Hazen

# Field Sampling and Monitoring 101

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**Tavares, FL**

# Agenda

1. Why do we collect odor-related data?
2. Sampling safety
3. Developing a Sampling Plan
4. Liquid phase data collection
5. Vapor phase data collection

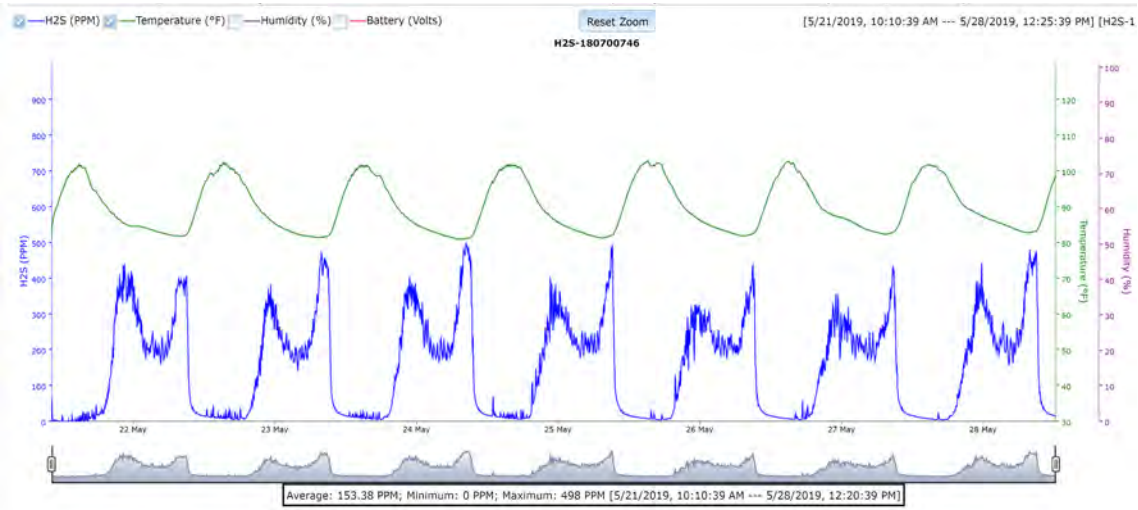
# Why Do We Collect Odor Data?

# Why Do We Collect Odor Data?

**For a lot of reasons!**

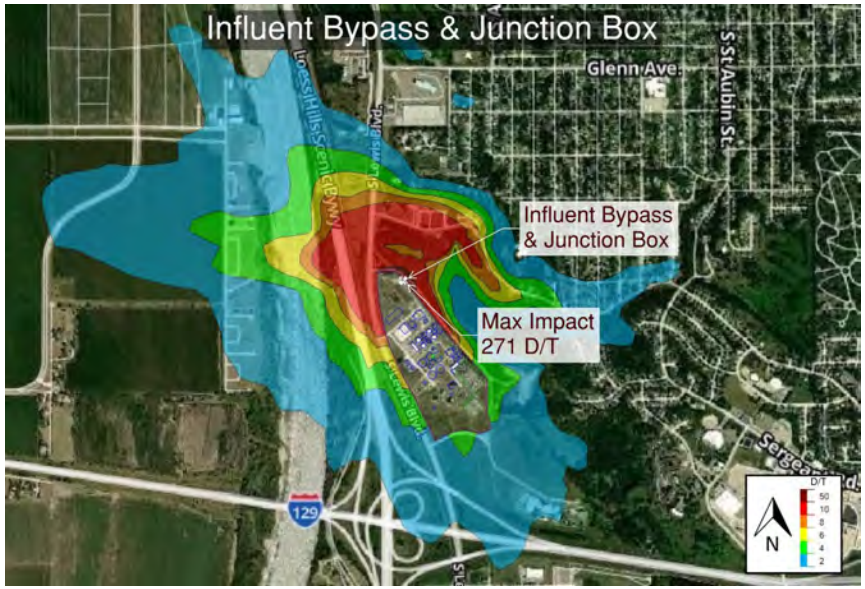
# Why Do We Collect Odor Data?

1. Develop System Design Criteria
2. System Performance Testing
3. System Monitoring/Optimization
4. Confirm Nuisance Odor Complaints



# Why Do We Collect Odor Data?

5. Air Dispersion Modeling (OERs)
6. Collection System WW Process Modeling
7. Regulatory Requirement or Client Goal (D/T, $H_2S$)
8. Assess Corrosion Potential
9. Verify Staff Safety



# Sampling Safety

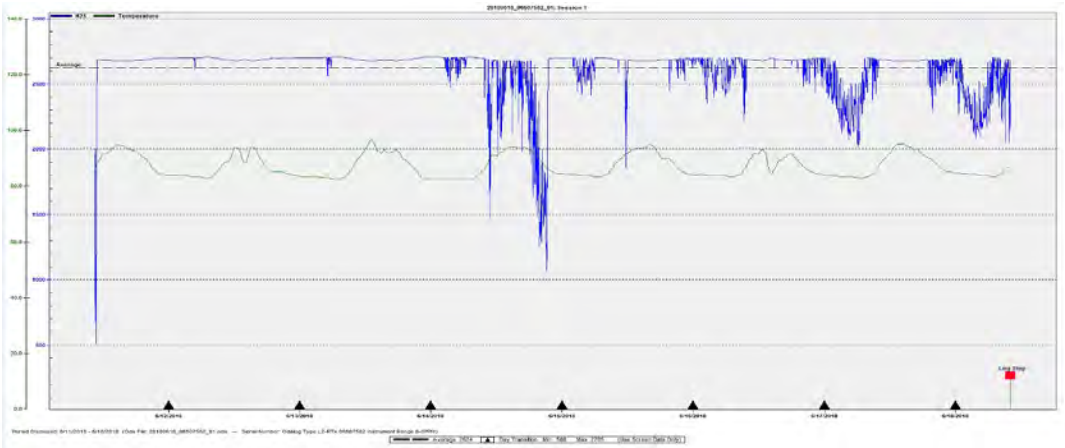
- $H_2S$ Gas:  nausea/dizziness (~100 ppm), coma/death ( > ~500 ppm)
- Wastewater/chemicals:  gloves, glasses, hand sanitizer
- Traffic:  MOT, cones, safety vests

# Sampling Safety

- Falling:  Wet wells, manholes, process tanks, vessels
- Heavy objects:  Manhole lids, access hatches, flux chambers
- Elements:  Sunscreen, hydration, shade, insects


# Developing a Sampling Plan

- Sampling objectives and parameters (targeted)
- Review background data (anticipated ranges)
- Select locations (walk through, operator interviews)
- Identify methods of sample collection and analysis (and supplies)
- Schedule (and season) and frequency (shipping/lab coordination)
- Sampling team (training if required)



# Liquid Phase Data Collection

# Liquid Phase Data Collection

**Total and Dissolved Sulfide – Grab Sample**

- Why:  Liquid sulfides are correlated to vapor phase $H_2S$ concentrations
- How:  LaMotte Sulfides Test Kit, GASTEC Tubes, Spec
- Considerations:  Practice (15 steps), time, interference

# Liquid Phase Data Collection

**Total and Dissolved Sulfide – Continuous**

- Why:  Liquid sulfides are correlated to vapor phase $H_2S$ concentrations
- How:  SulfiLogger Probe
- Considerations:  Range, pH


# Liquid Phase Data Collection

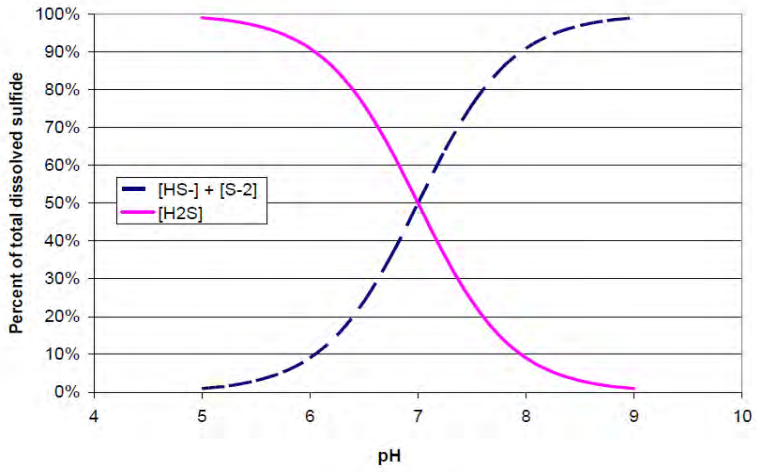
**Wastewater Temperature**

- Why: Warmer wastewater more favorable to biological activity (i.e., sulfide generation), release to the vapor phase (Henry's Law)
- How: Water quality probe
- Considerations: Straight forward
  (deg C vs. F)

# Liquid Phase Data Collection

**Wastewater pH**

- Why: Determines speciation of dissolved sulfides
- How: Water Quality Probe
- Considerations: At a pH of 8.3, ~95% of dissolved sulfides are in ionic form ($HS^-$ and $S^{2-}$)



# Liquid Phase Data Collection

**Wastewater Dissolved Oxygen (DO)**

- Why:  Aerobic conditions are good ( > 1.0 mg/L)
- How:  Water Quality Probe
- Considerations:  Take care not to introduce oxygen during sample collection, slowly "stir" the probe

# Liquid Phase Data Collection

**Wastewater Oxidation-Reduction Potential (ORP)**

- Why:  Aerobic conditions are good!
- How:  Water Quality Probe
- Considerations:  > +50 mV = aerobic;
- -50 to -300 mV = max sulfide generation

# Liquid Phase Data Collection

**Sulfate/Nitrate**

- Why:  SRBs preferentially utilize DO, then nitrate, then sulfate
- How:  Water quality probe, field test kit
- Considerations:  Upstream and downstream of calcium nitrate addition

# Vapor Phase Data Collection

# Vapor Phase Data Collection

**Hydrogen Sulfide ($H_2S$)**

- Why:  Primary compound for odor (and corrosion) control
- How:  OdaLog, AcruLog, Jerome Meters, Detection Tubes
- Considerations:  Range, safety, sampling system, depth


# Vapor Phase Data Collection

**Hydrogen Sulfide ($H_2S$)**

- Why:  Primary compound for odor (and corrosion) control
- How:  SmartCover H2Scents (web-based, app), SulfiLogger
- Considerations:  Range, accuracy, duration, depth, alarms

# Vapor Phase Data Collection

**Sensory Sampling – Laboratory/Odor Panel**

- Why:  Odor concentration (D/T and R/T), intensity, persistence, characterization (hedonic tone & descriptors)
- How:  Flux chamber/evacuation chamber, trained panel
- Considerations:  Holding time/coordination, bag volume

# Vapor Phase Data Collection

**Sensory Sampling – Field Olfactometry**

- Why:  Odor concentration (D/T), characterization (descriptors)
- How:  NasalRanger
- Considerations:  Training, Wind

Odor strength (D/T)

D/T: 2, 4, 7, 15, 60

High Range: 60 to 500

# Vapor Phase Data Collection

**Reduced Sulfur Compounds (RSCs)**

- Why: Organic sulfur-based compounds with very low detection thresholds (rotten cabbage/vegetables/garlic)
- How: Tedlar® bags, vacuum canisters, ASTM D5504-12 (or 20)
- Considerations: Holding time, flow regulator

# Vapor Phase Data Collection

**Ammonia**

- Why:  Pungent odor, solids handling processes
- How:  Sorbent tube and hand pump, Acrulog
- Considerations:  Relatively high detection threshold (e.g., OSHA: 5-50 ppm)

# Vapor Phase Data Collection

**Amines**

- Why: Nitrogen-based odorous compounds (e.g. trimethylamine = “fishy” odor), solids handling, polymers
- How: Sample pump and sorbent tube sent to lab
- Considerations: Time (1 L/min for 100 mins!)

# Vapor Phase Data Collection

**VOCs**

- Why:  Industrial discharges, regulatory drivers
- How:  Vacuum canisters sent to a lab (EPA TO-15)
- Considerations:  Flow regulator

# Vapor Phase Data Collection

**Differential Pressure**

- Why:  Determine potential for fugitive emissions
- How:  AcruLog, smoke testing
- Considerations:  Public/client outreach, volume/duration


# Vapor Phase Data Collection

**Airflow**

- Why:  Comparison of air flow to design value
- How:  Hot wire anemometer
- Considerations:  Straight run of duct, average of multiple values across the diameter


# Vapor Phase Data Collection

**E-Noses**

- Why:  Monitor odors in “ambient” conditions (fence line)
- How:  Portable or fixed electronic sensors
- Considerations:  Newer technology, odor “cocktail”, calibration



# Summary

1. Sampling/monitoring is helpful for many reasons
2. Develop a Plan and sampling log
3. Be safe!
4. Several methods for liquid and vapor phase data collection
5. Good investment

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