Controlling THC and Mercury Emissions for MACT Compliance

ADA Environmental Solutions
March 30, 2010

NASDAQ: ADES

Proposed Mercury and THC Emission Limits

	Current Level	Existing Source	New Source
Mercury	12 to 3,300 lb/MM tons clinker	43 lb/MM tons clinker	14 lb/MM tons clinker
THC	<1 to 173 ppmv	7 ppmv	6 ppmv

Keith Barnett, EPA Office of Air Quality Planning and Standards, May 27, 2009

Primary Sources of Mercury

Limestone. Some seams contain cinnabar (mercury sulfide, a cinnamon red to a brick red mineral)

Coal contains trace levels of mercury
Waste fuel may contain mercury

Some feed materials, such as coal combustion fly ash, contain mercury

Primary Sources of THC

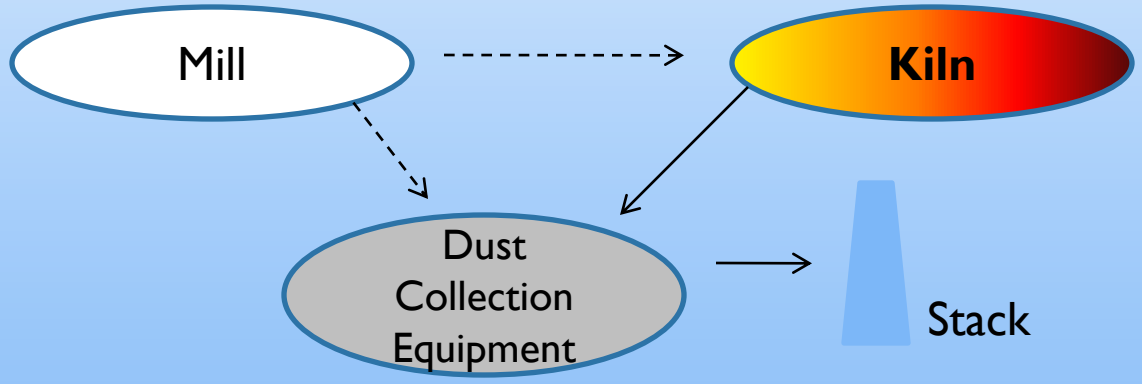
Organics in limestone

Incomplete fuel combustion (typically a secondary source)

Organics in millscale

High carbon flyash

Existing Mercury Control



- Mercury in the raw mix or fuel is released as elemental mercury when heated in the kiln
- Some elemental mercury combines with halogens present from the fuel to produce more reactive "oxidized mercury"
- Some reactive oxidized mercury may react in raw mill or with alkaline fines (CKD) and be removed in dust collector
  Some non-elemental mercury is soluble and can be removed in a wet scrubber
- Elemental mercury exits through the stack

Mercury Fundamentals

- Not all forms of mercury are the same
  - Elemental mercury: cement kiln dust (CKD) and wet scrubbers demonstrate poor capture efficiency
  - Non-elemental mercury: Raw mill and wet scrubbers demonstrate good capture efficiency for most reactive "oxidized" forms
- Many factors influence the concentration and form of mercury
  - Fuel chemistry, feed material (primarily limestone) equipment characteristics

Capture of Vapor-Phase Mercury using Activated Carbon

- Sorbent capacity for mercury control depends upon:
  - Sorbent characteristics: surface area, adsorptive capacity and reactivity
  - Gas temperature: decreases at higher flue gas temperatures
  - Vapor mercury concentration
  - Flue gas composition
    - H_2SO_4 and other contaminants decrease effectiveness
    - HCl and other halogens can improve effectiveness for elemental mercury

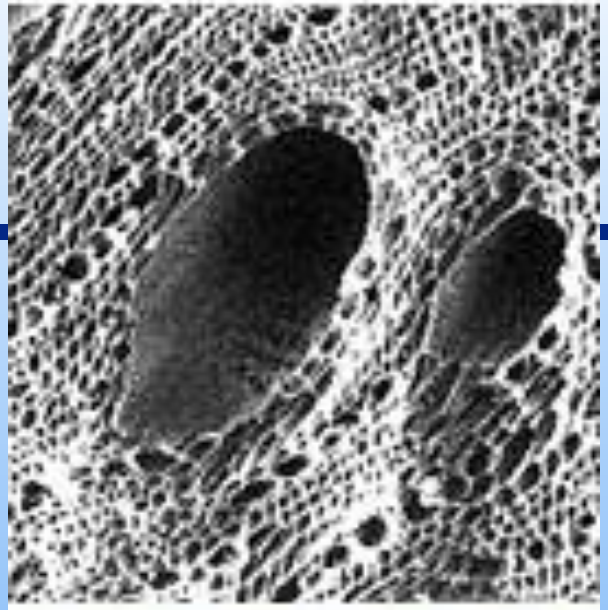
Capture of THC using Activated Carbon

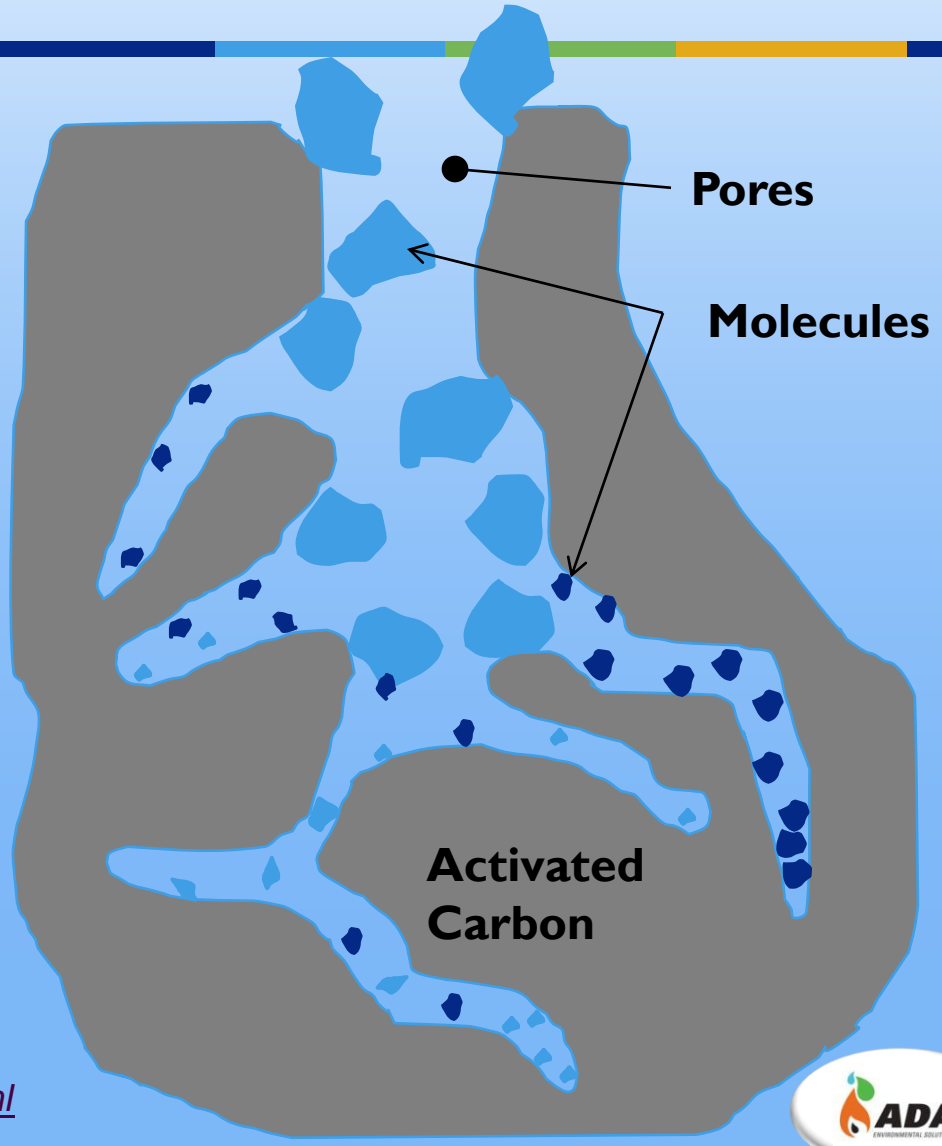
- The control of vapor-phase hydrocarbons/VOC is possible
  - Control approach is complex
  - Highly dependent upon hydrocarbon speciation
  - Requires customized activated carbon
- **Dual control of mercury and THC using activated carbon injection is possible**

What is Activated Carbon?

- Carbon-based materials
  - Lignite, coal, wood, coconut shells, etc.
- Treated with heat and steam
- A highly porous material
- High capacity for adsorbing or entrapping contaminants out of a liquid or gas stream (both physical and chemical)
- Can be augmented to enhance performance
  - Halogen treatment
  - Protective compound treatments
  - Selective pore distribution

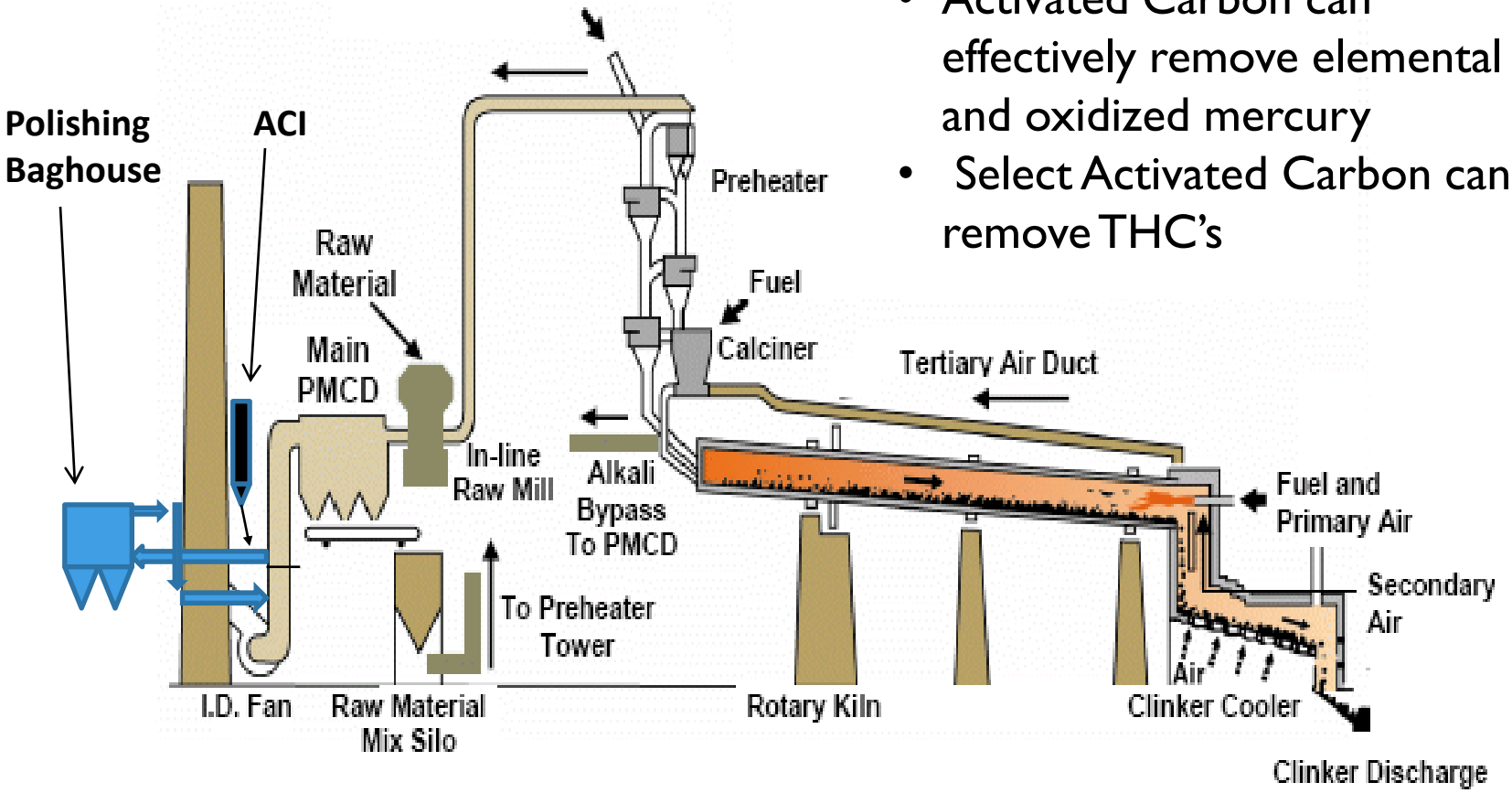
Activated Carbon





www.afssociety.org/education/0209oneminute.html

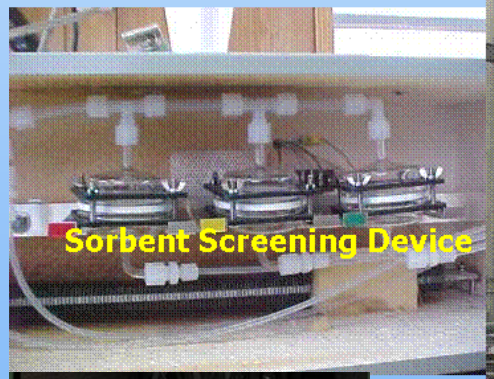
Polishing Baghouse with ACI

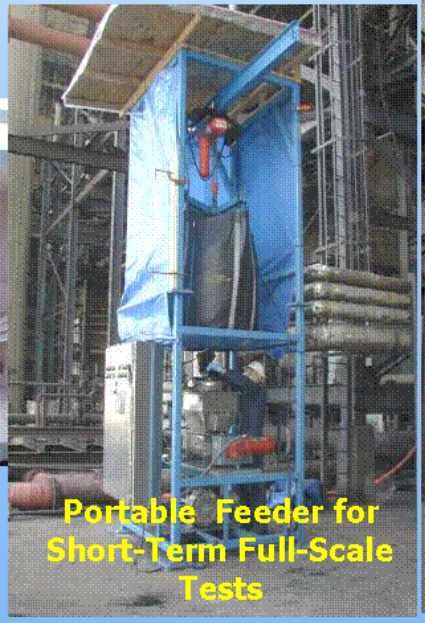


- Activated Carbon can effectively remove elemental and oxidized mercury
- Select Activated Carbon can remove THC's

Tools for Evaluating ACI Performance

Mercury CEMS





Portable Mercury CEMS and Calibration Units

Solid Sorbent Screening Evaluation

- Owner of long wet kiln desired to evaluate the effectiveness of using activated carbon injection in controlling mercury and hydrocarbon emissions.
- Mercury emissions and hydrocarbon speciation was completed
- Commercially available carbons from various feed stocks offering various properties were evaluated for their effectiveness at controlling mercury and THC

Results Summary from Sorbent Screening Tests

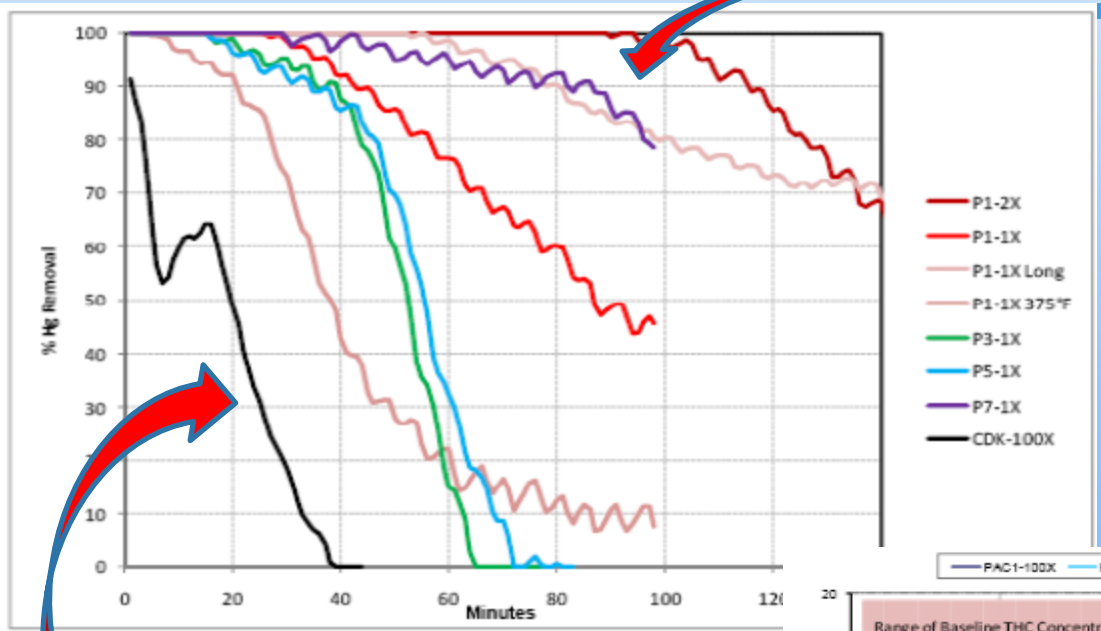
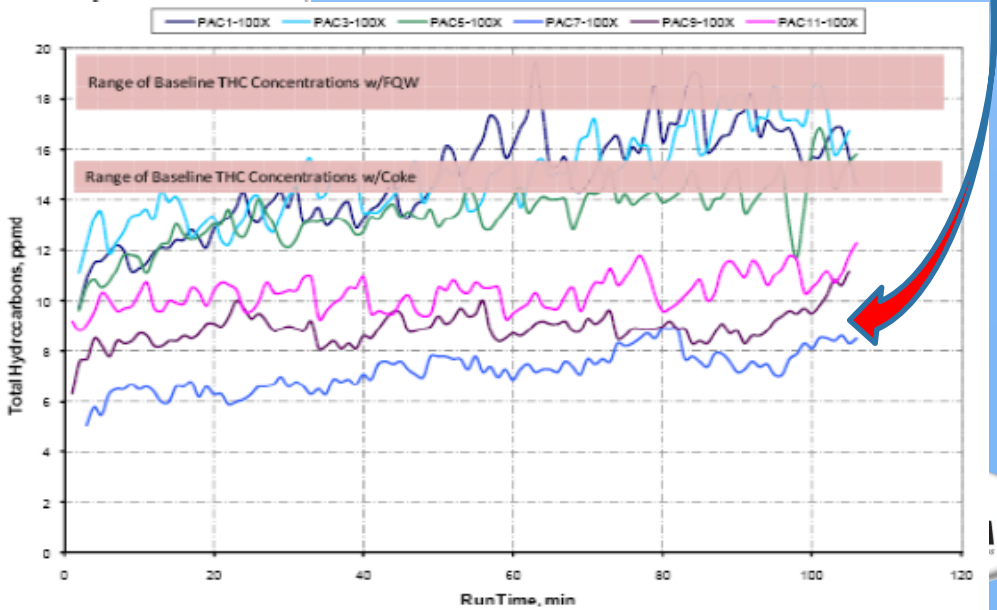


Figure 15. Normalized PAC Performance for all Materials Tested

Specialty carbon sorbent achieved a high level of mercury control, while outperforming mercury-specific sorbents for the control of THC.

Host kiln CKD lacks effectiveness in controlling mercury when compared to other commercially-available PAC sorbents.



Controlling THC and Mercury Emissions: Wrap up

- Activated carbon injection will require a polishing baghouse for reliable operation
- A polishing baghouse offers potential for:
  - Mercury and THC control with AC
  - HCl and SO_2 with other sorbents
  - Particulate polishing
- Compliance decisions will require an integrated, site specific approach, to meet regulatory requirements and minimize costs

Thank You

Questions?