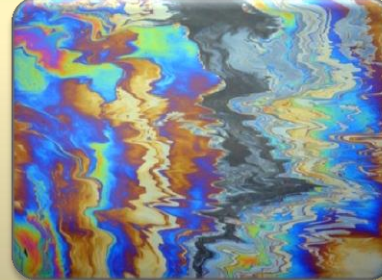


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Ensuring Precision and Accuracy:

Sample handling

SAIOH Annual Conference – 18 August 2011



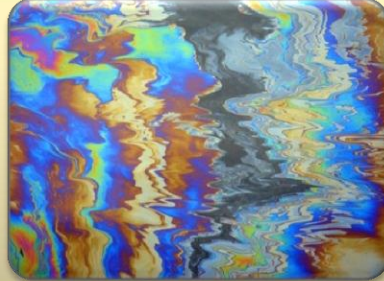
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1. What causes inaccurate sampling results

- Those caused by not meticulously following the prescribed method (i.e. systematic errors)
- Any condition, circumstance or action which causes the sampling NOT to be representative of normal/average (or targeted) exposure conditions (i.e. random errors)

- **Not following the prescribed method:**
 - **Using the wrong sampling equipment (filter/sorbent tube) – *not only the type, but also the size/dimensions***
 - **Calibration to the wrong flow rate**
 - **Sample volumes too small or too large (under/over sampling)**
 - **Incorrect sample handling/storage**
 - **Etc. (i.e. procedural issues)**

- **Unrepresentative Conditions, or actions spoiling the sample:**
 - **Selecting the wrong subject.**
 - **Selecting the wrong day (upset conditions)**
 - **Incorrect sample handling practises, resulting in sample contamination or loss.**
 - **Leakages in sampling train, during calibration, sampling or checking**
 - **Etc. (non-procedural, human factor issues)**



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2. How to avoid or minimise errors

Avoiding Systematic Errors

- Select the appropriate, validated (where possible) method – NIOSH, OSHA, MDHS, etc. (it must at least be recognised);
- Make sure you stay up to date with the latest developments in Occupational Hygiene sampling techniques, methods, equipment and consumables;
- Make sure you have the correct equipment and consumables.
- Never assume;
- Read, No, Study the method and follow to the “T”.

Example 1 (NIOSH # 1022 for TCE)

SYNONYMS: trichloroethene; ethylene trichloride; triclene

SAMPLING

SAMPLER: SOLID SORBENT TUBE
(coconut shell charcoal, 100 mg/50 mg)

FLOW RATE: 0.01 to 0.2 L/min

VOL-MIN: 1 L @ 100 ppm
-MAX: 30 L

SHIPMENT: routine

SAMPLE
STABILITY: not determined

BLANKS: 2 to 10 field blanks per set

Example 2 (NIOSH # 6013 for CS₂)

SYNONYMS: sulfuretted hydrogen; hydrosulfuric acid; hepatic

SAMPLING

SAMPLER:	FILTER + SOLID SORBENT TUBE (Zefluor, 0.5 µm; coconut shell charcoal, 400 mg/200 mg)
FLOW RATE-RANGE:	0.1 to 1.5 L/min
-RECOMMENDED:	0.2 L/min
VOL-MIN:	1.2 L @ 10 ppm
-MAX:	40 L
SHIPMENT:	routine
SAMPLE STABILITY:	at least 30 days @ 25 °C [1]
BLANKS:	2 to 10 field blanks per set

Example 3 (NIOSH # 6001 for Arsine)

SYNONYMS: hydrogen arsenide; arsenic trihydride.

SAMPLING

SAMPLER: SOLID SORBENT TUBE
(coconut shell charcoal, 100 mg/50 mg)

FLOW RATE: 0.01 to 0.2 L/min

VOL-MIN: 0.1 L @ 0.05 ppm
-MAX: 10 L

SHIPMENT: routine

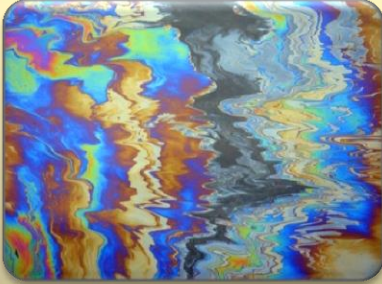
SAMPLE STABILITY: at least 6 days @ 25 °C [1]

BLANKS: 2 to 10 field blanks per set

- **What were the differences?**

- **Similarities:**
 - All utilise Coconut shell Charcoal sorbent tubes
 - That is all
- **Differences:**
 - Sizes of Sorbent tubes are different
 - Flow rates differ
 - Minimum/maximum sample volumes differ
 - Shipment requirements and Sample stability issues differ significantly

Never assume!



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3. Sample Handling – Sorbent tubes

The Basics – read the method

NAMES & SYNONYMS: Polycyclic aromatic hydrocarbons, PAH

SAMPLING

SAMPLER: FILTER + SORBENT TUBE
(37-mm, 2- μ m, PTFE + washed XAD-2, 100 mg/50 mg)

FLOW RATE: 2 L/min

VOL-MIN: 200 L
-MAX: 1000 L

SHIPMENT: transfer filters to culture tubes; wrap sorbent and culture tubes in Al foil; ship @ 0 °C

SAMPLE STABILITY: unknown; protect from heat and UV light

FIELD BLANKS: 3 to 10 field blanks per set
MEDIA BLANKS: 6 to 10 media blanks per set

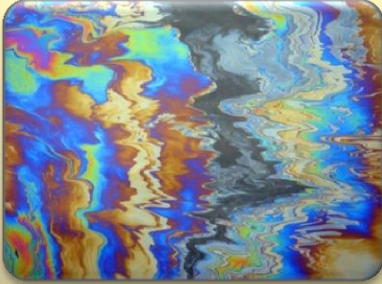
The Basics – read the information supplementary to the method

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Take personal samples at 2 L/min for a total sample size of 200 to 1000 L.
3. Immediately after sampling, transfer the filter carefully with forceps to a culture tube. Hold filter at edge to avoid disturbing the collected sample. Cap the tube and wrap in aluminum foil.
NOTE: This step is necessary to avoid loss of analytes by sublimation.
4. Cap the sorbent tube and wrap in aluminum foil.
5. Ship to laboratory in insulated container with bagged refrigerant.

- **Why sealing/capping the culture tube and sorbent tube?**
 - **Only to prevent sample loss?**
- **What is meant by the word “immediately”?**
- **Why a “bagged refrigerant”?**

- **Rather/Also consider bagging the samples – why?**



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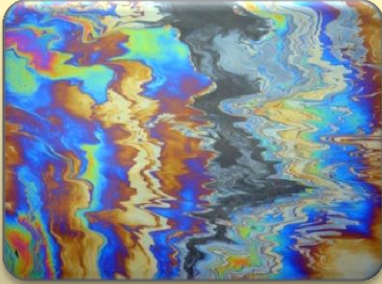
4. Sample Handling – Filter Samples

- **Read the Method**
- **Select the appropriate filter - considering what you want to sample and the analyses that will follow.**
- **Handle with care and keep sealed, except during sampling – use a dedicated filter cassette for sampling and post survey flowrate check.**

- Immediately after sampling remove the pump and sampling train from the subject (you, not the subject), switch off pump, plug the inlet-end, remove cassette, plug the other end and place cassette securely in sample transport container.
 - Note there is a right and wrong way to remove the cassette from the sampling train – the right way only cost R5.00.
 - *Demonstration (normal 3 tier cassette and cyclone)*
- The sample container is placed on the seat (not in the boot) of your vehicle and remember to buckle up!

Any “knocking” of the cassette will result in sample loss (up to 80% - perhaps even more)

- **Unless you deliver your samples to the laboratory yourself, the safest way to courier it to the Laboratory is while it is still in the cassette.**
 - **This implies that the laboratory will also do the gravimetric weighing (some laboratories provides a service of supplying pre-weighed filters assembled in cassettes) – it is costly, but worth it.**
 - **While still in the cassette and packaged in some sort of shock/vibration resistant insulated packaging (do not forget the “this side up” sign) it will be far more resilient than when the filters are placed in petri dishes.**
 - **If it must be couriered in petri dishes, it is advisable to secure the filters to the bottoms of the dish (cello tape the edges, or small ball of ‘Prestic’ on the edge)**



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5. Conclusion

Why Bother?

- You woke up at 05:00
- You spent 2 hours preparing/calibrating your equipment – making 100% sure there are no leakages and that the flow rates are as is prescribed.
- You drove an hour to the site
- You spent 8 hours sampling, observing and taking notes (hopefully)
- Another hour on the road, 2 hours doing post survey checks, etc.
- One or two days writing the report
- Probably charging someone good money for your professional service – if not, your report still has value; the health and wellbeing of the subject.

Because:

All of the above will be a total waste of time and (a worthless exercise) if the samples become spoilt because of careless, or incorrect sample handling and transport practises.

You may just as well not have bothered to calibrate the pumps or checked the flow rates. You may just as well have guessed the contaminant concentrations. You may just as well have held-up the client at gun point for the money, instead of doing the survey – **there is no real difference.**

- **General Discussion and Questions**

Thank You



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