Introduction

✓ Pulp and Paper RTR Inventory Development
✓ Pulp and Paper Survey Results
✓ Characterizing Emissions Sources
✓ Characterizing Pollutant Emissions
Pulp and Paper NESHAP RTR

- Residual Risk and Technology Review (RTR)
  - CAA Section 112(f)(2) Residual Risk Review (8 yrs)
  - CAA Section 112(d)(6) Technology Review (8 yrs)
  - “Cluster” rule (CAA and CWA)
- RTR due 2006
  - Proposed December 27, 2011
  - Final signed by Administrator on July 31, 2012
  - RTR to be completed
The Pulp & Paper RTR Timeline

- 8 years after promulgation of Subpart S standards
- Law suit filed against EPA
- Court-ordered mandate

- Subpart MM compliance
- 2002 NEI data available

2001: Phase I Subpart S compliance

2004: Phase II Subpart S compliance

2006: 2005 NEI data available

2007: 2008 NEI data available

2008: P&P ICR Survey

2009: Prelim. Sector Risk Review
- Opportunities to Correct Data Inputs…

2010: P&P RTR Risk Analysis and Proposal

2011: NESHAP 40 CFR Part 63 Subpart S Reviewed (Final RTR)

2012: 2005 NEI data available
Timing and Complexity

- Needed a post-MACT inventory
  - 2005 NEI updated with ICR data
- Detailed stack-by-stack information
  - Emissions must be allocated to individual release points
  - Unlike TRI which contains aggregated facility totals
  - Stack parameters and geographic coordinates specified
  - MACT codes, SCCs, and emission process groupings used to categorize emission sources
  - Several HAP estimated per emission release point
ICR

- Three-part ICR gathering data useful for 2 NESHAP RTRs and NSPS review
- Pre-populated inventories distributed 2/2011.
  - Based on 2005 NATA NEI
  - Spreadsheets with revision columns
- NEI updates were due 6/2011.
  - Spreadsheets were QA’d for completeness
  - Mills contacted with follow-up questions
- ERG assembled into compiled file
- Intensive QA and standardization of compiled inventory
Post-ICR Emissions Inventory
MACT Categories
Risk Assessments

Pulp & Paper Survey Results
P&P Post-ICR Inventory Numbers

- 171 HAP major source mill locations (some with multiple NEI IDs)
- 130,000 records (rows) including non-HAP
- 105,000 HAP records
- Average records per mill: 730
- 116 HAP (some grouped)
  - 214 HAP with groups speciated (e.g., POM)
- The nationwide HAP total in the inventory increased by about 5,000 tons/year (tpy) as a result of the ICR
- 15 MACT codes
- 225 SCCs
MACT Categories

• P&P Subpart S
• P&P Subpart MM
• Boiler MACT (4)

Others:
• P&P non-MACT
• Paper and Other Web Coating
• Printing/Publishing
• RICE (2)
• Comb. Turbines (2)
• Gasoline or organic liquids (2)

Pulp and Paper Industry HAP Emissions By Category
Total: 63,500 tpy
Subpart S Nationwide HAP Emissions

<table>
<thead>
<tr>
<th>tons/yr</th>
<th>pre-MACT</th>
<th>post-MACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>230,000</td>
<td>45,000</td>
</tr>
</tbody>
</table>

2012 International Emission Inventory Conference
Subpart S HAP

- Methanol
- Acetaldehyde
- **Other HAP:**
  - Cresols
  - Phenol
  - Chloroform
  - Formaldehyde
  - HCl
  - Biphenyl
  - Hexachloroethane
  - 75 others

RTR Inventory HAP (45,000 tpy)
# Sector Risk: 2007 – 2011

<table>
<thead>
<tr>
<th>Assessment Type(^1)</th>
<th>Prelim ('07)</th>
<th>2011 RTR</th>
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</thead>
<tbody>
<tr>
<td>No. of Facilities Evaluated</td>
<td>135</td>
<td>171 171</td>
</tr>
<tr>
<td>Max. Cancer Risk / 10^6</td>
<td>2500</td>
<td>30 10</td>
</tr>
<tr>
<td>No. of Facilities &gt; 1000/10^6</td>
<td>2</td>
<td>0 0</td>
</tr>
<tr>
<td>No. of Facilities &gt; 100/10^6</td>
<td>11</td>
<td>0 0</td>
</tr>
<tr>
<td>No. of Facilities &gt; 10/10^6</td>
<td>45</td>
<td>8 2</td>
</tr>
<tr>
<td>No. of Facilities &gt; 1/10^6</td>
<td>110</td>
<td>100 68</td>
</tr>
</tbody>
</table>

\(^1\)FW = facility-wide; S = Subpart S
Elevated Risk In Early Iterations Caused By:

- Pre-MACT emissions estimates
- Receptors on mill property
- Fugitive area sources that should have been coded as point sources with appropriate release parameters (e.g., stack height, exit gas velocity)
- Total source emissions reported to multiple vents instead of being apportioned to individual vents
- Consolidated emission releases reported from a single point or only a few points
- Emissions from multiple sources sharing the same set of latitudinal and longitudinal co-ordinates
- Double reporting: source emissions reported as compound groups (cresols, xylenes, POM, etc) and also reported as individual pollutant
Characterizing Emissions Sources

SCCs
MACT codes
Source Type and Release Parameters
Latitude & Longitude
SCC Revisions

- Pre-ICR SCC issues
  - Thousands of rows with not-elsewhere-classified SCCs
  - No SCC for some processes (O\textsubscript{2} delignification)
- EPA and NCASI joint effort to update P&P SCCs
  - 31 codes revised or eliminated
  - 43 new codes added
- Now there are approximately 100 SCCs in the 307xxxxxx group for P&P processes
- P&P mills also operate boilers (102xxxxxx group) and various other equipment classified in other SCC groupings
MACT codes

- SCCs and MACT codes reviewed together to ensure emission source properly identified
- Most common change: 1626-3 → 1626-1 (Subpart S)
- More difficult example: Recovery furnace with fuels separated

30700110 - recovery furnace – MACT 1626-2
10200601 - natural gas combustion – MACT 0107-2
10200401 - residual oil combustion – MACT 0107-3

30700110 - recovery furnace – MACT 1626-2
### Source Type and Release Parameters

**Point source (plume)**
- stack diameter and height
- exit gas velocity, flow and temperature

**Area source (fugitive)**
- quiescent surface
- length, width, and angle
- release height

**No SCC-, MACT-, or SIC-match defaults for point & area sources**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Point Source (02 – 06)</th>
<th>Area Source (01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stack height (ft)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Stack temperature (°F)</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Stack diameter (ft)</td>
<td>1</td>
<td>0.003</td>
</tr>
<tr>
<td>Stack velocity (ft/sec)</td>
<td>15</td>
<td>0.0003</td>
</tr>
<tr>
<td>Stack flow (cu ft/sec)</td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>
Improperly Located Process Equipment
Co-located Sources: the One-Point Mill

Coordinates for all emission points in one location

Coordinates on emission points
Characterizing Pollutant Emissions

Emission Factors
Post-MACT Testing
Resolving Pollutant Coding Issues
Emission Factors (EF)

- NCASI EFs commonly used to estimate annual emissions.
- Originated with 1990’s pre-MACT sampling programs & updated as new measurements become available.
- HEM3 results prompted a closer look at some factors:
  - Pre-MACT sampling no longer representative.
  - Some factors based on limited data.
  - Some factors based largely on BDL measurements.
- NCASI conducted targeted sampling to improve EFs for paper machines, BLO systems, and brownstock washers.
- NCASI conducted additional sampling to improve quality of effluent concentration data used to estimate fugitive HAP emissions from WW treatment sources.
Post-MACT Paper Machine Emission Factors

- Acetaldehyde 93% lower
- Formaldehyde 92% lower

- Acetaldehyde 88% lower
- Formaldehyde 64% lower
NCASI Wastewater HAP Study

- Multi-mill study
  - 24 Kraft mills: 9 bleached and 15 unbleached
  - 1 Sulfite mill, 1 Mechanical mill, & 1 Non-integrated mill

- Sample Collection (by mill staff)
  - Multiple points throughout WWTP: primary and secondary treatment inlets + in-basin

- Sample Analysis (by NCASI-SRC)
  - Methanol: NCASI Method DI/MEOH-94.03
  - Naphthalene: Mass Spectroscopy
Fugitive Emissions from WWTP

- Emissions may be calculated using EPA’s WATER 9 model to estimate the fraction of the inlet load that is volatilized, or emitted to air ($f_{\text{Air}}$)

$$\text{Emissions (E)} = \text{Load} \cdot f_{\text{Air}}$$

- Emissions may be estimated using in-basin HAP concentration measurements and Appendix C: Form XIII calculation procedures
Pollutant Issues in Inventory

- Hexachlorocyclopentadiene (HCCPD)
  - Emission factors mostly non-detect
- Hexachloroethane (HCE)
  - Emission factor review
  - Additional testing by NCASI following RTR proposal
- Speciation required for:
  - Chromium and Hexavalent Chromium
  - Mercury
  - Polycyclic Organic Matter
- Duplicate pollutant coding issues ➔ Case-by-case review
### Pollutant Coding Issue Example

<table>
<thead>
<tr>
<th>RTI_EmPt</th>
<th>Pollutant Code</th>
<th>Pollutant_Code_Desc</th>
<th>FINAL Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEI42410--LVHC--02--LVHC-2</td>
<td>179601231</td>
<td>m,p-Xylene</td>
<td>4.21E-05</td>
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<tr>
<td>NEI42410--LVHC--02--LVHC-2</td>
<td>1330207</td>
<td>Xylenes (mixed isomers)</td>
<td>8.43E-05</td>
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<tr>
<td>NEI42410--LVHC--02--LVHC-2</td>
<td>95476</td>
<td>Xylenes (o-)</td>
<td>1.28E-05</td>
</tr>
<tr>
<td>NEI42410--MulTk--01--MulTk</td>
<td>108383</td>
<td>Xylenes (m- &amp; p-)</td>
<td>0.00013140</td>
</tr>
<tr>
<td>NEI42410--MulTk--01--MulTk</td>
<td>1330207</td>
<td>Xylenes (mixed isomers)</td>
<td>0.00022995</td>
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<tr>
<td>NEI42410--MulTk--01--MulTk</td>
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<td>Xylenes (o-)</td>
<td>0.00030660</td>
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<td>NEI42410--NSSC--01--NSSC</td>
<td>108383</td>
<td>Xylenes (m- &amp; p-)</td>
<td>0.000053</td>
</tr>
<tr>
<td>NEI42410--NSSC--01--NSSC</td>
<td>95476</td>
<td>Xylenes (o-)</td>
<td>0.000053</td>
</tr>
</tbody>
</table>
Conclusions
- Substantial effort required to inventory HAP from numerous P&P process types
- Pre-MACT versions of the NEI inadequate for RTR
  - 2005 NEI with extensive revisions through ICR used
- 5-year iterative, collaborative effort between EPA, industry, and consultants
  - Beneficial to improve data quality for facility-specific risk assessments across entire industry
  - Sharing of intermediate modeling results key to targeted review of emissions inventory data
For More Information

Docket EPA-HQ-OAR-2007-0544
www.regulations.gov

RTR Webpage:
http://www.epa.gov/ttn/atw/rrisk/rtrpg.html

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