

Updates

PS-11 (PM CEMS),
Multi-metals CEMS,
Multi-metals Fence
Line Monitoring, &
CEMS Cost Model



Status of PS – 11 for PM CEMS



- Promulgated January 12, 2004
 - PS-11 (initial correlation)
 - Procedure 2 (ongoing QA/QC)
 - Corrections final November '06
- Guidance development
 - Spreadsheets, statistical tools, problem troubleshooting
 - Final November '06

Applicability of PM CEMS



- Work in any stack where filterable PM stack test (Method 17, Method 5, Method 5B or Method 5i) is used for compliance
- Work in wet or dry stacks
- Some technologies work only in dry stacks and others work in both

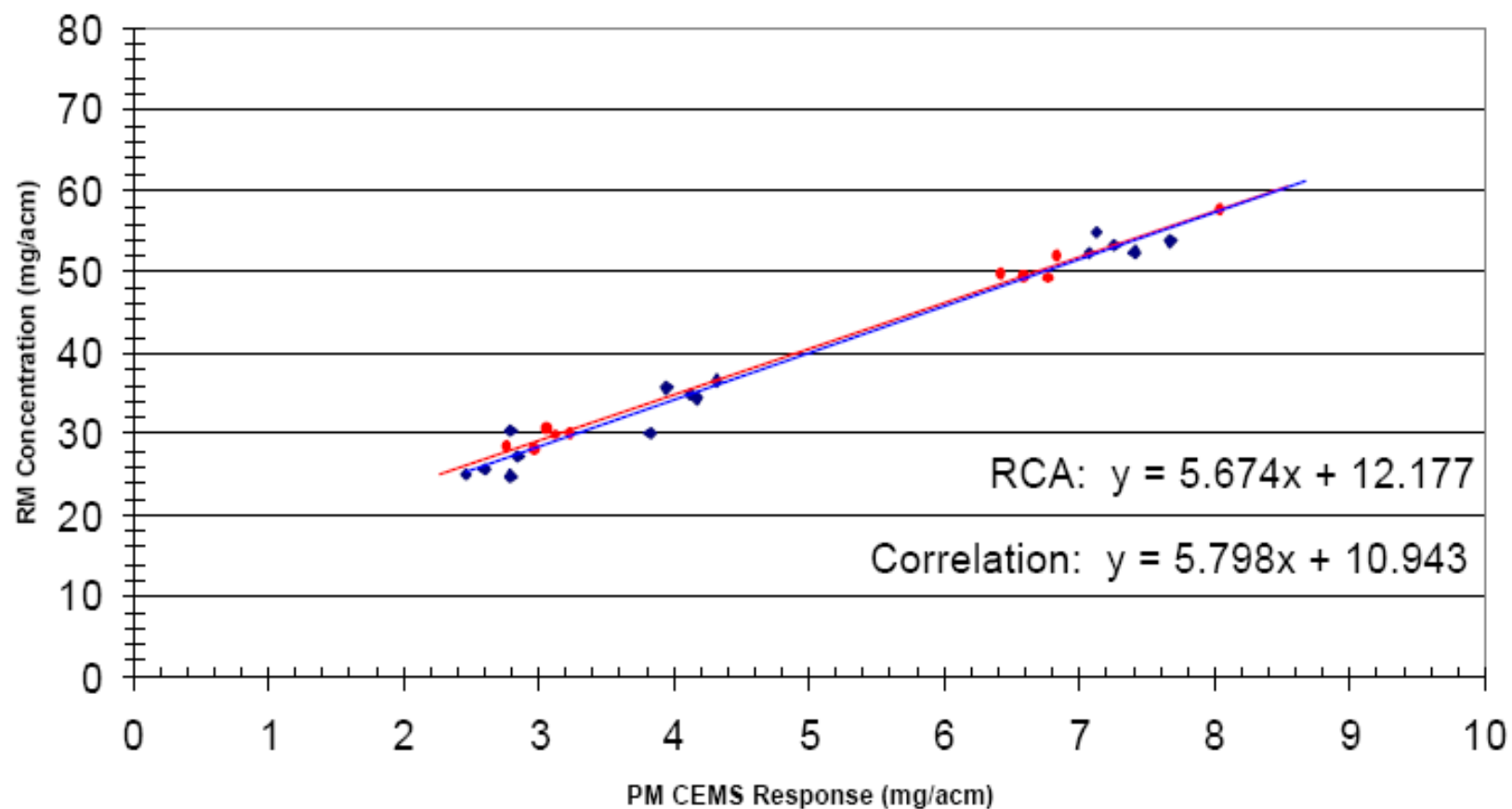
Correlation Testing Requirements



- Calibration gases not feasible
- PM CEMS responses are correlated to reference method for PM concentration using regression analysis
- Minimum of 15 test runs simultaneous with PM CEMS responses
 - Low, medium, high levels

LG & E – Mill Creek

Correlation & RCA Test Trendlines



◆ Initial Correlation Data

● RCA Test Data

— Linear (RCA Test Data)

— Linear (Initial Correlation Data)

Operational PM CEMS



- Electric utilities (coal)
 - Approximately 8 units
 - wet stacks and dry stacks
 - 4 to 5 have passed audit tests showing stability of correlations
- Pulp mill recovery boiler (spent liquor)
 - 3 years of data
- 2 solid/liquid incinerators
 - 2 years of data for one
- 15 recent coal-fired utility permits require PM CEMS

PM CEMS Costs



- First costs \$120K (expected to go down 15% next year)
 - Includes correlation testing and installation
- Annual costs \$40K
- SO₂ CEMS costs for comparison
 - First costs \$134K
 - Annual costs \$30K
- COMS costs for comparison
 - First costs \$64K
 - Annual costs \$13K
- Adjusted PM CEMS costs for elimination of COMS
 - First costs $\$120K - \$64K = \$56K$
 - Annual costs $\$40K - \$13K = \$27K$

Regulatory Options



- Require PM CEMS
 - Deviation regulatory language similar to industrial boiler MACT
 - “Deviation not always a violation”
 - Or, allow units to have a grace period prior to PM CEMS data becoming enforceable
- Make an option, but not require, PM CEMS for units as a replacement for COMS

Future PM CEMS Work

- PM 2.5 PM CEMS Development
 - Dilution technology
 - Sharp cut cyclones
 - Beta Gauge for back end gravimetrics
 - Baldwin Environmental and Desert Research
 - Hope to go to field in '08



Multimetal CEMS



- Eli Lilly Petitioned EPA for Alternative monitoring for their Haz Waste Incinerator in Lafayette, Indiana
- Metals, particulate matter (PM), and HCl/Cl Continuous Monitoring in place of parameters (scrubber flow rates, temperatures, etc.)

Concept to Proof



- Eli Lilly hired Cooper Environmental
- Met with us and OSWER
- Program designed together
- M-301 testing in the lab to prove quantitative aerosol generator (QAG)
- M-301 testing in the field to prove the multimetals CEMS with the QAG
- Multimetals CEMS called X-ACT
 - Non-destructive X-ray Fluorescence analysis (XRF)

Draft Methods from Program



- Multimetals CEMS Performance Specification
- Multimetals filter method
- Multimetals quantitative aerosol generation method
- HCL low level performance specification

Multimetal Fence Line Monitoring

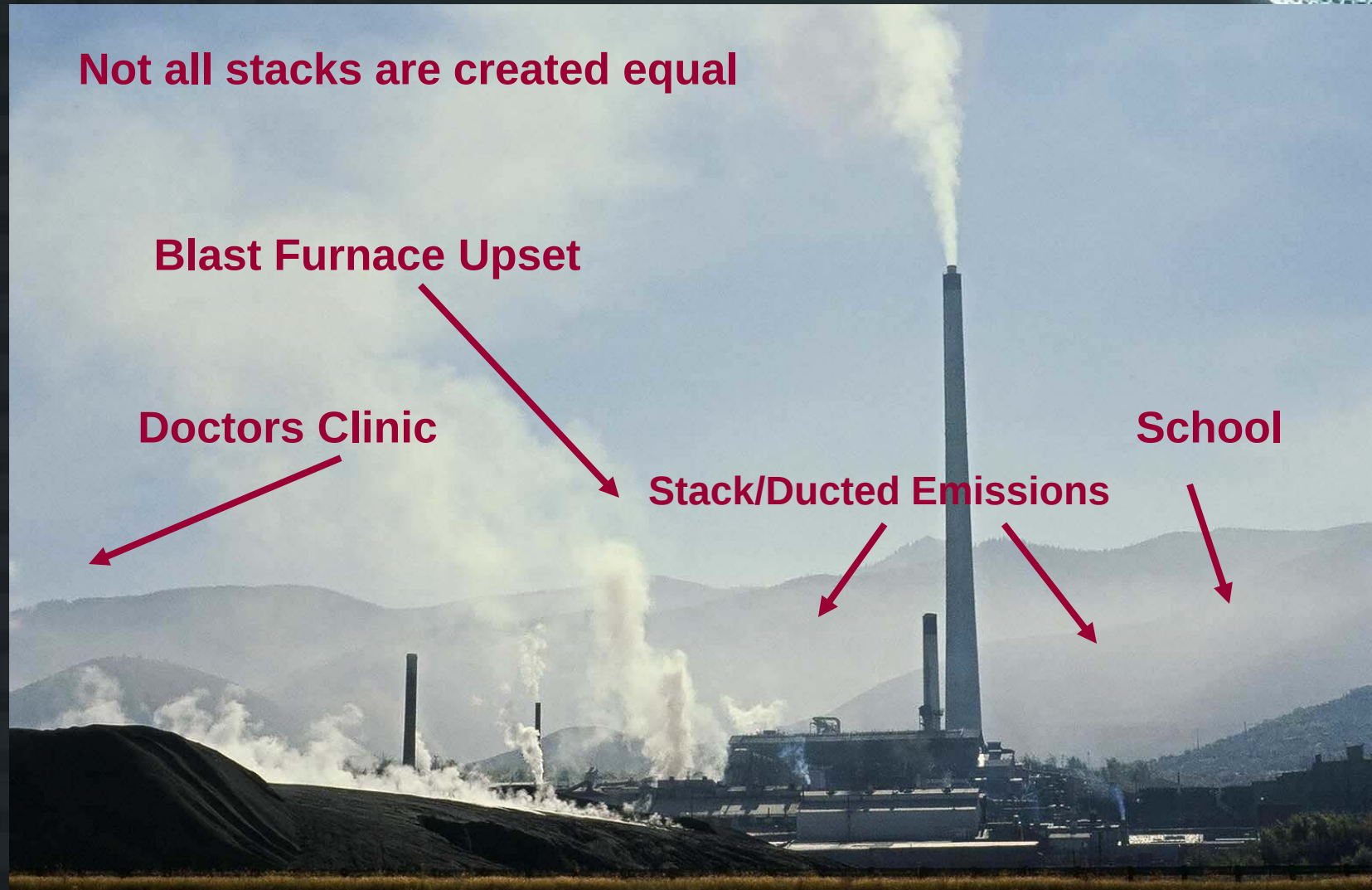
Real-Time Ambient
Metals Emissions
Apportionment?



Fugitive Emissions Can Dominate Local Impacts –



Not all stacks are created equal



Xact CEMS

Method 301
Validated

On-Stack
Certified



AMP
Approved

2.5 Years On-
Stack Operations

Can it be modified for a fence
line monitor application?

Concentration Range of Interest

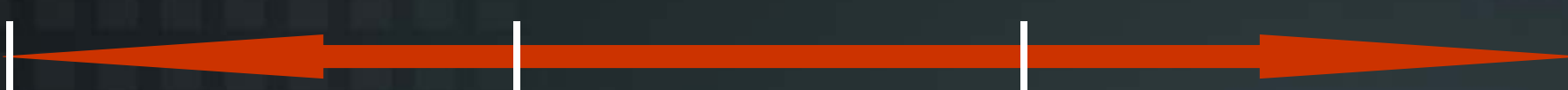


mg/m³

μg/m³

ng/m³

pg/m³



Xact-CEMS

Xact-IAP

XFM

Xact-FLM

Fence Line

Xact-ATM

Air Toxics

← QAG Validation →

Why Multi-Metals FLM?

Metals

- Eight of EPA's 33 highest concern pollutants
- High local concentrations
- Persistent
- Under reported

Fugitive/Area/Low Emissions

- Can dominate local exposure
- Infrequent/difficult measurements
- High uncertainty

Stack Emissions

- Uncertain, but MM-CEMS available



Why Short Term averaging?

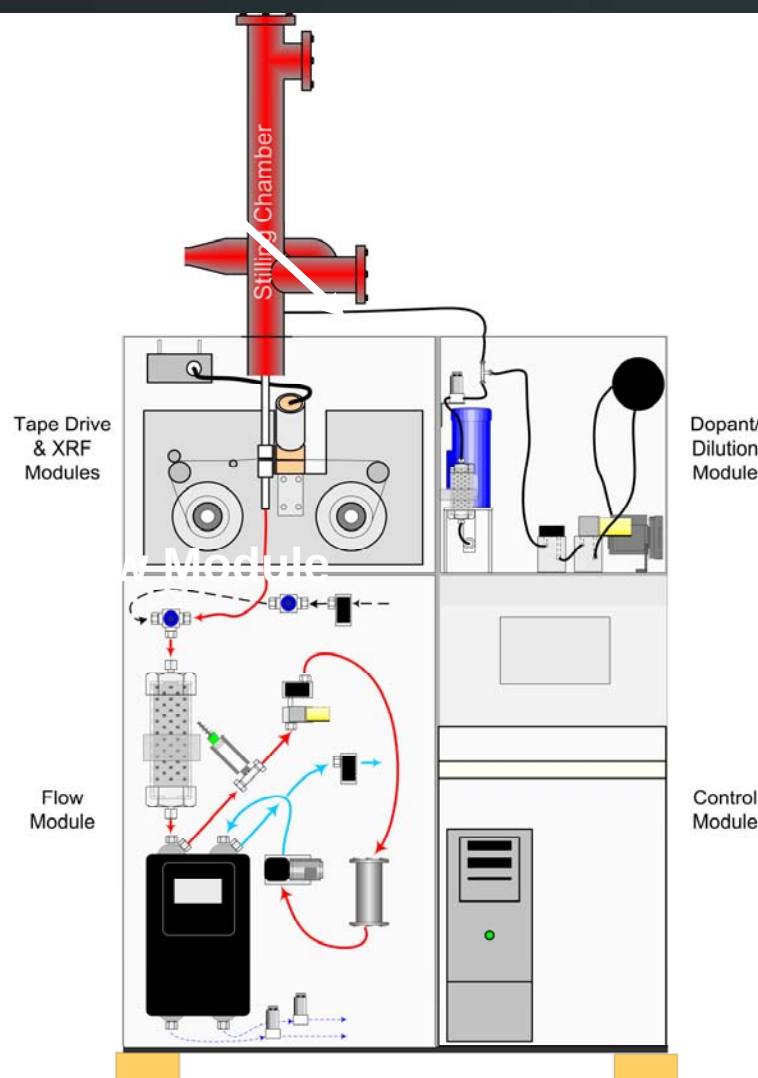
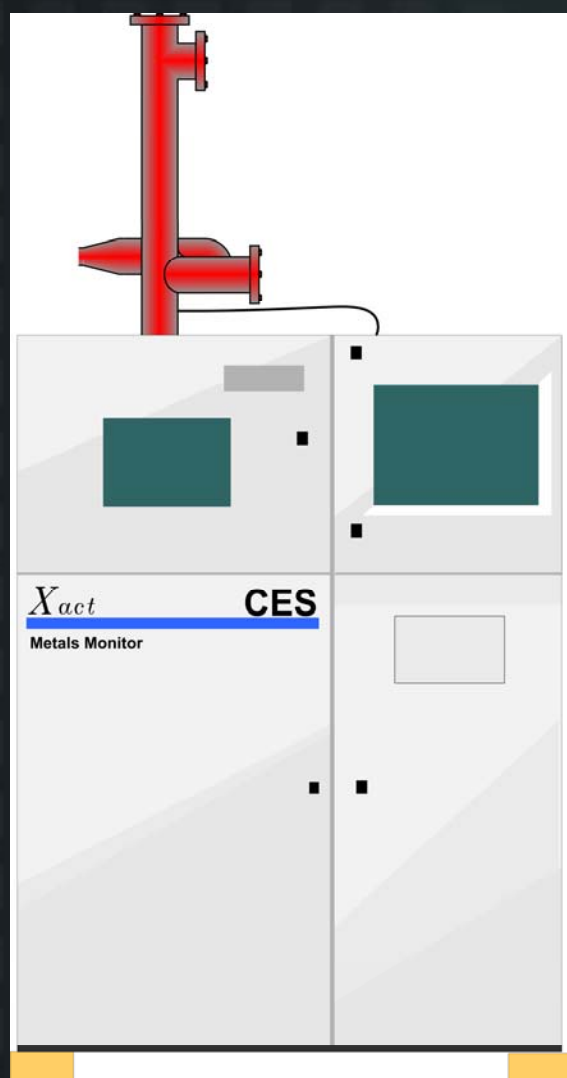
- **Protect Health**
- **Accurate emissions assessment**
- **Minimize emissions before they become problem**



Xact-CEMS to FLM Transition

CEMS to FLM Modifications

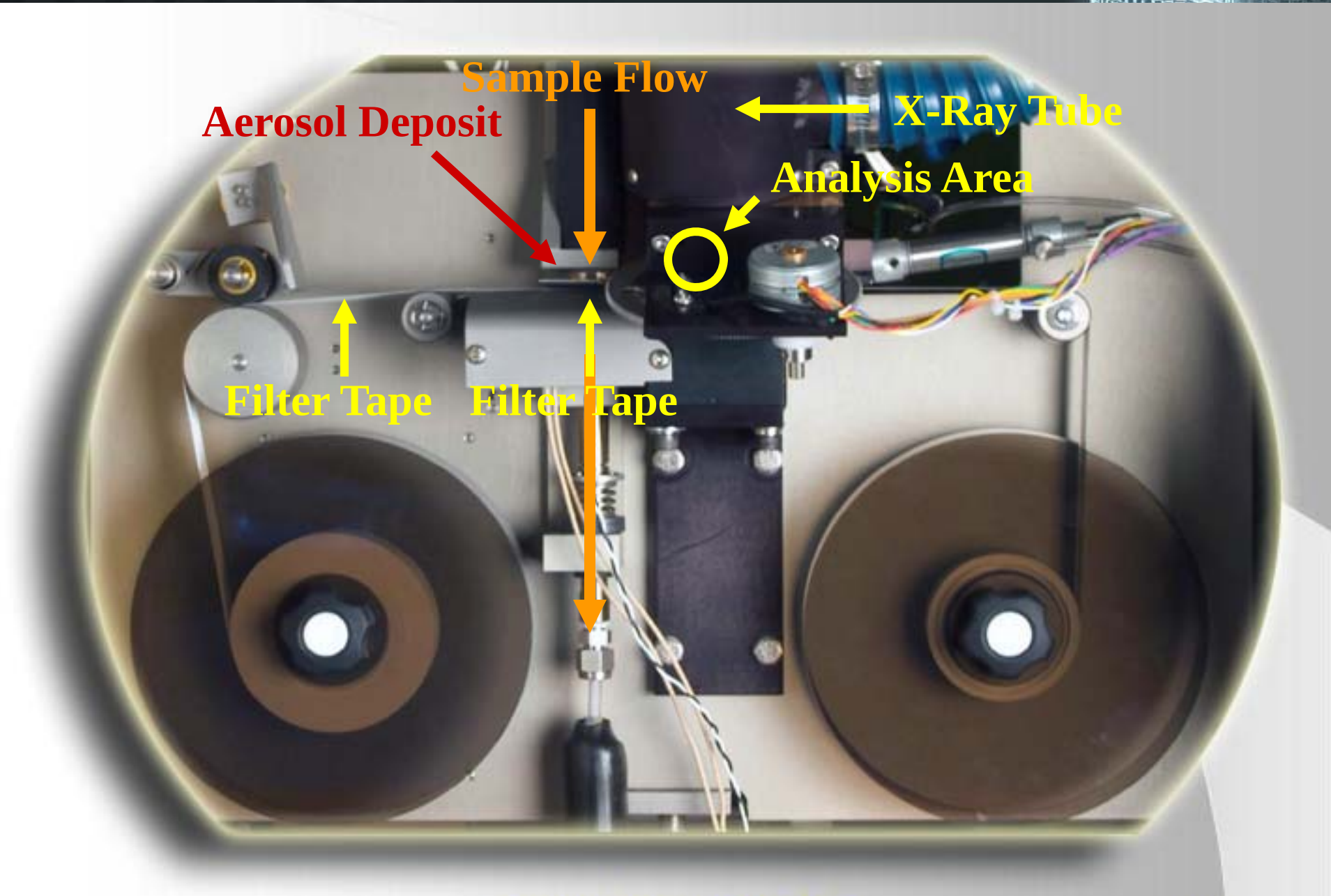
← **Inlet** → Inlet Tape Flow



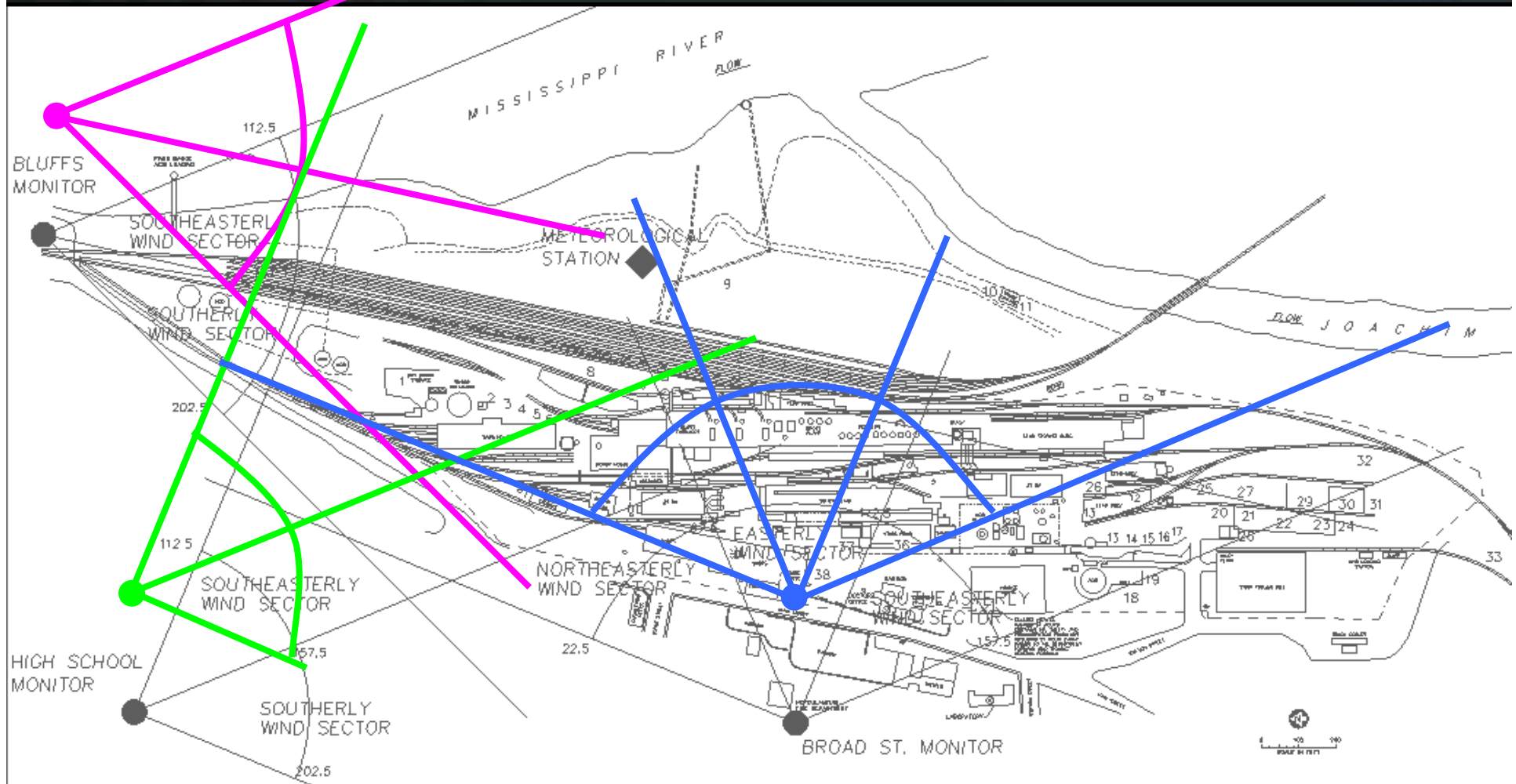
Firmware
Time

Control
Module

XACT-FLM SAMPLING AND ANALYSIS



WS, WD and MMs Can Provide Accurate Emissions Apportionment



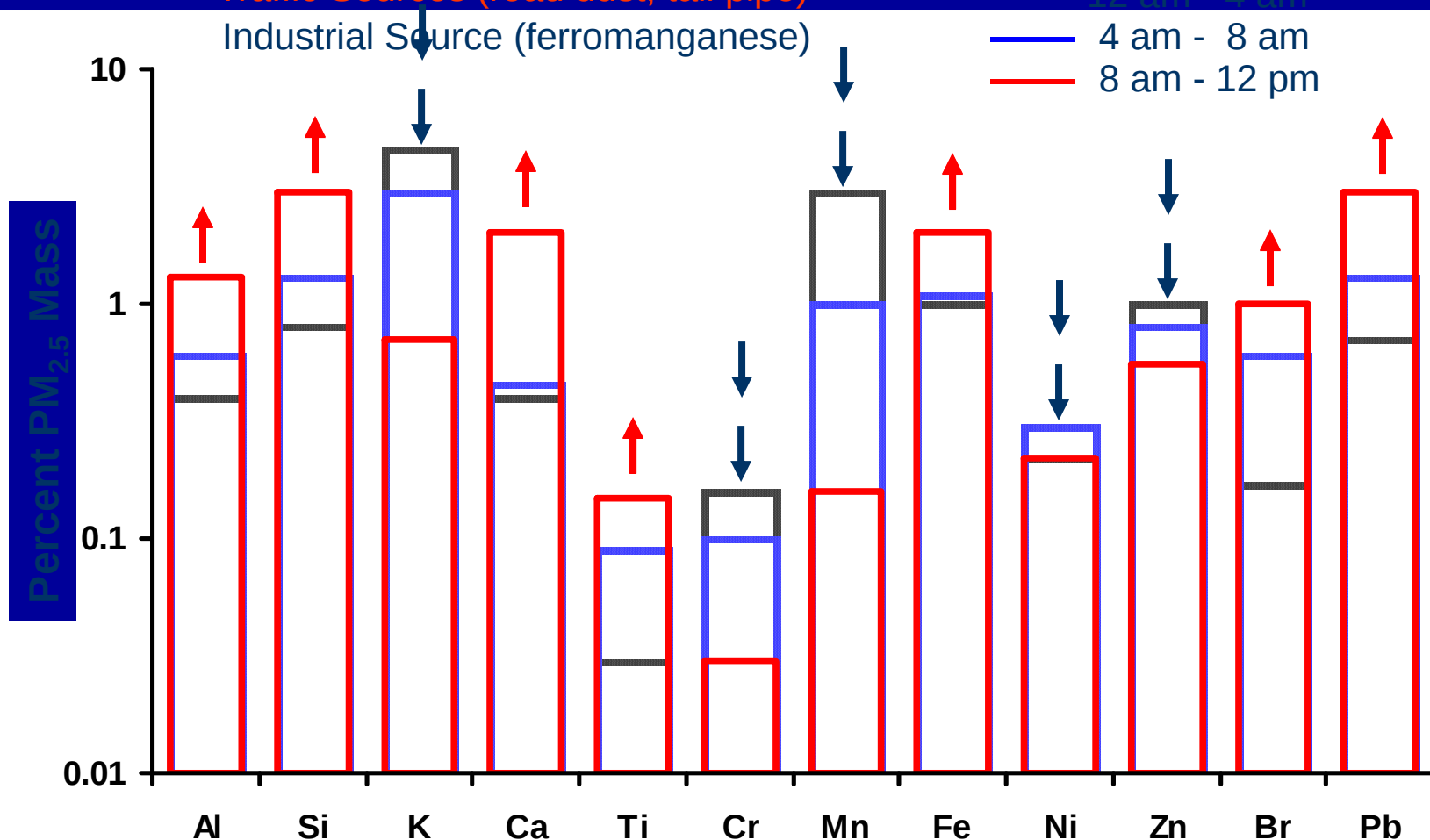
Multiple Species Contribute to Accurate Apportionment

Portland, OR CAMS - January 27, 1978

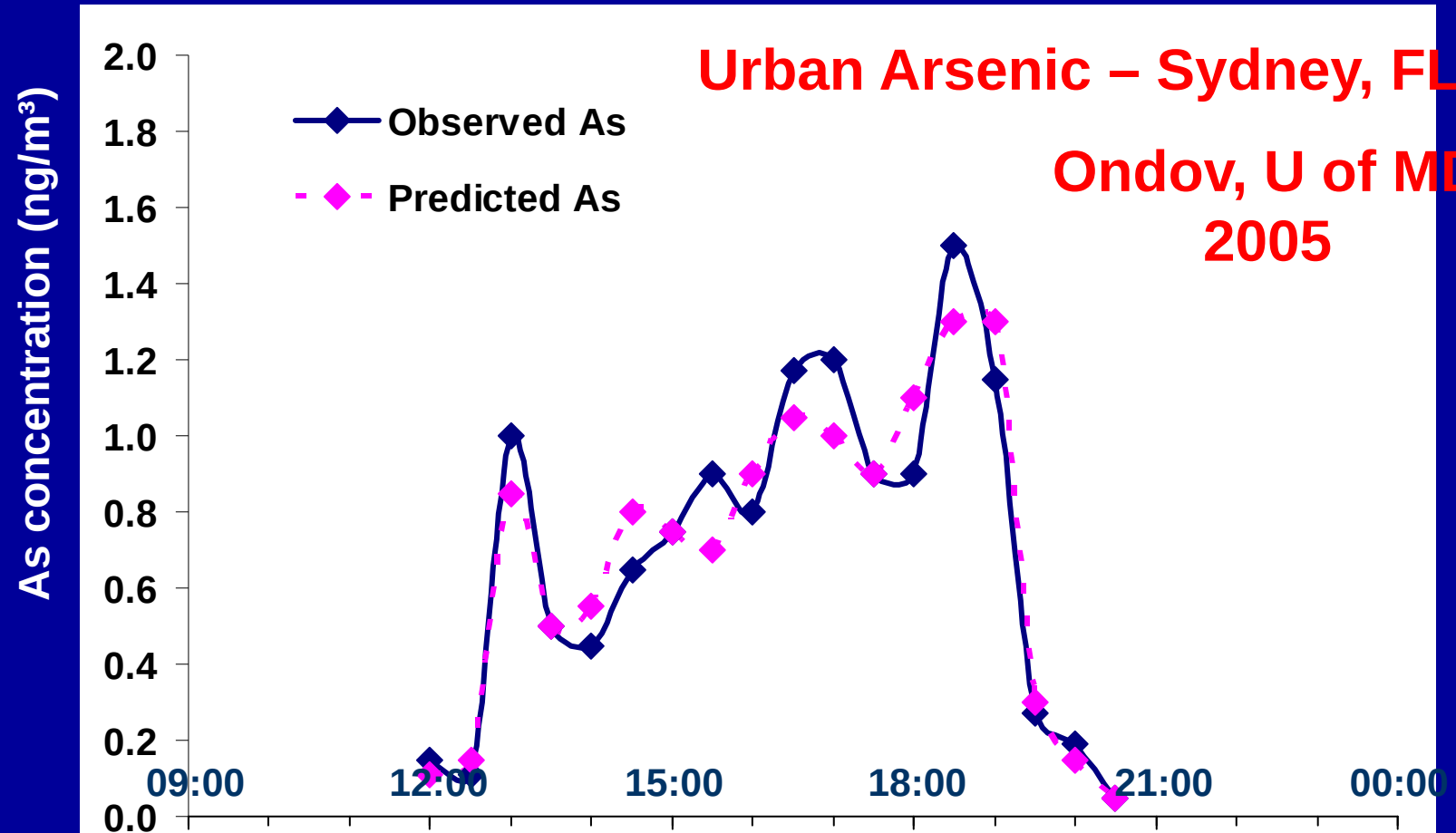
Traffic Sources (road dust, tail pipe)

Industrial Source (ferromanganese)

12 am - 4 am
4 am - 8 am
8 am - 12 pm



Pseudo-deterministic Receptor Model (PDRM)



This Technology Provides a Tool to:



- **Assess and protect health**
- **Effectively enforce compliance**
- **Effectively reduce emissions**
 - **Near real time response would allow emissions minimization before becoming a problem -**

Other Potential Applications

- Air quality and emissions assessment
- Strategy development and regulation setting
- Compliance assurance and enforcement
- Emergency response, clean up and solid waste management



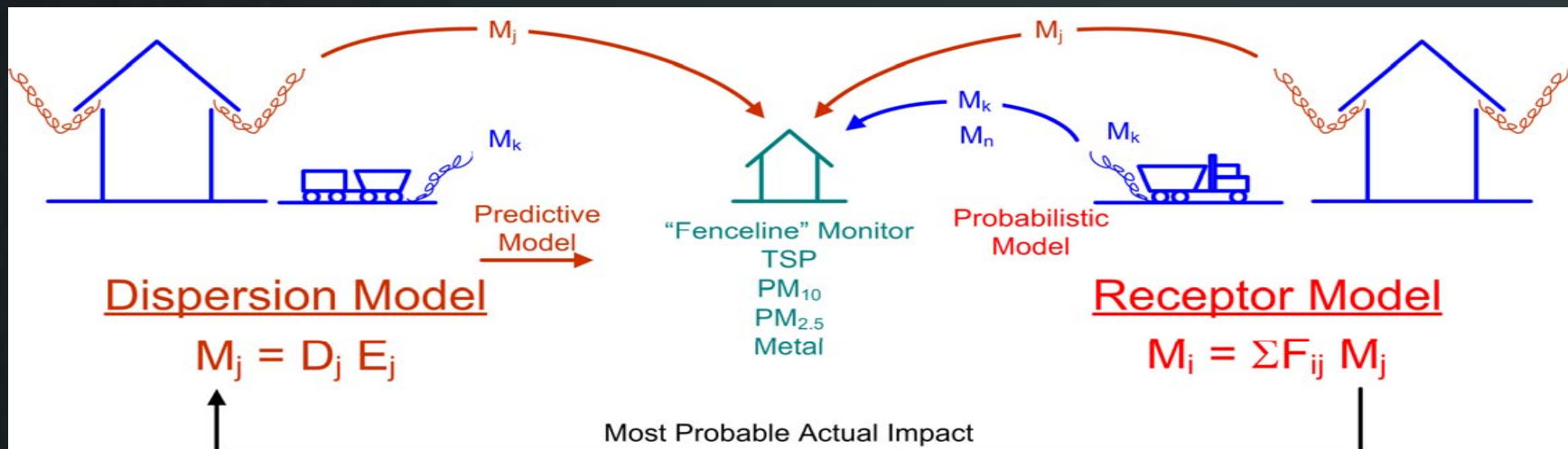
Possible Discussion Topics



- Regulatory options?
- How do these options impact measurements?
 - Monitor location and number
 - Reporting times
- Where to monitor – fence line or local community?
- How close to fence line to be a “fence line monitor”?
- Modeling approach

**Where do we
go from
here?**





Key Xact-FLM DETECTION LIMITS ($\mu\text{g}/\text{m}^3$)*



<u>Element</u>	<u>Kimoto**</u>	<u>Gore**</u>
Cr	0.002	0.001
As	0.001	0.0005
Cd	0.01	0.005
Cu	0.002	0.001
Pb	0.002	0.001
Mn	0.002	0.001
Co	0.003	0.002
Ni	0.002	0.001
Se	0.001	0.0006
Ag	0.009	0.004
Sb	0.03	0.01

Range of Interest: 0.01 to 1,000 $\mu\text{g}/\text{m}^3$

*95% confidence, interference free

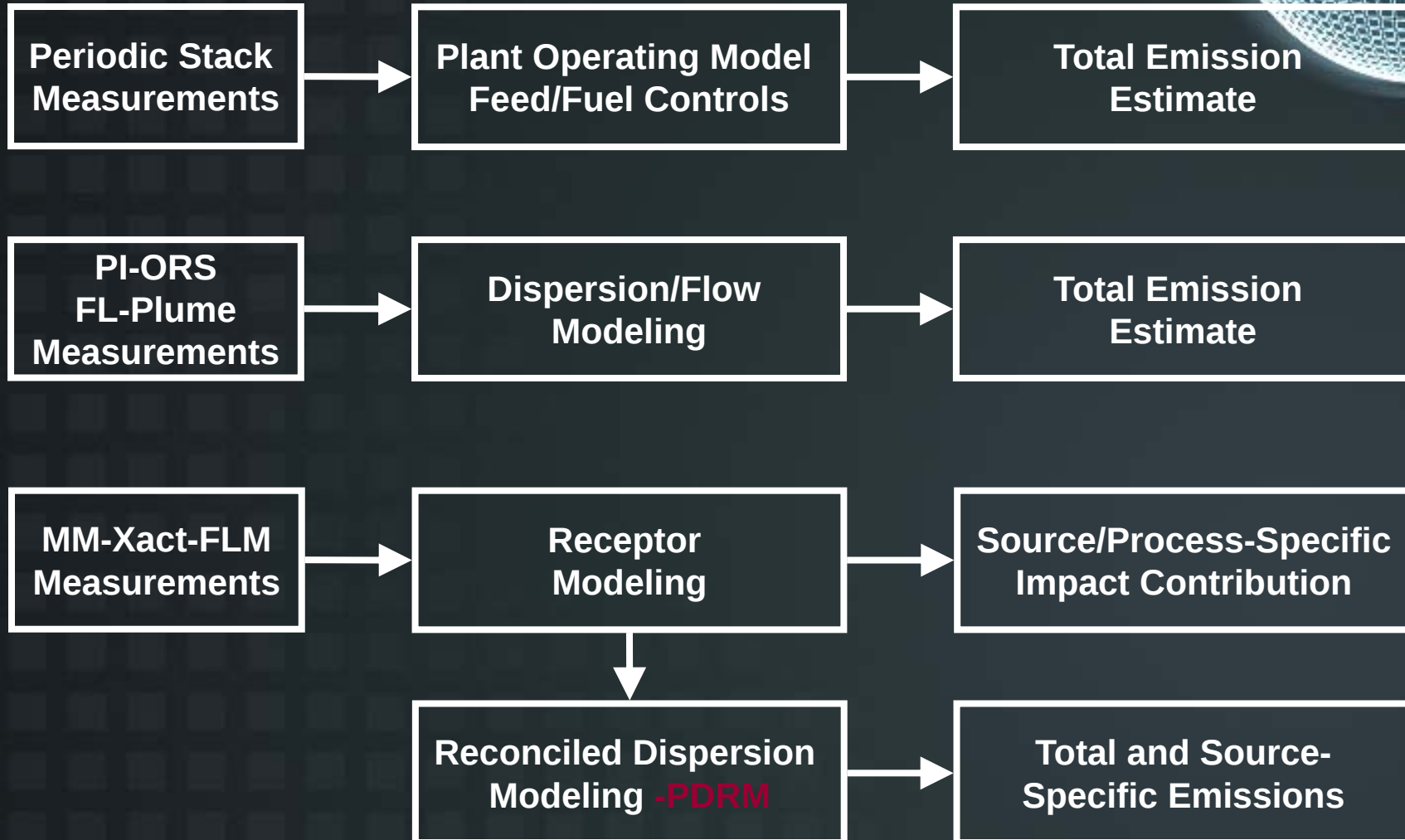
**60 minute sampling and analysis, 40 lpm/cm²

Comparison of Emission Estimating Models

Measured Impact

Model

Product



CEMS Revised Cost Model



CEMS Revised Cost Model



- Crude Computer model early 90's for SO₂ and NO_x
- 1998 – Updated Menu driven model with real cost data and questionnaire information
- 2006 – Updated cost information
 - Added Bag leak detectors and Hg CEMS
 - Split PM CEMS into several categories
 - Xcel Spreadsheet format
- EMC website

First Costs	Labor	Test	ODCs	Total
Planning	2,534	0	352	2,886
Select Equipment	10,941	0	3,067	14,008
Support Facilities	0	0	19,065	19,065
Purchase CEMS Hardware	0	0	95,400	95,400
Install and Check CEMS	6,762	0	11,979	18,741
Performance Specification Tests	2,244	33,855	628	36,726
QA/QC Plan	<u>2,570</u>	<u>11,981</u>	<u>692</u>	<u>15,244</u>
	25,052	45,836	131,182	202,070
Annual Costs				
Day-to-Day Activities	10,310	0	1,000	11,310
Annual RATA	885	33,485	0	34,370
PM Monitor RCA	0	0	0	0
PM Monitor RRA	0	0	0	0
Cylinder Gas Audits (ACA/SVA for PM)	1,164	0	15,881	17,045
Recordkeeping and Reporting	1,253	0	160	1,413
Annual QA & O&M Review and Update	2,074	0	2,980	5,054
Capital Recovery	<u>3,567</u>	<u>6,527</u>	<u>18,680</u>	<u>28,775</u>
Total w/o capital recovery	15,686	33,485	20,021	69,192
Total with capital recovery	19,254	40,012	38,702	97,967