Lessons Learned on TEOM-FDMS Units, Met-One BAM 1020, As of February 1, 2005

Presented by your good friends at the

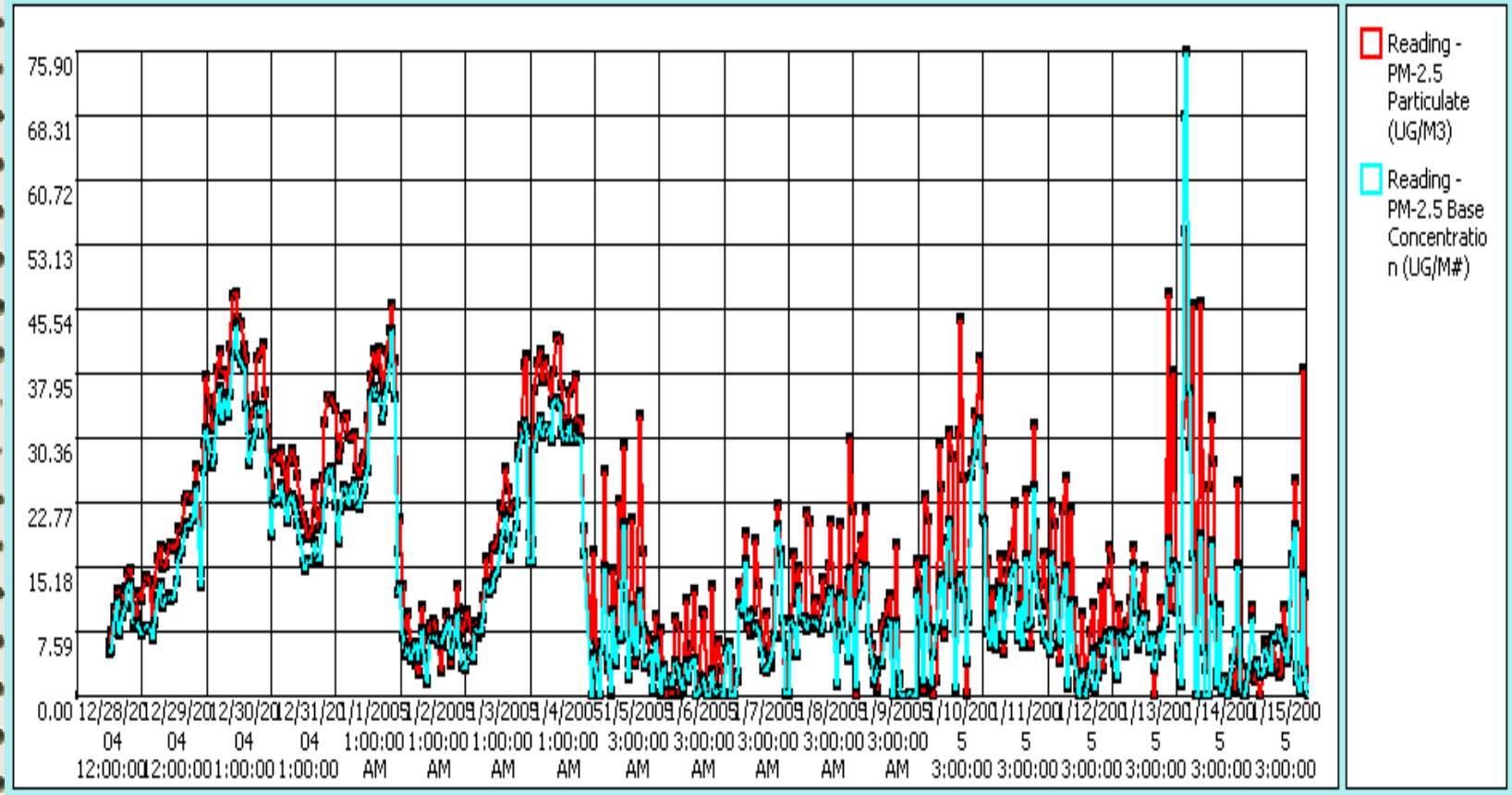
Pa. DEP, Bureau of Air Quality

Air Quality Monitoring

TEOM-FDMS Experiences

PROBLEM: Reading: Moisture in Inlet. 01/04-01/19/05

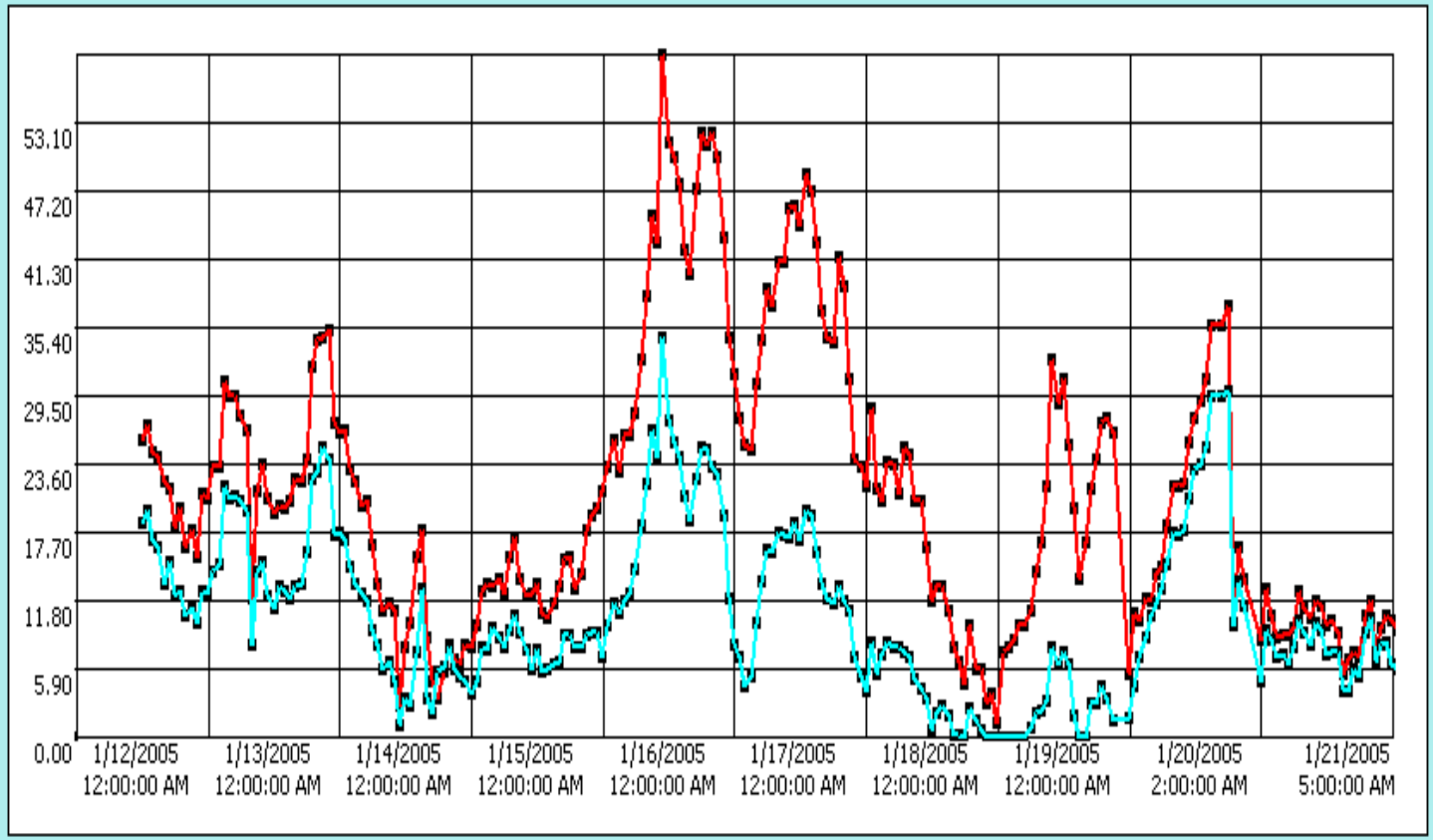
Solution: Monitor ambient and sample dew point on main screen



TEOM-FDMS experience

Problem: Forgot to put FDMS reference flow filter change in maintenance routines.

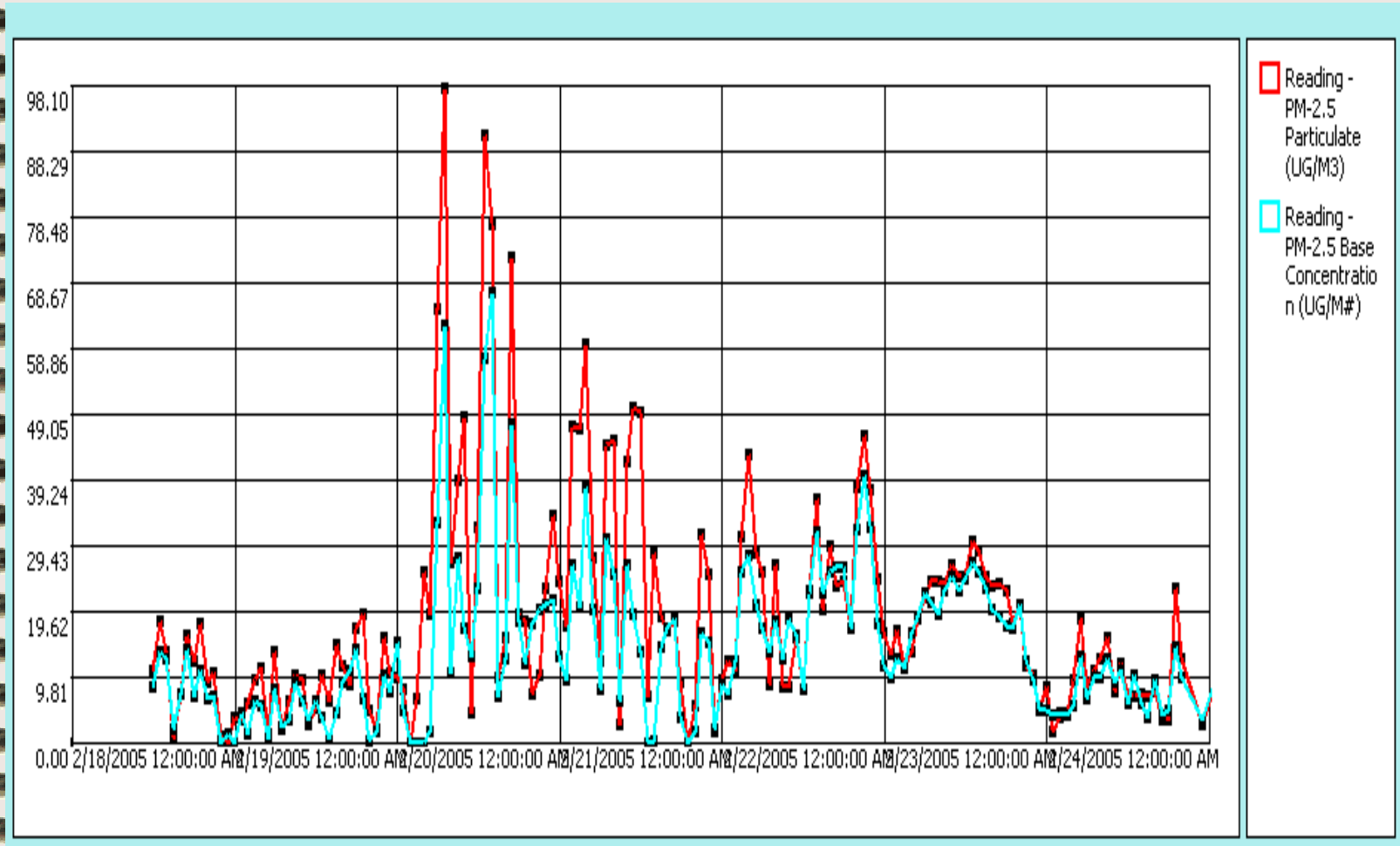
01/15-01/19/05



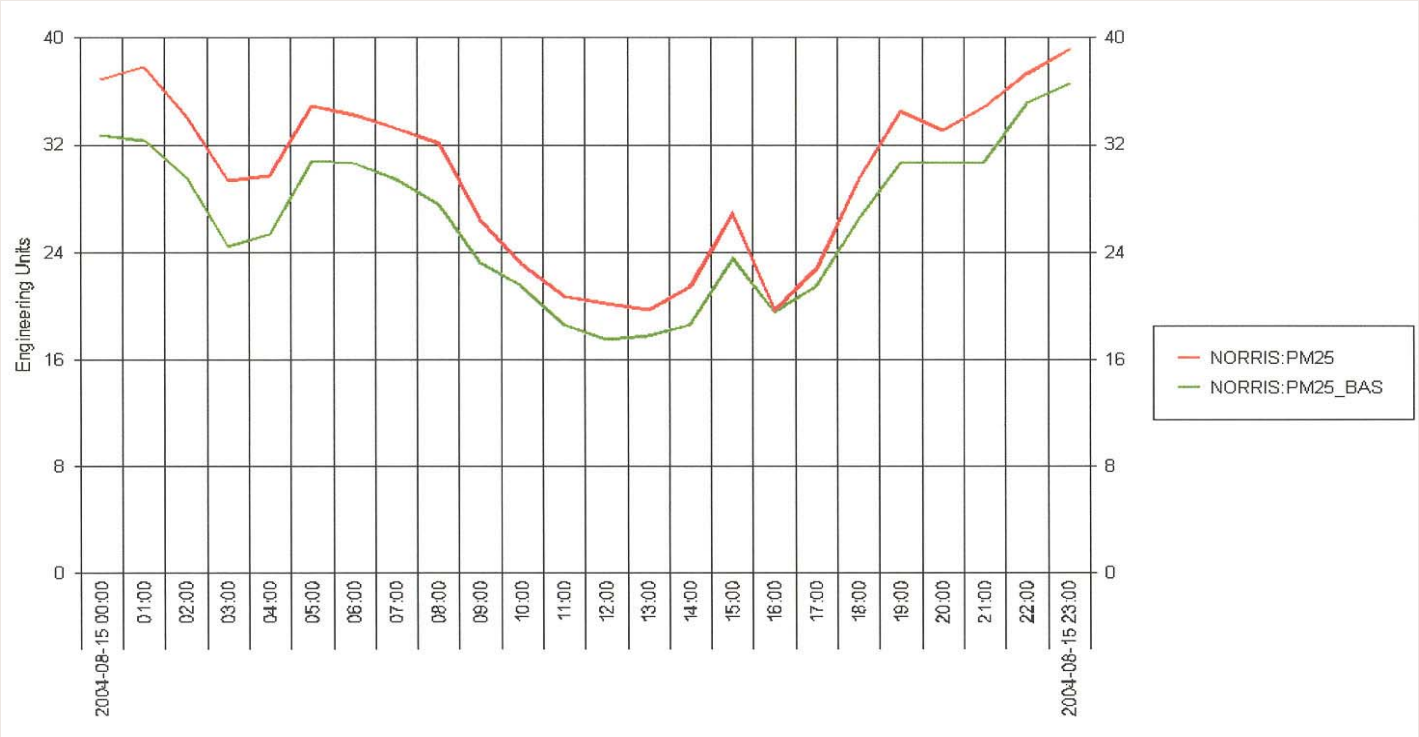
TEOM-FDMS experience

Problem: Unexplainable spiky output caused by pump vacuum that appears to be on the edge of optimum performance.

02/19-02/21/05



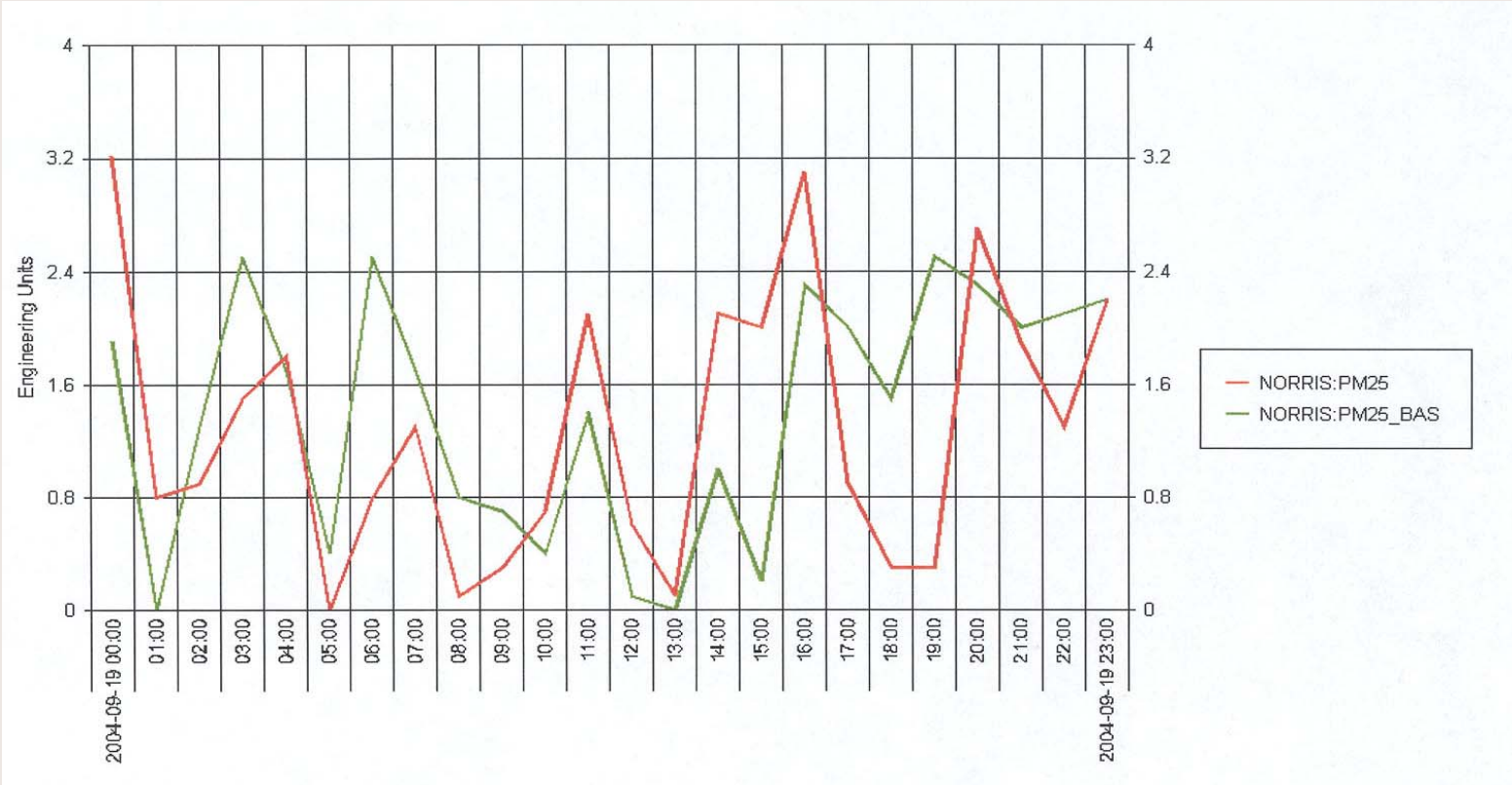
FDMS Characteristics
Actual TEOM FDMS Output
PM2.5 base – (-PM2.5 loss) = Total Mass



Can base concentration exceed total concentration? Yes, and it does.

Causes: Atmospheric chemistry, amplifier noise, precision error, under performing dryer.

Example situation caused by amplified noise and precision error.
Note low concentration values



FDMS Characteristics We Watch Out For (Maybe) ??:

- NOTE: If you follow directions, the sample filter is to be removed before a leak check is performed. Otherwise, you get the following results

- When doing a leak check, if it takes too long, we find we need to change the sample filter to avert long periods of negative concentration output. (1400AB many times, not much experience with FDMS at this time)

FDMS Characteristics We Watch Out For :

- 1. Pump vacuum seems to be on the edge of optimum performance
- 2. Bring to sampler main screen “ambient dew point” and “sample dew point”.
- 3. In general, any event that increases moisture content in sample can cause a output problem.

2004 Correlation to FRM

	(# of months)	Slope	Int.	R^2
• Norristown FDMS	(12)	1.25	0.98	0.92
• Lancaster FDMS	(12)	1.11	0.13	0.92
• Beaver Falls FDMS	(6)	1.05	-0.4	0.82
• Harrisburg BAM	(7)	1.19	1.7	0.95
• Johnstown BAM	(5)	1.09	-1.3	0.94

2004 Corrections to FRM like

	(# of months in 2004)	XCM	Int.	R^2
• Norristown FDMS	(12)	0.74	0.2	0.92
• Lancaster FDMS	(12)	0.83	1.19	0.92
• Beaver Falls FDMS	(6)	0.78	3.09	0.82
• Harrisburg BAM	(7)	0.80	-0.5	0.95
• Johnstown BAM	(5)	0.86	2.09	0.94
• Arendtsville 1400AB (30 ^{O}C)	(12)	1.01	1.3	0.85

Current Compliment, Including spares:

Three--1400ab (3 in service)

Five—FDMS (4 in service)

Three—BAM (2 in service)

Future Expansion:

Three units/year for 5 years

Mixed bag of FDMS and BAM, depending on need and space

Improvements to FDMS Units

1. Install pump vacuum monitoring
   Vacuum is critical to proper dryer function.
   Need a minimum of 20 inches of Hg.
   We see vacuums of 21 to 22 inches of Hg at our vacuum monitored sites.

2. Install a by-pass flow condenser and moisture drop out.
   Avoids losing by-pass flow control when moisture gets into system

Possible improvements for BAM Units (Met-One)

1. Watch for new Teflon filter paper (under evaluation)

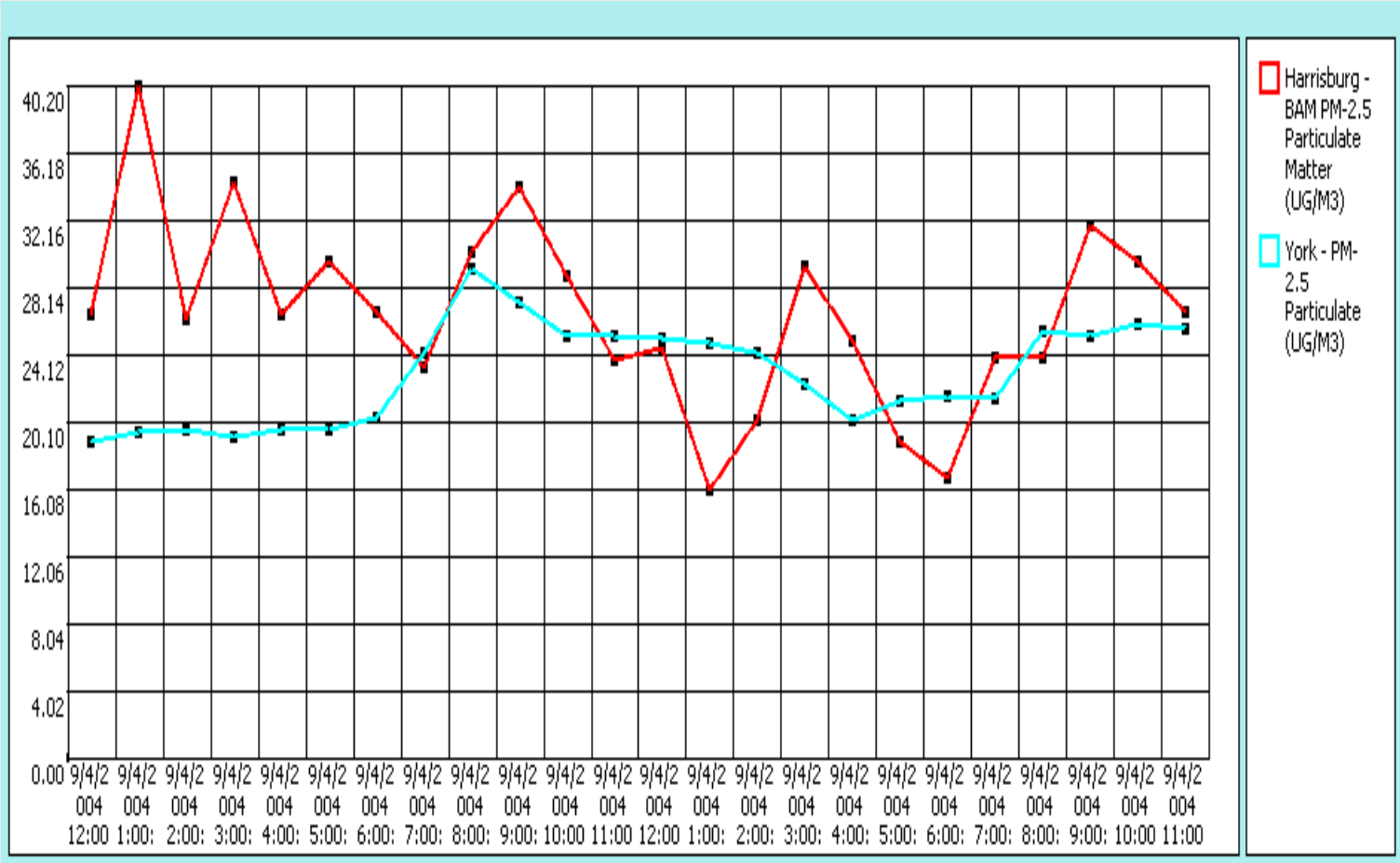
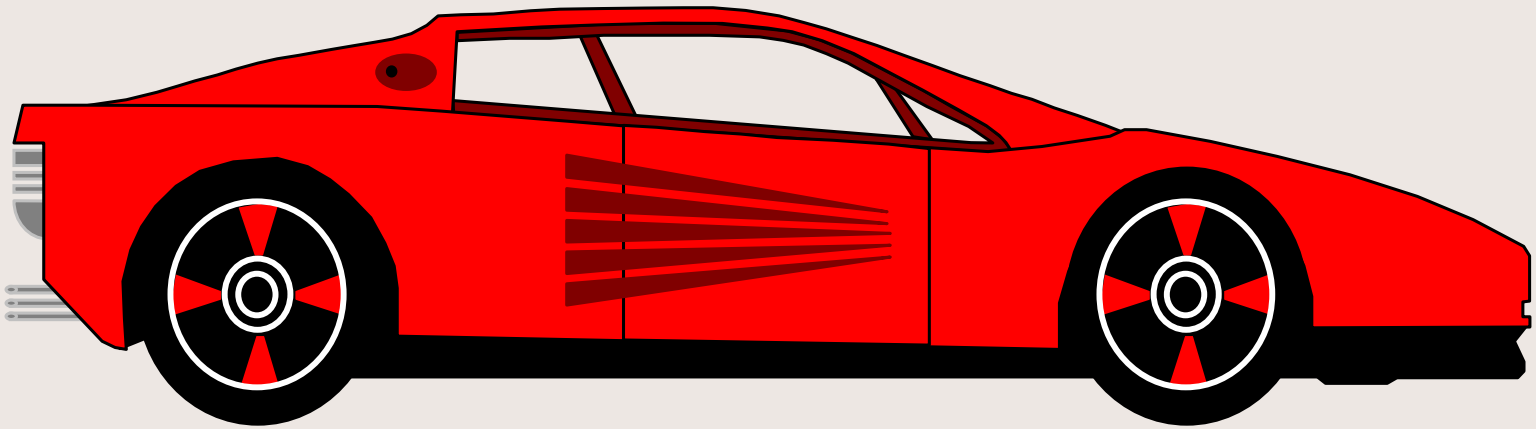
BAM 1020 Maintenance Considerations

- When manually lowering the nozzle after cleaning, go slow.
- Cleaning the “Vane” requires us to remove 8 feet of inlet tubing. But, we have been able to clean the vane from the front. (If we keep after it.)
- Where does the vane residue go? To a filter prior to the flow measurement sensor. This may eventually cause low flow problem if large chunks of paper residue are present.

BAM-1020 Output/Maintenance

- When comparing short term FRM to FDMS to TEOM, BAM units typically reads highest.
- Only had two significant problems in 3 years:
- 1. Flow control failure (upgraded)
- 2. Reference Membrane position sensor error
  - *P.S. Do not forget to clean nozzle and leak check after every filter paper change or tear.*

Harrisburg BAM / York FDMS



DOOR PRIZE:
Compliments of the citizens and businesses of Pennsylvania