Missouri PM–CEMS Experience

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- Three PM–CEMS for CAM
- One PM–CEMS for permit compliance
- 2 Successes 2 Failures
- Teledyne Laser Hawk back scatter PM–CEMS

PM–CEMS as CAM indicators

- CAM indicator range: 90% of PM limit in lb/MMBtu
- M–17 runs at three PM conditions
- PM data analyzed on–site
- PM control by ESP

Case 1—Success

- Old PC boilers, ESP control, PM–CEMS in ducts to stack
- RM data in lb/MMBtu
- PM–CEMS data in mg/ACM
- Correlation initially computed from 3–run averages.
- Agency rejected this approach, insisted on correlation based on all nine runs.
- CAM excursion = 1 hour above PM–CEMS level correlated to 90% of PM limit.
- Condensable PM not considered
Unit 1 CAM Correlation (RM-17 vs PM CEMS)

\[ y = 0.0012x + 0.0088 \]

\[ R^2 = 0.9482 \]

PM CEMS (mg/acm)

Reference Method 17 (lb/mmBtu)

Unit 2 CAM Correlation (RM-17 vs PM CEMS)

\[ y = 0.0016x + 0.0035 \]

\[ R^2 = 0.9501 \]

PM CEMS (mg/acm)

Reference Method 17 (lb/mmBtu)

Unit 3 CAM Correlation (RM-17 vs PM CEMS)

\[ y = 0.0014x + 0.0201 \]

\[ R^2 = 0.9811 \]

PM CEMS (mg/acm)

Reference Method 17 (lb/mmBtu)
Case 2—Success

- Cyclone boiler, ESP control, PM–CEMS in stack
- RM data in lb/MMBtu
- PM–CEMS data in mg/ACM
- CAM excursion = 1 hour above PM–CEMS level correlated to 90% of PM limit.
- Condensible PM not considered

\[ y = 0.0014x - 0.0016 \]
\[ R^2 = 0.9569 \]

Case 3—Failure

- PC boiler, ESP control, PM–CEMS in stack
- RM data in lb/MMBtu
- PM–CEMS data in lb/MMBtu
- CAM excursion = 1 hour above 90% of PM limit.
- Condensible PM not considered
- Testing done without consulting agency.
- Only 3 RM runs
What went wrong

- Not enough RM data
- Not enough spread in RM data
- Wild outliers in PM–CEMS data
- Poor planning
- Poor communication with agency
Case 4---Failure

- New PC boiler, PM–CEMS in stack
- Baghouse control of PM + FGD & SCR
- RM data in lb/MMBtu
- PM–CEMS data in mg/ACM
- PM–CEMS required by permit to meet PS 11.
- Regulated pollutant, PM\textsubscript{10}, assumed equal to PM.
- Condensible PM assumed to be a constant proportion of PM.
What went wrong

- PM could not be varied
- No meaningful correlation was possible

Challenges and lessons learned

- How to meet PS 11 with baghouse control
- Are PM–CEMS useful or necessary when actual emissions are miniscule?
- Is there another way to validate PM–CEMS?

- Demand good test planning.
- If baghouse stack can’t be spiked forget about PS 11.