Where will it all go wrong?

6 COMMON PITFALLS

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Author Details

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Taking valid workplace air samples
6 common pitfall areas and how to avoid them

It is now generally recognised and accepted that many substances, gaseous, vapour or particulate are potentially harmful to humans, either through inhalation or skin contact. Inhalation and skin contact should therefore be prevented or limited in order to prevent ill health, whether that is a chronic or an acute effect. Although the primary driver should be to use safer materials or failing that, utilise engineering controls, often the reliance has to be a mixture of the use of personal protective equipment, together with administrative controls. Such a situation is not a modern phenomenon, since as long ago as 54AD, Pliny the Elder, issued sheep bladders as masks to refiners working in mercury mines.

As the years have passed since Pliny, a considerable amount of thought and effort has been devoted to the subject of exposure control. This thought process has evolved into one area attributed to the profession of Occupational Hygiene and follows those principles: - • Recognition • Evaluation • Control.

For exposure to airborne hazards, Occupational Health and Hygiene professionals have long relied on the taking of air samples to assess and reduce exposure. If there were no scientific measurements to quantify a hazard, how would levels be assessed and compared with any degree of accuracy or be correlated against the exposure limits?

Equipment for carrying out air samples has developed over the years and the range of available techniques has improved in accuracy, repeatability and cost. However, a spectrum of choice is not a benefit when it means more opportunities to make the wrong choice.

There are pitfalls involved with taking an air sample, however, most can be easily avoided. Here are six areas in which even the expert could fall down.

PITFALL 1

Lack of training and information

Financing and budgets will dictate that not every company, especially the SME, can employ a hygiene professional. A 'competent' person or team from the existing workforce will often be charged with the responsibilities related to 'safety' in their department and this can include air sampling.

But defining competence is a step in itself which the employer should give careful consideration. Under C.O.S.H.H. employers are required to provide suitable information, instruction and training to employees. The employer should also assess whether everyone actually understands their responsibilities, and ensure the provision of the correct tools. Procedures for the sampling program need to be put into place, as a team project, supporting the competent person. Monitoring should never be 'for the sake of being seen to do', it should be there to prevent harm. This needs to be understood by everyone involved.

Why the right education will always be worth the money.

In 1988 SKC, like others in the sampling industry, faced a dilemma. Owner/managers with corporate cheque books in hand just wanted to hand over their money. The C.O.S.H.H. regulations (Control of Substances Hazardous to Health) had created a panic. Companies wanted to take air samples. Most were not sure how, or really why, they just wanted to know how much it would cost to 'comply to C.O.S.H.H.'. With even basic training costly mistakes can be avoided. Education will improve the understanding of the task, and lead to more informed decisions when spending company money.

Occupational Exposure Limits, (OELs), are provided by the Health and Safety Executive as a guideline to work with. They are intended to provide a safe limit for the majority of workers. Changes to the limit system are in progress, which set out to simplify the systems into Working Exposure Limits. Companies should ensure that they have procedures in place, and people charged with the responsibility, to keep up to date with changes in guidance and legislation.

PITFALL 2

Failure to research and plan

The choice of sampling method will save you time, money or both.

Choices should be made with B.A.T.N.E.E.C. in mind - "best available technology not entailing excessive costs", but while recognising that a variety of media and methods may be needed to sample all areas. Consideration must also be given to the physical state(s) of the contaminant. Some can exist simultaneously in both the vapour and particulate phases.

Virtually every sampling method has recommended protocols covering

- type of media
- preparation
- the flowrate
- minimum and maximum sample volumes
- storage of media
- analysis

PITFALL 3

Failure to correctly use sampling media

It can be easier to sample an area than to sample on an employee. However, all exposure limits relate to personal exposures. Sampling media is positioned in the 'breathing zone' which is a hemisphere of approximately 30cm from the nose or mouth. Even if you believe that measurements from the area sample are a good approximation of worker exposure, your position will be difficult to defend.

Some mistakes are not specific to any particular method; these include assembling the media in a contaminated area, or failure to consider temperature and humidity effects on the media. Problems can also arise in manufacture, transport or storage. Materials need to come from a reliable source, must be clean and be supplied with low backgrounds appropriate to the method, certified if necessary. Considerations should be made for effective storage before and after sampling, and appropriate transportation to the laboratory.

Other pitfalls are specific to the type of media and here are the most common.

Sorbent tube sampling
- using an inappropriate sorbent for the contaminant
- allowing too small a diameter hole when opening the tube ends
- choosing too high or too low a flowrate
- using the tube the wrong way round (with contaminant entering the back up sorbent bed first)
- using tubes horizontally instead of vertically which can allow channelling through the air gap

Filter sampling
- incorrect choice or assembly of sampling head for the filter or application
- inappropriate choice of filter for the contaminant
- incorrect flowrate
- damage or contamination to filter during handling
- failure to preweigh the filter when using gravimetric analysis

Passive Sampling
- inappropriate sampler choice for the contaminant
- failure to use a validated sampler
- use in still air conditions or at the other extreme - very windy ones

Sample bags
- failure to purge and clean efficiently between uses note: not all bags are reusable.
- ineffective storage or transportation leads to loss of sample
- overfilling and bursting due to not regulating the air intake

Most media pitfalls are avoidable by consulting and adhering to the usage instructions for recommended storage, flowrate and analysis.

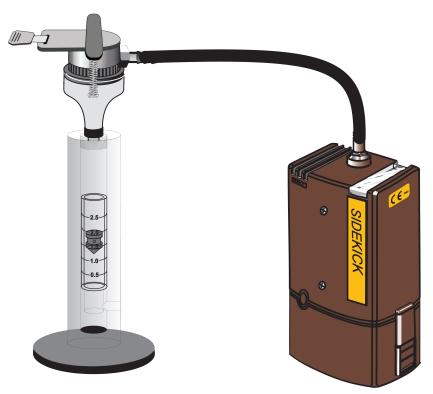
PITFALL 4

Failure to calibrate effectively

Calibration may be incorrect, inaccurate or maybe no calibration is performed. Some pumps have an inbuilt flow meter. This is allowable as a guideline only, but not for calibrating the sampling train. In order to be correct, calibration should be performed, and the flow rate set, at the point where air enters the sampling media. The majority of mistakes come from calibrating without the intended media inline.

When purchasing a calibrator think about the flow rates you will be using, and the accuracy you are prepared to accept. For air sampling a figure of ±5% accuracy is the minimum recommended by most methods. Rotameters can be a cheap device, but are traditionally at their most accurate at the top of their scale only, (full scale deflection). At the bottom end accuracy can fall to less than ±20% on some models - ask suppliers for details and check specifications carefully.

Rotameters are available in two types, with a float or ball unit. The reading must be taken at eye level and interpreted by the operator. Electronic calibration takes away the guesswork - avoiding operator error, but will be more expensive than a simple float rotameter. The speed and ease of use combined with a higher accuracy (generally +1%) could make it a smart investment.



PITFALL 5

Failure to record adequate information

Valuable company resources -in time and money are spent taking samples.
Omitting to collate all required information before, during and after the sample could render it worthless.
Typically the following information should be gathered :

- date and time of sampling activity
- run time of sample
- flow rate of sample
- worker sampling was carried out on
- area and process worker is involved in
- sample data (exposure results)
- current exposure limits (to compare to results)

Observing the process and worker activity will give clues as to why some worker exposures are higher than others, and help in implementing better work practices, leading to lowered exposures.Data should be presented in an organised and readable format. If time and effort has been taken to do a professional job generating the information, allow enough time to present it effectively.

Summary - if it can go wrong why are we still monitoring?

Air sampling is not just about getting a job done. It is about protecting worker health now and for the future. Researching, planning and sampling for a variety of contaminants can be an interesting and rewarding process. Often the activity of sampling can help reduce exposure levels - workers can be trained to use best practice. By displaying more care and attention at work there are often benefits to the employer in the efficiency of the business. Any improvements in operator or plant efficiency can lead to greater operating profits. (There can be gain from the perceived pain!)

By following Health & Safety Executive guidelines, observing and staying under exposure limits as far as it reasonably practicable, and by verifying this with the use of measurements, the potential for harm to employees can be limited.

Surely this is reward enough.

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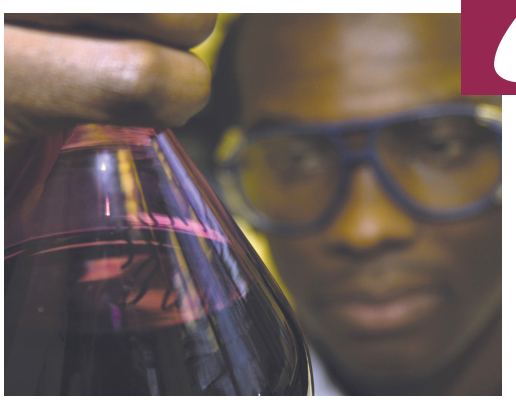
PITFALL 6



Failure to analyse quickly or effectively

The analysis technique is appropriate to the chemical and the media used. Gathering this information, talking with your laboratory, and arranging the analysis is part of the planning process.

Work with the laboratory and they should provide you with an effective service. Laboratories regularly encounter pitfalls with samples:
- incorrectly labelled
- the wrong analysis is requested for the media and contaminant
- the wrong media has been used
- information about flow rate and volume is not supplied to the laboratory
- no blanks are supplied

A good laboratory will be happy to be consulted in the research stage. If they are unable to give advice and discuss your choice of sampling method, consider whether they are the right partner for you.

Storage and transport issues should not be taken lightly. In general, tubes should be stored no longer than 2 weeks (preferably less) at ambient or ideally refrigerated temperatures. Some methods require storage and shipment under very cold conditions, or rapid analysis after sampling. Always check the method in advance for these details and be prepared.