Effect of hood size on a qualitative fit test

25th April 2018

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Respiratory Protection

- Provide adequate protection
- Fit the wearers face
- To ensure the mask fits carry out a fit test

Qualitative fit test (QLFT) kits

- Hood
- Two nebulisers to produce aerosols of the
  - Sensitivity solution
  - Test solution

Standard QLFT

Standard QLFT sensitivity test

- Bitrex sensitivity solution used
- Place the hood on the wearer
- Introduce sensitivity aerosol using nebuliser
- Count the number of squirts needed for the wearer to taste the solution

HSE Operational Circular 282/28

Standard qualitative fit test

- Don mask
- Place hood over wearers head
- Introduce initial number of squirts of test solution
- Perform each exercise for 1 minute
- Introduce half the number of initial squirts at 30 second intervals
- If the wearer can taste the Bitrex then the test has failed and the mask doesn’t fit

Initial number of squirts

Sensitivity result	Initial number of squirts
1-10	10
11-20	20
21-30	30
30+	-

Standard QLFT 7 exercises

- Normal breathing
- Deep breathing
- Head side to side
- Head up and down
- Talking out loud
- Bending at waist
- Normal breathing

HSE Operational Circular 282/28

Hood dimensions - standard hood

- 300mm (12”) in diameter
- 355mm (14”) in height
- Forms a cylindrical shape
- Internal hood space volume 20l

HSE Operational Circular 282/28

ANSI Z88.10:2010

QLFT Kits available

- Range of kits available on the UK market
- Range of hoods
- Differ in
  - Construction
  - Shape
  - Size
  - Volume

Identification of QLFT kits

- 10 commonly available QLFT kits purchased
- Three different designs of hood across the 10 manufacturers

Concerns over differing volumes

- How different are the volumes?
- Does this affect the concentration of aerosol in the hood space?
- Does this have a bearing on the quality and consistency of the fit test?

Standard Hood

Hood A

Hood A upright

Hood B

Hood C flat

Hood C shaped

Hood volumes

- Total volume of hood, calculated from its external dimensions when placed on a mannequin torso
- Volume of standard Sheffield head calculated by water immersion technique
- Volume of empty space calculated

Percentage increase of hood volumes

Hood Type	Volume of hood space when worn (L)	% increase from standard hood
Standard	20	-
A	20	0
A Upright	30	50
B	23	15
C Flat	48	140
C Shaped	44.5	122.5
+/- 5%		
ANSI recommended hood space volume 20L		

Experimental set up

- Standard Sheffield head attached to torso
- Connected to breathing machine
  - 1.5 l @ 20 strokes per minute
  - Regular breathing at low work rate (ISO, 2004)
- Tee shirt fitted to stop the hood slipping
- Alpha Solway 3030V disposable FFP3 mask fitted (used throughout testing)

Position of sampling location

Measurement

- **TSI PortaCount**
  - Measures ambient particles/cm^3
- **TSI AM150 Sidepack aerosol monitor (SPAM)**
  - Measures ambient particles mg/m^3 (mass)
  - Calibrated flow rate 0.7l/min

Tests

- PortaCounts and SPAMs allowed to equilibrate for 2 minutes
- 10 squirts of Bitrex test solution introduced before start of test
- 5 squirts introduced at 30 second intervals for 7 minutes – duration of fit test
- No attempt to simulate head movements or exercises during the test

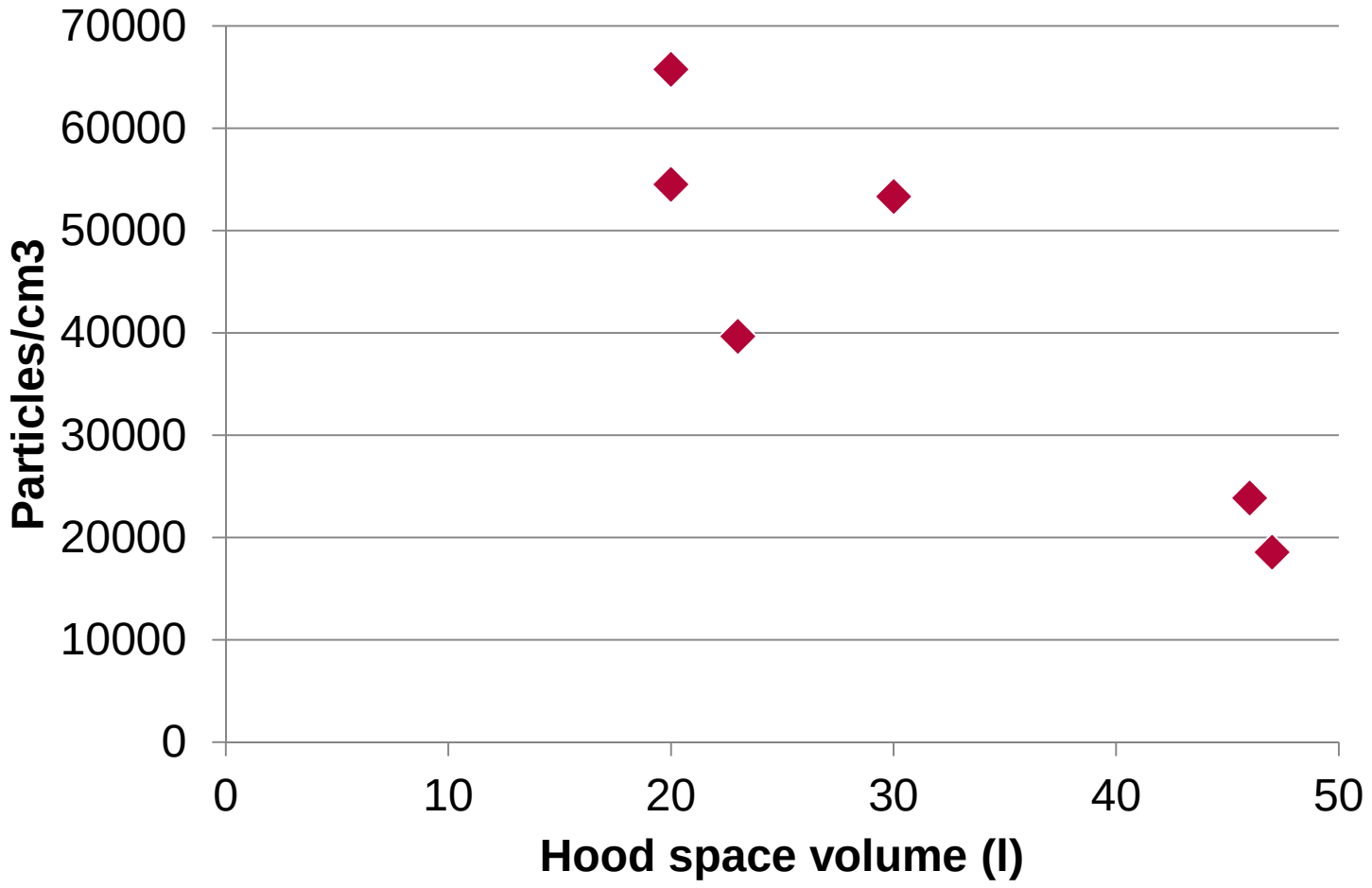
Tests

- Each test was carried out on the 3 styles of hood in all configurations
- The aerosol concentration was measured
- Each hood configuration was tested 3 times and a mean concentration calculated

PortaCount results in hood volume order

Hood Type	Particle/cm³	Volume(L)
Standard	65782	20
A	54523	20
B	39673	23
A Upright	53341	30
C Shaped	23876	46
C Flat	18582	47

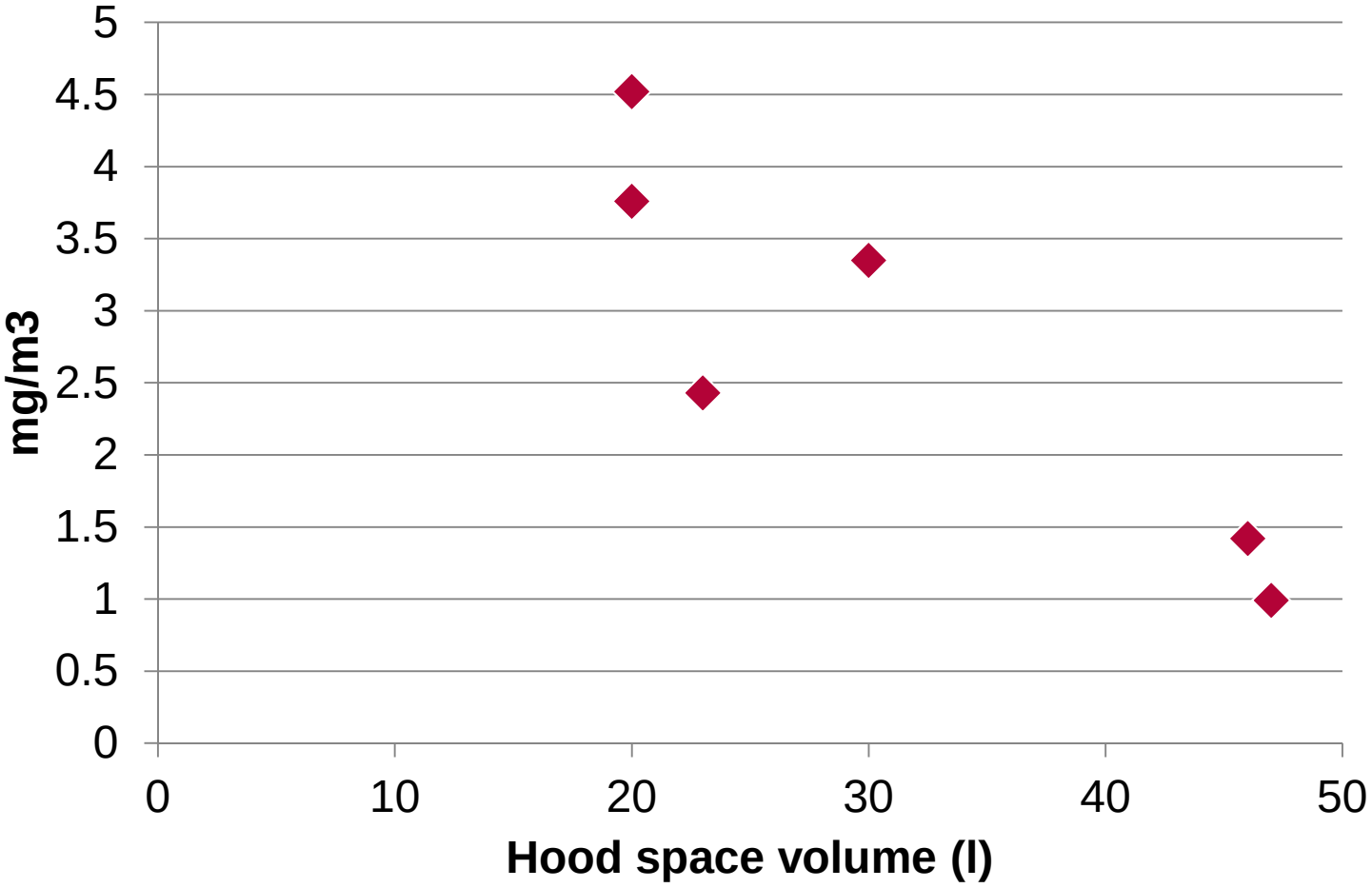
PortaCount results in hood volume order



SPAM results in hood volume order

Hood Type	mg/m³	Volume(L)
Standard	3.76	20
A	4.52	20
B	2.43	23
A Upright	3.35	30
C Shaped	1.42	46
C Flat	0.99	47

SPAM results in hood volume order



Results

- There is a general trend in reduction of concentration of aerosol with increasing hood size
- A lower concentration of aerosol in the hood may lead to a fit test that is not as sensitive as required

Manufacturers

- Produce hoods which have a larger volume than that specified in 282/28 and recommended in the ANSI standard
- Instructions of correct assembly of the hood is sometimes unclear
- Instructions on the delivery of the aerosol is sometimes confusing

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