

# Local Exhaust Ventilation (LEV)

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# Size of the problem in terms of business in Great Britain (GB)



Research shows that:

- Around 100,000 businesses use LEV to control respiratory risks, with up to 2.6 million workers
- Only 40,000 businesses have their LEV systems tested – the rest don't
- That is up to 60 % that **DON'T** test the LEV with 1.6 million workers potentially at risk.



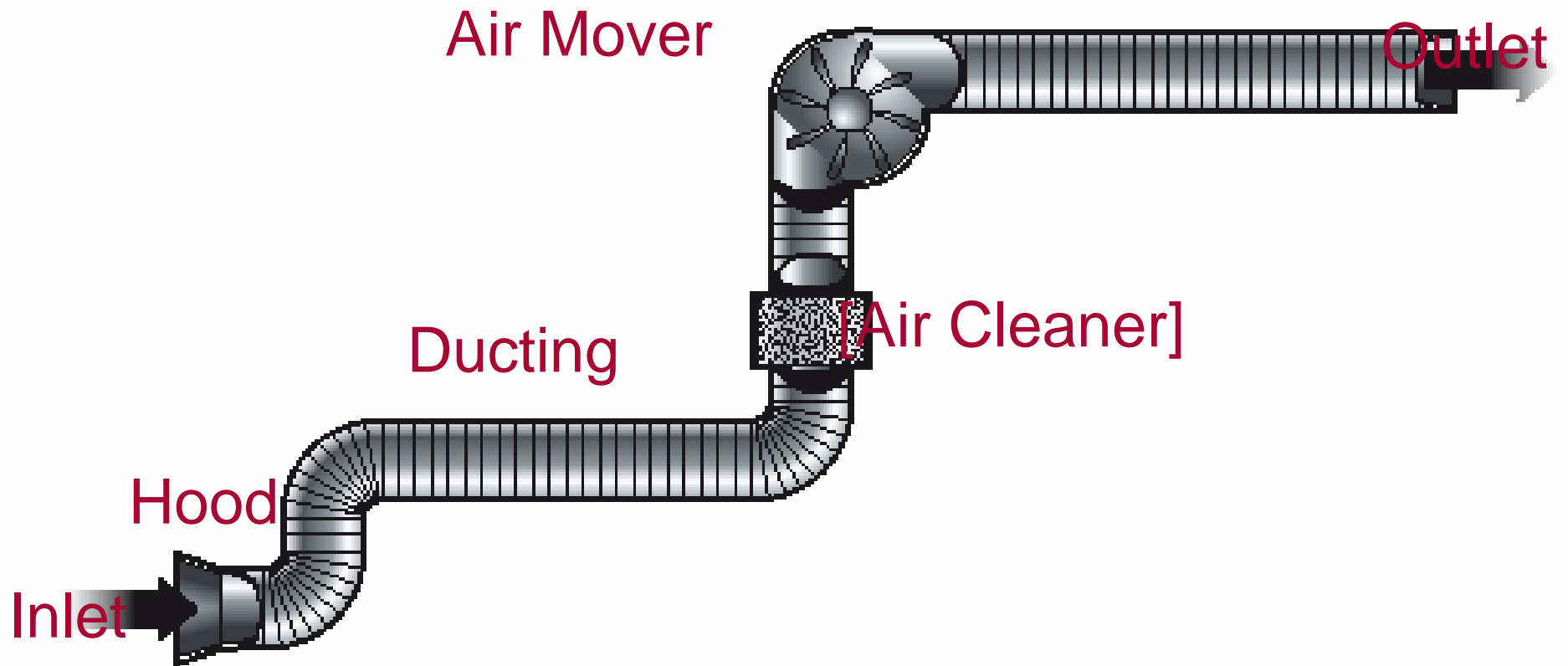
**Source:** "Disease Reduction Programme (DRP) cross-cutting Engineering Controls Project - Local Exhaust Ventilation (LEV) demography in the UK" James Wheeler and Andrew Darnton. Based on figure from the 2004 Annual Business Inquiry (ABI), carried out by the Office for National Statistics (ONS), and the Health and Safety Executive's (HSE) statistical survey of UK workplaces, known as the 'Fit3 Workplace Employers Survey'.

## Revised Guidance:

*“To bring about a significant, measurable improvement in the coverage and effectiveness of engineering exposure control, particularly LEV, in the UK”*



# Typical components of an LEV system



# The control problem in a nutshell



The main problems are:

- Employers often don't appreciate the extent of exposure risk from their processes
- Employers and employees, are often over-optimistic about LEV capabilities
- LEV buying – There has been no guidance and employers are often mislead and miss-sold



# The control problem in a nutshell, continued



- LEV design – Often the LEV hood is not matched to the process and source(s) causing exposure
- LEV commissioning – this is rarely done thoroughly, often done mechanically and control effectiveness, matched to need, is usually missed out

# The control problem in a nutshell, continued



- LEV checking and maintenance – suppliers provide little guidance and employers don't do it frequently or systematically enough
- LEV *thorough examination and test* – is often not done and when it is it is often incomplete and uncritical (it's not "*thorough*")

# Airborne contaminant control

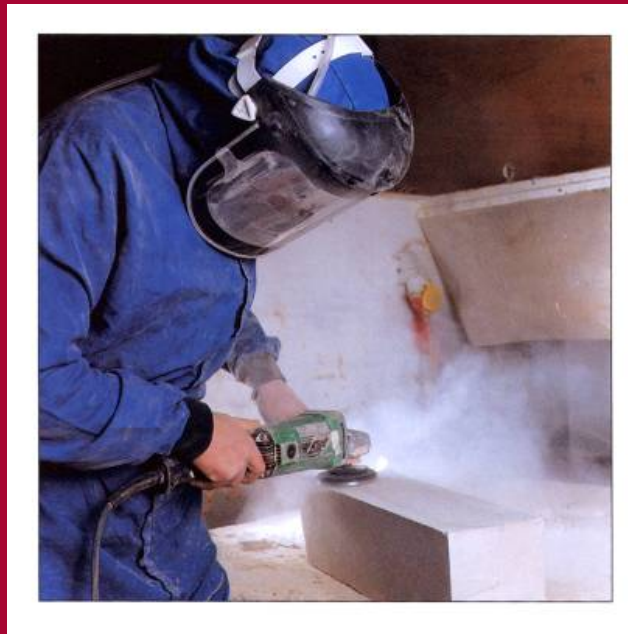
Airborne contaminant control is all about understanding and controlling the movement of clouds of contaminant which move suspended (particles) or mixed (vapours/gases) in air



# Three basic types of LEV hood



**(Capture)**

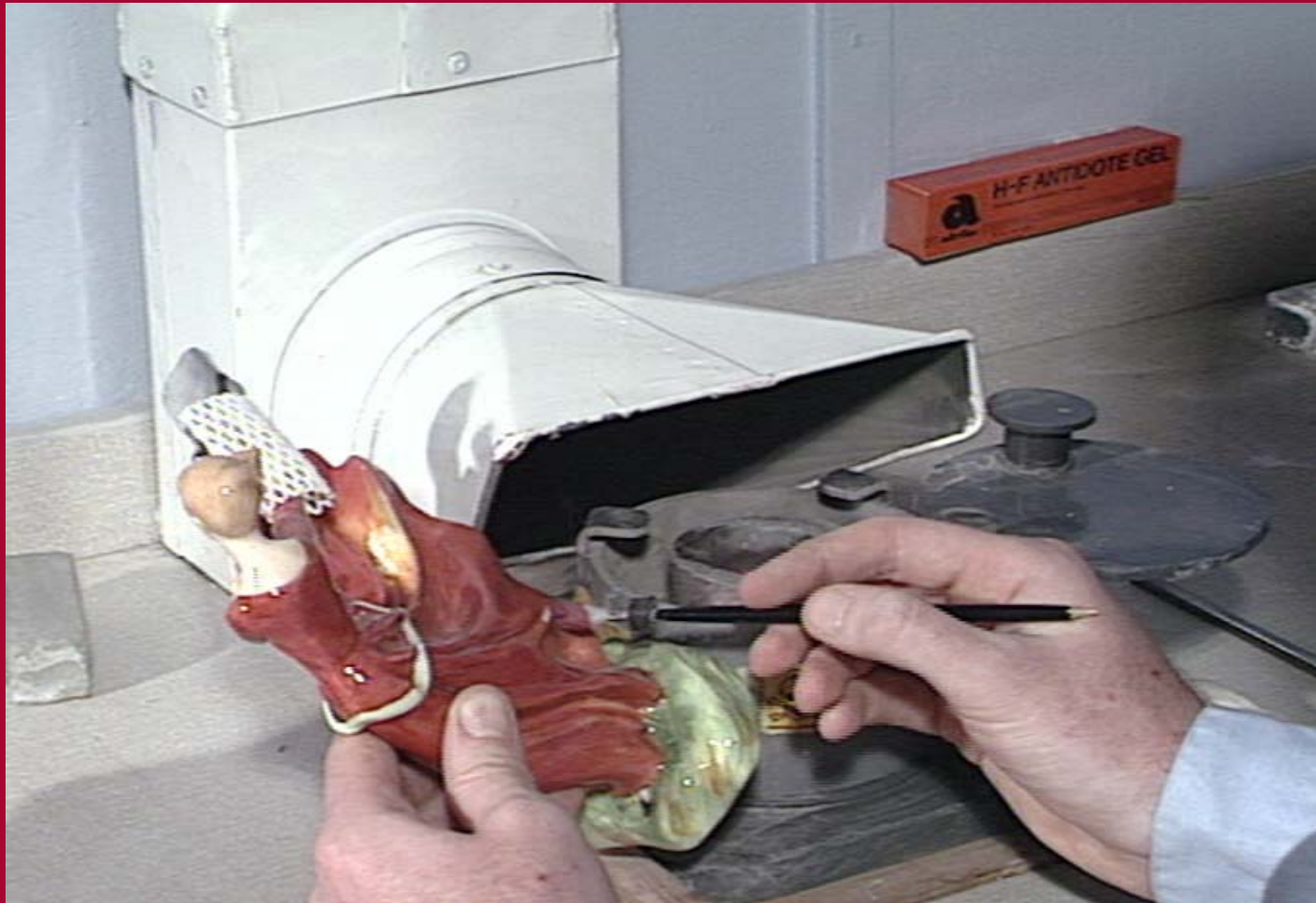


**(Receive, contain & empty)**

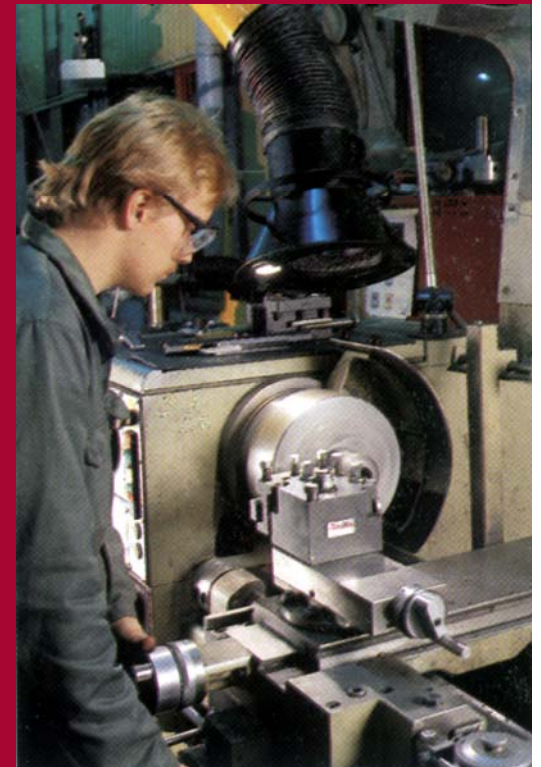


**(Enclosure  
Contain and separate)**

# Fixed capture hood



# Movable capture hoods



Small capture hoods often  
'built-in' (Low Volume High  
Velocity (LVHV))

Solder fume



Welding fume

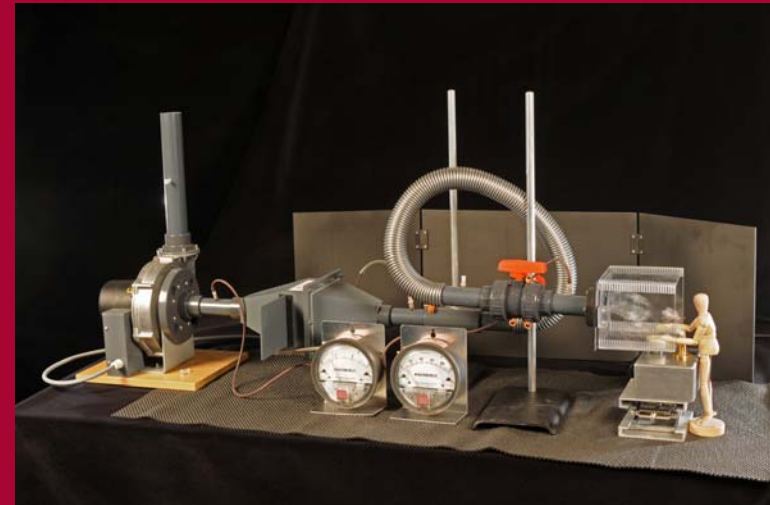


Dust



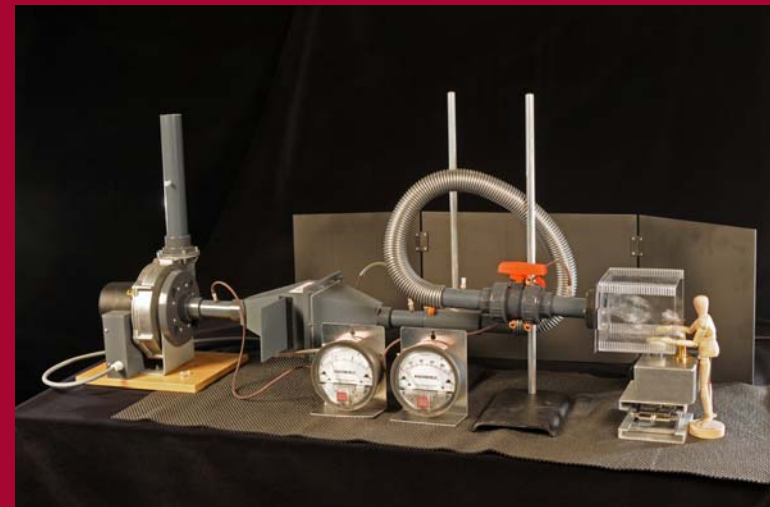
# Capture Hood Plain Opening

- Capture Velocity
- Capture distance
- Capture zone
- Working zone



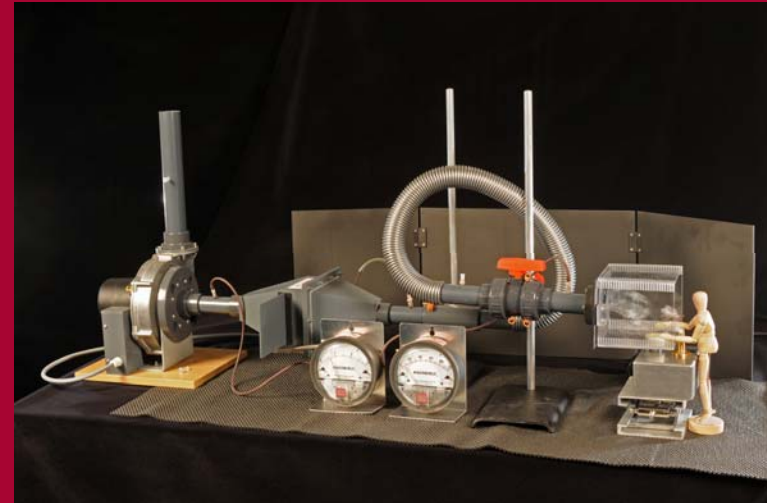
# Capture Hood Plain Opening

- Energetic source
- Draughts
- Effect of adding a flange to a plain opening



# Capturing Hood - Demonstration

- Position of hood
- Source size
- Energetic source
- Draughts
- Working Zone/Zone
- Capture distance
- Opening dampers



# Capturing Hoods – Key Points



## Think in terms of :

- Capture distance
- Capture 'bubble'
- Capture zone and working zone
- Impact of process-induced air movement and draughts

## Myths & tips

- People (including suppliers) are wildly optimistic about their 'reach'
- Minimise draughts, and,
- Maximise (process and source) enclosure

# What people believe about capturing hoods



# Final thoughts on capture hoods



- A capture hood doesn't work when;
  1. It's too small.
  2. Has insufficient airflow
  3. Is applied to a large/diffuse/mobile/energetic process and source.
  4. It's very draughty
- They can work when
  1. Closely applied to a source, which is
  2. The same or similar size to the hood,
  3. With sufficient airflow created in and around the source
- Even better; turn capture into an enclosure

# Enclosures



**Full**



**Partial, small**

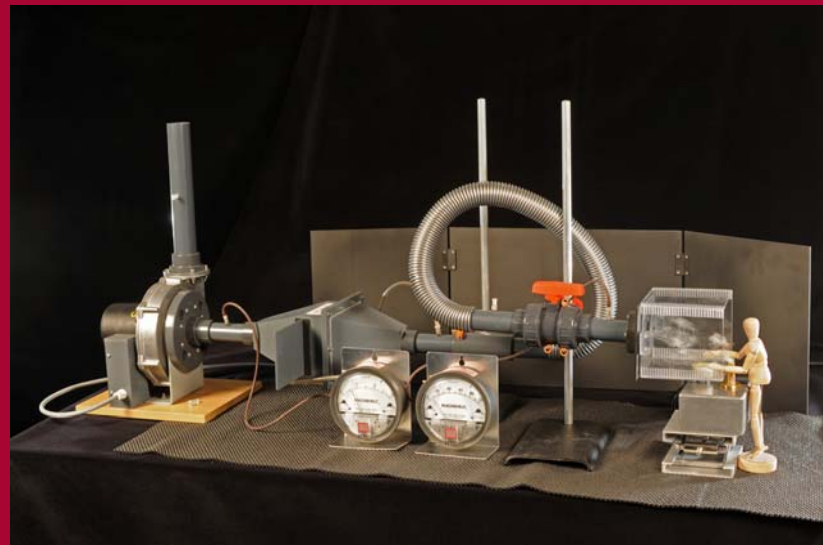


**Partial, large**

# Partial Enclosing (Shallow Booth)



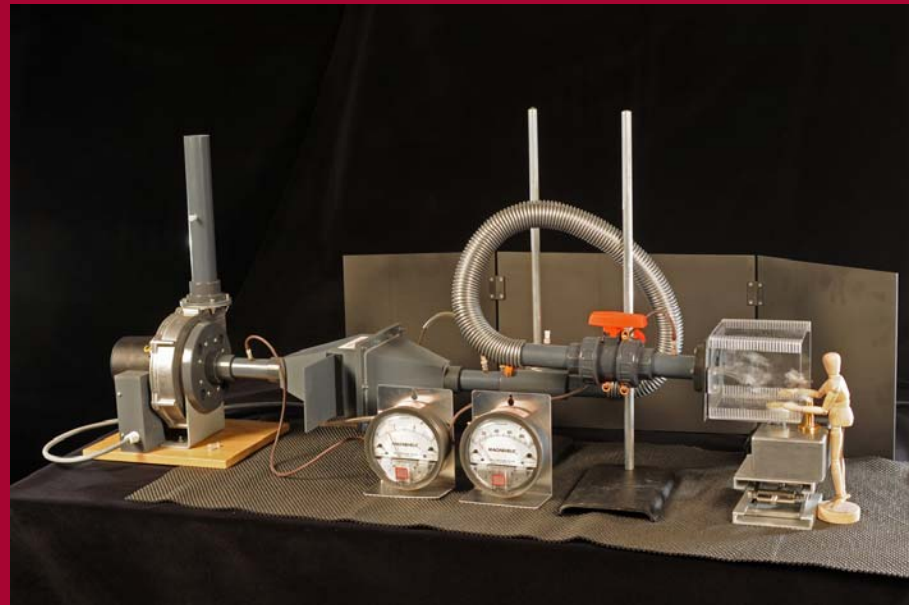
- Shallow booth contamination rebound
- Size of source loss of containment



# Partial Enclosing (Shallow Booth)



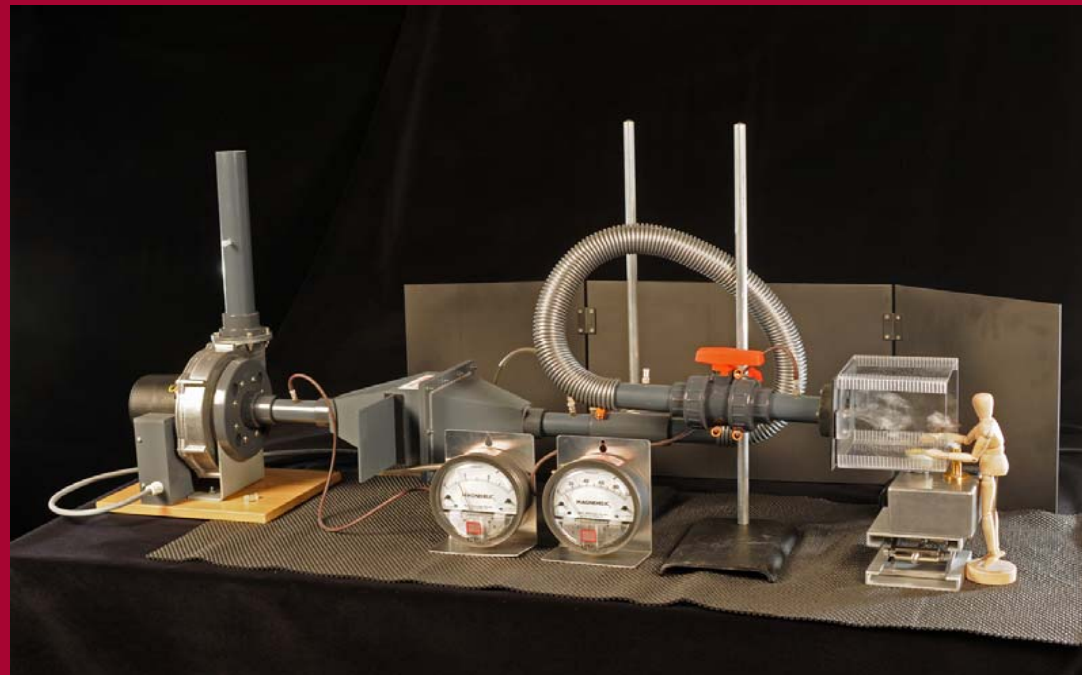
- Wake effect



# Partial Enclosing (Shallow Booth)

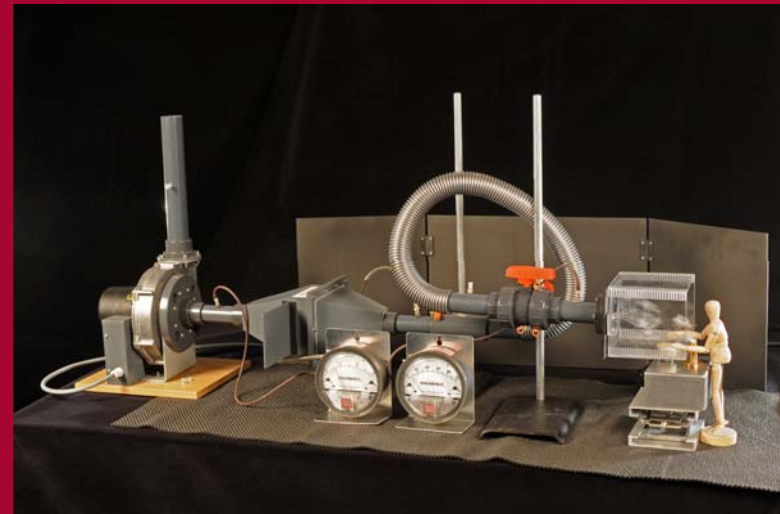


- Draughts



# Partial Enclosing Deep booth

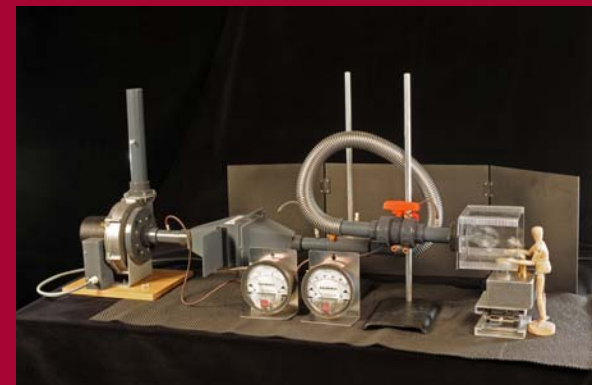
- Deep booth no rebound from wall
- Velocity high enough to clear booth
- All contaminant contained inside booth



# Partial Enclosing Deep booth

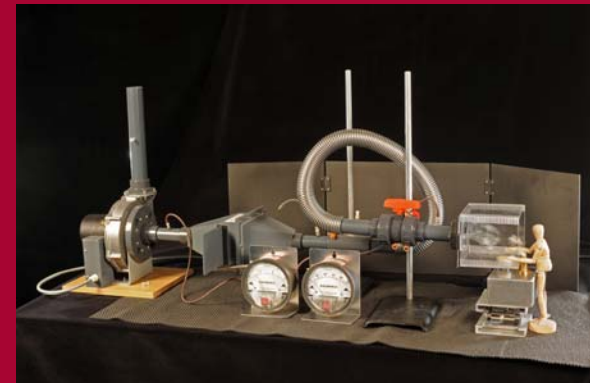


- Worker leaning into booth - wake effect



# Partial Enclosing Deep booth

- Shield to stop wake effect
- Draughts
- Energetic source
- 45° angle to increase containment



# Eliminating & reducing wake effect – transparent barrier



Physically separate breathing zone from source with a transparent barrier. Get ergonomics right.



**SIMPLE TOP  
AND REAR  
EXTRACTION**

**WORKSPACE FRONT  
EDGE between hip  
and elbow height**



**1895**



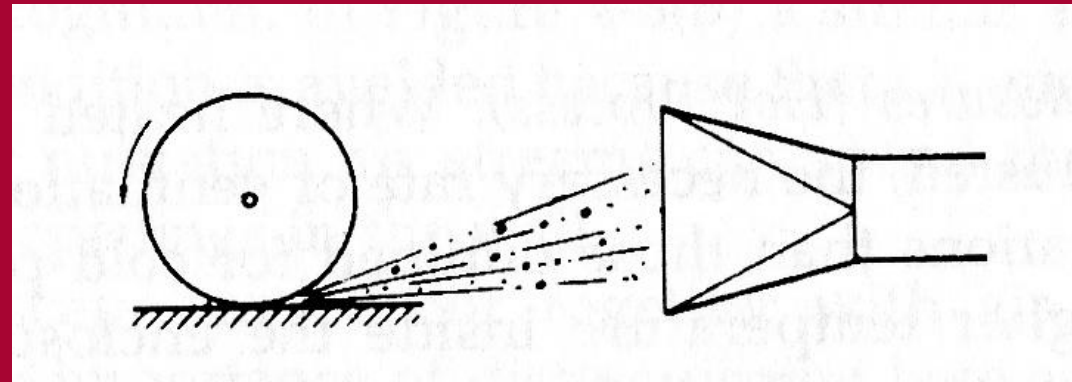
# Matching hoods to processes and control challenge



# Receiving hoods – interrelated properties



- Big enough to receive all contaminant cloud
- As close and enclosing as possible
- Emptied as fast as it's filled
- Careful design



# Matching LEV extract rate to saw-induced air flow



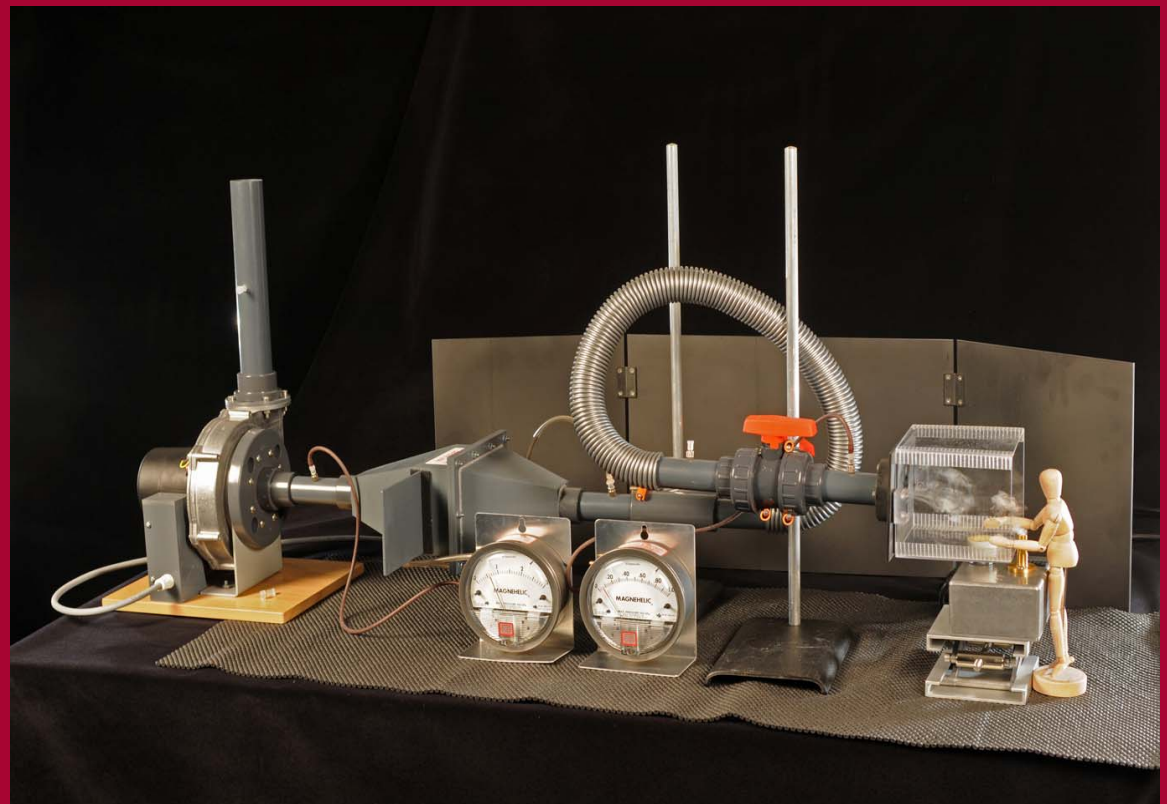
Saw-induced air flow  
~200m<sup>3</sup>/h



Extract air flow  
~50m<sup>3</sup>/h

# Other parts of the LEV system

- Ducting
- Fan/motor
- Gauges
- Air cleaners
- Stack
- Changes



# Practical measurements of the LEV system



Visualisation of the airflow

Observe where air is moving

Leakage testing

Breathing zone encroachment



# Equipment used for visualisation



Smoke generators and  
smoke tubes

# Evaluating LEV systems

## Dust lamp

Visualise the flow of pollutants (particulates)

Dust scatters the light, making the very small respirable particles visible.

Useful tool in the investigation of processes

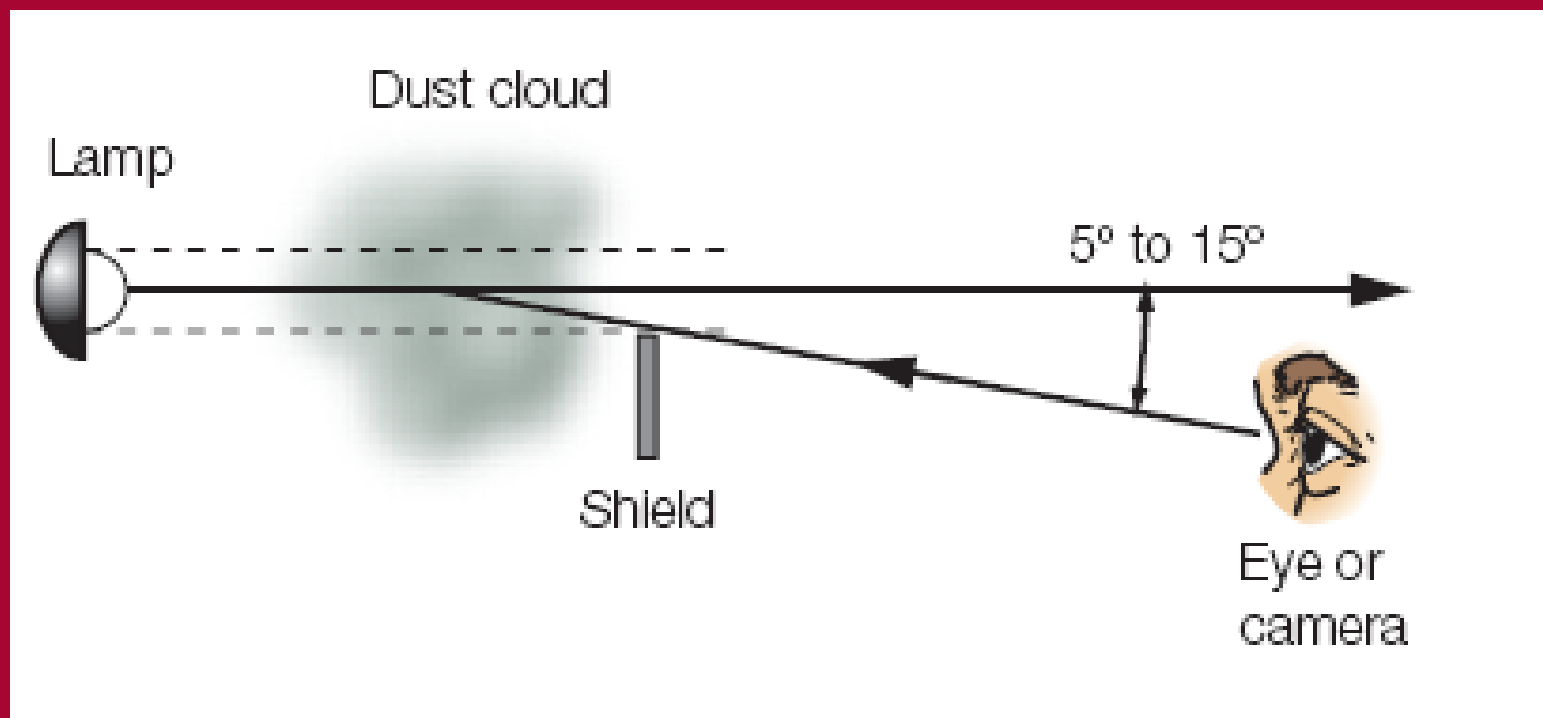


# Sun light in a foundry



## Use of Dust Lamp

- Critical that the lamp is set correctly to show the air contaminant



## General Points

- Provide supplier with basic specification
- Ask for commissioning report
- Provide training on the use of the system
  - User manual
  - Log book
- Preventative maintenance
- User checks
- Thorough, examination and test - audit

# Time to Clear the Air



Further information is on the  
HSE Website:  
[www.hse.gov.uk/lev](http://www.hse.gov.uk/lev)

**THANK YOU**

**ANY QUESTIONS**

