Workplace Airborne Hazards and Air Sampling

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Size of the Problem?

**Recreation Ground, Bath**

**Home Park, Plymouth Argyle**

**Bristol Balloon Festival**

1 mg/m³

one teaspoon of flour spread over a rugby/football field, to a height of one metre

1 ppm

contents of a party balloon in the volume of 50 three bedroom houses
Size of the Problem?

Safety

Health

142

12,000 - 13,000

Pareto’s Principle - 80:20 Rule does not apply

Deaths due to airborne exposure 99:1
Health

Cancers
- Lung Cancer
- Silicosis
- Mesothelioma
- Leukaemia
- etc

Asbestos
- Respirable
- Crystalline Silica
- Chromic Acid Mist
- Nickel
- Cadmium

Benzene
- Butadiene
- Wood Dust
- Rubber Dust/Fume

Isocyanates
- Styrene
- Dust
- Wood, Flour, Cotton, etc

Diseases
- COPD
- Occupational Asthma
- Chronic Bronchitis
- Emphysema
- Asbestosis
- Rhinitis
- etc

Formaldehyde
- Welding
- Fume
- Particulates

Wood Dust
- Rubber Dust/Fume
Getting the Balance right
Getting the Balance right

Safety

Health
Airborne Exposure - Focus?

PURPOSE OF CONTROLS: MINIMISE PERSONAL EXPOSURE

IS EXPOSURE ACTUALLY MEASURED?
Costs?

CONTROLS
LEV, Suppression, RPE, etc

AIR SAMPLING
Equipment, Analysis (Lab)

What Does it Cost **NOT** to do Air Sampling?
Reasons for Workplace Air Sampling

• Health Protection

• Compliance with Government Legislation
  – COSHH: Control of Substances Hazardous to Health
  – EH40: HSE Workplace Exposure Limits
  – CLAW: Control of Lead at Work Regulations
  – CAR: Control of Asbestos Regulations

• Compensation Claims

• Effective Control Measures
Exposure Limits in the Workplace

- **EH40:2005**
  - WEL’s (Workplace Exposure Limits)
  - 8 Hour (Time Weighted Average)
  - 15 Min (Short Term Exposure Limit) Vapours

- **OTHER EXPOSURE LIMITS**
  - e.g. USA
    - OSHA - PEL’s (Permissible Exposure Limits)
    - NIOSH - REL’s (Recommended Exposure Limits)
    - ACGIH - TLV’s (Threshold Limit Values)
What is Air Sampling?

• Air is passed through a filter, tube or other collecting media
• Hazard Presence/Level detected by
  
  – Direct Reading
    
    *(Dust)*

  or

  – Colour Change of Media
    
    *(Vapours)*

  or

  – Laboratory Analysis
    
    *(Dust, Silica, Metals, Vapours)*
Passive Sampling
- Diffusion
- Semi-quantitative *(Indicator)*
- Immediate results *(Gastec, Dräger)*

Grab Sampling
- Small sample volume
- Semi-quantitative *(Indicator)*
- *Not* Time-Based Exposure

Active Sampling
- Compensating Pump
- Quantitative - *Known Flow Rate & Time*
- Much Larger Sample Volume
Sampling Train

- Pump
- Connecting tube
- Sampler

Active Sampling

- Setup Sampling Train
- Calibrate Flow Rate - *Before* Sampling
- Fit Sample Train to Operator
- Check Flow Rate - *After* Sampling
- *Send Sample to Laboratory*
- Review Results
  - *Actual Exposure vs 8 hr WEL 15 min STEL*
Personal vs Static Sampling

Workplace Exposure Limits (WELS) based on PERSONAL SAMPLES

30 cm hemispherical breathing zone around the nose and mouth

Sampler (Sampling Head)

Sampling Pump

MUST be taken in the BREATHING ZONE
Particulates

- General Dust
- Wood Dust - Mills, Furniture, Workshops, Paper
- Fumes - Welding, Solder, Rubber, etc
- Metals - Electroplating, Grinding, Cutting, etc
- Fibres - Asbestos, Mineral, Ceramic, Silica
- Flour/Grain Dust - Mills, Bakeries
- Rubber Process Dust
- Diesel Particulates
- Mining – Coal, etc
- Cotton, Wool Dust
Inhalable Dust

- Size Distribution BS EN 481:1993
- Up to 100 micron AED
- Affects ALL the respiratory system
- Partially visible

Workplace Exposure Limits

- Dust
  - 10 mg/m³  8 Hours
- Hard Wood & Soft Wood Dust
  - 5 mg/m³  8 Hours
Respirable Dust

- Size Distribution BS EN 481:1993
- Up to 12 micron AED
- Penetrates Deep into the Lungs
- Invisible

Workplace Exposure Limits
- Dust
  4 mg/m$^3$  8 Hours
- Respirable Crystalline Silica
  0.1 mg/m$^3$  8 Hours
Air Sampling - Particulates
Sampling Heads (containing a Filter)

- IOM Inhalable Dust Metals
- Cyclone Respirable Dust Silica
- Cowled Fibres Asbestos
- Mini Sampler Welding Fume Components (Metals)

- Direct Reading Dust Monitor
- Cleaning Processes TIMES
Vapours

- Organic Chemicals – *solvents / VOCs, etc*
  - Benzene, Toluene, Formaldehyde, Methanol, etc

- Inorganic Chemicals - *mineral acids*
  - Hydrochloric Acid, Nitric Acid, Sulphuric Acid, etc

- Gases
  - Nitrous Oxide, Chlorine, Chloroform, etc

- Isocyanates
Vapours - Exposure Limits (WELs)

- Parts per Million (ppm)
- Wide Range
  - Vapours
  - Limits

- Examples
  - Formaldehyde: 8 Hour TWA 2 ppm, 15 Minute STEL 2 ppm
  - Xylene: 8 Hour TWA 50 ppm, 15 Minute STEL 100 ppm
  - Dichloromethane: 8 Hour TWA 100 ppm, 15 Minute STEL 300 ppm
  - Propan-2-ol (IPA): 8 Hour TWA 400 ppm, 15 Minute STEL 500 ppm
Passive/Grab Sampling - Vapours

Passive Sampling Badges

Colour Change Tubes
Active Sampling - Vapours

Sorbent Tube with Holder & Cover

Cassette & Holder
(Containing treated filter)
HSE Methods

MSDS - Method for the Determination of Hazardous Substances

Dust

- MDHS 14/4 - Dust: Respirable, Thoracic & Inhalable
- MDHS 101/2 - Respirable Crystalline Silica

Vapours

- Generic (VOCs)
  - MDHS 88 - Passive Sampling
  - MDHS 96 - Active Sampling
Workplace Air Sampling - Options

- Consultant
- DIY
- Both

DIY Benefits
- Cost Savings
- Flexibility
- Involvement / Ownership
- Additional Skills / Experience
Excellence

The quality of being outstanding or extremely good.

Air Sampling

Major Step towards Excellence in H&S
Air Sampling - Exposure Measurement

Don’t *just* rely on Controls

Take the Guesswork Out

Defuse the Exposure Time bombs

Redress the Balance

Safety  Health
IOSH Conference

Striving for Excellence
In Health & Safety