

# Boiler MACT

Performance Tests & Options



# Regulated Pollutants

- Mercury
  - Solid HAP metals
    - PM or TSM (As, Be, Cd, Cr, Pb, Mn, Ni, Se)
  - Inorganic HAPs
    - HCl
  - Organic HAPs
    - CO (work practices; applies to new units only)
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# Hg Emission Limits (lb/10<sup>12</sup> BTU)

Fuel	Size/Use					
	Small		Limited		Large	
	New	Exist	New	Exist	New	Exist
Gas	--	--	--	--	--	--
Liquid	--	--	--	--	--	--
Solid	3	--	3	--	3	9

# PM/TSM Emission Limits (lb/10<sup>6</sup> BTU)

Fuel	Size/Use					
	Small		Limited		Large	
	New	Exist	New	Exis	New	Exist
Gas	--	--	--	‡	--	--
Liquid - PM	0.03	--	0.03	--	0.03	--
Solid - PM	0.025	--	0.025	0.21	0.025	0.07
Solid - TSM	0.0003	--	0.0003	0.004	0.0003	0.001

# HCl Emission Limits (lb/10<sup>6</sup> BTU)

Fuel	Size/Use					
	Small		Limited Use		Large	
	New	Exist	New	Exist	New	Exist
Gas	--	--	--	--	--	--
Liquid	0.000 9	--	0.000 9	--	0.000 5	--
Solid	0.02	--	0.02	--	0.02	0.09



# Options

- Traditional Performance Test
    - Emission & operating limits for HAPs
    - Initial & periodic compliance (stack) testing
      - PM/TSM, Hg, HCl
      - Done for fuel mixture with highest pollutant content
    - Continuous compliance shown by CEMs, COMs, CMS for parametric monitoring &/or operating records
  - Fuel analysis
    - May be used to comply with Hg, Cl, TSM limits
    - Maximum fuel pollutant input compared with emission limit
    - Fuel analysis for each fuel type with operating limits
  - Health-based Compliance (Risk analysis)
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# Performance Test Option – Fuel Analysis Requirements

- Fuel analysis must be conducted for
    - each fuel type
    - each of operating limits established
  - Determine 90% confidence level concentration for each pollutant for each fuel type
  - Performance tests must be conducted with fuel or fuel mixture with highest content of Cl, Hg or TSM
    - operating limits established based on performance tests
    - likely to conduct more than one performance test
  - Fuel sampling and analysis
    - written plan
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# Establish Operating Limits

- Determine fuel mixture that has highest pollutant content
  - During performance test, determine fraction of total heat input for each fuel type
    - Additional fuel sampling and testing during performance test not required
  - Establish maximum pollutant input level
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# Emission Rates/Operating Limits

- Calculate the weighted pollutant emission rate
    - Sum (90% confidence level fuel pollutant concentration for each fuel type X fraction of total heat input for each fuel type)
  - Calculated pollutant emission rate must be less than emission limit to use fuel analysis option
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# Example Calculation

- 10.4 ton/hr HF/fluff + nat gas for 150,000 lb/hr steam
- Fluff and hogfuel are mixed on the pile with a bulldozer, so fuel mixes are difficult to pin down.
- Max. Hg emission rate (lb/10<sup>12</sup> BTU)
  - Sludge:  
 $0.0889 \times 0.022 \times 1.028 = 0.00201$
  - HF:  
 $2.65 \times 0.976 \times 1.028 = 2.66$
  - Total = 2.66
- Comparison with Hg emission limit: 2.66 lb < 3 lb/10<sup>12</sup> BTU (OK)

Fuel Analysis Option		
Fuel Type	Fluff	Hog Fuel
Hg Conc. (lb/10 <sup>12</sup> BTU)	0.0889	2.65
Fuel mix - max. Hg Input	9.1%	90.9%
- Fuel firing rates (TPH)	0.95	9.45
- Heat input (10 <sup>6</sup> BTU/hr)	8.8	393.5
Fraction - total heat input	0.022	0.976




# Continuous Compliance

- Both Performance Test and Fuel Analysis Options
    - Keep records of type and amount of fuel burned during reporting period
  - Performance Test Option
    - Must result in lower fuel pollutant input than maximum values calculated during last performance test (if new input is higher, then another performance test is needed)
  - Fuel Analysis Option
    - Must result in lower emissions rate than applicable emission limit
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# Fuel Averaging

- Averaging period for demonstrating compliance with fuel operating limits (for both the performance test and fuel analysis options) is not explicitly defined
  - It is important that an averaging period be explicitly defined for fuel operating limits so continuous compliance can be confidently determined
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# Operating Limits – Add on controls

Control Type	PM	Hg/TSM	HCl
Wet scrubber	Min PD & liquid flow	Min PD & liquid flow	Min PD & liquid flow, pH
Fabric filter	Max opacity or leak detection	Max opacity or leak detection	--
ESP alone	Max opacity	Max opacity	--
ESP followed by wet controls	Min voltage & sec current or min total power input	Min voltage & sec current or min total power input	Flow, pH
Dry scrubber or carbon	--	Min sorbent or carbon inject rate	Min sorbent inject rate
Other dry controls	Max opacity	Max opacity	--

# Typical removal Efficiency, %

Pollutant	Mechanical Collector	Wet Scrubber	Electrostatic Precipitator	Fabric Filter
PM/TSM	50-75	90-95	98-99+	99+
HCl	0	90+	0	0
Hg	0	10-75	5-70	30-90



# Opacity & Leak Detection

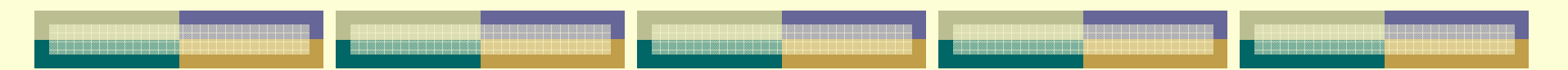
- Fabric filter alarm
  - Opacity
    - Existing:  $\leq 20\%$  (6 min avg) except during one 6-min avg/hr  $\leq 27\%$
    - New:  $\leq 10\%$  (1 hr avg)
  - Alternate limits or parameters, or if control device combo doesn't fit tables 2 thro 4 – apply to EPA for alternate limits
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# Add on Control - Parametric Limits

- Minimum limits set during performance test
  - 90% of lowest test run average
  - 3-hour block averages
  - If multiple performance tests for different fuel mixes, set at highest of the minimum values






# Health-Based Compliance Option

- Available to sources that show low off-site risk for HCl/Cl<sub>2</sub> and Mn
  - Conduct test under worst-case operating conditions
  - Monitor operating parameters at least 15 min
  - Test methods are challenging – follow specs on equipment & reagents religiously, choose the lowest detection limits possible
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# Risk Justification

- Negligible health benefits
  - Costly/cost ineffective controls
  - Small contribution to HAP loadings
  - Use when other compliance options won't work
    - Averaging, fuel testing first, existing controls
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# HCl risk

- Model both HCl and Cl<sub>2</sub> (respiratory effects)
  - Use lookup tables
    - Height of stack
    - Distance to fence line
  - If meet criteria, then don't have to install acid gas scrubbers
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# Risk TSM alternative

- Alternative to TSM limit
- Model risk from Mn
  - If meet health-based criteria, then
- check mass of remaining 7 metals
  - below 0.001 lb/MMBTU limit , then meet the requirement





# Title V Permit Modification

- Reopen to include
    - Emission rates
    - Fuel type(s)
    - Control device(s)
    - Process and stack parameters
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*Questions?*

