Using the NEI to Conduct Residual Risk Assessments – The Pulp and Paper Industry Experience

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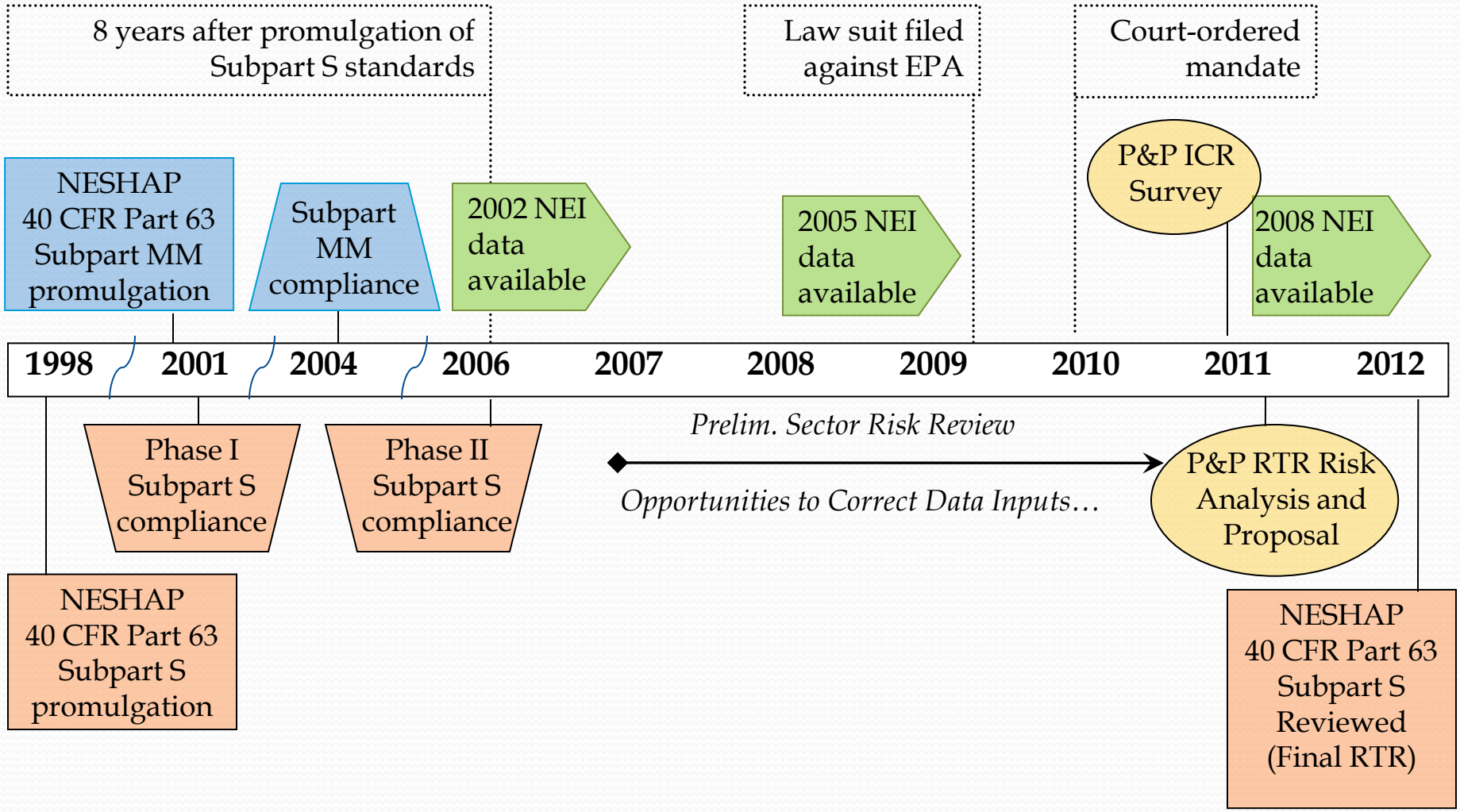
Introduction

- ✓ 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)
- 40 CFR Part 63, Subpart S – Promulgated 1998
  - "Cluster" rule (CAA and CWA)
  - RTR due 2006
    - Proposed December 27, 2011
    - Final signed by Administrator on July 31, 2012
- 40 CFR Part 63, Subpart MM – Promulgated 2001
  - RTR to be completed

The Pulp & Paper RTR Timeline



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

Pulp & Paper Survey Results

Post-ICR Emissions Inventory

MACT Categories

Risk Assessments

P&P Post-ICR Inventory Numbers

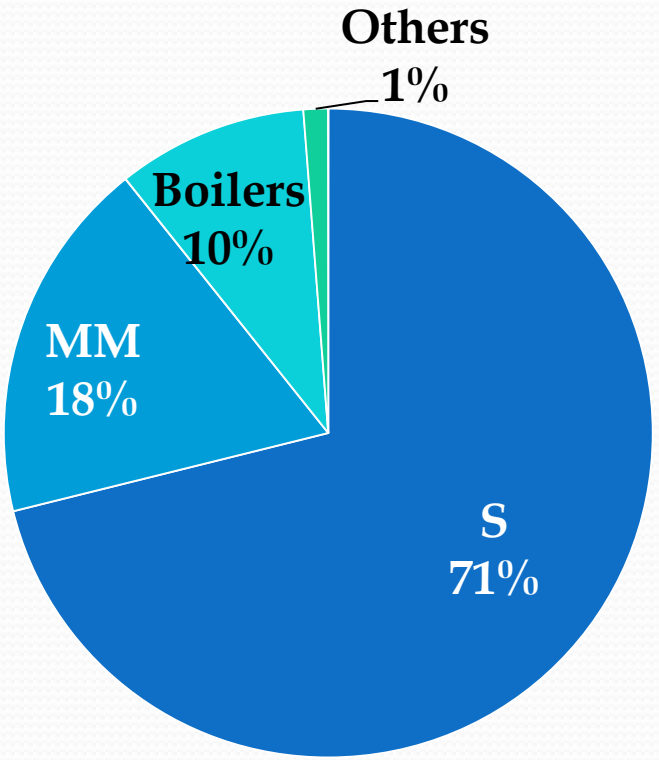
- 171 HAP major source mill locations (some with multiple NEI IDs)
- 130,000 records (rows) including non-HAP
- 105,000 HAP records
- Average records per mill: 730
- 116 HAP (some grouped)
  - 214 HAP with groups speciated (e.g., POM)
- The nationwide HAP total in the inventory increased by about 5,000 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)

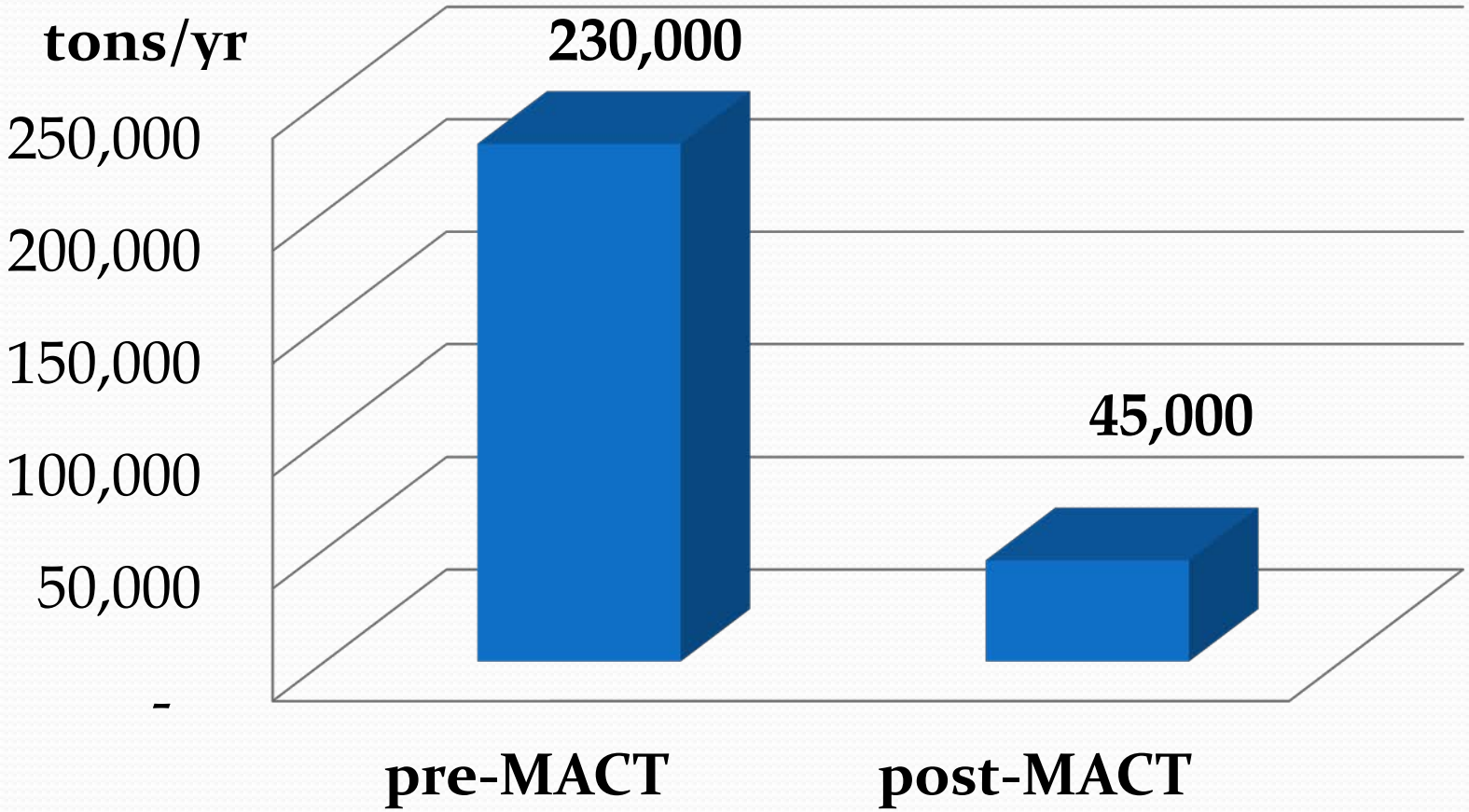
Others:

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



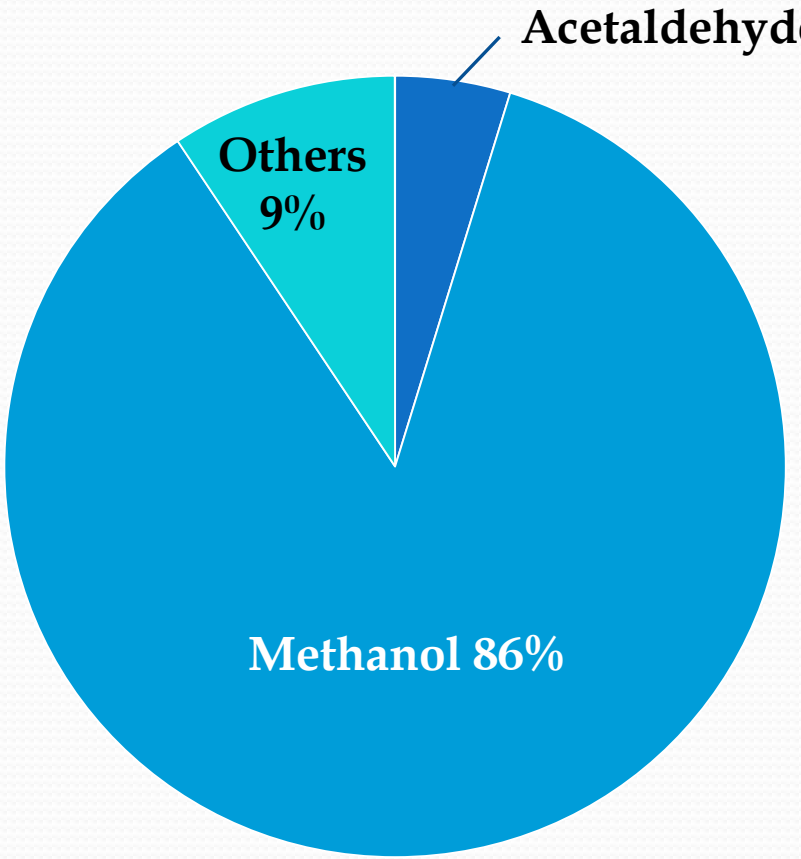
Pulp and Paper Industry
HAP Emissions By Category
Total: 63,500 tpy

Subpart S Nationwide HAP Emissions



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

	Prelim ('07)		2011 RTR	
Assessment Type[1]	FW		FW	S
No. of Facilities Evaluated	135		171	171
Max. Cancer Risk / 10^6	2500	→	30	10
No. of Facilities > $1000/10^6$	2		0	0
No. of Facilities > $100/10^6$	11		0	0
No. of Facilities > $10/10^6$	45	→	8	2
No. of Facilities > $1/10^6$	110		100	68

[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_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 307xxxxx group for P&P processes
- P&P mills also operate boilers (102xxxxx 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)

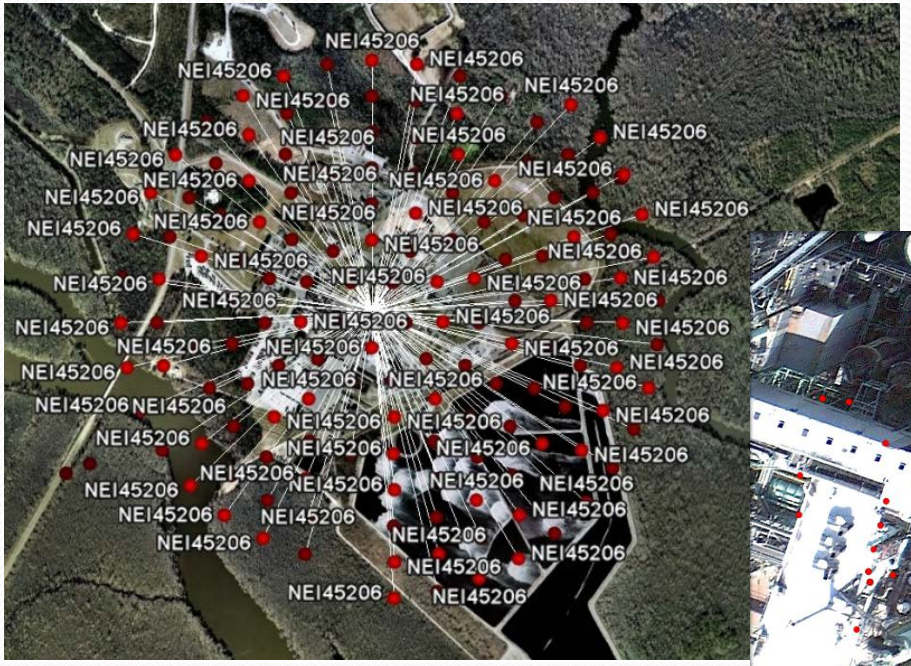
- quiescent surface
- length, width, and angle
- release height

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

Parameter	Point Source (02 – 06)	Area Source (01)
Stack height (ft)	10	10
Stack temperature (°F)	72	72
Stack diameter (ft)	1	0.003
Stack velocity (ft/sec)	15	0.0003
Stack flow (cu ft/sec)	12	0

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

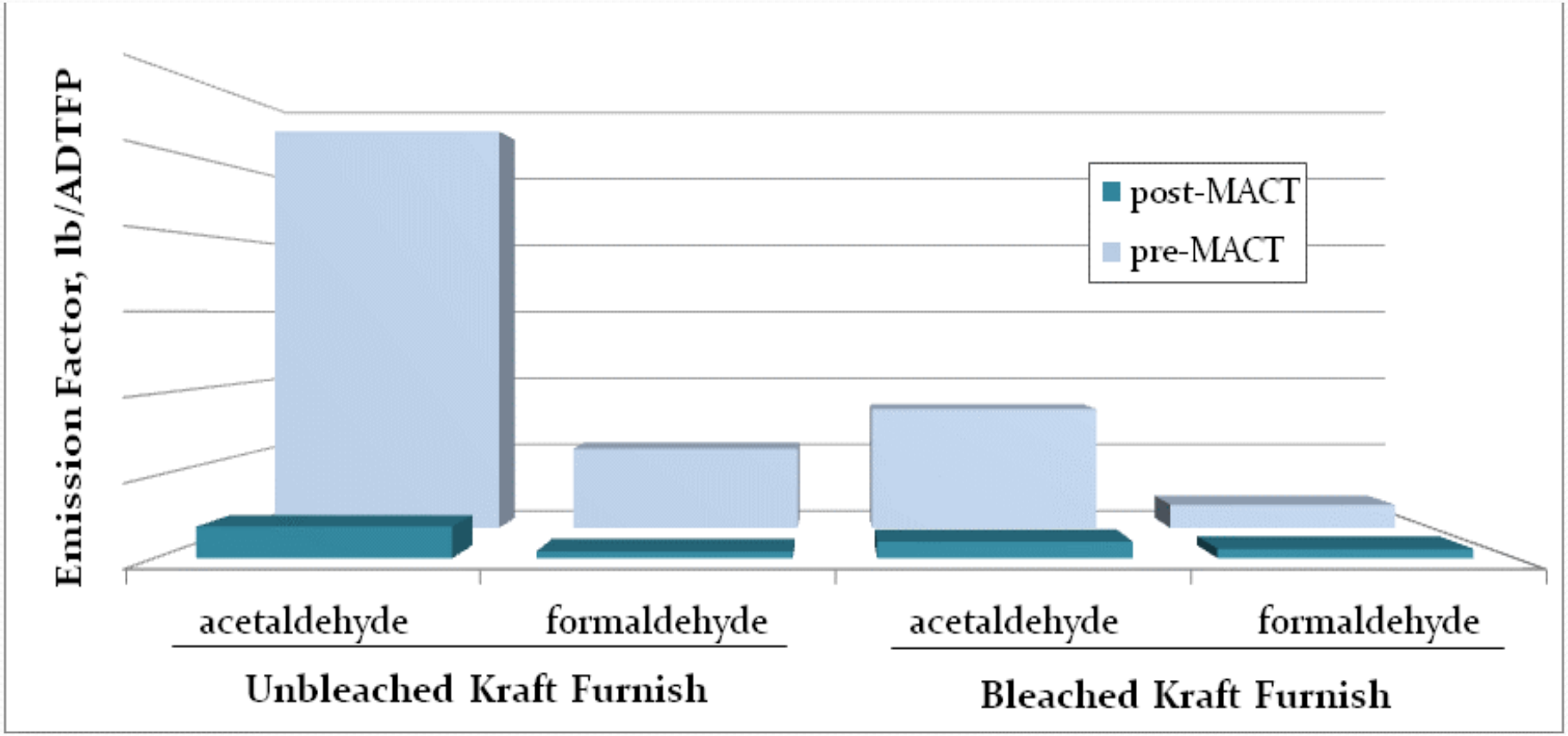
Post-MACT Testing

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

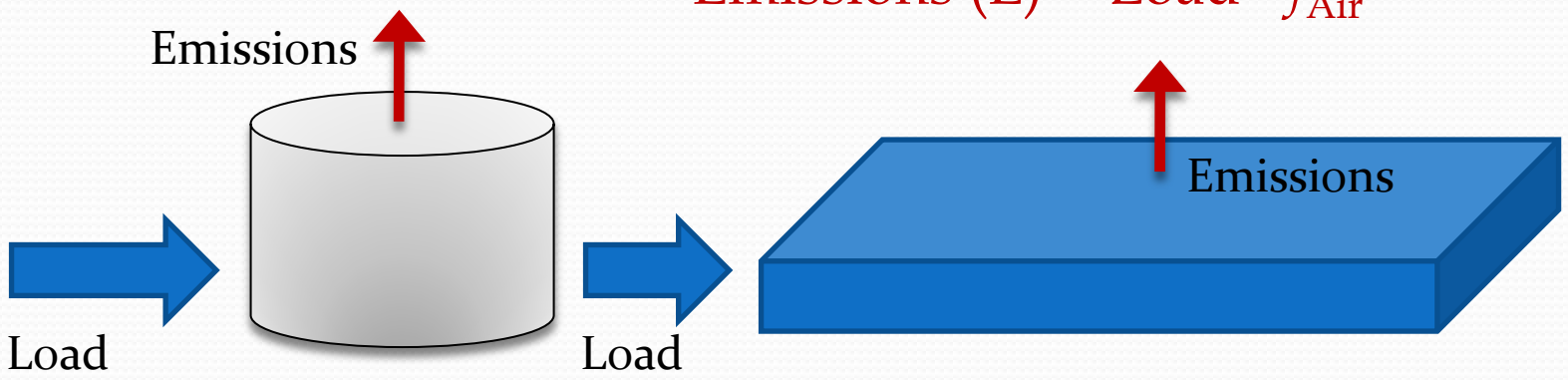
NCASI Wastewater HAP Study

- 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
  - *Acetaldehyde & Formaldehyde*: NCASI Method ISS-FP-A105.1 – "Derivatization Method for Selected Aldehydes, Ketones and Polar Compounds"
  - *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_{Air})

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



- 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

RTI_EmPt	Pollutant Code	Pollutant_Code_Desc	FINAL Emissions	
NEI42410--LVHC--02--LVHC-2	179601231	m,p-Xylene	4.21E-05	delete
NEI42410--LVHC--02--LVHC-2	1330207	Xylenes (mixed isomers)	8.43E-05	
NEI42410--LVHC--02--LVHC-2	95476	Xylenes (o-)	1.28E-05	delete
NEI42410--MulTk--01--MulTk	108383	Xylenes (m- & p-)	0.00013140	
NEI42410--MulTk--01--MulTk	1330207	Xylenes (mixed isomers)	0.00022995	delete
NEI42410--MulTk--01--MulTk	95476	Xylenes (o-)	0.00030660	
NEI42410--NSSC--01--NSSC	108383	Xylenes (m- & p-)	0.000053	
NEI42410--NSSC--01--NSSC	95476	Xylenes (o-)	0.000053	

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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