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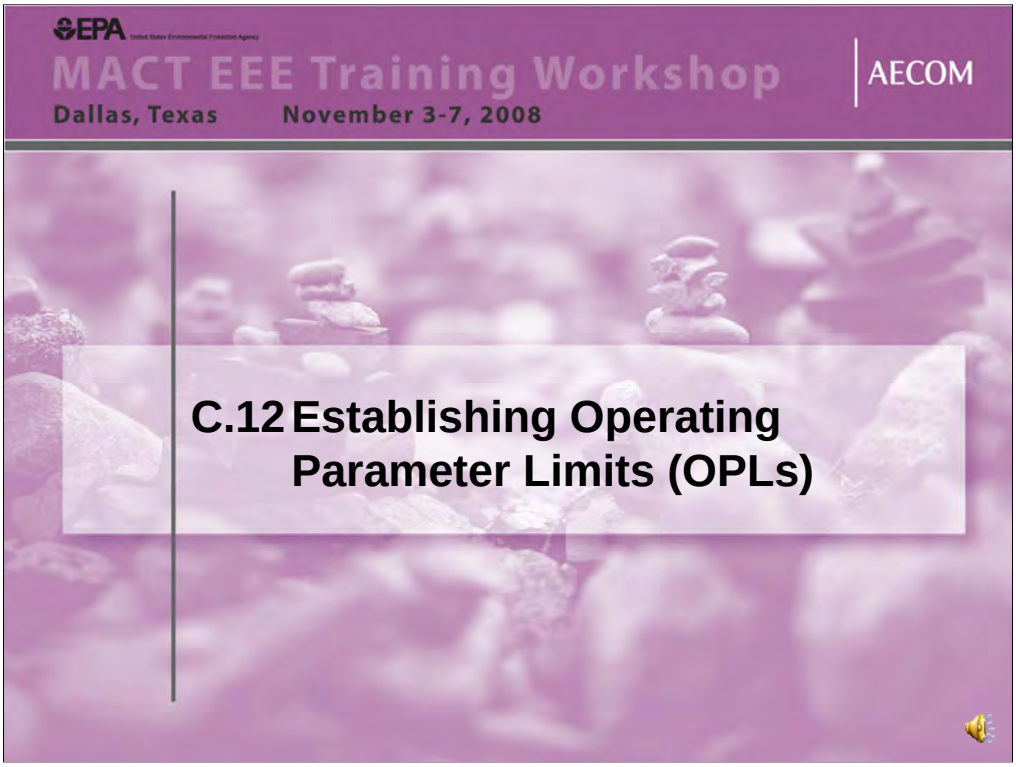

This module covers the topic of establishing Operating Parameter Limits or OPLs

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Presentation Overview

- Summary of Parameters requiring OPLs
- DRE
- PCDDs/PCDFs
- Mercury
- Particulate Matter
- Semi-volatile and low volatile metals
- HCl and Cl_2

This module will cover:

Summary of Parameters requiring OPLs,

DRE-Destruction and Removal Efficiency,

PCDDs/PCDFs,

Mercury,

Particulate Matter,

Semi-volatile and low volatile metals, and

HCl and Cl_2

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Types of OPLs

- OPLs set during CPT
  - Maximum waste feed rates
  - Maximum production rates
  - Maximum flue gas flow rates
  - Minimum combustion chamber temperature
  - Air pollution control device settings
- OPLs set by design
  - Waste firing system
  - Combustion chamber pressure
- OPLs set by Manufacturer's recommendations
  - Absorbent/adsorbent specifications
  - Carbon system carrier fluid flow rate or pressure drop
  - IWS/ESP voltage
  - Low energy scrubber fluid flow rates and pressure drop

To start with, there are a number of different type of OPLs that can be established for an HWC under Subpart EEE. These fall into three general categories. First, many of a unit's OPLs will be set during the CPT or from some type of historical testing (i.e., via use of the data in lieu of testing provisions). The other two groups of OPLs that may be established for compliance can be design based or based on manufacturer's specifications and cannot for practical reasons be minimized or maximized during a test.

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DRE – 40 CFR § 63.1209(j)

OPL	Type	How Set
Min. Comb. Chamber Temp.	HRA	Avg of test run avgs
Max. Flue Gas Flowrate or Prod. Rate	HRA	Avg of Max. HRAs for each run
Max. HW Feed Rate (Pumpable & Total)	HRA	Avg of Max. HRAs for each run
Other Parameters to Ensure Good Operation of firing system	--	Manuf. Specs.

- Some units can set minimum temperature and maximize other parameters in same condition
  - Low overall Btu/lb feedrate
- Other units will need to run two separate test conditions, one for minimum temperature only, the other to maximize waste and flue gas rates
- Good firing system operation OPLs may include:
  - Atomization of liquids,
  - Minimum instantaneous combustion chamber temperature and bed depth for fluid bed units
  - Maximum viscosity
  - Minimum oxygen content

To establish OPLs for meeting the DRE standard, a HWC must set several operating limits during the CPT which are summarized on the table in this slide. One key issue to note is that setting a minimum temperature and a maximum flue gas flow rate (this sets the minimum residence time) may not be thermodynamically possible in the same test condition for certain units. First, where the waste feed(s) contribute significant thermal load (i.e., Btu's hour) to the HWC, setting the minimum temperature usually also involves minimizing the waste feed rate and combustion air and thus not be able to set the maximum waste throughput rate at any limit that would be workable. In addition, to set the maximum throughput and maximum flue gas flow rate, this will mean firing at a much higher Btu/hr rate, thus raising the temperature significantly as a result. By doing this, the unit will not be able to establish a reasonable low temperature cutoff. For HWCs firing high Btu waste, the single test condition will not result in OPLs that the unit can operate under. Units combusting waste with a low Btu content are more likely to be able to set up a single test condition to meet the two objectives for setting OPLs for DRE, however, there may be other OPLs the unit may need to establish that may still dictate a two condition test. The other OPL that must be met for DRE deals with maintaining good operation of the firing system. This slide includes examples of different parameters that may be appropriate for this. It should be noted though that irrespective of an OPL for this, any direct fired equipment will have a well established program designed to prevent uncontrolled combustion or explosions which is often called the "flame safety" or burner management" system which will already have incorporated some or all of these types of limits.

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PCDDs/PCDFs – 40 CFR § 63.1209(k)

OPL	Type	How Set
Maximum Gas Temperature at Dry PM Control Device Inlet (Baghouse, ESP)	HRA	Avg of test run avgs
Min. Comb. Chamber Temp.	HRA	Avg of test run avgs
Max. Flue Gas Flowrate or Prod. Rate	HRA	Avg of Max. HRAs for each run
Max. HW Feed Rate (Pumpable & Total)	HRA	Avg of Max. HRAs for each run
OPLs for PM control		

- LWAKs must set a maximum temperature at the exit of the last combustion chamber

Establishing OPLs where numerical D/F standards are applicable has some overlap with setting standards for DRE as can be seen in the table on this slide. One primary concern in controlling D/F emissions is the temperature in downstream equipment where D/F re-formation is a known phenomena. Thus, dry APCs must establish the maximum gas temperature limit and the HWC's must also establish OPLs for PM control.

PCDDs/PCDFs - continued

OPLs For Carbon Injection Systems	Type	How Set
Min. Carbon Feed Rate (Each Location)	HRA	Avg of test run avgs
Min. Carrier Fluid Flowrate or Press. Drop	HRA	Manuf. Specs.
Carbon Specs - Brand & Type	--	Manuf. Specs.

A number of HWCs inject powdered activated carbon at various locations in their APC and if a carbon injection system is used for D/F control, these OPLs must also be set.

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PCDDs/PCDFs - continued

Carbon Bed OPLS	Type	How Set
Monitor bed life	--	Manuf. Specs
Document procedures in the O & M Plan	--	--
Record results of performance monitoring in the operating record		
Carbon Specs - Brand & Type	--	Manuf. Specs.

For units using a fixed carbon bed for D/F control, these OPLS must be set. In addition, performance monitoring of the bed must be performed and documented in the Operating Record to make sure the bed is replaced before it reaches breakthrough.

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PCDDs/PCDFs - continued

Catalytic Oxidizer OPLs	Type	How Set
Minimum flue gas entrance temperature	HRA	average of test run averages
Maximum time of catalyst in use	--	Manuf. Specs
Catalyst replacement specifications	--	Manuf. Specs
Maximum flue gas temperature	HRA	Manuf. specs

Where a catalytic oxidizer is used for D/F control, a minimum flue gas entrance temperature must be established during for the catalytic oxidizer unit and several other OPLs must be set based on manufacturer's specifications.

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PCDDs/PCDFs - continued

Inhibitor OPLs	Type	How Set
Minimum inhibitor feedrate	HRA	Average of test run averages
Inhibitor specifications	--	Manuf. Specs

Finally, if an inhibitor system is used to control D/F emissions to meet the standard, the minimum feedrate must be established in the CPT and specification must be established based on the manufacturer's specifications.

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Mercury – 40 CFR § 63.1209(l)(1)(i)
Incinerators and Solid Fuel Boilers

OPLs	Type	How set
Feed Rate of Total Mercury	12-hr RA	Avg of test run avgs

For incinerators and solid fuel boilers, a maximum feedrate of total mercury must be set from the CPT that will be used to compare to a calculated 12-hour rolling average.

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Mercury OPLs for Liquid Fuel Boilers – 40 CFR § 63.1209(l)(1)(ii)

OPL	Type	How Set
For LFBs, feed rate of total mercury	Annual R.A.	Avg of test run avgs
Wet scrubber minimum pH	HRA	Avg. of test runs averages

- For LFBs, calculate an SRE as the average of the test run averages
- Feed rate = emission standard/(1-SRE)
- Two different standards depending on whether waste is ≥ or < 10,000 Btu/lb
- Special details for how to calculate the operating feedrate averages
- Pre-conditioning requirements for wet scrubbers

For liquid fuel boilers, the maximum feedrate of mercury can be established by using the CPT's calculated system removal efficiency (SRE) and extrapolating to the emission standard. As part of this, it must be determined whether the boiler feeds waste that have a Btu content above or below 10,000 Btu/lb. Also, if wet scrubbers are used, conditioning time for scrubber fluids to reach an equilibrium level for mercury must be considered and a minimum pH must be established as part of the CPT.

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Mercury OPLs for Cement Kilns and Light Weight Aggregate Kilns - 40 CFR § 63.1209(l)(1)(iii) & (iv)

OPLs		
Maximum Mercury waste feed rate	12-hr R.A.	Avg. of test runs averages
MTEC	12-hr R.A.	

- If using MTEC, monitor and record feed rate and flue gas flow rate or its surrogate to calculate emissions.
- Assume 100% of feed is emitted.
- As an option, establish a minimum flue gas flow rate and maximum feedrate that assures MTEC is not exceeded.

For cement and light weight aggregate kilns the maximum mercury feedrate must eb established in the CPT or MTEC can be used to show compliance.

Mercury – Extrapolation

- 40 CFR § 63.1209(l)(1)(v) allows it if the Administrator approves
- Based on an assessment that
  - CPT levels were appropriate (normal or greater)
  - Requested feed rates are warranted considering historical actual feedrates

Whereas there has been historical debate concerning the use of extrapolation, Subpart EEE allows its use under certain circumstances. First, CPT design must include feedrates that are comparable or higher than normal feedrates, plus, extrapolated feedrates established through the CPT must be warranted based on historical actual feed rates while showing compliance wit the applicable emissions standard.

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Mercury – Miscellaneous OPLs

- If using wet scrubbers, comply with provisions of 1209(o)(3)(iv) for HCl/Cl_2
- If using carbon injection, comply with 1209(k)(5) for PCDD/PCDFs
- If using carbon bed, comply with 1209(k)(7) for PCDD/PCDFs

There are also additional OPLs that must be set for mercury of the unit is using wet scrubbers or some type of activated carbon control system.

Particulate Matter - 40 CFR § 63.1209(m)

High Energy Wet Scrubbers Only:	**Type**	**How set**
Min. Press. Drop	HRA	Avg of test run avgs
Limit on either Min. L/G Ratio or Min. Scrubber water Flowrate & Max. Flue Gas Flowrate	HRA	Avg of test run avgs
All Wet Scrubbers:		
For Solids Content of Scrubber Liquid, either Max. Solids Content Limit by CMS or • Manual (Hourly) Sampling or • Min. Blowdown rate and either min. scrubber tank volume or Liquid Level	HRA	Avg of test run avgs
Max. Flue Gas Flowrate or Prod. Rate	HRA	Avg of Max. HRAs for each run
Max. Ash Feed Rate (Incinerators Only)	12-hr RA	Avg of test run avgs

- Define OPLs for other devices not listed and set them

PM OPLs are generally classified based on the type of scrubber being used and OPLs for each type of scrubber must be set as shown in the CPT. Should the HWC employ a control device not specifically listed in this section of the regulation, the HWC must set appropriate OPLs foe them during the CPT. Maximum ash feed rates and flue gas flow rates (or production rates for units such as boiler) must also be established.

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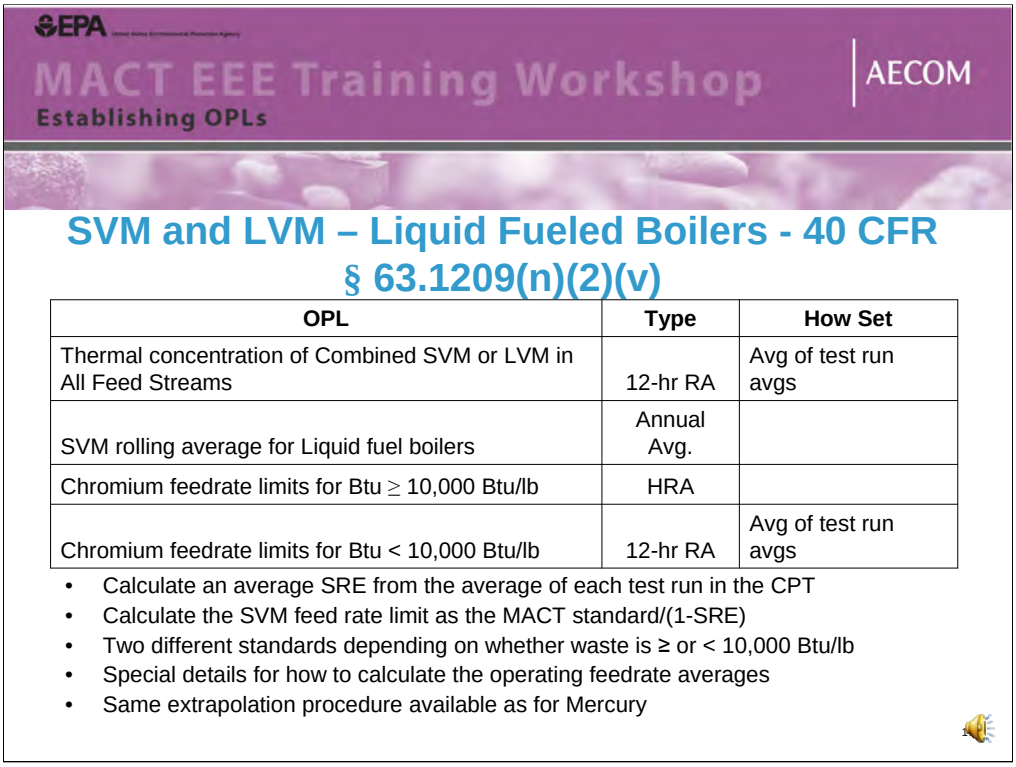
Semi-volatile and Low volatile Metals – 40 CFR § 63.1209(n)

OPL	Type	How Set
Max. Gas Temp. at Dry PM Control Device Inlet	HRA	Avg of test run avgs
Max Feed Rates for SVM and LVM:		
Combined SVM or LVM in All Feed Streams	12-hr RA	Avg of test run avgs
Thermal concentration of Combined SVM or LVM in All Feed Streams	12-hr RA	Avg of test run avgs
Max. Total Chlorine/Chloride Feed Rate	12-hr RA	Avg of test run avgs
Max. Flue Gas Flowrate or Prod. Rate	HRA	Avg of Max. HRAs for each run

- OPLs Consistent with Good PM Control at 63.1209(m)(1) must be set

OPLs for semi and low volatile metals include establishing maximum feed rates for those metals, for chlorine on the premise that higher amounts of chlorine in the feeds may cause more volatile forms of the metals to occur, which are more highly volatile and difficult to control and a maximum flue gas flow rate or production rate. In addition a maximum temperature limit must be set, if dry APC is used and other OPLs for good PM control must be set as well.



For SVM and LVM for liquid boilers, the OPLS can be set similarly as for mercury. Note that LVM for this subcategory only includes chromium.

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HCl/Cl_2 – 40 CFR § 63.1209(o) Wet Scrubbers

OPLs	Type	How Set
Max. Total Chlorine/Chloride Feed Rate	12-hr RA	Avg of test run avgs
Feed Rate Limit for Liquid Fuel Boilers - thermal rate as lbs total chlorine/MMBtu hazardous waste	12-hr RA	Avg of test run avgs
Max. Flue Gas Flowrate or Prod. Rate	HRA	Avg of Max. HRAs for each run
For High Energy Wet Scrubbers		
Min. Pressure Drop	HRA	Avg of test run avgs
For Low Energy Wet Scrubbers		
Min. Pressure Drop	HRA	Manuf. Specs.
Min. Liquid Feed Pressure	HRA	Manuf. Specs.
Min. Scrubber Liquid pH	HRA	Avg of test run avgs
Limit on either Min. L/G Ratio or Min. Scrubber	HRA	Avg of test run avgs
Water Flowrate and Max. Flue Gas Flowrate	HRA	Avg of test run avgs
IWS: Min. Power Input	HRA	Avg of test run avgs

The feed rate OPL for chlorine is typically a measure of total chlorides in the feed since neither HCl or Cl2 can generally be directly measured in feed streams. Other OPLs are generally classified by scrubber type.

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HCl/Cl_2 – 40 CFR § 63.1209(o) Dry Scrubbers

OPL	Type	How Set
Min. Sorbent Feed Rate	HRA	Avg of test run avgs
Min. Carrier Fluid Flowrate or Press. Drop	HRA	Manuf. Specs.
Sorbent Specifications	--	Manuf. Specs.

Dry scrubbers work slightly different than west scrubbers in controlling acid gases in that they typically use some type of wet sorbent (like a lime slurry) that is sprayed into a hot chamber where the wet sorbent not only reacts with and ties up the acid gas, but also quenches the flue gas and the sorbent/acid becomes a solid particulate that is then removed by the PM control device. OPLs for this type of control are thus set for the sorbent and its delivery system.

Other Issues

- Maximum Combustion chamber pressure - 40 CFR § 63.1209(p)
  - Maintain below atmospheric for negative draft systems, or
  - Maintain totally sealed to prevent leaks if balanced or positive draft systems

Another OPL that must be set deals with combustion chamber system. For units that utilize induced draft fans and operate under negative pressure, usually the OPL is set to require the unit to operate below atmospheric pressure.

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How to Set the Right OPLs

- Identify what test condition (if more than one will be used) that MACT OPL will be demonstrated in

Minimum Temperature DRE, PCDD/PCDFs	Maximum Throughput DRE, PCDD/PCDFs, Metals, PM, HCl/Cl_2
Minimum Temperature Carbon monoxide Total hydrocarbons	Maximum flue gas flow or production rate Maximum waste feed rates Metals, ash and total chlorine/ chloride feedrates Maximum dry APC inlet temperature Minimum APC settings

Finally, if more than one test condition will be performed in the CPT, certain OPLs will be established in certain conditions and these should be specified in the Plan.

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