldehyde emissions. EPA explained: "[W]e do not believe that such measurements are sufficiently reliable to use as a basis for establishing an emissions limit."
- We deferred to EPA's scientific judgment on this exact point in U.S. Sugar, rejecting Sierra Club's argument that the imperfect formaldehyde data disproved the general validity of CO as a surrogate and noting EPA's assurances that the "apparent breakdown" of the relationship between formaldehyde and CO below 130 ppm "was most likely caused by the difficulty of measuring the regulated HAP at such extremely low emission levels."
- In separately attempting to justify its conclusion that CO limits would not yield further reduction in organic HAPs if set below the level where the formaldehyde data became unreliable, however, EPA relied on the same data it had elsewhere decisively characterized as untrustworthy. EPA asserted in support of its decision to reject any limit more stringent than 130 ppm that, "[a]t CO levels less than [130 ppm], our data indicate that there is no apparent relationship between CO and organic HAP (i.e., formaldehyde)."
- In other words, EPA's only support for its upward-revised floors was the very data it had just dismissed as inaccurate, now cited as reliable evidence that reducing CO below 130 ppm does not in fact reduce organic HAP emissions.

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Key Excerpts - 2018 Sierra Club Case

- Three points highlight the lack of basis to sustain the rule on a novel, "conservative surrogacy" ground.
  - 1) The MACT Floor assessment must be specific
    - "EPA never took the position that organic HAP emissions fall to zero, nor gave any reason why they could not be further reduced, once CO emissions reach 130 ppm. It said only that, where CO is emitted at or below 130 ppm, organic HAP emissions are "extremely low." But describing HAP levels as "low," even "extremely low," or saying that their combustion is "essentially" complete, implies that HAPs have not been entirely eliminated. So EPA's observation that HAP emissions are "extremely low" when CO is at 130 ppm is not a reasoned basis for concluding that organic HAP emissions cannot be reduced still further. There is no "close enough" exception to the requirement that EPA's MACT floors limit emissions to the full extent shown to be achievable by the best-performing sources; to the contrary, the Act's MACT provisions instruct EPA to "maximize" the reduction in emissions, up to and including "a prohibition on such emissions, where achievable."

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Key Excerpts - 2018 Sierra Club Case

- 2) Formaldehyde data not reliable
  - "…the formaldehyde data on which EPA generally relied are the only data EPA offered for its decision not to require that CO emissions be reduced below 130 ppm, and EPA staked its "conservative surrogate" theory on those data. But, in virtually the same breath, EPA said those data were not a reliable indicator of what happens to organic HAP emissions at the low levels in question. Again, that contradiction leaves us unable to discern any reasoned basis for determining that organic HAPs disappear from the emission stream before CO does, or to otherwise conclude that organic HAP emissions cannot be further reduced."

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Key Excerpts - 2018 Sierra Club Case

- 3) 130 PPM limit not supported by the data
  - "…even if EPA had grounds to conclude that there is some nonzero level of CO emissions that marks a point below which organic HAP emissions cannot be further reduced, it offered no basis for identifying 130 ppm as that level. As just noted, EPA cites only the unreliable formaldehyde data— which, on average, show HAP emissions increasing below 150 ppm of CO, not leveling off or zeroing out. Accepting that boomerang as a data flaw, and not as an accurate representation of a shift in the physical correlation between CO and HAP combustion, it is not evident how those unreliable data could support a conclusion that emissions in fact plateau at their lowest achievable level, rather than either increasing or continuing to decrease, at an inflection point of 130 ppm. EPA has not explained how the data could suffice."

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Key Excerpts - 2018 Sierra Club Case

- "If EPA concludes that the relationship it previously identified between CO and organic HAP is actually valid only to a point—a conclusion the likes of which our prior regulation-by-surrogate cases have not endorsed—it must explain how the limiting point it specifies reflects the emission control actually achieved by the best performing sources and, further, that it is the lowest emission level achievable with existing technology. We therefore remand to EPA to reconsider its decision to adopt the 130 ppm CO limits."
- "We do not vacate those limits, because Sierra Club has asked us not to do so and because "vacatur would cause substantial disruptive effects by removing emissions limits for the regulated HAPs." EPA may, if it finds it feasible to do so, undertake this reconsideration in conjunction with the broader task we gave EPA when remanding in U.S. Sugar: To further consider "the portion of the Major Boilers Rule providing for CO's use as a surrogate for non-dioxin/furan organic HAPs."
- "In revisiting the CO-based standards (in light of both this decision and U.S. Sugar), however, EPA must consider both
  - (1) whether the standards it adopts are Section 7412(d)(3)-compliant MACT Floors and
  - (2) whether Section 7412(d)(2) beyond-the-floor standards are called for here."

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Summary

- As a result of the two court decisions, EPA must address three issues related to the emission limits for CO established in the Boiler MACT on remand:
  - (1) adequately explain how CO emissions act as a reasonable surrogate for non-dioxin organic HAP emissions,
  - (2) address the fact that the best performing sources are not using alternative control technologies or methods for reducing organic HAP emissions lower than what is achieved by regulating surrogate CO emissions to 130 ppm, and
  - (3) demonstrate that its decision to set CO limits no lower than 130 ppm was reasonable because that threshold reduces organic HAP emissions to the fullest extent achievable by the best performing sources.

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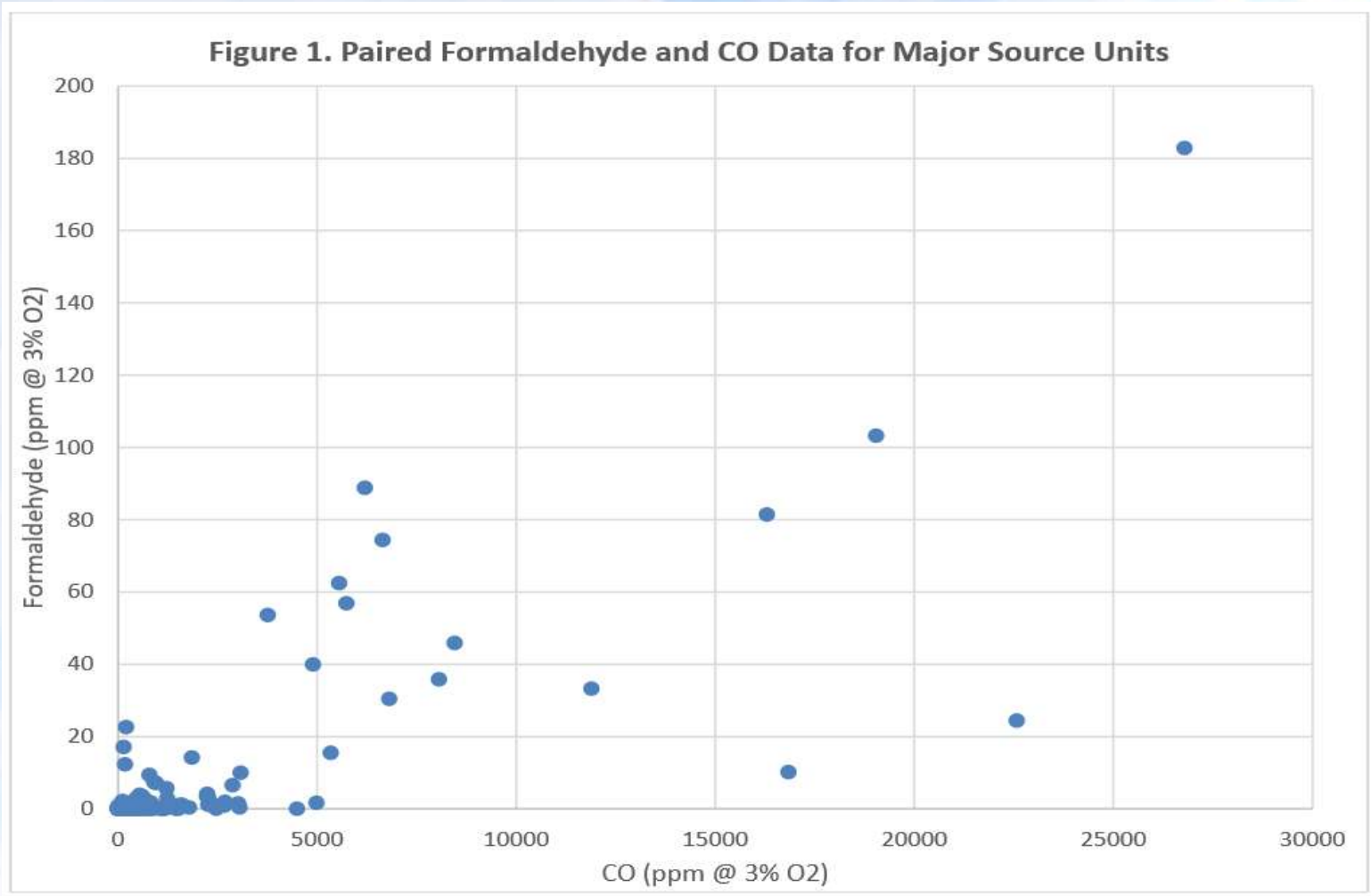
Formaldehyde versus CO



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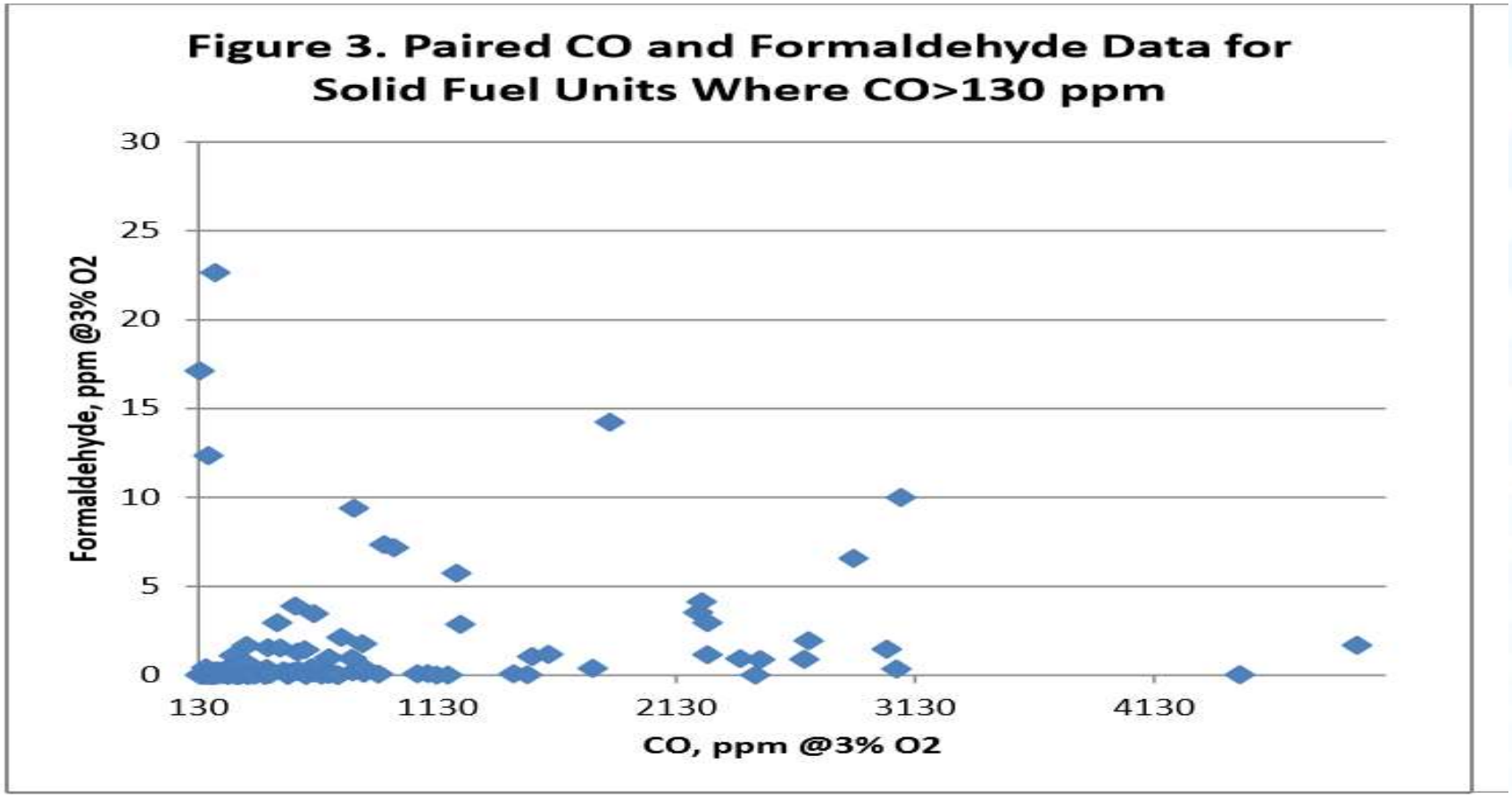
Formaldehyde versus CO



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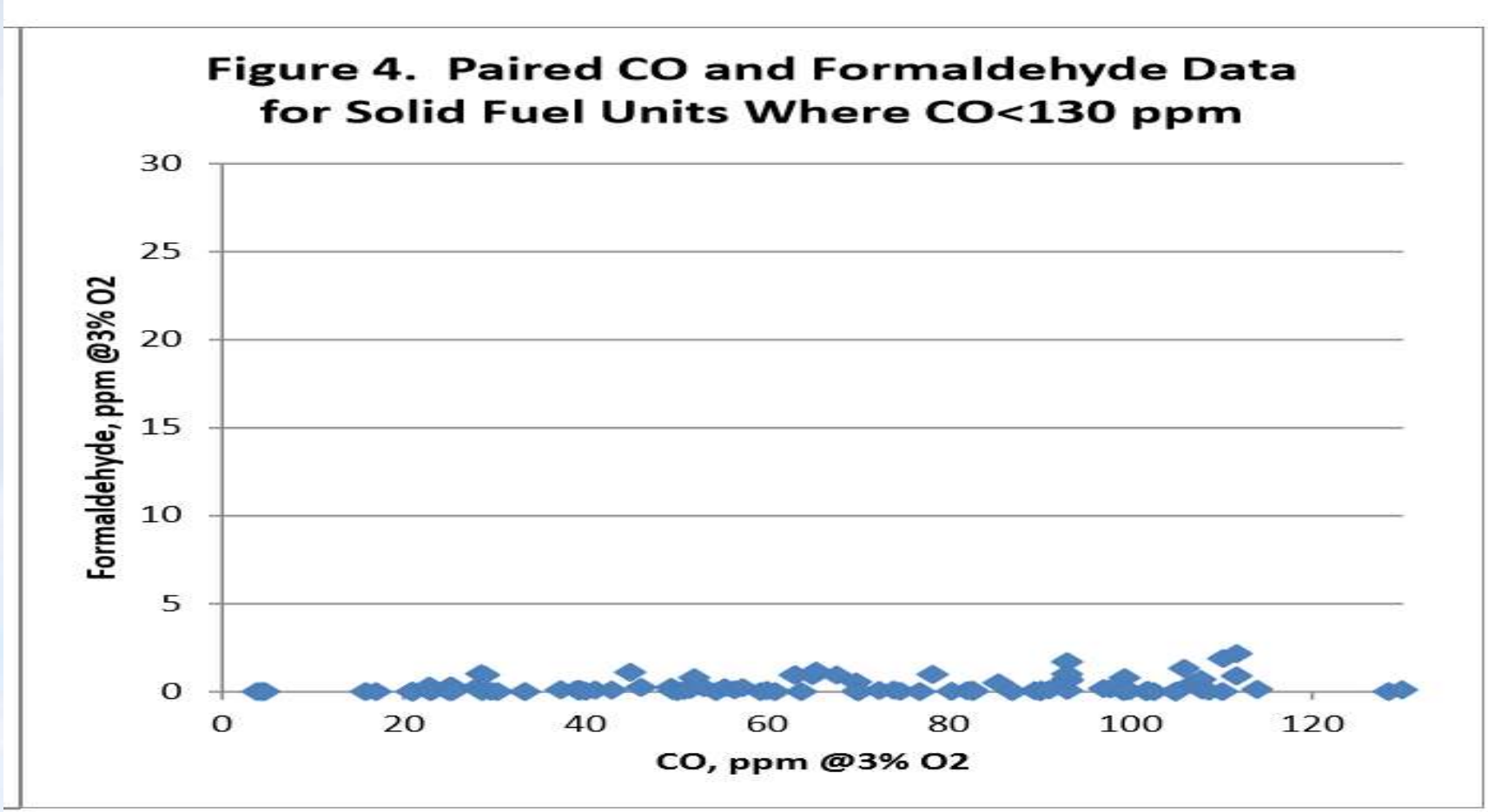
Formaldehyde versus CO



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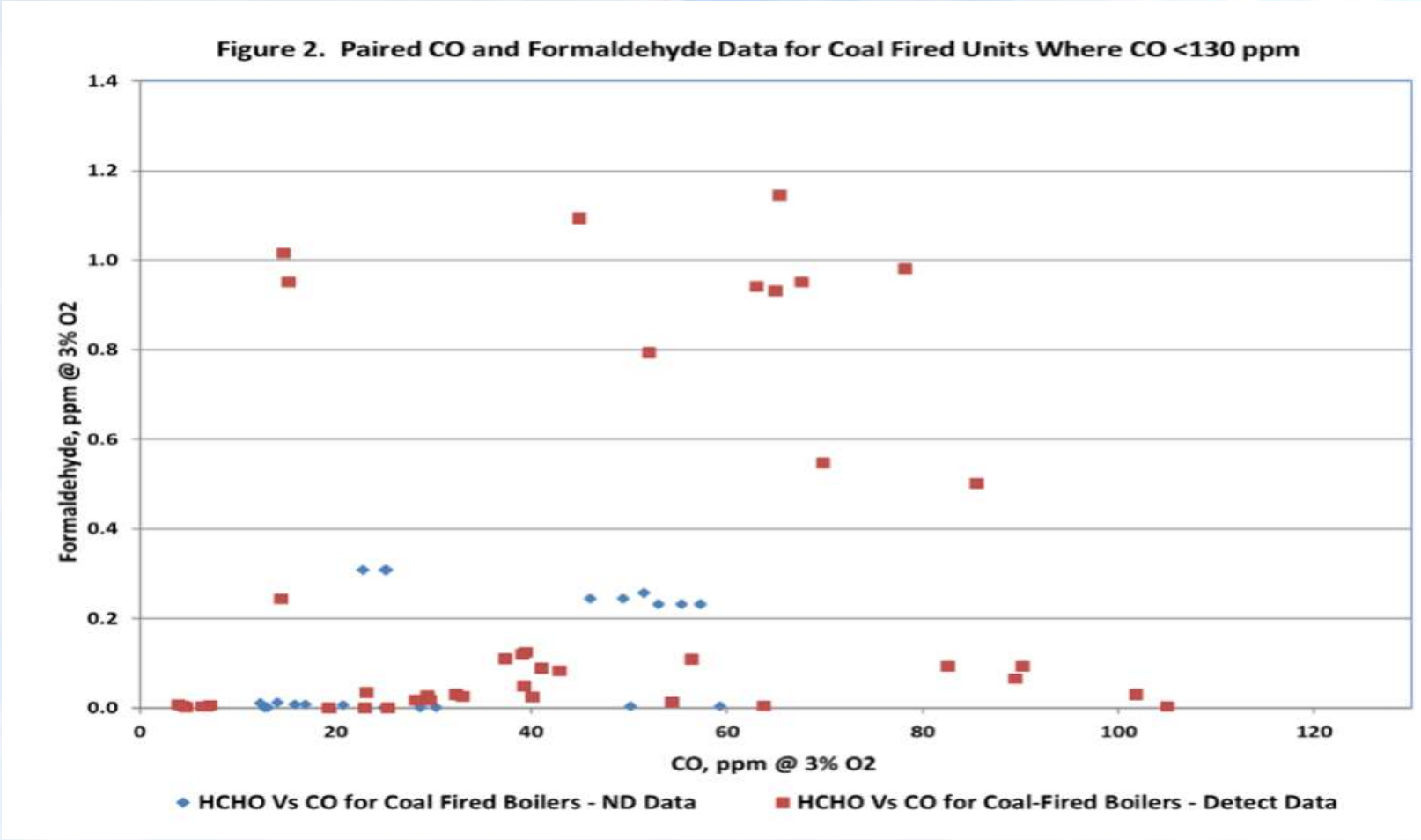
Formaldehyde versus CO



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Hg, PM, and HCl Limits

HAP/Fuel	Proposal	2011	2013+R	2020	Factor Better	Proposal	2011	2013+R	2020	Factor Better	Units
	Existing Boilers					New Boilers					
Hg Biomass	0.9	4.6	5.7	5.4	0.9	0.2	3.5	0.8	0.80	1.0	lb/TBtu
PM Biomass	0.02	0.039	multiple	multiple	below	0.008	0.0011	multiple	multiple	NA	lb/MMBtu
HCl Biomass	0.006	0.035	0.022	0.020	0.9	0.004	0.0022	0.022	0.020	0.9	lb/MMBtu
Hg Coal	3	4.6	5.7	5.4	0.9	2	3.5	0.8	0.80	1.0	lb/TBtu
PM Coal	0.02	0.039	multiple	multiple	below	0.001	0.0011	multiple	multiple	below	lb/MMBtu
HCl Coal	0.02	0.035	0.022	0.020	0.9	0.00006	0.0022	0.022	0.020	0.9	lb/MMBtu
Hg Oil	4	3.5	2.0	0.7	0.4	0.3	0.21	0.48	0.48	1.0	lb/TBtu
Hg Oil non-continental	4	0.78	2.0	0.7	0.4	0.3	0.78	0.48	0.48	1.0	lb/TBtu
PM Oil	0.004	0.0075	multiple	multiple	below	0.002	0.0013	multiple	multiple	NA	lb/MMBtu
HCl Oil	0.0009	0.00033	0.0011	0.00035	0.3	0.0004	0.0032	0.00044	0.00035	0.8	lb/MMBtu
Hg Gas 2	0.2	13	7.9	7.9	1.0	0.2	7.9	7.9	7.9	1.0	lb/TBtu
PM Gas 2	0.05	0.043	0.0067	0.0067	1.0	0.003	0.0067	0.0067	0.0067	1.0	lb/MMBtu
HCl Gas 2	0.000003	0.0017	0.0017	0.0017	1.0	0.000003	0.0017	0.0017	0.0017	1.0	lb/MMBtu

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Alternative CO Limits (30 day with CEMS or other)

HAP/Fuel	Proposal	2011	2013+R	2020	Factor Better	Proposal	2011	2013+R	2020	Factor Better	Units
	Existing Boilers					New Boilers					
CO Biomass Wet Stoker/Sloped Grate/Other	NA	NA	720	720	NA	NA	NA	390	390	NA	ppm at 3%O2
CO Biomass Kiln-Dried Stoker/Sloped Grate/Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ppm at 3%O2
CO Biomass FB	NA	NA	310	310	NA	NA	NA	310	310	NA	ppm at 3%O2
CO Biomass Fuel Cell	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ppm at 3%O2
CO Biomass Suspension Burner	NA	NA	2000 (10 day)	2000 (10 day)	NA	NA	NA	2000 (10 day)	2000 (10 day)	NA	ppm at 3%O2
CO Biomass Dutch/Pile	NA	NA	520 (10 day)	520 (10 day)	NA	NA	NA	520 (10 day)	520 (10 day)	NA	ppm at 3%O2
CO Biomass Hybrid Suspension/ Grate	NA	NA	900	900	NA	NA	NA	900	900	NA	ppm at 3%O2
CO Coal stoker	NA	NA	340	340	NA	NA	NA	340	340	NA	ppm at 3%O2
FB with heat exchanger			150	150	NA			150	150	NA	
CO Coal FB	NA	NA	230	230	NA	NA	NA	230	230	NA	ppm at 3%O2
CO Coal pulverized	NA	NA	320	320	NA	NA	NA	320	320	NA	ppm at 3%O2
CO Oil - Heavy	NA	NA	na	na	NA	NA	NA	na	na	NA	ppm at 3%O2
CO Oil - Light	NA	NA	na	na	NA	NA	NA	na	na	NA	1 day block average
CO Oil non-continental	NA	NA	na	na	NA	NA	NA	na	na	NA	3 hour rolling average

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PM Limits

HAP/Fuel	Proposal	2011	2013+R	2020	Factor Better	Proposal	2011	2013+R	2020	Factor Better	Units
	Existing Boilers					New Boilers					
PM Biomass Wet Stoker/Sloped Grate/Other	0.02	0.039	0.037	0.034	0.9	lb/MMBtu	0.001	0.03	0.03	1.0	lb/MMBtu
PM Biomass Kiln-Dried Stoker/Sloped Grate/Other	0.02	0.039	0.32	0.32	1.0	lb/MMBtu	0.001	0.03	0.03	1.0	lb/MMBtu
PM Biomass FB	0.02	0.039	0.11	0.021	0.2	lb/MMBtu	0.001	0.0098	0.0098	1.0	lb/MMBtu
PM Biomass Dutch/Pile	0.02	0.039	0.28	0.18	0.7	lb/MMBtu	0.001	0.0032	0.0025	0.8	lb/MMBtu
PM Biomass Suspension Burner	0.02	0.039	0.051	0.041	0.8	lb/MMBtu	0.001	0.03	0.030	1.0	lb/MMBtu
PM Biomass Fuel Cell	0.02	0.039	0.020	0.020	1.0	lb/MMBtu	0.001	0.02	0.02	1.0	lb/MMBtu
PM Biomass Hybrid Suspension/ Grate	0.02	0.039	0.44	0.44	1.0	lb/MMBtu	0.001	0.026	0.026	1.0	lb/MMBtu
PM Coal pulverized	0.02	0.039	0.040	0.040	1.0	lb/MMBtu	0.001	0.0011	0.0011	1.0	lb/MMBtu
PM Coal stoker	0.02	0.039	0.040	0.040	1.0	lb/MMBtu	0.001	0.0011	0.0011	1.0	lb/MMBtu
PM Coal FB	0.02	0.039	0.040	0.040	1.0	lb/MMBtu	0.001	0.0011	0.0011	1.0	lb/MMBtu
PM Oil - heavy	0.004	0.0075	0.062	0.062	1.0	lb/MMBtu	0.0013	0.013	0.013	1.0	lb/MMBtu
PM Oil - light	0.004	0.0075	0.0079	0.008	1.0	lb/MMBtu	0.0013	0.0011	0.0011	1.0	lb/MMBtu
PM Oil non-continental	0.004	0.0075	0.27	0.27	1.0	lb/MMBtu	0.0013	0.023	0.023	1.0	lb/MMBtu
PM Gas2	0.05	0.043	0.0067	0.0067	1.0	lb/MMBtu	0.0067	0.0067	0.0067	1.0	lb/MMBtu

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Summary of Expected Changes

- HCl - reduction
- CO – wet biomass stokers and biomass fluidized bed limit decreases
- PM – biomass fluidized bed drop as well as other biomass boilers
- Mercury – smaller drop

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