PM Continuous Monitoring with the TAPI 640

Betsy Frey
DE DNREC
MARAMA Air Quality Monitoring Training Workshop
November 21, 2019
Teledyne API Model T640

- Method – continuous PM monitoring using real-time scattered light spectrometry
  - T640 approved FEM for PM\(_{2.5}\) but also measures PM\(_{10}\) and PM\(_{10-2.5}\)
  - Flow rate 5.0 lpm
- Can be installed inside a walk-in shelter or in a stand-alone enclosure
- T640 inlet not size selective
TAPI 640 PM$_{2.5}$ Assessment

MLK TAPI 640 vs FRM
2017 - 2019

\[ y = 0.907x + 1.2391 \]

\[ R^2 = 0.9322 \]
TAPI 640 PM$_{10}$ Assessment

2017 June - 2019 July

\[ y = 0.899x + 2.7937 \]

\[ R^2 = 0.9282 \]

2017 June – 2019 July outliers removed

\[ y = 0.9274x + 2.4676 \]

\[ R^2 = 0.9546 \]
Difference in $\text{ug/m}^3$
TAPI – Partisol PM$_{10}$
Walk in shelter installations
Roof inlet

- Rain cap to prevent water intrusion
Inside installation, inlet through shelter roof
Modification to top of outer heater tube (Aerosol Sample Conditioning “ASC” tube) to allow easier installation of inlet tube.
Regular QC checks
Without slip-coupler

Magic pixie dust calibration/check

Flow check
Things to pay attention to:

- **Careful** use of magic pixie dust during span check/calibration
  - Avoid clogging – very slight tap on bottle is sufficient
  - Don’t use dust if it is “clumping” or past expiration date
- Clean optics at least every 6 months
- Operational checks that can result in data invalidation
  - Example: Failed monthly flow check caused invalidation of one month of data. Now we perform **weekly** flow checks.
Excessive dust (agricultural activities, too much magic pixie dust) can accumulate on cup (in optical chamber)
Clogging from excessive pixie dust
Removing ASC

Sleeve should remain over nozzle

Sleeve may stay in ASC
Karl Dyer Sleeve Removal Tool
(patent pending)
Replacing ASC – sleeve should go on first

Undamaged

Damaged
Data Validation

- Monthly field sheets: flow, zero, and leak checks
  - Follow EPA/TAPI suggested field forms, but
    - Less frequent magic pixie dust checks
    - More frequent flow checks
- Visual assessment – time-series graphs of hourly averages, compare sites
  - Look at both PM10 and PM2.5 data
Typical Hourly Averages

PM10

PM2.5
Not so typical
Operational checks were OK

PM10

PM2.5
Seaford PM$_{10}$ problem resolved by:

- Clean inlet and down tube (found obstruction – piece of cleaning wipe)
- Clean optics
- Recalibrate with magic pixie dust

*Lesson learned – look at both PM$_{10}$ and PM$_{2.5}$ data!*
What’s next – stand-alone shelters
TAPI 640 – Happy TAPI!

- Easier QC checks and servicing than SHARP BAM, more reliable, better PM2.5 correlation with FRM
- PM10 data is precise but biased approx. 2 ug/m³ high
  - PM10 can act as indicator of TSP
- Next phase is installing T640 in stand-alone shelters on platforms at 3 sites

P.S. Several slightly used SHARP monitors available FREE to good home, see Chuck Sarnoski.
Questions?