Candidate Stationary and Area Control Measures

Chicago PM2.5 Workshop
June 21, 2007
Tim Smith, USEPA/OAQPS
Overview

This talk:
- Overview of efforts to summarize control measures and promote info sharing
- Discuss stationary and area source control measures

(other presentations: mobile, state/local perspectives)
Topics

● Point sources:
  ● Direct PM2.5, SO2, NOx
  ● Generic issues
  ● Category-specific measures

● Area sources
  ● Available controls
  ● Categories being regulated
Point sources – general thoughts

- Direct PM has been regulated in some form since 1970s
- “Method 5” and total PM generally the focus, not PM2.5, so main question is “how is PM-fine different?”
- Completely uncontrolled stack sources of PM are relatively rare.
General thoughts (cont)

- Methods to achieve further reductions in the fine fraction include:
  - Improving performance of existing controls
  - Improving capture of particles
  - Identifying and mitigating malfunctions
  - Control device upgrades
General thoughts (cont)

- Analysis of impacts of these types of measures are pretty case-specific engineering
- Likely tough to work with inventory to assess whether:
  - Control devices undersized
  - Fine fraction well controlled
  - Increased capture possible
How significant are point sources?

Percentage of PM2.5-PRI emissions within each Nonattainment Area

- Nonroad
- Onroad
- Nonpoint
- Point: Uncontrolled
- Point: Regulated
- Point: Controlled

Ref: EVALUATION OF POTENTIAL PM2.5 REDUCTIONS BY IMPROVING PERFORMANCE OF CONTROL DEVICES: PM2.5 EMISSION ESTIMATES. Pechan/RTI report to OAQPS. 2005.
PM$_{2.5}$ ($\mu$g m$^{-3}$)
Ways to improve performance of control devices


- Ref: Note from ICAC, 16 papers on improving devices. (Titles in binder; CD with papers available)
Types of control device improvements

- Two broad improvements:
  - Improvements to existing devices
  - Innovative upgrades or technologies
Improvements to existing devices

- **Methods/Modifications:**
  - Improved monitoring (FF, ESP, WS)
  - Addition of conditioning agents (ESP, WS)
  - ESP upgrades
    - Gas Conditioning
    - Replace weight wire with rigid
    - Modernization of electrical controls
  - Improved filter fabrics
  - Increased scrubber pressure drop
  - Reduce temperature (to collect condensibles)
Fabric filters

- Bag leak detectors
Bag leak detectors

Figure 4. Monitoring system schematic.
Innovative PM2.5 Controls

Examples:

- Advanced Hybrid filter—combines ESP with FF
- Compact Hybrid Particulate collector (COHPAC). “Polishing filter” collects fine PM2.5 escaping ESP. High air-to-cloth.
- Indigo Agglomerator. Upstream modification to ESP. Charging + mixing → increased size to ESP, better collection
- Wet ESP
Category-specific point source topics

- Integrated iron and steel mills
- Stationary diesel retrofits
- Non-EGU Stationary source categories with controllable SO2
Steel Mills

- Upon request by Michigan, EPA did multi-pollutant controllability study at two Detroit area steel mills and coke oven facility.
- Contract report by RTI: Evaluation of PM2.5 Emissions and Controls at Two Michigan Steel Mills and a Coke Oven Battery.
Possible further Controls identified in Detroit study

- Capture and control system for blast furnace casthouse (now using flame suppression technology)
- Increased capture of charging/tapping emissions at BOF shop
- Studies recommended for improving control efficiency of baghouses, ESP
- Coke oven gas desulfurization (study recommended testing to evaluate effect of desulfurization on condensable PM from the combustion stack)
- NOx combustion controls
- PM2.5 from sinter coolers (others, not Detroit issue)
Other steel mills

- Case-by-case analysis may identify further control candidates

- Measures identified in Detroit study might apply to some other plants
Stationary Diesel Retrofits

- Prime uses (often backup only):
  - Remote generation
  - Power industrial motors and equipment

- Uncertain:
  - magnitude (especially in urban n/a areas
  - feasibility of retrofits

- Available PM controls:
  - Oxidation catalyst (DOC) 10-30%
  - Diesel Particulate Filter (DPF) 80-90% requires low sulfur fuel

- New Jersey Pilot study underway
  - Detailed emissions inventory
  - Retrofit DPF on large 1970s engines
Retrofit pilot application

- Combined heat and power facility in Jersey City, NJ
- Facility has 6 large engines 500kW (680 hP)
- 3 in operation at all times
- NJ DEP working with Stevens Institute, facility owner and manufacturer (Engelhard)
NJ Stationary Engine Retrofit Pilot
Status of project

- Design/fabrication complete
- In operation soon
- Differences from typical mobile source retrofit
  - Large engines, much larger DPF
  - Older engines with much higher particulate loading
  - Steady-state loads
- Not sure application like this fits typical "installation of verified technology" model
Stationary diesel retrofits

- Regulations: CA, WI
- EPA petition on diesel exhaust
  - August 2003: Environmental Defense petition to add diesel exhaust to the HAP list.
  - EPA considering whether the Agency should take further action to address stationary diesel emissions and, if so, what actions may be appropriate.
  - EPA intends to address this petition in the context of this process.
- Further info: Chris Stoneman OAQPS 919 541-0823
Point Source SO2

- Industrial Boilers:
  - FGD
  - Fuel switching
  - Ultra low-sulfur distillate

- Refineries: measures identified in settlements
  - FCC units
  - Sulfur recovery plants
  - Process heaters
Point source SO2 (cont)

- Sulfuric acid plants – emissions

<table>
<thead>
<tr>
<th>SO$_2$ to SO$_3$ Conversion Efficiency (%)</th>
<th>SO$_2$ Emissions$^b$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kg/Mg Of Product</td>
</tr>
<tr>
<td>93 (SCC 3-01-023-18)</td>
<td>48.0</td>
</tr>
<tr>
<td>94 (SCC 3-01-023-16)</td>
<td>41.0</td>
</tr>
<tr>
<td>95 (SCC 3-01-023-14)</td>
<td>35.0</td>
</tr>
<tr>
<td>96 (SCC 3-01-023-12)</td>
<td>27.5</td>
</tr>
<tr>
<td>97 (SCC 3-01-023-10)</td>
<td>20.0</td>
</tr>
<tr>
<td>98 (SCC 3-01-023-08)</td>
<td>13.0</td>
</tr>
<tr>
<td>99 (SCC 3-01-023-06)</td>
<td>7.0</td>
</tr>
<tr>
<td>99.5 (SCC 3-01-023-04)</td>
<td>3.5</td>
</tr>
<tr>
<td>99.7 NA</td>
<td>2.0</td>
</tr>
<tr>
<td>100 (SCC 3-01-023-01)</td>
<td>0.0</td>
</tr>
</tbody>
</table>
NonEGU Point source SO2

- Cement Kilns
  - NESCAUM looked at SO2 controls in BART review
    - [http://bronze.nescaum.org/regionalhaze/BART/MA\_NE-\_VU\_BART\_Resource\_Book/AppendixC\_Cntl\_Tech\_Ops/(09)%20BART\_Control\_Assessment.pdf#search=%22%22cement%20kilns%22%20%2B%20%22NESCAUM%22%20%2B%20%22SO2%22\%22](http://bronze.nescaum.org/regionalhaze/BART/MA\_NE-\_VU\_BART\_Resource\_Book/AppendixC\_Cntl\_Tech\_Ops/(09)%20BART\_Control\_Assessment.pdf#search=%22%22cement%20kilns%22%20%2B%20%22NESCAUM%22%20%2B%20%22SO2%22\%22)
  - Controls:
    - In-process removal
    - Process changes (e.g. raw material change)
    - Wet or dry FGD
Area source topics

- Woodstoves
- Restaurants
- Land clearing open burning
- Home heating oil sulfur content
Residential Wood Smoke: What is EPA doing?

- **Outdoor Wood Boilers**
  - Helped States develop Model Rule
  - Partnership with Industry to bring cleaner units to market

- **Fireplaces**
  - Consensus ASTM Method complete
  - Working on Consensus emission standard

- **Great American Wood Stove Changeout**
  - Partnership program to replace inefficient wood stoves with cleaner-burning technologies
  - Replacing one old stove is equivalent to taking 5 diesel buses off the road
Wood Stove Partnership Progress to Date

- Over 20 communities implementing wood stove changeouts
- Partners have invested over $5 million nationally
- 7 Supplemental Environmental Projects supporting wood stove changeouts
- Over 3000 stoves and/or fireplaces changed out
- More than 100 tons of PM reduced/year from changeouts
- SIP Credit Guidance Document (www.epa.gov/woodstoves)
Restaurants

- Commercial cooking significant in inventories.
  - In 16 Eastern N/A areas:
    - Total PM: typically 2-4%
    - OC: typically 6-12%

- Inventory consists of:
  - Conveyorized ("Burger King") readily controlled 10%
  - Underfire (controllable but expensive) 75%
  - Other cooking /deep frying (controls not identified) etc 15%
Catalyst controls
Conveyorized charbroilers

- Agencies regulating:
  - South Coast AQMD Rule 1138 (1997)
  - San Joaquin Rule 4692 (2002)
  - Ventura County Rule 74.25 (2004)

- Catalysts controls in place at many corporate-owned Burger Kings. Fewer at franchise-owned.
Underfire grilling

- Catalyst technology not feasible due to higher flowrates, lower temperatures

- Recent rulemaking proposal by Bay Area AQMD.
  - Cost information developed in staff report
  - Board deferred for further study
ESP “Smog-Hog” Technology

- Has been used to address zoning concerns in retail developments and near high-rise buildings
Land clearing open burning

- State of Washington bans land clearing open burning in “Urban Growth areas”
- http://www.ecy.wa.gov/pubs/0602016.pdf#search=%22%22urban%20growth%20areas%22%20%22land%20clearing%22

- Alternative:
  - Chipping/shredding/landfilling
  - EPA RIA analysis: $3500/ton

- 1997 EPA report suggests “air curtain” not effective in reducing emissions
These tests did not provide conclusive evidence regarding the effectiveness of air curtain combustors in reducing emissions. While the emissions of some pollutants seemed to be decreased, others were unchanged or, in a few cases, appeared to increase.
Resources for Control Info

- STAPPA/ALAPCO menu of options
- EPA website: [http://www.epa.gov/pm/measures.html](http://www.epa.gov/pm/measures.html)
- We want to use website to link to useful efforts on controls
- Current links: NJ, CA 656, CA Goods Movement, OTC, LADCO, SCAQMD
- EPA summary tables [just released]
- Need your input/comments!
Summary tables

- “Lists of Potential Control Measures for PM2.5 and Precursors”
- Informational listing of potential measures
- Stationary/Mobile
- Listing of costs, reductions, references
- Intended as complement to other sources of info (e.g. Menu of Options)
- We want your feedback!!
New Jersey Workgroups

[presentation later in this session]
LADCO White Papers

- [http://www.ladco.org/Regional_Air_Quality.html](http://www.ladco.org/Regional_Air_Quality.html)
- White Papers (list of white papers)

- 1. EGUs
- 2. ICI Boliers
- 3. Portland Cement Plants
- 4. Industrial Surface Coating
- 5. Degreasing
- 6. AIM Coatings
- 7. Portable Fuel Containers
- 8. Auto Refinishing
- 9. Consumer Solvents
- 10. Gasoline Dispensing Facilities (Stage I and Stage II)
- 11. Asphalt Applications
- 12. Petroleum Refineries
- 13. Asphalt Plants
- 14. Glass/Fiberglass M
South Coast AQMP

- Draft on South Coast Website:
  - Control technology info in Appendix A
  - [http://www.aqmd.gov/aqmp/AQMPIntro.htm](http://www.aqmd.gov/aqmp/AQMPIntro.htm)
  - Modified recently
Ozone Transport Commission (OTC)

- Identification and Evaluation of Candidate Control Measures
Fugitive Dust

- WRAP Fugitive Dust Handbook
- Excellent resources for fugitive dust controls and costs for:
  - Fugitive Dust Handbook
  - Agricultural Tilling
  - Construction & Demolition
  - Materials Handling
  - Paved Roads
  - Unpaved Roads
  - Agricultural Wind Erosion
  - Open Area Wind Erosion
  - Storage Piles Wind Erosion
  - Agricultural Harvesting
  - Mineral Products Industry
  - Abrasive Blasting
  - Livestock Husbandry
NOx

- Much work has been done on NOx for ozone, CAIR, NOx SIP call
- Many references for NOx developed in 1990s e.g. ACT documents: see http://epa.gov/ttn/catc/products.html
- Technology advancing
NOx -- Cement Kilns

- EPA/OAQPS Reports on NOx controls for cement kilns: 1994 and 2000
- OAQPS has prepared detailed draft report on NOx from recent permitting (all are preheater/precalciner kilns).
- New sources:
  - 10 BACT determinations for NOx since 2002, 3 pending
  - Emissions limits of 2.0 lb/T in recent permits
  - Controls vary: all require combustion controls, most require SNCR, none SCR
- Contact is Bill Neuffer: neuffer.bill@epa.gov
Industrial sources – other example NOx controls

- Glass plants
  - Container (LNB, SNCR 40% control)
  - Glass plants –flat (Oxyfiring 40%; SCR 75%; SNCR 40%)
  - Pressed (LNB 40%, SCR 75%)
- Asphalt plants: LNB + flue gas recirc 50%
- Refineries-FCC units LNB + FGR
- Iron and steel mills:
  - Annealing furnaces 50-80% LNB → LNB + SCR
  - Galvanizing  LNB 50% ; LNB + FGR 60%
  - Reheating Furnaces:  LNB 50%  LNB + FGR 77%
- Fiberglass- recuperative furnaces (LNB 40%)
- Lime kilns (Mid kiln firing, LNB 30%)
Time needed to install NOx controls

- ICAC White Paper available from their website:
Bottom Line

- Local measures are available
  - [note: this presentation is examples, not exhaustive]
- Agencies are working to identify
- Work needed to assess most effective strategies for given nonattainment area