THE NEW OSHA SILICA RULE; WHAT WE HAVE LEARNED THUS FAR

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NEW SILICA RULE

- OLD RULE WAS INADEQUATE.
  - HAD A MOVING TARGET PEL.
  - DIDN'T PROPERLY ADDRESS HUMAN EXPOSURE EFFECTIVELY ENOUGH.

- NEW RULE
- CONSTRUCTION STANDARD 26CFR 1926.1153
- GENERAL INDUSTRY STANDARD 29 CFR 1910.1053

NEW RULE TIMELINE

- **September 12, 2013** -- OSHA published a Notice of Proposed Rulemaking for respirable crystalline silica.
- **March 24, 2016** -- OSHA issued a Notice to protect workers from exposure to respirable crystalline silica – First enforcement set for June 23, 2017 .
- **April 6, 2017** -- OSHA delays enforcing crystalline silica standard in construction from June 23, 2017 to September 23, 2017.
- **September 23, 2017** -- OSHA Enforcement in Construction begins.
- **June 23, 2018** -- OSHA Enforcement in General Industry and Maritime Begins.
- **June 23, 2021** -- Hydraulic Fracturing Industry engineering controls.

Former Silica Standards

- **OSHA 29 CFR 1910.1000 Table Z-3**
  - "Sliding or Variable" PEL-Air Sample General Industry and Maritime/Construction- Same Calculation
    - Respirable Silica

$$\frac{10}{[\%\ \text{quartz} + (\%\ \text{cristobalite} \times 2) + (\%\ \text{tridymite} \times 2) + 2]}$$

    - Total Silica

$$\frac{30}{[\%\ \text{quartz} + (\%\ \text{cristobalite} \times 2) + (\%\ \text{tridymite} \times 2) + 2]}$$

  - Multiple TWA samples(A,B)
    - Time Weighted average of the silica %s

Many calculations can be involved!

NEW SILICA STANDARD

- Defined Action Level Air Concentration;
  - 25 µg/m3 (0.025 mg/m3) TWA Respirable Crystalline Silica – any / all species
- Defined Permissible Exposure Limit Air Concentration;
  - 50 µg/m^3 (0.050 mg/m^3) TWA Respirable Crystalline Silica – any / all species
- Action Level / PEL Comparison
  - TWA Air Concentration is compared directly to the defined Action Level and PEL

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WHAT DATA DO WE HAVE?

- Approximately 15,000 samples analyzed since January 1, 2017
- Multiple Combinations of Respirable Crystalline Silica (RCS)
  - How many Alpha Quartz only?
  - How many all three phases?
  - How many with respirable dust?

12,554

Samples requesting all three analytes

2,458

Samples requesting Alpha Quartz only

13,325

Samples requesting inclusion of respirable dust

15,139 samples processed since January 2017

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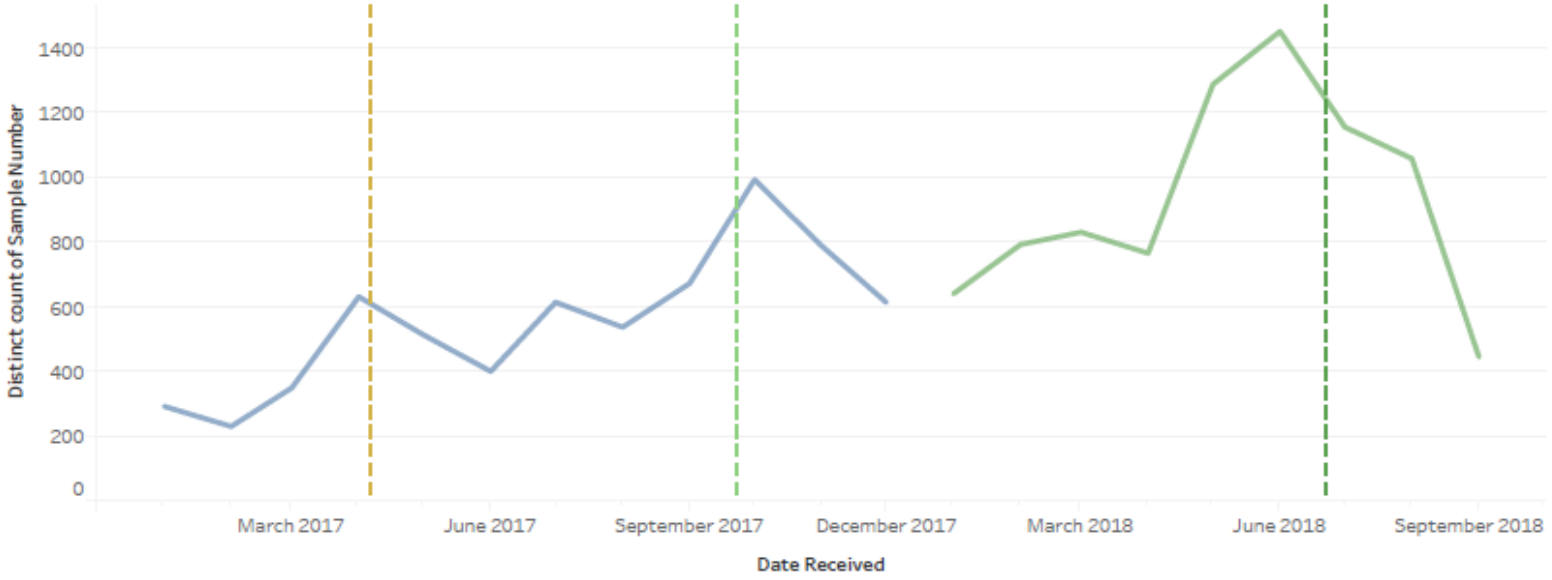
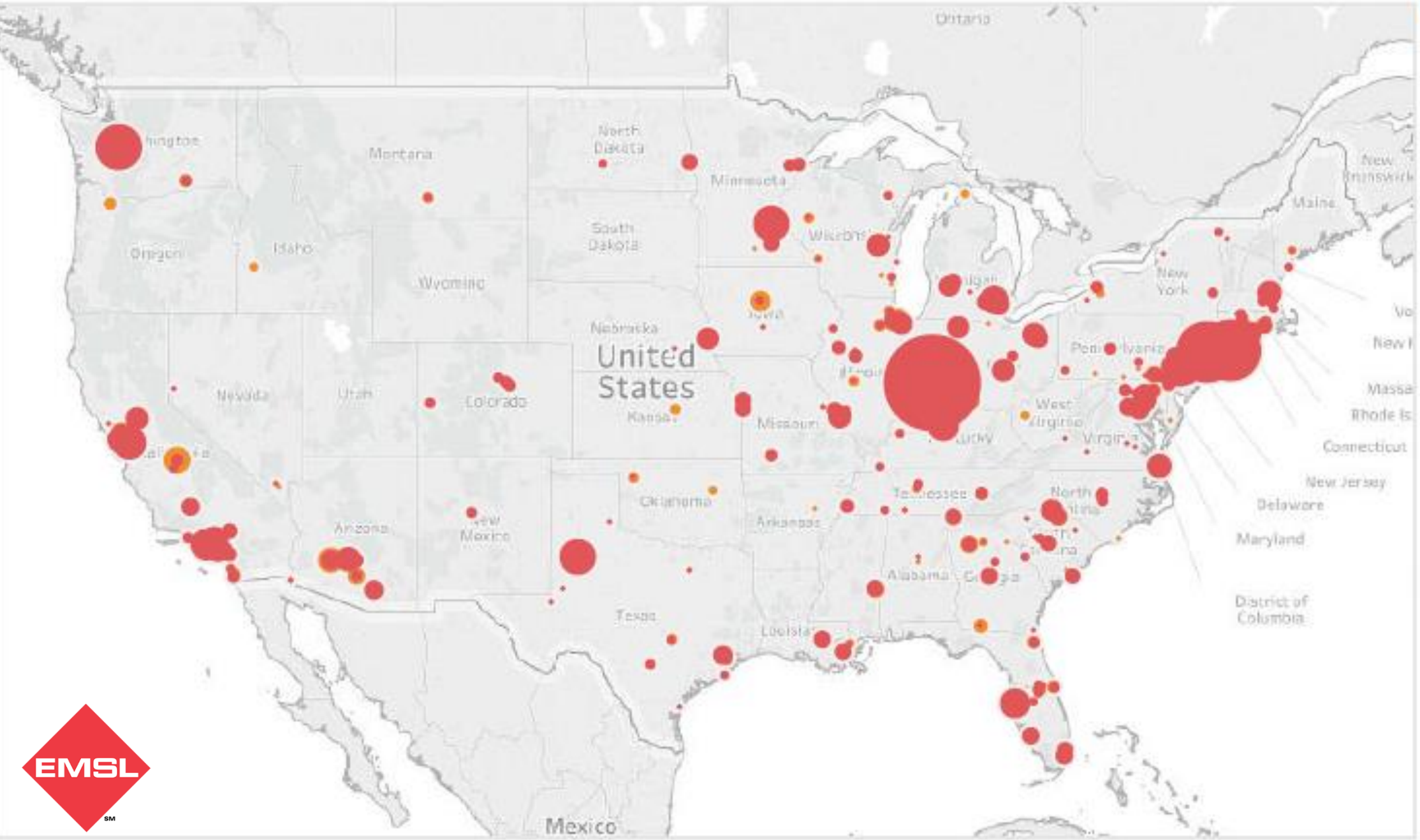
June 23, 2018 - OSHA enforcement in General Industry and Maritime begins



Compliance MAP



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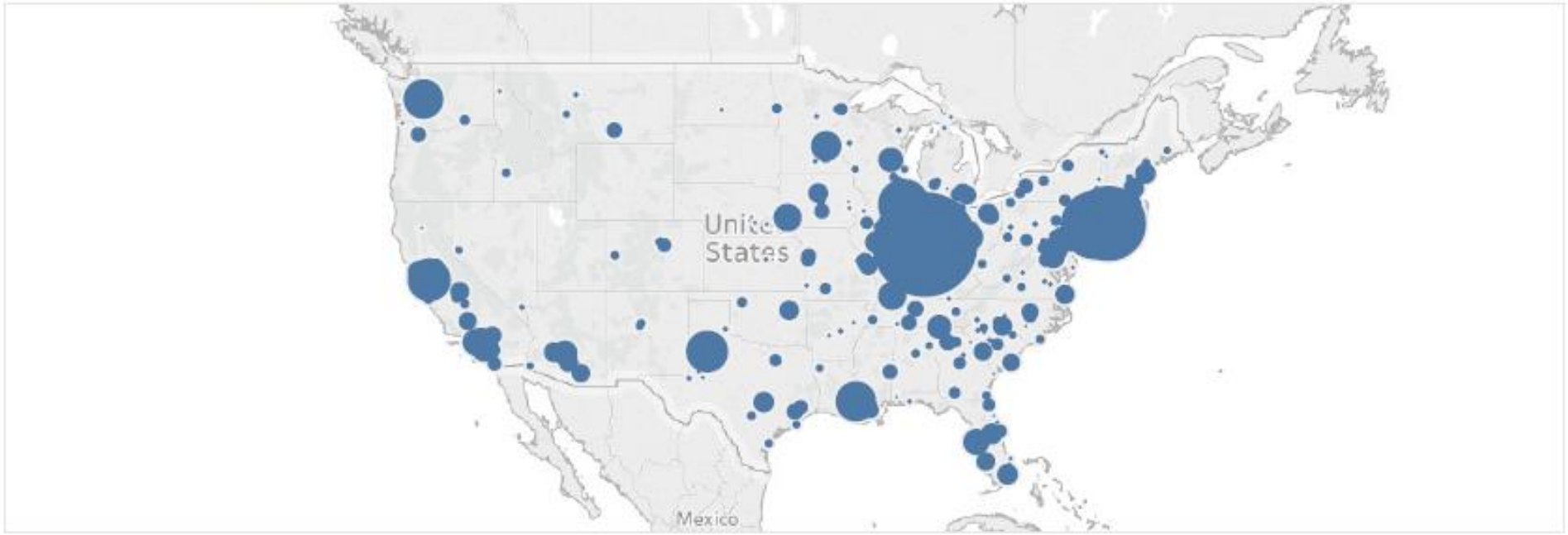
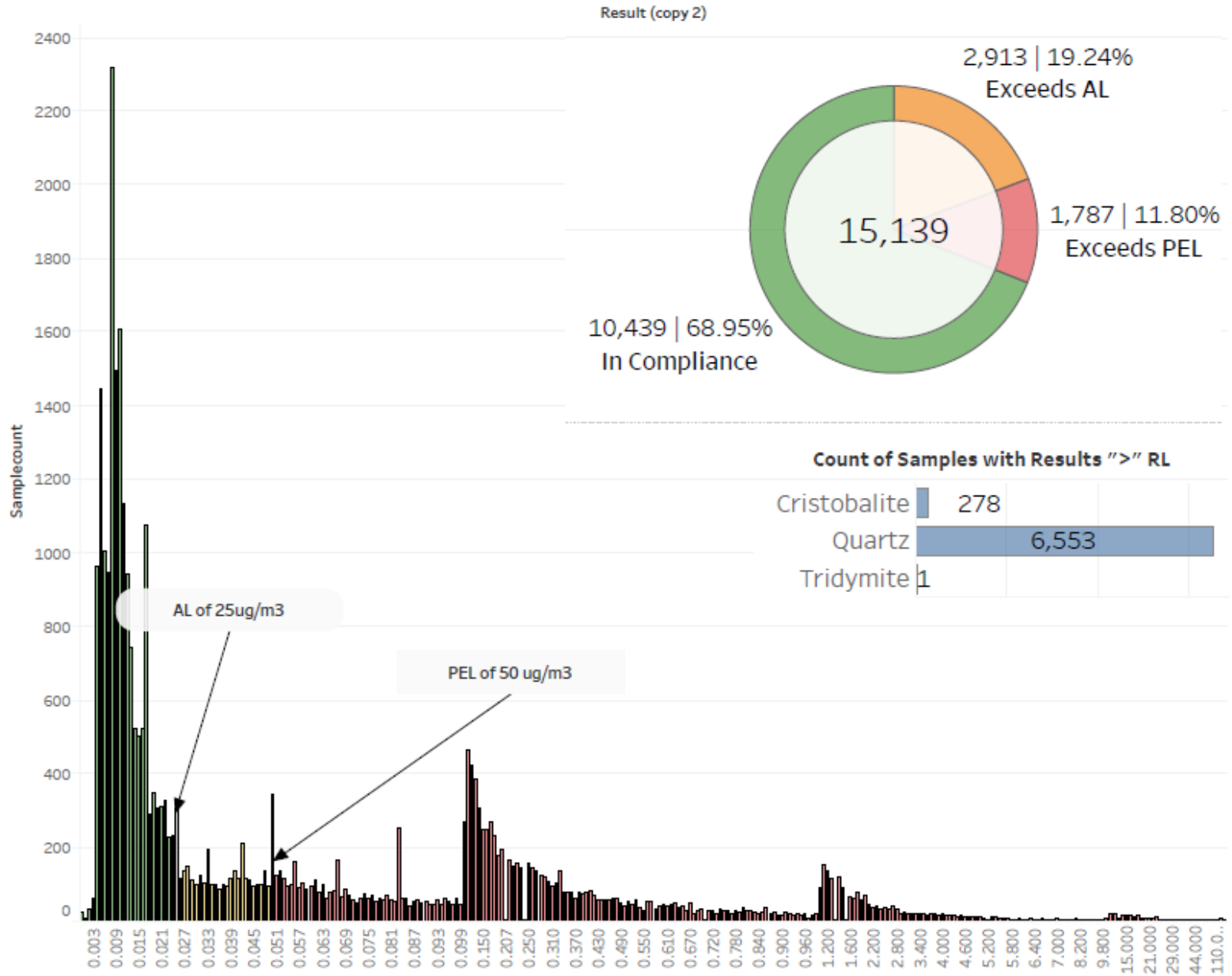
Sample volumes by Zip Code



Samples In-Compliance

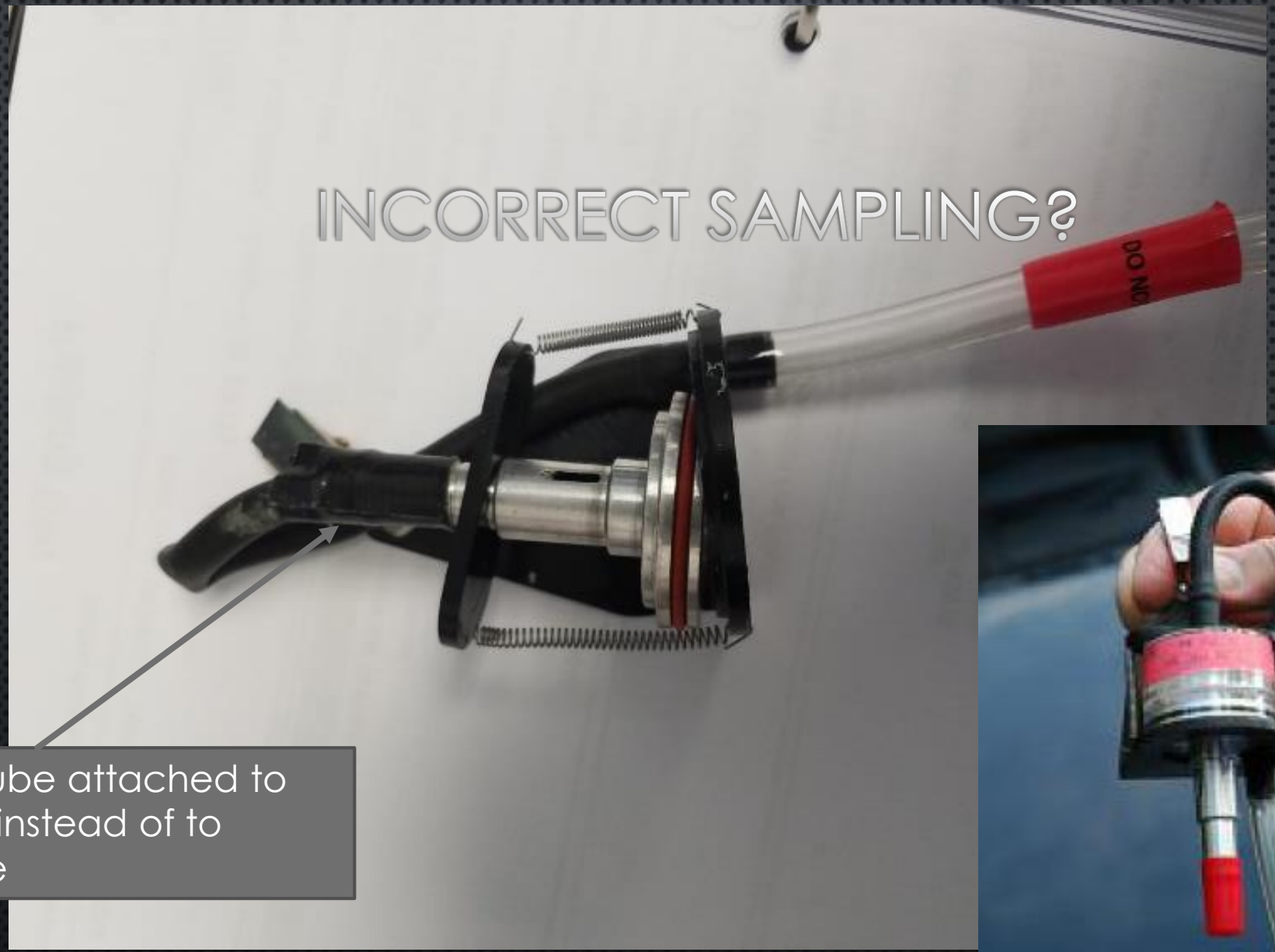
Samples exceeding PEL

Samples exceeding AL


Result (copy 2)
2,913 | 19.24%
Exceeds AL
15,139
1,787 | 11.80%
Exceeds PEL
10,439 | 68.95%
In Compliance
Count of Samples with Results ">" RL
Cristobalite 278
Quartz 6,553
Tridymite 1
Samplecount
AL of 25ug/m3
PEL of 50 ug/m3

INCORRECT SAMPLING?

INCORRECT SAMPLING?



Pump tube attached to grit pot instead of to cassette

INCORRECT SAMPLING?

Sampling for Respirable Dust / Respirable Silica Using Aluminum Cyclone

WATCH THE VIDEO

https://www.youtube.com/watch?v=74eDBqRjzeA

1. Take the 5um PVC 3-piece cassette and using the screwdriver provided, cut the clear plastic band between the inlet section (embossed with the word INLET) at the first grove where the top ring meets the middle ring. Use the cassette opening tool provided to remove the inlet section of the cassette. **DO NOT** damage and/or remove the **red pre-printed label.** This information is needed to perform the analysis. Remove the colored nibs (cassette plugs). Place the inlet section and the cassette nibs in a safe location. They will need to be replaced once the sampling is completed.

2. Turn the cassette upside down and insert the cyclone into the open face of the cassette.

   DO NOT ALLOW THE CYCLONE TO GET INVERTED Make sure the cyclone stays in an upright position during and after sampling.

   Press the cyclone in until it seals AND NO FURTHER. Insert the cassette and cyclone assembly into the holder. Make sure the index mark on the bottom of the cyclone is in the proper position. Insert the Luer taper fitting (black hose connector) into the outlet (outlet section has a grid pattern) and turn the pump on.

3. To check the initial flow rate, take the rotameter with the calibration adapter and slide the adapter over the cyclone and read the flow rate. It should be 2.5 L/min read at the center of the ball.

4. If it needs to be adjusted, you adjust it by holding the pump set button down and simultaneously pressing the up and down arrows. See the "Pump Manual instructions" included in the kit.

5. If you are satisfied with the flow, remove the calibration adapter and place the pump in the area where you are sampling, either as an area sample or as a worker sample typically on the lapel of the a worker (breathing zone).

   DO NOT ALLOW THE CYCLONE TO GET INVERTED Make sure the cyclone stays in an upright position during and after sampling.

6. At the end of the sampling period, take the pump, check the flow rate again. Make sure you write the flow rates on the chain of custody when you check them.

Do we want client to adjust and/or just record "final" flow? Where do they record pre & post cal info?

7. Attach the adapter, check the flow rate and write it down. Take it off and turn the pump off. The Libra is turned off by holding the power button down for 5 secs.

8. Take out the cassette, again, not inverting the cyclone, remove the cassette and install the inlet section (top portion) and colored nibs, complete your chain of custody, pack up your samples and pump kit and ship them back to EMSL.

If you need further assistance, please call EMSL at 1-800-220-3675 and request the Industrial Hygiene division.

Loaner pump calibration chart- include in kit/on-line

Most current COC- include in kit/on-line

Purposely block off bottom of flowmeter-remove bottom port fitting (exhaust)

DAMAGED EQUIPMENT

Sample Collection

- Who should collect this data?
  - Experienced Industrial Hygienists or IHs working under CIHs
  - Trained OSHA Competent Person
  - Inexperienced personnel properly communicating with their lab.

What does proper sampling look like?

- Air Sampling
  - Respirable Crystalline Silica (RCS)
  - Respirable Dust
- Bulk Materials

How to collect an air sample

- What do we need?
  - ✓Preweighed* 5µm 37mm PVC Cassette
  - ✓Cyclone(or similarly effective device)
  - ✓Cyclone Calibrator-Adapter or Calibration-Jar
  - ✓Constant Low Flow Sampling Pump (1-4 LPM)
  - ✓Field Rotameter or Primary Calibrator(optional)

* pre-weighed cassette only needed if analyzing for respirable dusts

AIR SAMPLE COLLECTION

CYCLONE(RESPIRABLE FRACTION)

SKC

2.5 LPM

DORR-OLIVER

1.7 LPM

HIGGINS-DEWELL

2.2 LPM

GK 2.69

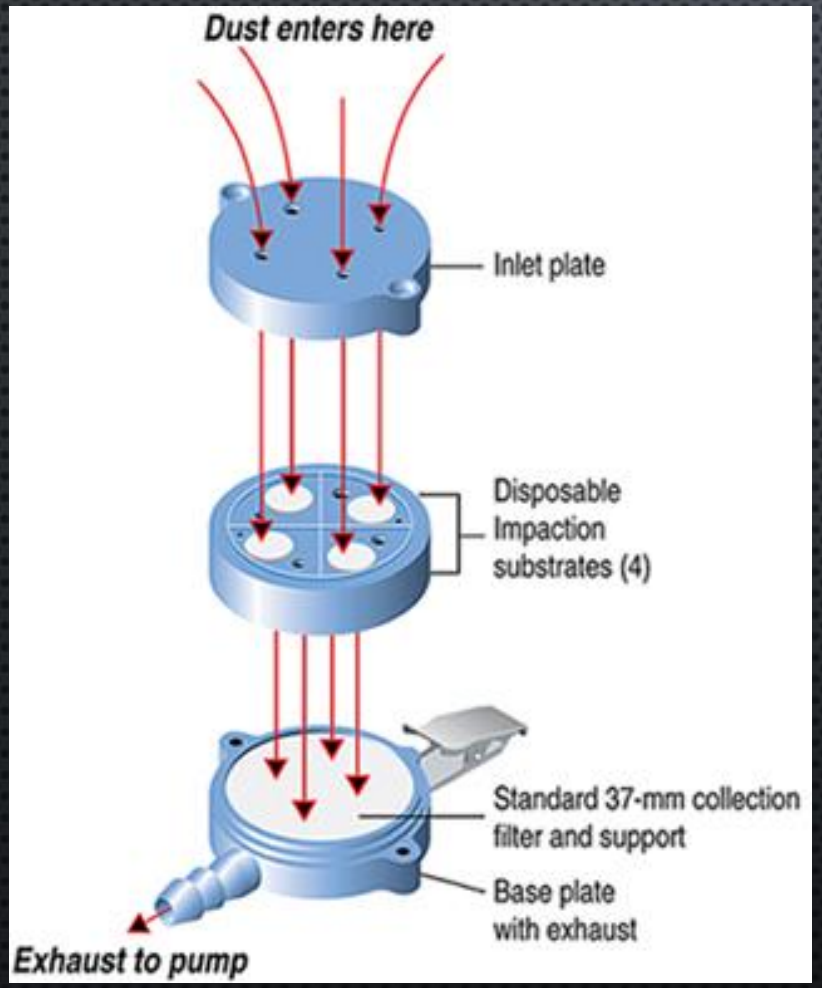
4.2 LPM

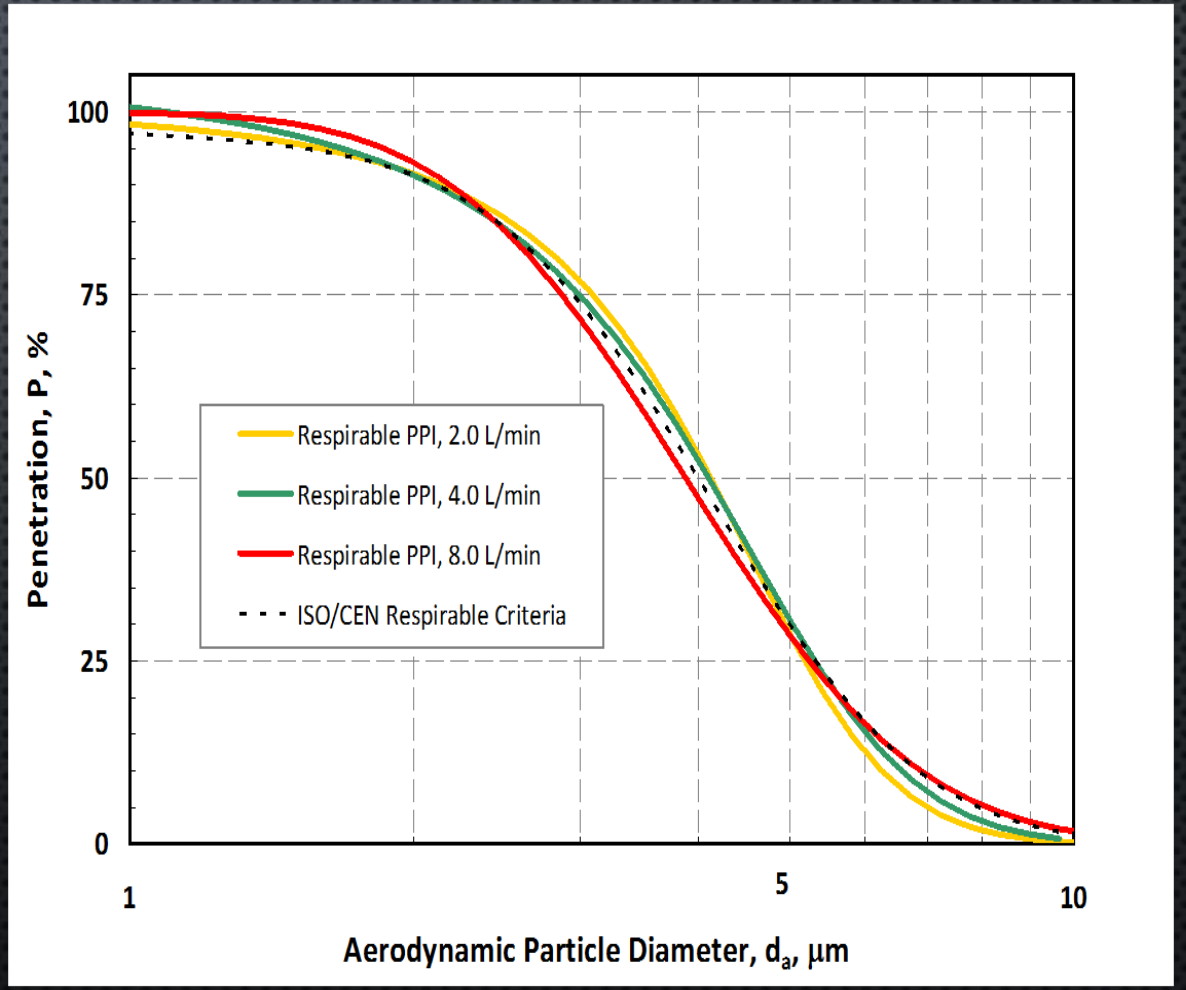
CYCLONE SAMPLING TRAIN.

AIR SAMPLE COLLECTION

Parallel Particle Impactors (PPI)

PARALLEL PARTICLE IMPACTOR (PPI)





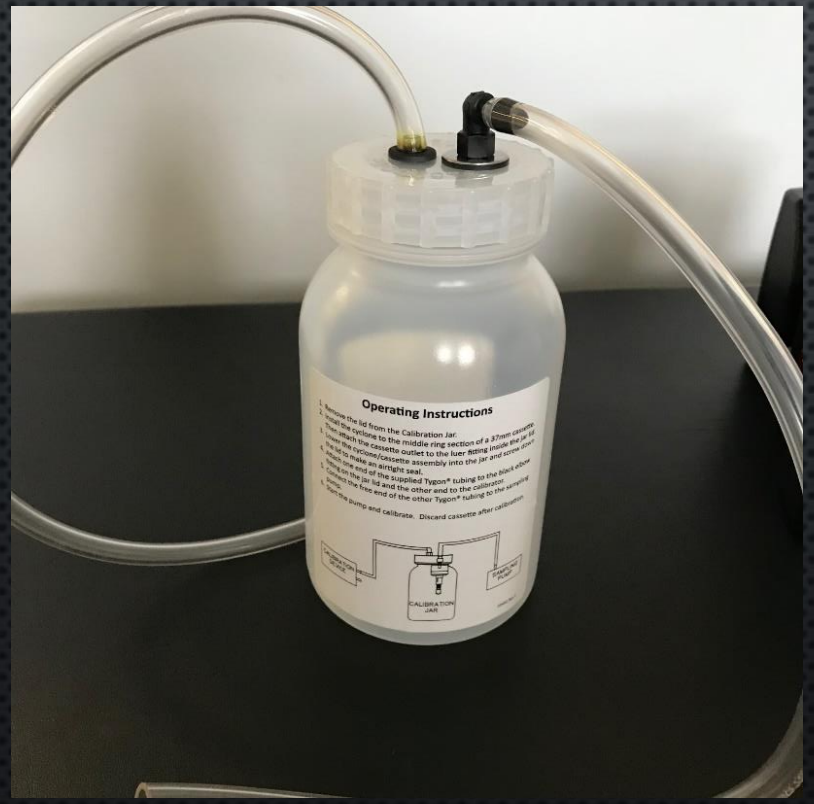
WHAT ARE YOUR OPTIONS?

REUSABLE

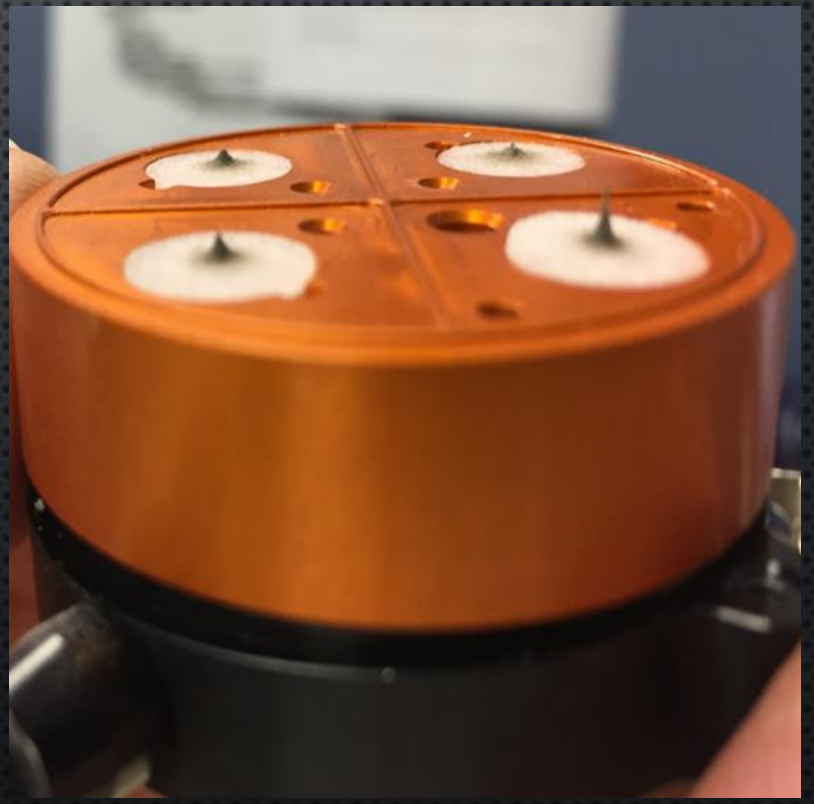
DISPOSABLE

CHALLENGES WITH REUSABLE PPI's?

JAR CALIBRATION



REPLACING STICKY IMPACTORS



DISPOSABLE PPI CALIBRATION

SILICA ANALYSIS METHODS, LOD, AND SAMPLING TIME

- EACH ANALYSIS METHOD HAS A LOD

- **APPENDIX A TO § 1910.1053– METHODS OF SAMPLE ANALYSIS**

- THE SAMPLER TYPE HAS PREDETERMINED FLOW RATES.
- REMEMBER MUST HAVE A LARGE ENOUGH SAMPLE TO PROVIDE A LOD NO HIGHER THAN 25% OF THE PEL OR 12.5 µg/m^3

Approved Methods

Method	Analysis	Published Limit of Detection (LOD)
OSHA ID-142	XRD, Redeposition	9.8µ
NIOSH 7500	XRD, Redeposition	5µ
NIOSH 7602	IR, KBr Pellet	5µ
NIOSH 7603	IR, Redeposition	10µ
MSHA P-2	XRD, Redeposition	20µ
MSHA P-7	IR, Redeposition	20µ

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EXAMPLE

- You decide to use a Dorr-Oliver cyclone (1.7 LPM) to sample for 480 minutes using the NIOSH 7500 Method for analysis (LOD - 5µg)

What happens if the task is only 180 minutes?

$$\frac{5.0\ micrograms}{(1.7\frac{l}{min})(480\ min)(\frac{m3}{1000\ l})} = 6.12\ \mu/m^3$$

$$\frac{5.0\ micrograms}{(1.7\frac{l}{min})(180\ min)(\frac{m3}{1000\ l})} = 16\ \mu/m^3$$

SAMPLE TIME

- NIOSH 7500 states minimum and maximum volumes. Min. 400 L, Max. 1,000 L

- Additionally dust loading cannot exceed 2 mg on the filter

Device	Flow Rate (LPM)	Minimum Time (min.)	Maximum Time (min.)
Dorr-Oliver	1.7	235	588
PPI	2	200	500
PPI	4	100	250
GK 2.69	4.2	95	238
PPI	8	50	125

What are some best practices?

- Use PPI's over cyclones
- Use disposables over reusable
- Use Pre-weighed Filters to capture Respirable Dust
- On site full time
- Bump Check Flow every 30 min.

FOR MORE INFORMATION

- RDEMALO@EMSL.COM
- SROHLF@EMSL.COM
- WWW.EMSL.COM
- HTTPS://WWW.OSHA.GOV/DSG/TOPICS/SILICACRYSTALLINE/
- HTTPS://WWW.OSHA.GOV/SILICA/INDEX.HTML
- HTTPS://WWW.FEDERALREGISTER.GOV/DOCUMENTS/2018/03/25/2018-04800/OCCUPATIONAL-EXPOSURE-TO-RESPIRABLE-CRYSTALLINE-SILICA
- WWW.SKCINC.COM