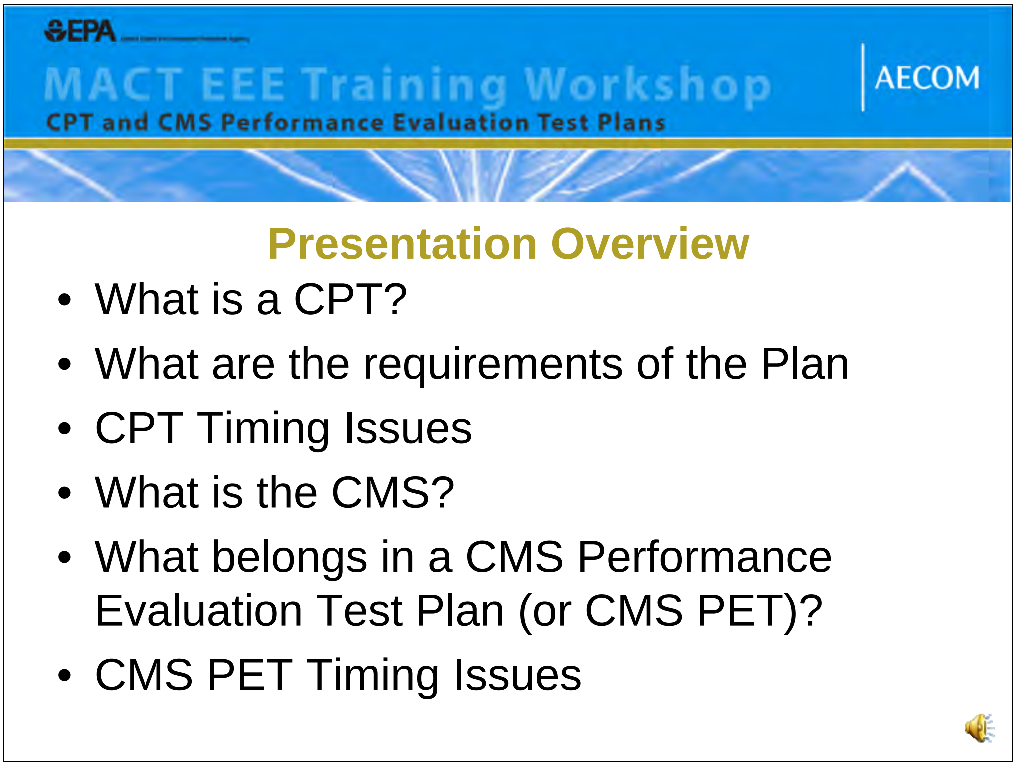
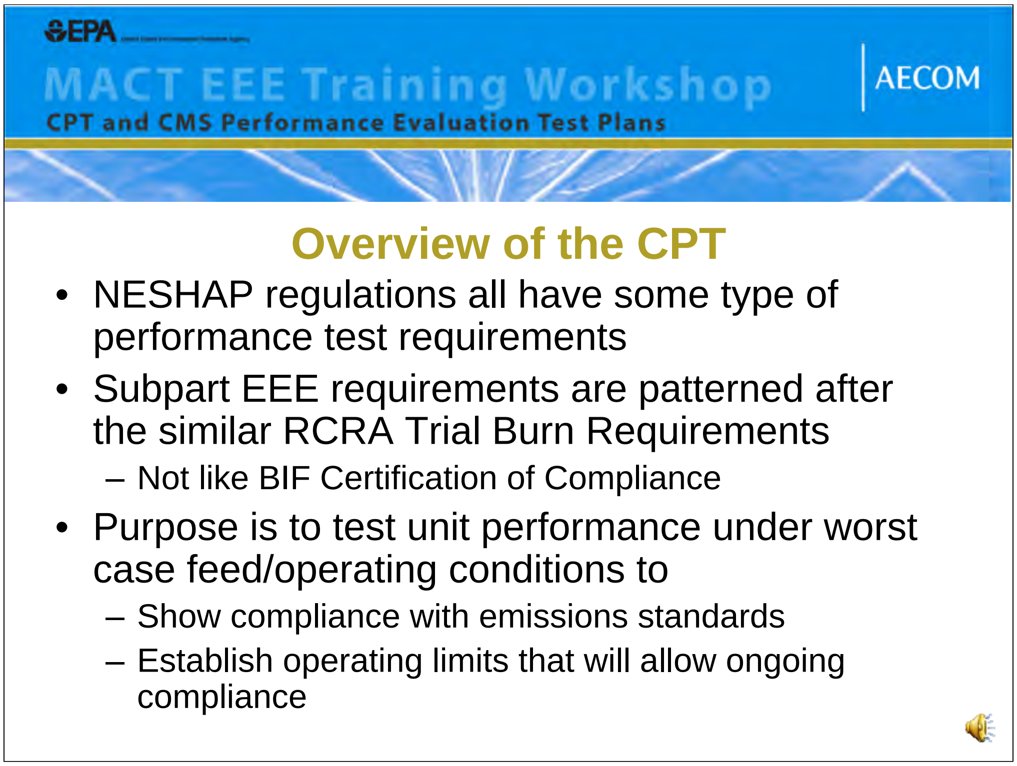
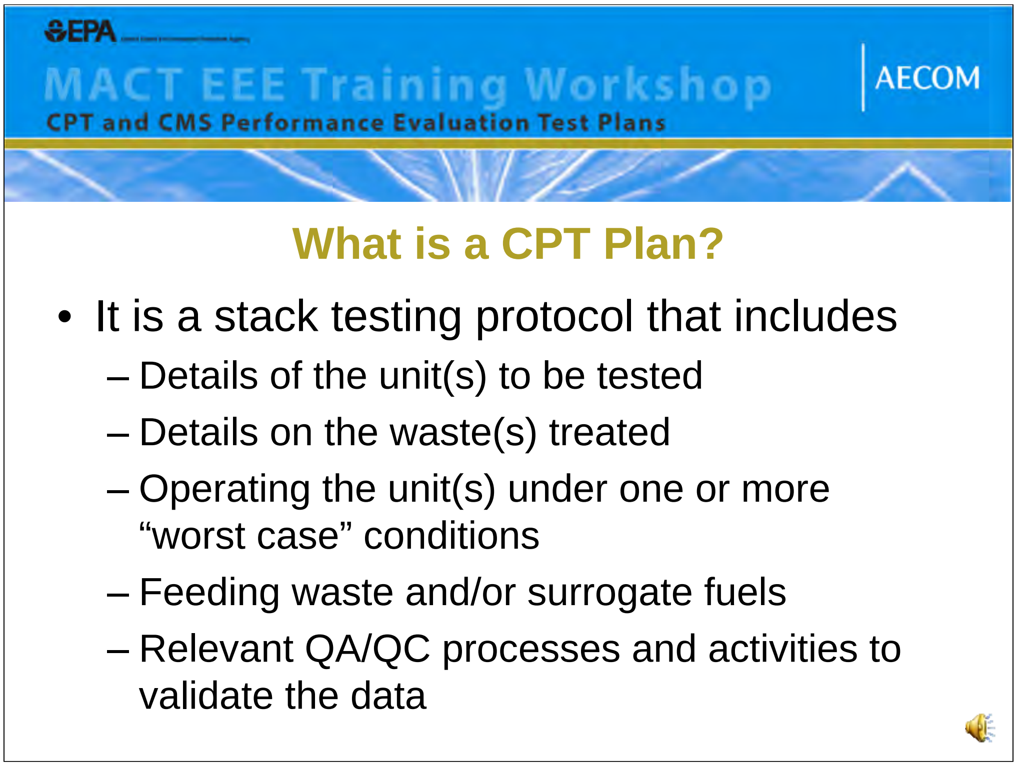
This module summarizes requirements pertaining to Comprehensive Performance Test (CPT) and Continuous Monitoring System Performance Evaluation Test (CMSPETs) Plans



Each of these will be defined and a discussion of what the requirements are for each type of plan. Finally, scheduling and timing of each of these plans will be presented.



NESHAP regulations in general each have some type of performance test requirements associated with them. For Subpart EEE units, the CPT requirements are patterned after historical Trial Burn testing requirements contained in RCRA, but are much more rigorous in general than the BIF Certification of Compliance. The primary object of CPTs performed under Subpart EEE is to test units under worst case operating conditions to show compliance with the emissions standards while establishing operating limits that will assure ongoing compliance.



In general, a Subpart EEE CPT Plan is a stack testing protocol that includes the several components listed in the slides. These requirements are detailed in the regulations at 40 CFR 63.1207. Besides providing technical details of the unit(s) to be tested and wastes that are routinely processed, the CPT Plan describes how the unit will be operated during the test so that the dual objective of showing compliance with standards and establishing Operating Parameter Limits (or "OPLs") that establish the minimums or maximums under which a unit can be operated (termed the "operating envelope") will be achieved. The test may be comprised of a single test condition with three replicate test runs or it may be designed for two or more test conditions of three replicate runs each as not all OPLs can be achieved in a single test condition. The description of the test condition will also include what wastes or other materials (i.e., "surrogates") will be fed in what quantities and feed rates. And finally, the CPT Plan must contain relevant and applicable QA/QC requirements needed to assure that all data collected is accurate and meets accepted quality criteria for the purpose for which it is being used.

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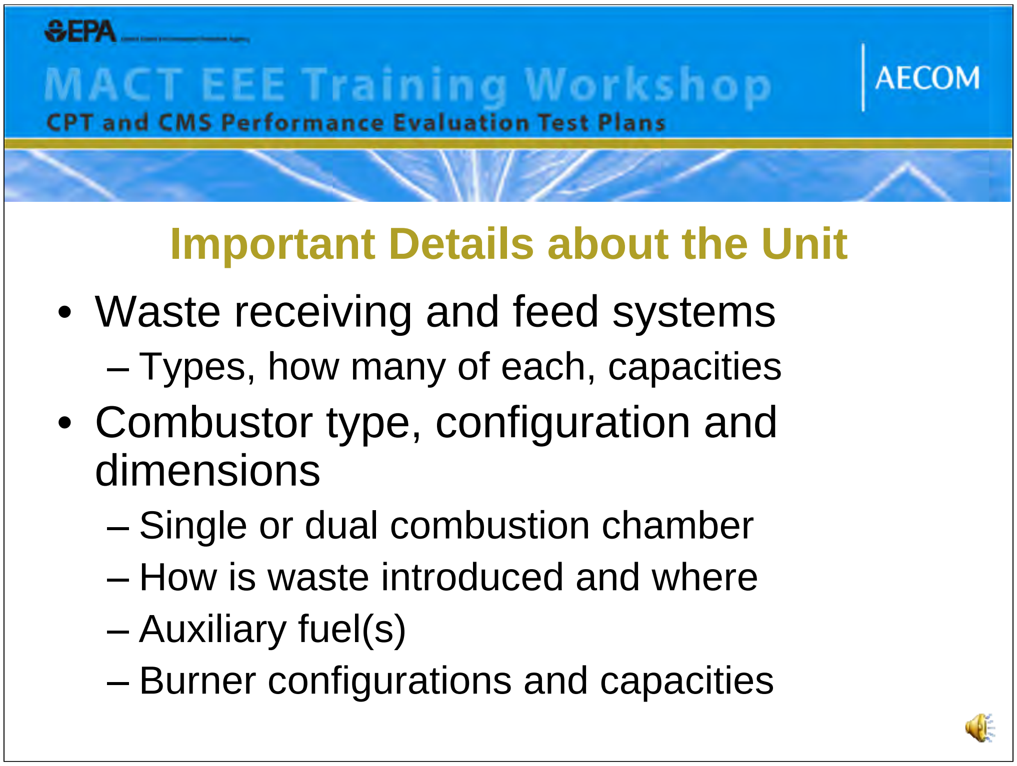
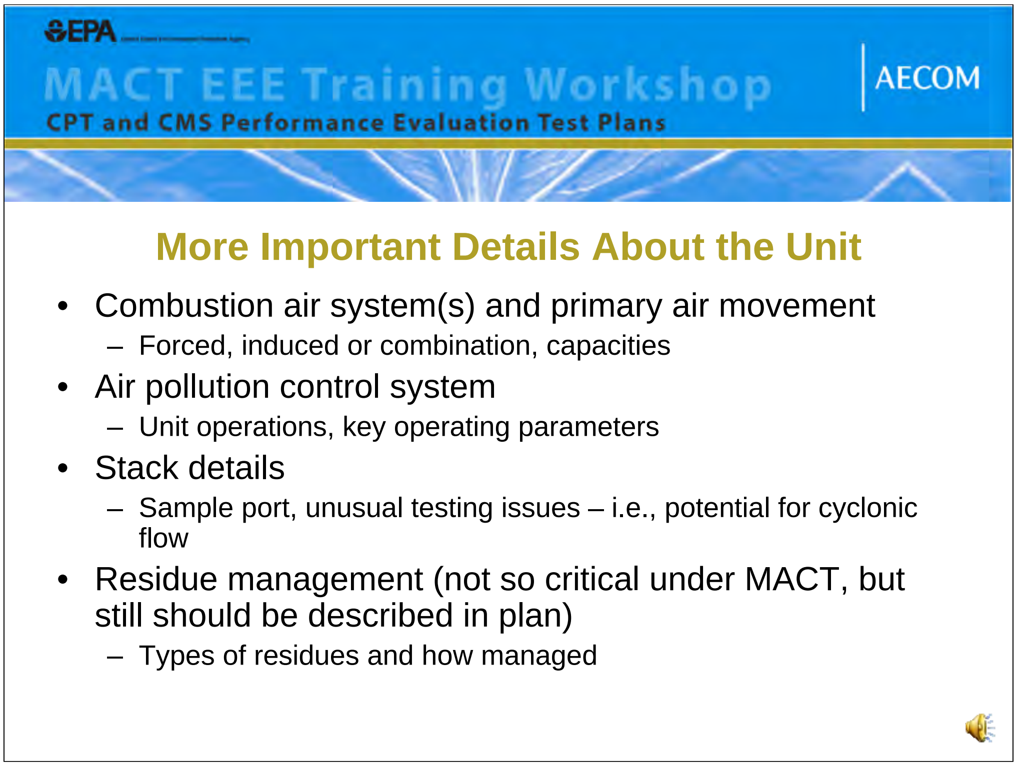
Required Content of the CPT Plan

Topic	Regulatory Citation
Program Summary	40 CFR § 63.1207(f) and § 63.7(c)(2)(i)
Test schedule	40 CFR § 63.1207(f), (f)(1)(v) and § 63.7(c)(2)(i)
Data Quality Objectives (DQOs)	40 CFR § 63.1207(f) and § 63.7(c)(2)(i)
Internal and External Quality Assurance Plan	40 CFR § 63.1207(f) and § 63.7(c)(2)(i)
Analysis of feedstreams (as fired)	40 CFR § 63.1207(f)(1)(i)
Detailed engineering description of combustor	40 CFR § 63.1207(f)(1)(iii)
Description of Waste handling and blending Operations	40 CFR § 63.1207(f)(1)(ii)(C)
Detailed test protocol Planned Feed and Operating conditions during the CPT	40 CFR § 63.1207(f)(1)(iv) 40 CFR § 63.1207(f)(1)(vi) & (vii)
Procedures for rapidly stopping hazardous waste feed and controlling emissions during malfunction	40 CFR § 63.1207(f)(1)(viii)
Determination of hazardous waste residence time	40 CFR § 63.1207(f)(1)(ix)
Metal feed rate limit extrapolation (if used)	40 CFR § 63.1207(f)(1)(x)
CMS and CEMS performance evaluation plans	40 CFR § 63.8(e)(4) and 1207(b)(1)
Levels of regulated constituents feedstreams that are not analyzed	40 CFR § 63.1207(f)(1)(xi)
Conditioning time needed to reach steady state prior to testing	40 CFR § 63.1207(f)(1)(xii)

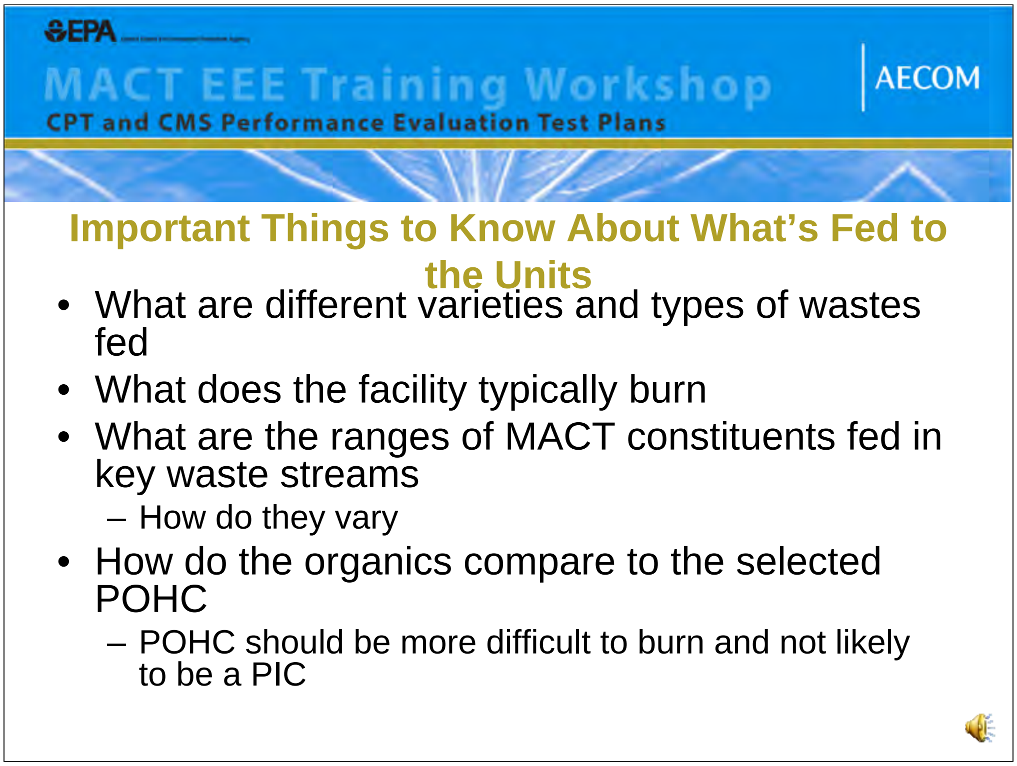
A detailed summary of the content of a CPT Plan and its associated regulatory citations are shown in this table.



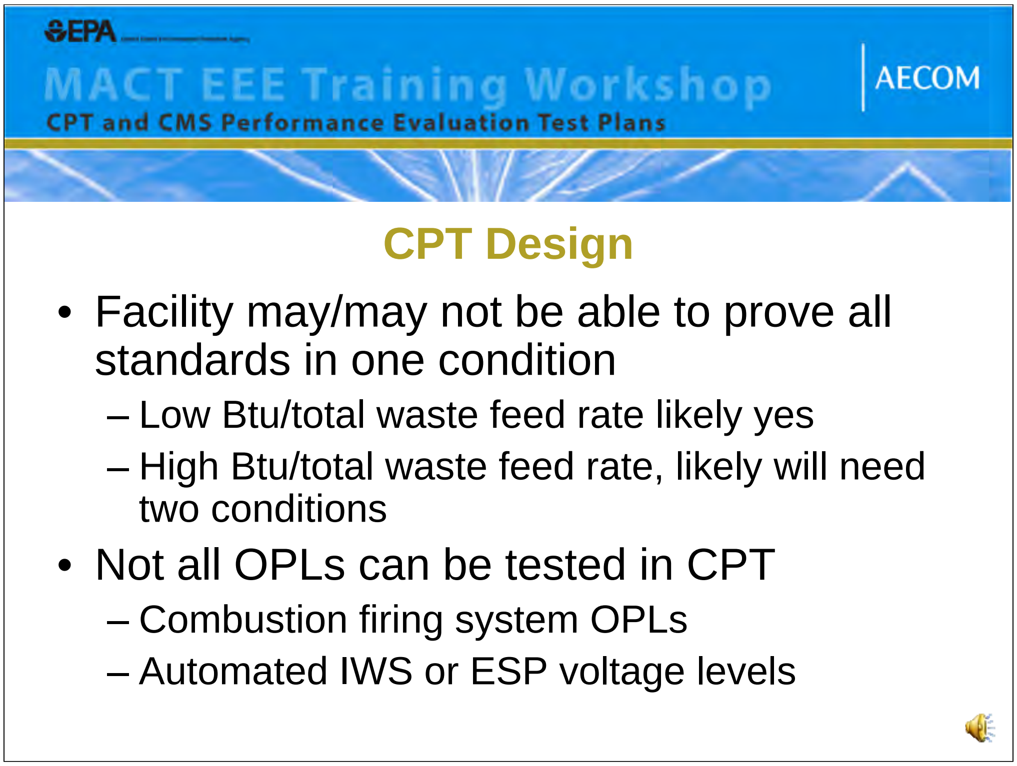
In order to adequately understand how the CPT Plan will actually demonstrate compliance with Subpart EEE, it is first important to understand the unit(s) being tested from a technical standpoint. Starting with waste handling systems, the overall feed systems should be understood along with what is proposed to be used for the CPT. In addition, details regarding the combustion portion of the unit should be reviewed as well.



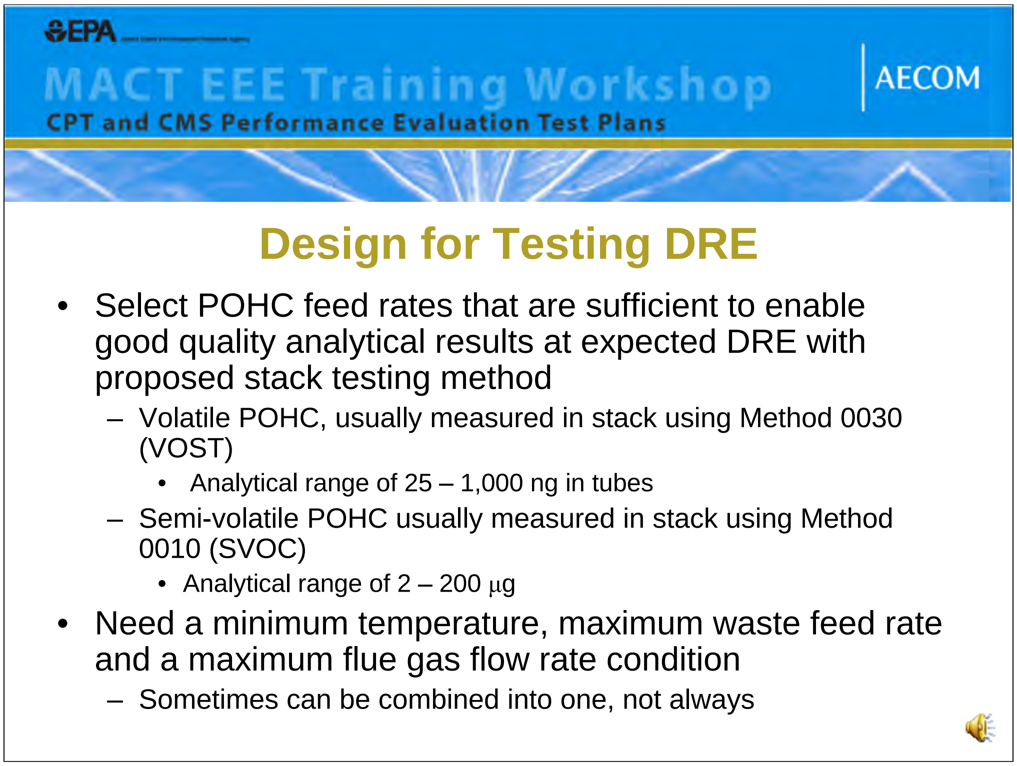
As part of understanding the combustion system, combustion air supply should be understood along with knowing whether the unit is maintained under vacuum (via use of induced draft fans), under positive pressure (using forced draft fans) or is a combination of the two, resulting in a balanced draft operation. Unit operations that are part of the air pollution control system should be reviewed along with their relevant OPLs. From an actual testing perspective, it is important to understand the specifics of how the stack testing is going to be completed and whether there might be any unusual testing issues (such as the presence of cyclonic flow) that may arise due primarily to sample port location and the type of stack flow expected at the sampling location(s). Finally, while residue management is not a direct factor in MACT CPTs, an understanding of combustor residues and how they are managed should be obtained.



Some facilities, particularly commercial units and onsite facilities servicing large manufacturing plants can manage a broad range of waste materials over the course of a year. However, in most cases, these HWC's will typically burn a predominant subset of the total number they might handle. To understand how best to evaluate the CPT design, these top streams should be reviewed to understand what predominant physical forms of waste are fed and what the range of HAPs and MACT constituents are in those streams. HWCs can provide historical feed rate information along with profiles of their top waste streams in the CPT Plan. This information is useful in assessing whether the proposed CPT feed rates for inorganic constituents regulated under Subpart EEE make sense considering historical feed rates and also whether the compound being chosen for the DRE test (The Principal Organic Hazardous Constituent or POHC) represents a more difficult to burn organic compound than is typically managed. Guidance criteria for POHC selection is the same as what has been used historically under RCRA and POHC should also be selected that are not likely to be present in emissions as a Product of Incomplete Combustion or PIC as this could adversely affect the emission rate and put the DRE results into question.

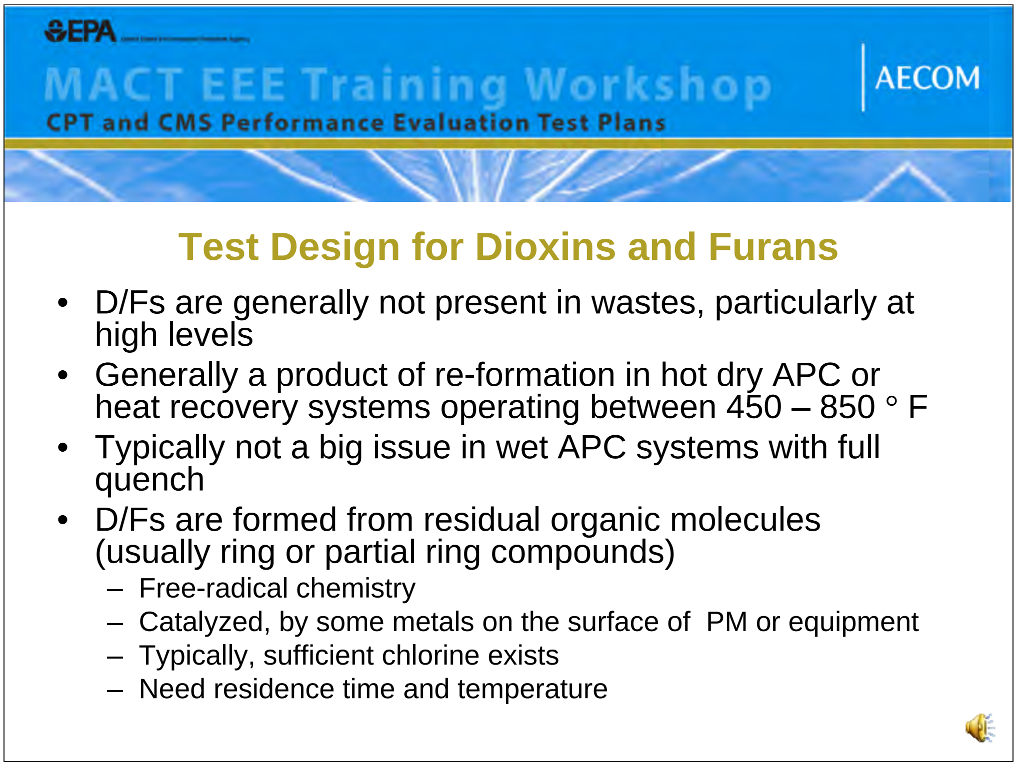


HWCs are not required to conduct CPTs under a single test condition. In fact, there are situations where this is not possible. The most common example of where two test conditions may be needed is for units that treat wastes with a relatively high Btu content. In this case, it will be physically impossible to establish a minimum temperature limit that is required for DRE while at the same time setting a maximum throughput limit that is required for other standards in the same condition. In addition, not all OPLs can be tested during a CPT and some must be set based on operating experience or manufacturer’s recommendations. For example, most atomizing media systems (steam or air are the most common, but natural gas can be used for atomization as well) are designed to provide a certain minimum atomizing pressure and either it is on and working or it is not. The HWC cannot “dial in” a certain minimum pressure or flow rate for atomization as the system is generally not designed to be controlled. Similarly, ionizing wet scrubbers (IWS’) and electrostatic precipitators (ESPs) are designed with control electronics that adjust the voltage to the electrified field based on how much particulate matter is being handled. Thus, these units are not designed to manually control voltage and cannot “set” a minimum voltage during a CPT.

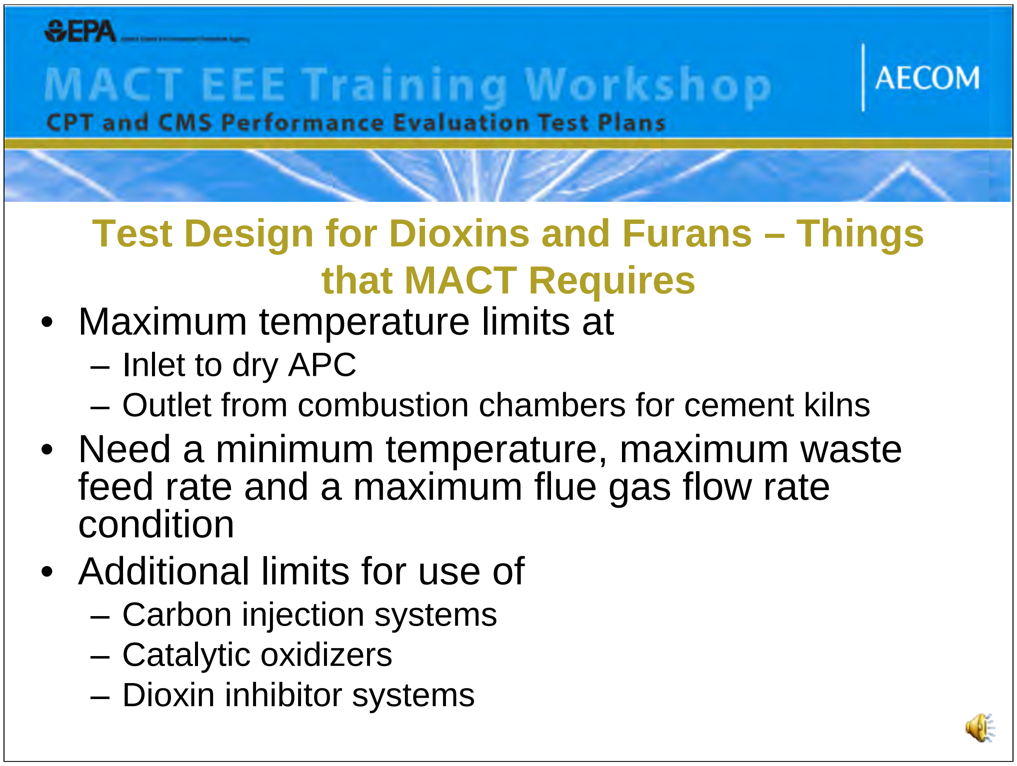


As mentioned in a previous slide, POHC selection is still done the same way it was for RCRA Trial Burns and has some general guidelines associated with it. First, a POHC or POHCs should be selected on the basis of whether or not they are more difficult to burn than the predominant organic wastes being treated in the HWC. There are two generally accepted criteria for this. The first method is based on the principal of thermal stability which was developed at the University of Dayton Research Institute (UDRI). This approach is based on gas-phase thermal stability under oxygen-starved conditions. Compounds are ranked on the basis of the temperature required for 99 percent destruction at a residence time of two seconds. The second is based on considering the higher heat of combustion of the waste and intended POHC as it is generally held that burning a waste with a lower heat of combustion is more difficult than burning one with a higher heat of combustion. The two approaches are often used together but it is important to also look at what has historically been used at the HWC as well.

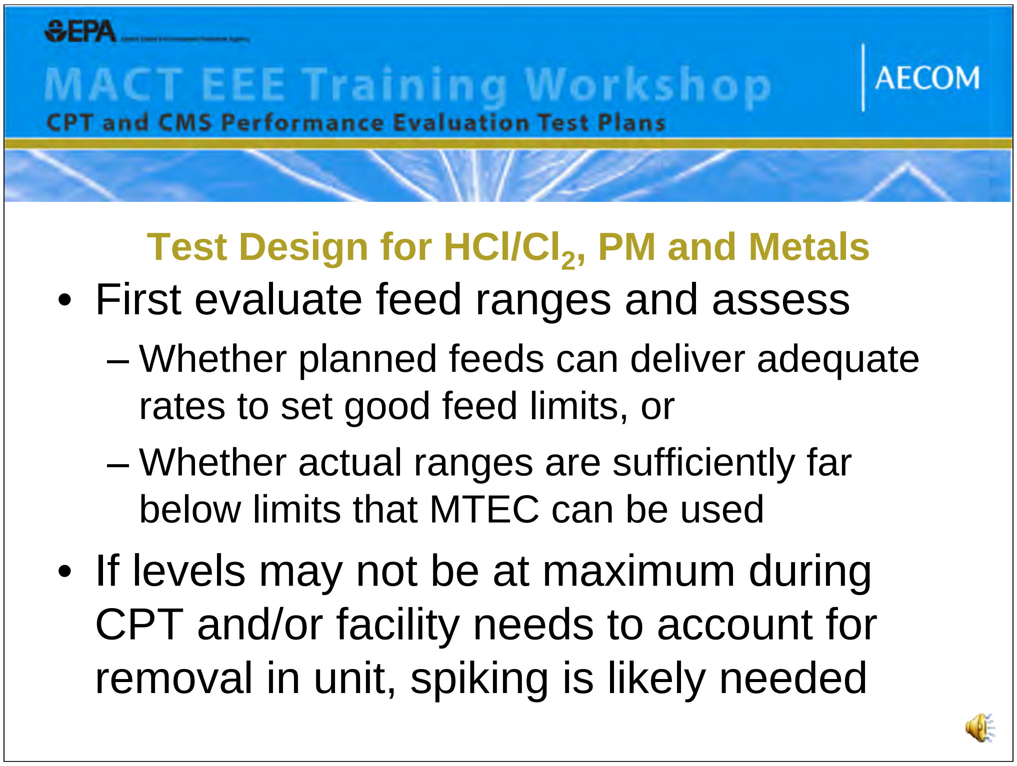
Additionally, POHC feed rates should be selected such that sufficient amounts are fed so that the expected DRE can be calculated from an actual emission rate in the stack (versus a non-detect result). While ND stack values can certainly be used to calculate a DRE, if too low a rate of POHC has been fed, the necessary DRE may not be shown. Feed rates for volatile and semi-volatile POHCs or thus chosen based on expected DRE and the dynamic range of the analytical method being used.



In designing CPTs to test for dioxins and furans, it is important to understand a few things about them. First, in most cases, these compounds are not present in wastes and only in very unique situations would they be present at high levels, unless the manufacturing chemistry would indicate otherwise. For almost all HWCs then, Ds and Fs are generally a result of re-formation in post combustion air pollution control equipment, in particular, where such equipment is operated within the temperature range of 450 to 850 F. Examples include hot baghouses or ESPs and units with heat recovery. D/F reformation is generally not an issue where rapid quench, water based air pollution control equipment is used. In order for these compounds to re-form though, not only does the temperature need to be in the range discussed, but the presence of ring or partial ring compounds as PICs is important as well. In addition, studies have shown that some metals, like copper can catalyze the reaction where there is adequate particulate matter or other surface area for the reaction to proceed and where adequate residence time exists within the correct temperature range.



From a CPT design perspective, Subpart EEE requires some specific maximum temperature limits as described above and in addition, for a number of subcategories it requires establishing the same limits for DRE. Solid and liquid fuel boilers, hydrochloric acid production furnaces and light weight aggregate that are not subject to a numerical emissions standard must conduct a one time test that is reflective of daily maximum operating variability. For units equipped with carbon injection systems, catalytic oxidizers or D/F inhibition systems, additional OPLs as defined in 40 CFR 63.1209 and discussed in a later module will apply and must be incorporated into the CPT Plan.

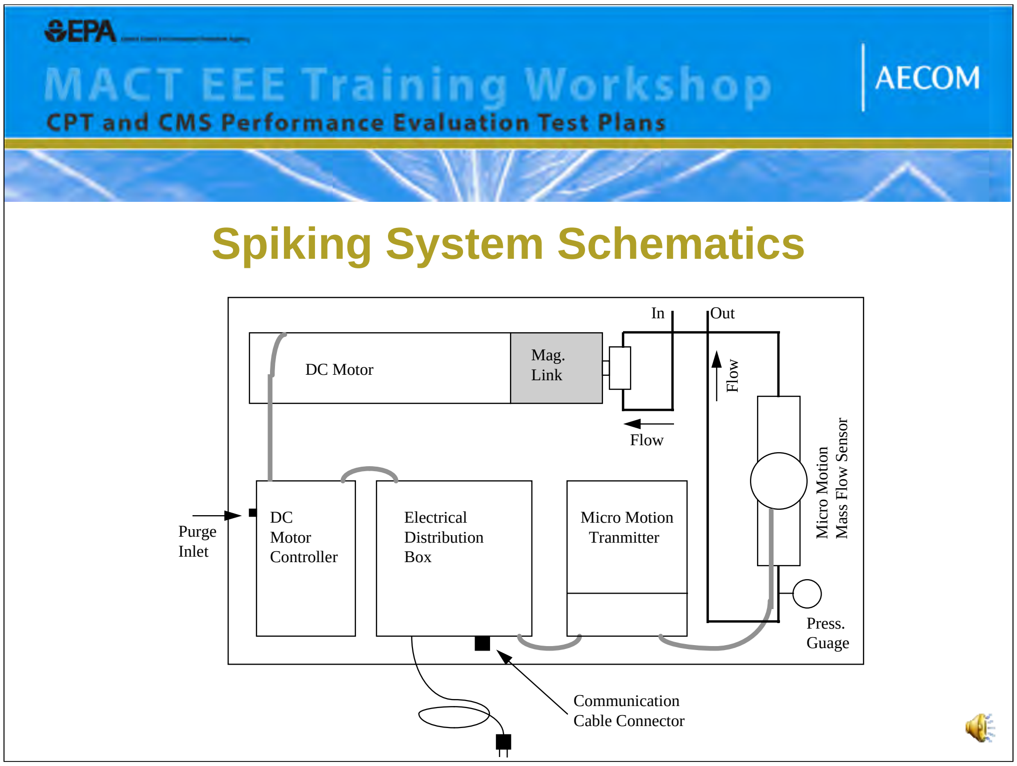


For the inorganic Subpart EEE constituents and particulate matter, it is important to review historical feed ranges to assess whether the planned feed rates can deliver adequate feed limits or whether the actual ranges are sufficiently below the standard such that it makes sense to use an MTEC approach for compliance purposes. Where MTEC cannot be used and where normal feed rates may not provide sufficient amounts of metals, ash or chlorine/chlorides and yet maximum feed rates indicate the need to set higher OPLs for these constituents, spiking must be considered.

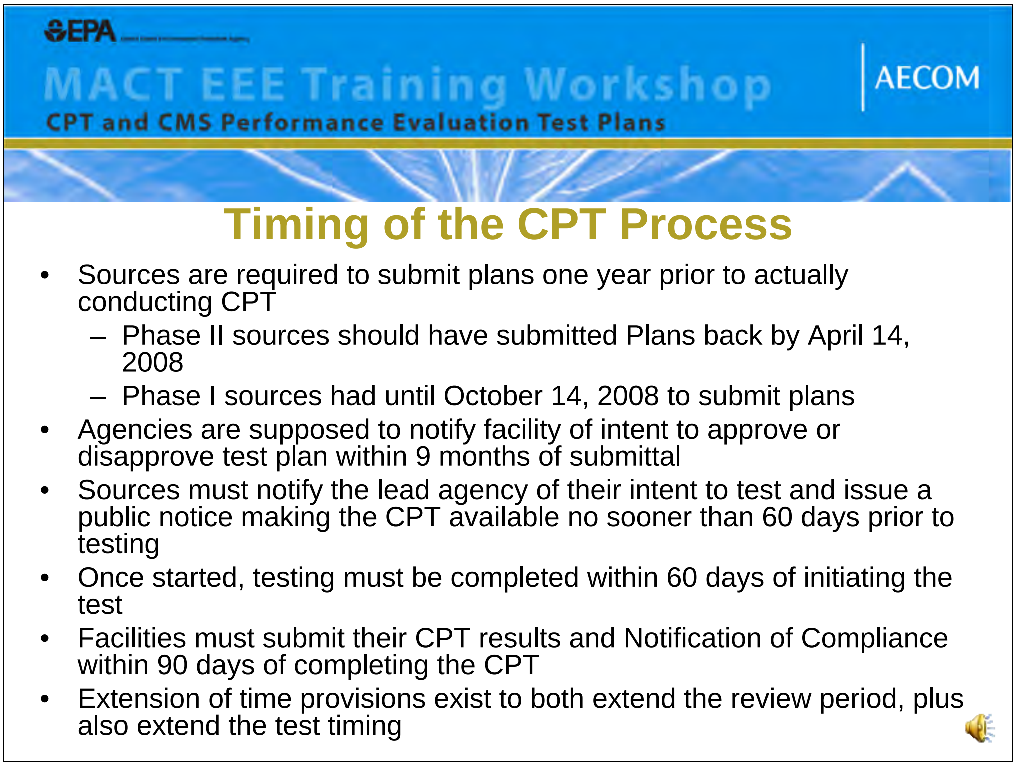
Selection of Inorganic Spiking Approaches

- Safety first, pick materials that can be safely handled
- Pick materials that can be provided by commercial suppliers with a certificate of analysis
- Deliver spiked materials to emulate how combustor would actually see them
  - As solid with solid feed
  - As liquid in liquid feed – organic/aqueous
  - Combination
- Need to consider impact of spiked materials on
  - Combustor materials
  - Downstream systems like wastewater treatment plants
- Always sample waste upstream of spiking location
  - Can choose to ignore or count feed contributions in removal efficiency calculations

There are many options to choose from in terms of using materials besides routine waste in order to “spike” selected constituents at the desired rates during a CPT. First and foremost is the issue of safety and obtain Material Safety Data Sheets (MSDS’) from candidate suppliers as part of the initial planning. Materials that are highly hazardous or toxic should be avoided if possible and any spiked materials must be compatible with the waste streams and construction materials of the feed systems or they should be avoided for those reasons as well. Spike materials can be provided by commercial suppliers with a certificate of analysis (COA) indicating the concentration or purity of the constituent you are interested in and should be provided in a physical form that is representative of how the target constituents might normally be fed. In addition to satisfying the test objectives and compatibility with initial feeds and feed systems, impacts on the rest of the HWC and any downstream treatment systems like a wastewater treatment plant should be considered as well. Obviously if the spike materials are to be fed in very small amounts, these impacts may be insignificant, but in some cases, excessive equipment corrosion, refractory impacts or possibly operational or compliance impacts on a downstream wastewater treatment system could be problematic. Generally, it is good practice to waste streams upstream of spiking location so that native wastes can be evaluated by themselves. Contributions from the spiked materials should be based on accurate tracking of feed rates and the COA. It is also important to note for removal efficiency determinations, it is common to ignore contributions from waste streams and rely solely on the amount spiked for the input amount as this represents a conservative assessment of the unit’s performance.

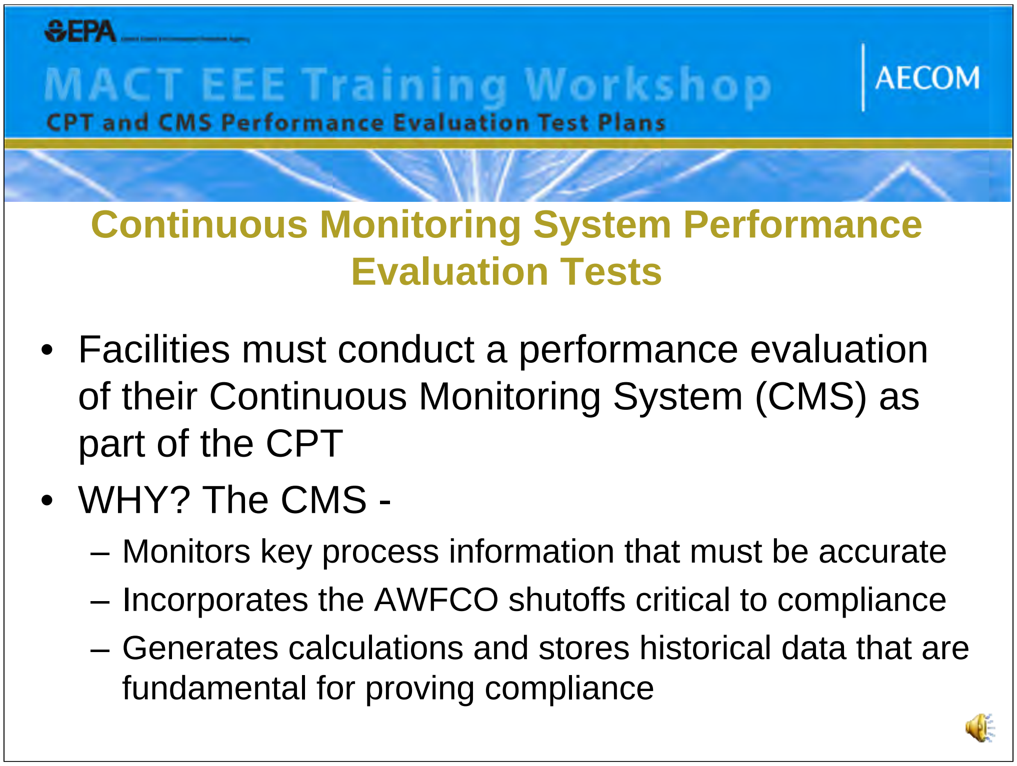


This slide shows a typical spiking system used to spike liquid solutions. Of importance in this are a couple of items. First, the pump should be a positive displacement “metering” type pump, these are designed to deliver precise amounts of material. Second, reliable, calibrated flow metering technology is also essential. These are generally connected to a data logging system or laptop capable of monitoring the entire operation. It is common that separate systems are used for each spiked material and that they are fed discretely from separate solution containers to avoid mixing and assure accurate feed rates are delivered according to the CPT Plan.



From a timing perspective, HWCs are required to submit CPT Plans at least one year prior to when they plan to be conducted. For Phase II sources not granted an extension of time, this should have been done by April 14, 2008. Phase I sources had until October 14, 2008 to submit their plans. Agencies are supposed to notify facilities of their intent to approve or disapprove the plan within 9 months of submittal. Sources must then notify the agency of their intent to test and issue a public notice making their plan available 60 days prior to testing.

Once the CPT begins, it must be completed within 60 days, unless other arrangement can be agreed to with the lead agency and results and the associated Notification of Compliance or NOC must be submitted within 90 days of completing the CPT. Extension of time provisions do exist for both the test plan review period and also for extending the duration of the CPT.



Switching now to the Continuous Monitoring System Performance Evaluation Test or CMS PET, HWC's must conduct this as part of conducting their CPT. This is an essential component of conducting CPT as it involves assuring that all the critical process information, waste feed cutoffs and process data needed to establish OPLs is accurate and working properly.

Continuous Monitoring System (CMS)

- What is it?
  - Term of art used in MACT regulations that means the overall control system for an affected source
- It includes
  - Field instrumentation (thermocouples, flowmeters, pressure gauges)
  - Control loop
  - Control hardware and software
    - Including AWFCO system
  - Data acquisition and management system
  - CO and O_2 analyzer systems

Basically, the CMS is a term used in NESHAP regulations to describe the process monitoring and control system used at the HWC. The CMS includes field instrumentation used to monitor process operations and performance, the control loop meaning the signals from the field instrumentation, the process control system through which they are processed and the control hardware that uses output signals from the process control hardware and software to adjust the process, the central processing unit that performs the various process calculations sent to the control equipment, the data acquisition and management system, which is typically a separate computer used for data archiving and long term storage and finally the Continuous Emission Monitoring (or CEMs) systems for oxygen and carbon dioxide.

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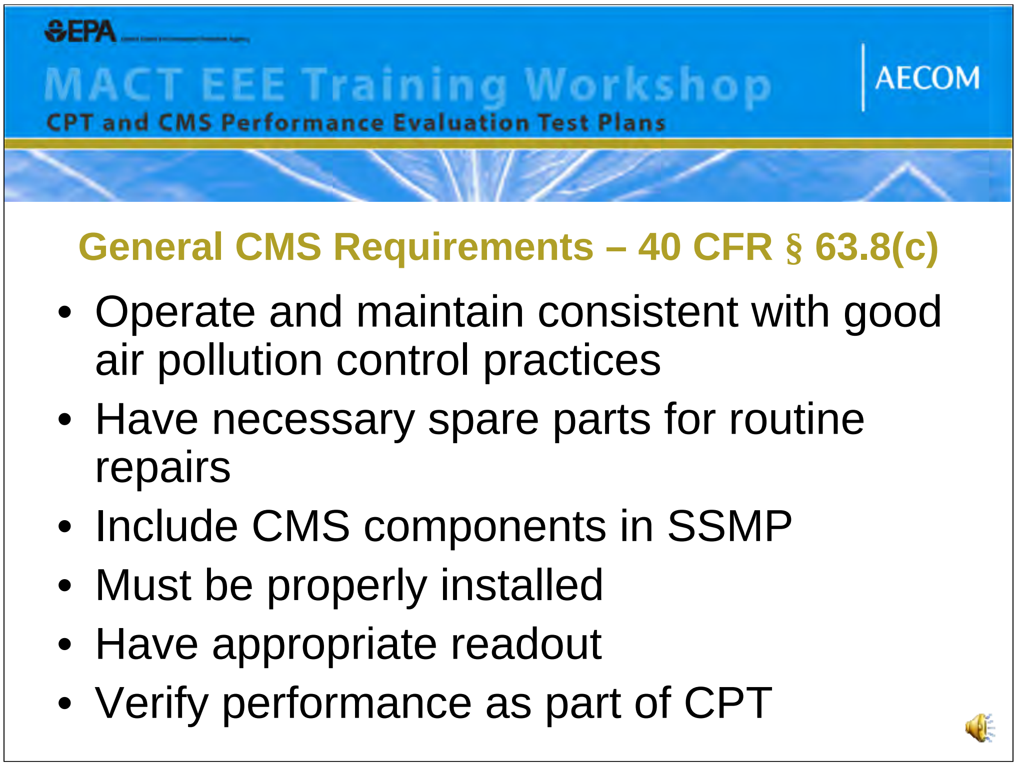
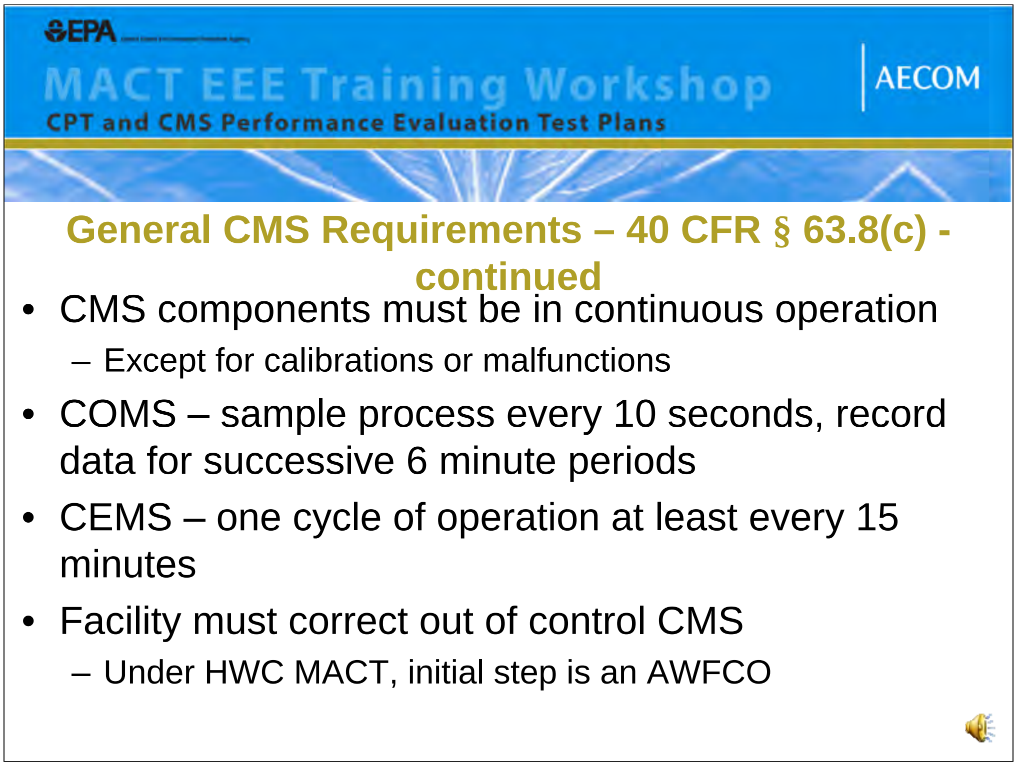
CMS Components - Control Loop

- Field Transmitters and wiring back to control system
- Some type of process control system that
  - "Samples" process data very rapidly
  - Performs calculations to analyze status of system (hourly and 12 hour averages)
    - Compare actual feed rates to limits
  - Sends output signals to control devices
    - Adjust controls (0-10 volt or 4-20 mili Amp)
    - Open or close valves (energize or de-energize a circuit)

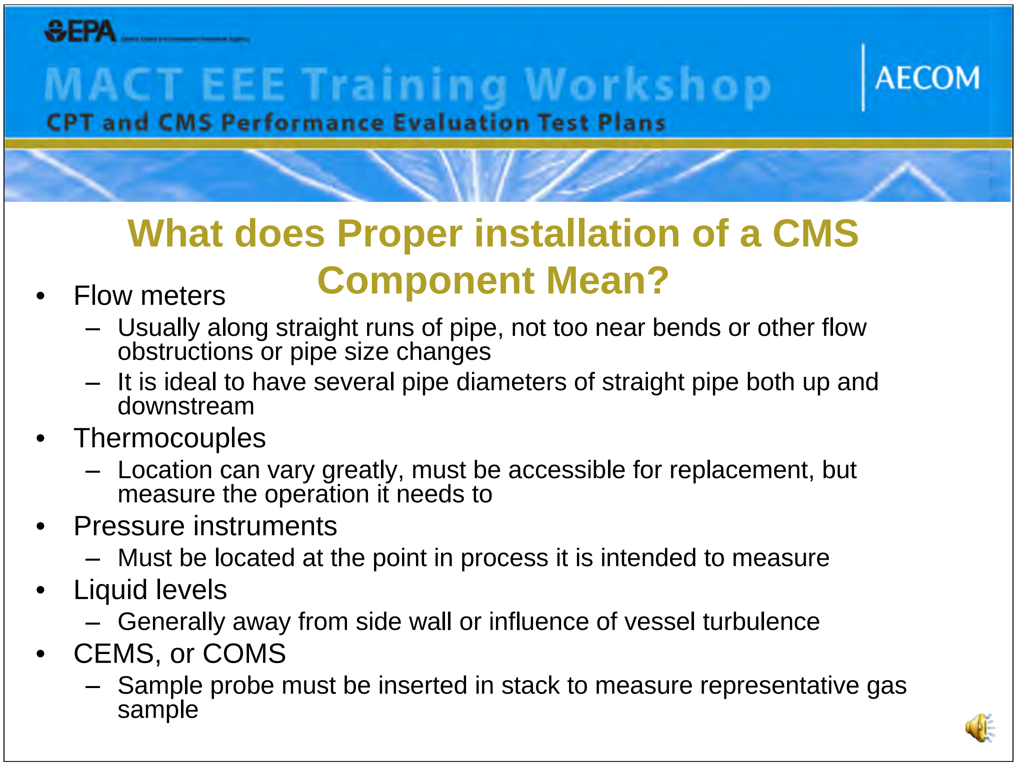
In more detail, the control includes field located transmitters that send output signals from the process instruments back to the control system. These electrical signals are usually digital either indicating equipment is "on" or "off" or analog, providing a variable strength signal that the process control computer can interpret as some value within 0 to 100% of the range of that instrument. The process control computer then performs calculations to analyze the status of the HWC and sends output signals back to control equipment, like valves, or pumps to adjust their operation. Digital, on/off signals open or close valves and analog signals make adjustments to current settings by changing their signal which is either typically a 0 to 10 volt signal or a 4 to 20 milli amp signal.



There are general requirements for the CMS that can be found in the regulations at 40 CFR 63.8(c) that include the items summarized on the slide above. Interpretation of these requirements for specific HWC's will depend on the unit and what kind of equipment is included in the CMS.



One key aspect of the CMS is that it must be in continuous operation while the HWC is burning hazards waste in order for the unit to be in compliance. The General Provision also do stipulate operational requirements for opacity carbon dioxide and oxygen continuous monitors and HWC's must correct any CMS that operate out of control. Under Subpart EEE, if this occurs, the HWC must initiate an Automatic Waste Feed Cutoff and correct the issue before re-commencing the treatment of waste.



Manufacturers of process instrumentation have installation specifications to assure their equipment is installed correctly. Incorrect installation can lead to faulty reading that are not indicative of representative process conditions. In general terms though, flow meters usually should be located along straight runs of piping so that there are several pipe diameters both upstream and downstream of any bends or other obstructions (like valves) that could affect the accuracy of the flow reading. Thermocouple location can vary greatly and sometimes facilities install multiple ones to monitor the part of the process, but these should be located so that they measure the temperature they are intending to and also so that they can be readily replaced as facilities often replace these on a fairly regular basis. Pressure instrumentation should be located with similar guidelines as thermocouples. Liquid level measurement, such as for tank levels should be located generally away from vessel side walls and CEMS or COMs sample points must be located in stacks so that they cam measure a representative sample of the gas stream.

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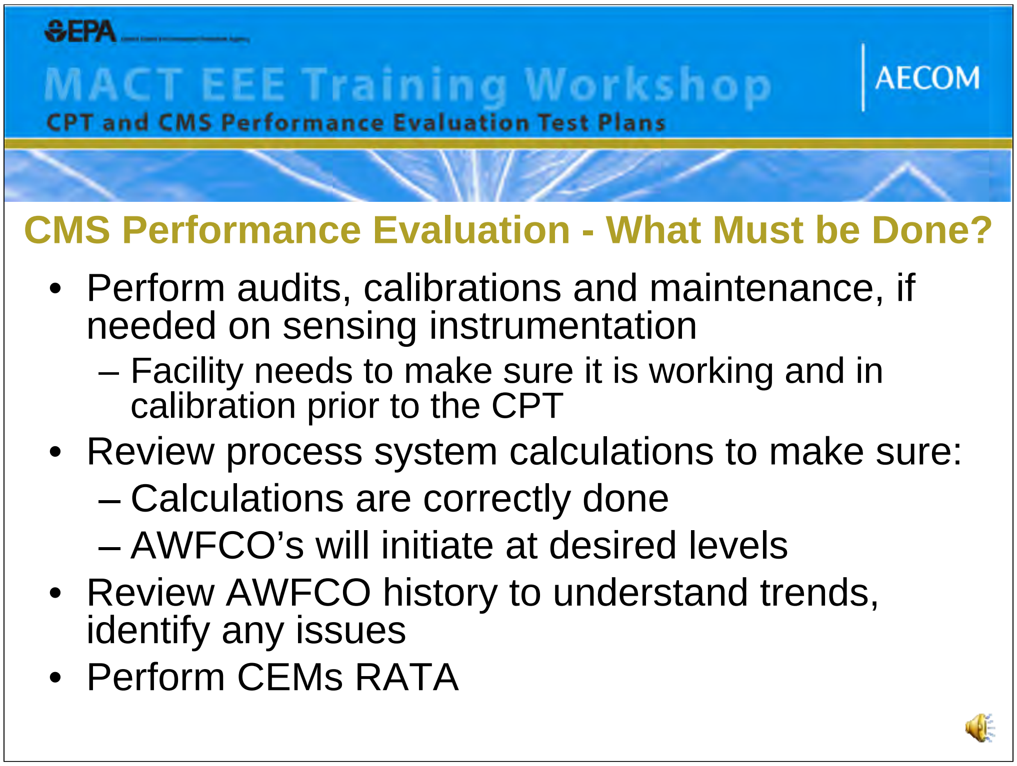
CMS Program – Example Calibration Frequencies

Parameter	Units	Equipment Type	Calibration or Replacement Frequency
Maximum Hazardous Waste Feed Rate	lb/hr	Mass flow meter	Annually
Maximum Total Pumpable Hazardous Waste Feed Rate	lb/hr	Mass flow meter	Annually
Minimum Steam Production Rate	lb/hr	Calculation	N.A.
Maximum Steam Production Rate	lb/hr	Calculation	Annually
Minimum Combustion Chamber Temperature	° F	Thermocouple	Annually
Maximum Combustion Chamber Temperature	° F	Thermocouple	Annually
Maximum Combustion Air Flow	MM SCFH	Annubar	Annually
Maximum Ash Feed Rate	lb/hr	Calculation	N.A.
Maximum mercury feedrate	lb/hr	Calculation	N.A.
Maximum SVM (Cd + Pb) Feed Rate	lb/hr	Calculation	N.A.
Maximum LVM (Cr only) Feed Rate	lb/hr	Calculation	N.A.
Maximum Chlorine Feed Rate	lb/hr	Calculation	N.A.
Maximum stack gas carbon monoxide concentration	ppmv, dry @ 7% O_2	Infrared analyzer	Daily, quarterly, annual

Different HWC facilities calibrate their instrumentation on different frequencies, however this table provides an indication of how a facility might summarize their key CMS components and associated calibrations. In some cases, CMS parameters may be calculations which can be checked for accuracy but cannot be calibrated.



The performance evaluation needs for a specific HWC will be unique to the components that comprise it. However, in general, there are several key features of the CMS that should be reviewed to assure the performance evaluation addresses the critical issues. First is to make sure that all field instruments that are formally part of the Subpart EEE CMS have been audited and calibrated per their appropriate schedule before the CPT is commenced. This should include needed repair or maintenance of deficient components. HWC facilities should also have reviewed their process calculations to make sure that these are being done correctly. A prime example is verifying all calculated feedrates such as metals, ash and chlorine are being totaled correctly and that AWFCOs are set at appropriate levels. It is also suggested that the AWFCO history should be reviewed to understand any ongoing trends or issues that may exist. And finally, all required testing, audits and calibrations for CEMS systems should be current.