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How do hazardous waste combustors remove pollutants from their stack gases?

Hazardous waste combustors use a number of different air pollution control systems depending upon the type of combustion system and the pollutants being controlled. Below is a list of typical air pollution control equipment used by the six different types of hazardous waste combustors.

- Cement kilns – Electrostatic precipitators (ESPs) and fabric filters (FFs) for particulate (containing condensed metals and organics) control.
- Lightweight aggregate kilns – FFs for particulate control, sometimes in combination with dry scrubbing and wet scrubbing for acid gas control.
- Incinerators – A variety of different air pollution control systems. These include:
 - Dry scrubbing in combination with dry particulate control with FFs or ESPs (“dry” air pollution control systems).
 - FFs or ESPs (dry PM control devices) followed by wet scrubbing (“wet/dry hybrid” air pollution control systems).
 - Wet scrubbing systems for both PM and acid gas control, including various different combinations of wet scrubbers such as ionizing wet scrubbers, wet ESPs, venturi scrubbers, packed beds, and spray towers.
- Solid fuel boilers – FF or ESPs.
- Liquid fuel boilers – Most do not require controls due to extremely low amounts of pollutants produced; some use FF or wet scrubbers.
- Hydrochloric acid production furnaces – Multiple stages of wet scrubbers.

The following is a brief description of the air pollution control techniques mentioned above:

- Cyclones – Used for coarse particulate removal.
- Fabric filters – Used for coarse and fine particulate removal.
- Electrostatic precipitators – Used for coarse and fine particulate removal.
- Venturi scrubbers – Used for both particulate and acid gas control

- Wet scrubbers – Used primarily for acid gas control. Ionizing wet scrubbers control particulate matter as well as acid gases.
- Spray dryers and dry scrubbers – Used for acid gas control.
- Hybrid wet/dry scrubbing systems – Used for both acid gas and particulate control.
- Flue gas cooling – Includes techniques such as water quench, air dilution, waste heat boilers, or heat exchangers.
- Other control techniques – Including activated carbon used for volatile metals and organics control, earth-based sorbents for semi-volatile metals control, and specific mercury control techniques including selenium coated filters, sodium sulfide injection, and mercury scrubbers.
- Catalytic oxidation – Used for organics control.
- Sulfur-based control – Used for organics control, in particular dioxin.

EPA has provided two good sources of additional details for each of these methods and how each may be used. The first is https://www3.epa.gov/ttn/catc/cica/atech_e.html. This website provides links to detailed descriptions of several different types of equipment. The second is Volume 1, Chapters 2 and 3 of the Technical Support Document for the 2005 final hazardous waste combustor MACT rule. Chapter 2 is primarily a description of each source category but the last section in each source category discusses the types of air pollution control used by that source category and why it is used. Chapter 3 provides a detailed description on how each piece of equipment works. EPA has not posted the Technical Support Documents on their webpage but a copy of Volume 1 can be found at www.crwi.org/textfiles/tsd2005v1.pdf. Copies of the other four volumes can be obtained by either contacting CRWI (mel@crwi.org or 703-431-7343) or EPA (behan.frank@epa.gov).