Reducing Occupational Disease Through Effective Exposure Control

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Tenets of Occupational Hygiene

- Recognition
- Evaluation
- Control

Whilst recognition and evaluation are important, it is only when the right controls are in place, used and effective that health is protected

Statistics

Deaths from Occupational Respiratory Disease in UK:

12,000 per year

Deaths from ‘Accidents’ at Work in UK:

133 per year

Source: BOHS factsheet

Control

'……..the major determinant of risk for the development of occupational asthma is the level of exposure … …reducing exposure reduces the number of workers who develop disease'.

Ref : ' Evidence based guidelines for the prevention, identification, and management of occupational asthma P J Nicholson et al Occupational and Environmental Medicine 2005;62:290-299

Effective control is key to reducing the toll of occupational death and disease

Nickel Platemaking – 1

Poor control

Excessive urine levels

Significant airborne exposure: Ave nickel levels 57 µg/m3

Recommendations included:

Control at source

- Minimise generation of mist
  - Change agitation method
  - Better temperature control
- Improve seals / covers on tanks
- Deploy LEV at tanks

Improved room ventilation to supplement the above

PPE

Nickel Platemaking – 1

Action

2007 – 2008

- Better temperature control
- Improved seals / covers on tanks
- Improvements to room ventilation
- PPE / Personal Hygiene
- Training
- No LEV as recommended.

2008 – 2009

- Enclosure + LEV

Ave Nickel Levels (µg/m³) (WEL = 100)					
Personal			Statics		
2007	2008	2009	2007	2008	2009
56	29	<1	73	46	<1

Nickel Platemaking 2

Excellent mist control !

- Nickel levels have been 1 µg/m3 or less constantly over last 5 years (OEL = 100)

- Why?

- Well designed LEV
- Competent factory engineer

Flour Dust

[loading a mixer]

Inhalable Dust Levels (mg/m^3)		
Before	Partial fix	Full fix
11.9 – 53.1	3.2 – 16.1	2.0 – 3.7
Ave 26.8	Ave 7.2	Ave 2.9

Flour Dust

		Inhalable Dust Exposure
Original	Poor Control	6.2
New LEV	Poor Design	3.1

Flour Dust

- LEV applied to mixer hopper
- Insufficient suction
- Does not into account of bag disposal

- Inhalable dust levels:

  3.7 – 48 mg/m^3

Rubber Fume

HSE improvement notice.

Some fume levels above OEL

Fumes from

- Press
- Transfer of parts from press to fettling table (LEV applied but poor)
- Post fettling

Advised that best solution would be LEV plus change in work layout so that all major sources of fume exposure were controlled.

Rubber Fume

Outcome: ….company decide to purchase fume cupboards !

- Modest control at fettling
- No control at other sources
- Cut slot at sides of FC …fume escapes

Modest improvement only

Still significant exposure

Cost: 2 x cost of proper LEV

£45k cf £22K)

Why ??

Enzymes (food industry)

High dust levels

5 cases of asthma

- Clearly a dust problem
- Engineering director: *'we have LEV – what more can we do'*

Artificial Eye Manufacture (methyl methacrylate)

- Moderately high MM levels (~ 10 – 125 ppm)
- Proposed solutions by ‘ventilation engineers’
  - Not effective
  - Impossible to use
- Final AJW/FSG solution: Reduction in levels to <1 – 2 ppm

Key Factors

ART:

- Technology
- Procedures
- Worker Behaviour

BOHS conference (2014):

- Organisational
- Technical
- Financial
- People

Ideal

- Problem ?

- Consult Directory of Solutions

- Choose Solution

- Apply

Reality ??

Control Strategy

- Understanding the problem
- Identifying key aspects
- Deciding level of control
- Consider control options
- Selection of most appropriate option
- Commissioning of control
- Management

Guidance

- **BOHS / ACGIH …..**
- **Published literature**
- **HSE**
  - CoSHH Essentials
  - HSG 258
  - CE control sheets
- **Occupational Hygienists**
- **Industry Guidance**
- **Data Bases** (ECEL, CEFIC)

Control Efficiency

- Efficiency ? Effectiveness? Efficacy ?
- Misleading terminology?
- Bottom line is that effective means
  - protecting health
  - complying with the law

Defining Effectiveness:

Reduction factor: $\frac{\text{Exposure before control}}{\text{Exposure after control}}$

- **RMM effectiveness**: % reduction in exposure concentration…produced by application of the risk management measure (*ECHA*)
  - **RMM efficacy value** ***(****ECEL database****)***
  - **Modifying Factor (MF) score** **(***ART)*
    - **Exposure reduction** *(HSE)*

Scope for confusion ?

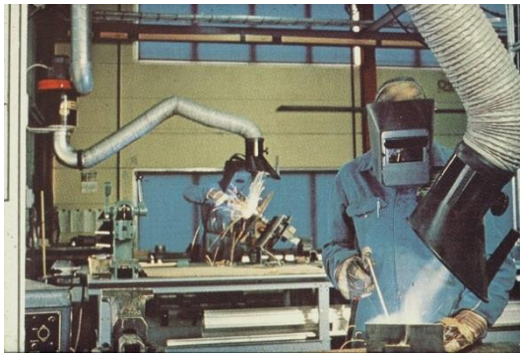
Efficiency of a Movable Capture Hood

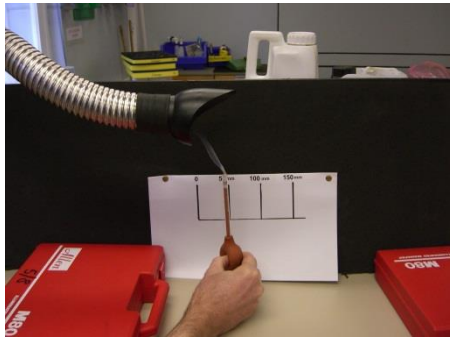
20 % ?

50 % ?

90 % ?

95 % ?

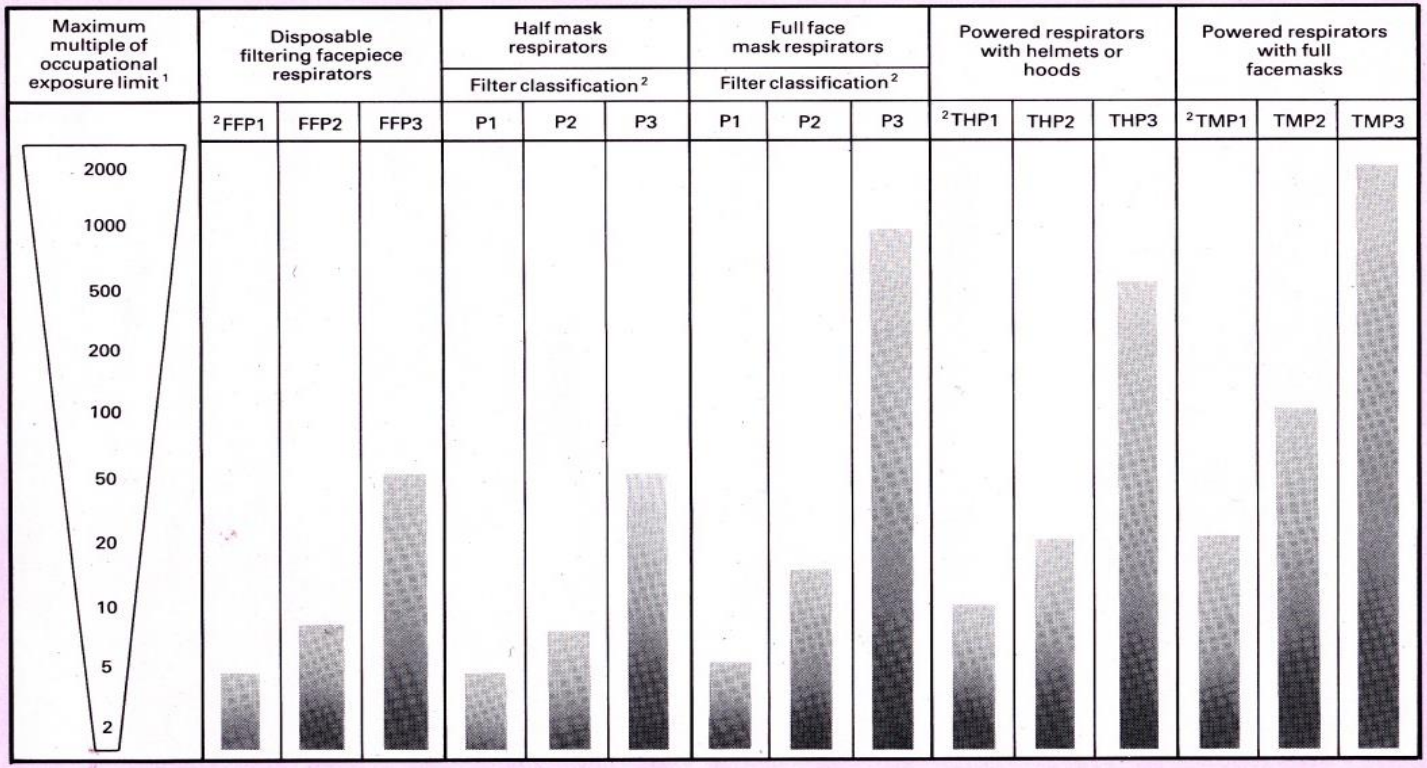




Analogies with PPE?

- RPE
  - NPFs
  - APFs
- Noise
  - APF
  - Fiddle factor

Development of NPFs in respiratory protection



Notes: [1] *See paragraphs 14 and 23-32*
[2] *Classifications in European (CEN) standards*

Figure 4 Selection chart: Respirators for dusts and other particles

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- Micro control
  - individual control measures

- Macro control
  - An holistic approach
  - e.g. BOHS ‘Breathe Freely’ Campaign to protect health of construction workers

Reducing Occupational Disease Through Effective Exposure Control

- A long way to go
- Many influencing factors
- Need for understanding of such factors and how they interrelate
- Lack of agreement of effectiveness of individual control measures
- Only from better knowledge of the application of effective controls will the toll on worker health and deaths decrease

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Thank You for Listening !!

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