INTRO TO QUANTITATIVE FIT TESTING

RESFT 101

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Course Description

Part 1:

+ Basics of Respirator Fit Testing
+ The what, who, why and when of Respirator Fit Testing

Part 2:

+ Defining QUANTITATIVE Fit Testing
+ Quantitative Fit Testing Exercises

Part 3:

+ PortaCount Pro/Pro+ Technology
+ N95 Companion (8038) Technology

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Part 1:

Basics of Fit Testing

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WHAT is Respirator Fit Testing?

+ The practice of determining if a specific mask (respirator) fits to a persons face

HOW WELL DOES THE FACEPIECE SEAL TO THE PERSONS FACE?

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WHO needs to be Fit Tested?

OSHA 29CFR1910.134 (f):

"… requires that, before an employee may be required to use any respirator with a… tight-fitting facepiece, the employee must be fit tested with the **same make, model, style, and size** of respirator that will be used." (Refer to CSA Z94.4-11 sections 9.1.2 & 9.1.3 for comparative statements)

WHO needs to be Fit Tested?

WHY should we fit test?

Safety

- Confirms the respirator provides a satisfactory seal or barrier between the wearer and the contaminated environment

Training

- Ensures the wearer knows how to properly **don** (put on) and operate the respirator

Comfort

- Helps determine if a respirator will be comfortable, and allow the wearer to perform their work duties

OSHA & CSA REQUIRE it

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OSHA…

In 2011 OSHA issued over **95,000** safety-related citations

The Top 10 Violations from October 2010 thru September 2011 include:

1. Scaffolding, general requirements
2. Fall protection, construction
3. Hazard communication standard, general industry
4. **Respiratory protection**, general industry – 3,944 violations
5. Control of hazardous energy (lockout/tagout), general industry
6. Electrical, wiring methods, components and equipment, general industry
7. Powered industrial trucks, general industry
8. Ladders, construction
9. Electrical systems design, general requirements, general industry
10. Machines, general requirements, general industry

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Provided by OSHA
http://www.osha.gov/dcsp/compliance_assistance/frequent_standards.html

Did you know?

Employee comfort takes precedence

"…the employee shall be given reasonable opportunity to select a different respirator…"

OSHA 29CFR1910.134 (f)(4)

(Refer to CSA Z94.4-11 sections 9.1.3 for comparative statement)

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WHEN do we fit test?

- Refer to OSHA 29CFR1910.134 (f)(2 & 3)

  (Refer to CSA Z94.4-11 sections 9.1.6 for comparative statement)

Prior to initial use of the respirator, and annually (biennially for CSA)

If a different respirator is used

- Size, style, model or make

If there are changes in the employee's physical condition that could effect respirator fit

- Facial scarring
- Dental changes
- Cosmetic Surgery
- Obvious change in weight, etc.

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Part 2:

Quantitative Fit Testing

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Fit Testing Methods

Qualitative

Subjective

Quantitative

Objective

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Quantitative Fit Testing (QNFT)

OSHA 29CFR1910.134 (b):

(Refer to CSA Z94.4-11 Annex C section C.4.1 for comparative statement)

> "…an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator."

In other words…

To objectively test how a specific **make**, **model**, and **size** of mask fits to a specific person's face?

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Quantitative Fit Testing (QNFT)

Fit Factor

- *Ratio* of a substance measured outside of respirator when compared to a substance measured from within donned respirator
- PortaCount Pro/Pro+ measures particle concentration outside of respirator (C out) and *divides* this by particle concentration measured from inside the respirator (C in)

Fit Factor = $C_{out} \div C_{in}$

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Fit Factors in the Real World

A Fit Factor of **500**

means the air inside the respirator is **500** *times cleaner*

than the air outside the respirator

Mask Particle Concentration

C in

Ambient Particle Concentration

C out

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Did you know?

If fit factor is >100
you **must** use *quantitative* fit testing

Full face respirators
Fit Factor ≥ 500

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Refer to OSHA 29CFR1910.134 (f)(6,7)
(Refer to CSA Z94.4-11 sections 9.4 for comparative statement)

Fit Factor vs. Assigned Protection Factor (APF)

Two separate functions of the same respirator…

Fit Factor: Determined when the Respirator is used in APR (Air Purifying) mode

Assigned Protection Factor: Determined by mode of operation in the workplace, i.e. SCBA, PAPR, CCBA, etc.

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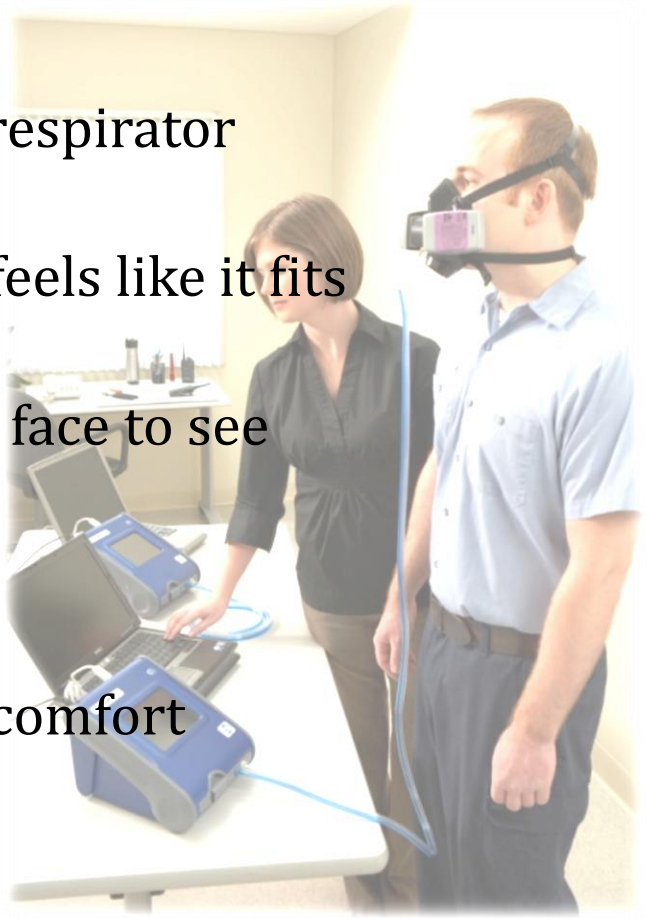
OSHA
Fit Testing Procedures

1. Choose a respirator
2. Show how to properly don and doff the respirator
3. Ask if the respirator is comfortable and feels like it fits
4. Hold different respirators up to subjects face to see if there is a better fitting option
5. Don respirator for 5 min, user assessed comfort



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OSHA
Fit Testing Procedures

6. Assess Comfort

• Position of mask on the nose	• Room to talk
• Room for eye protection	• Position of mask on face and cheeks

7. Assess Fit

• Chin properly placed	• Adequate strap tension, not overly tightened
• Respirator proper size to span distance from nose to chin	• Self-observation in mirror to evaluate fit and position
• Tendency of respirator to slip	• Fit across nose bridge

8. Conduct User Seal Check

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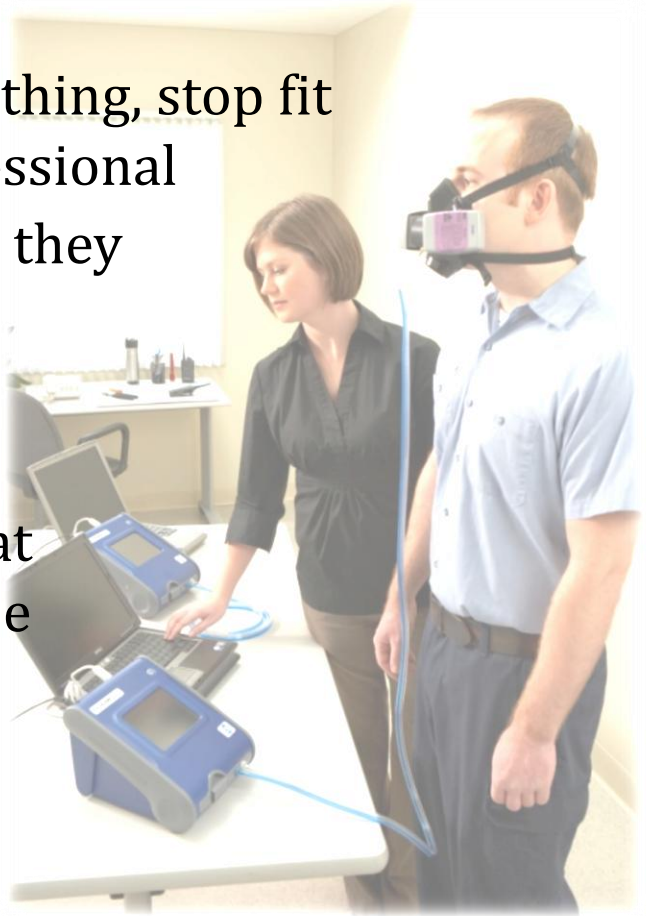
OSHA
Fit Testing Procedures

9. Confirm there is no hair growth, clothing or jewelry that would interfere with a proper fit
10. If the test subject exhibits difficulty breathing, stop fit test and refer them to a healthcare professional
11. If the employee find the fit unacceptable they may choose a different respirator
12. Give test subject a description of the Fit Testing exercise regimen
13. Don any applicable safety equipment that may be worn during actual respirator use
14. Perform fit test…



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OSHA
QNFT Protocol

OSHA requires 8 exercises…

these simulate common workplace motions

1. Normal breathing
2. Deep breathing
3. Turning head side to side
4. Moving head up and down
5. Talking
6. *Grimace*
7. Bending over
8. Normal breathing

Each exercise will receive a corresponding fit factor

OSHA is only concerned with the overall fit factor (weighted average of each exercise)

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~Grimace~

NOT factored into the overall fit factor…

OSHA 29CFR1910.134 Appendix A (C)(b)(8)(i)

"The fit factor shall be determined… for each test exercise except the grimace exercise"

Why not?

- The goal is to attempt to momentarily break the seal of the respirator to the face

  Only takes 15 seconds

- To verify the respirator re-seats properly for the last two exercises

Smile or Frown

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CSA, HSE (UK), & ANSI QNFT Protocols

Requires 7 exercises…

these simulate common workplace motions

1. Normal breathing
2. Deep breathing
3. Turning head side to side
4. Moving head up and down
5. Talking
6. Bending over
7. Normal breathing

Each exercise will receive a corresponding fit factor

CSA & ANSI are only concerned with the overall fit factor (weighted average of each exercise)

**HSE requires a passing fit factor for each exercise*

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Part 3:

PortaCount Pro Fit Testing

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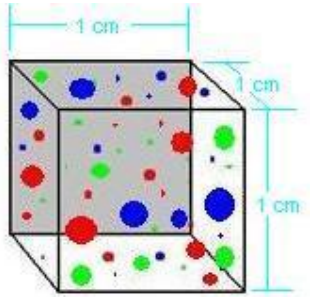
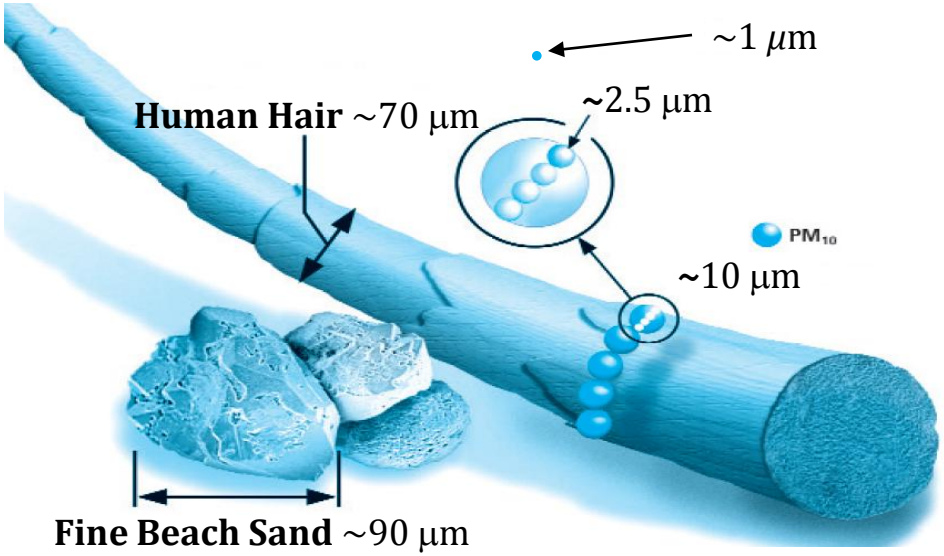
PortaCount Challenge Agent

Particle Concentration

- The PortaCount Pro/Pro+ *challenge agent*
- Also referred to as: *ambient aerosol* or *particle count*
- Number of particles per cubic centimeter (pt/cc) of air

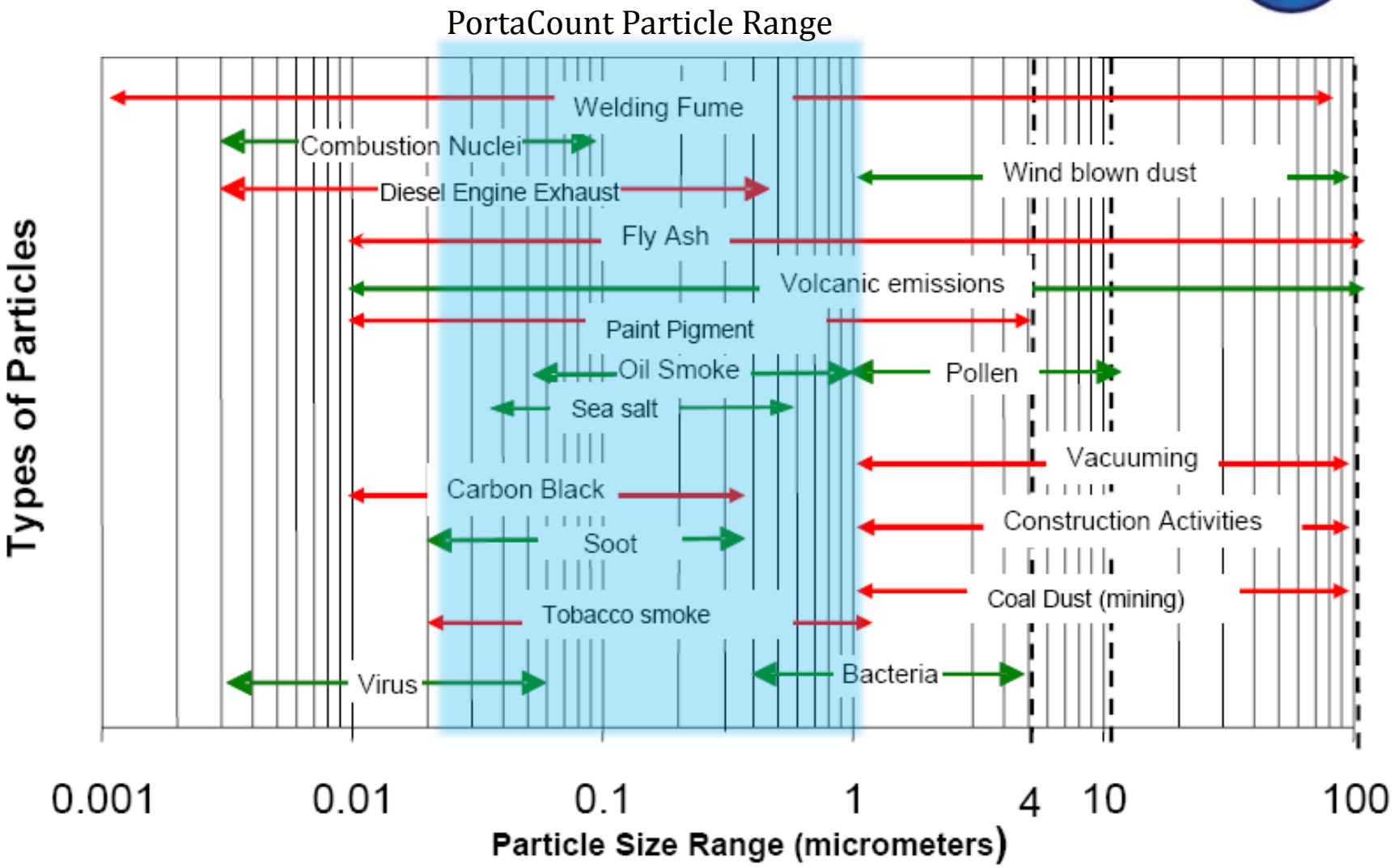




PortaCount Particle Range

~0.02 *μm* - 1.0 *μm*

Particles in the Real World



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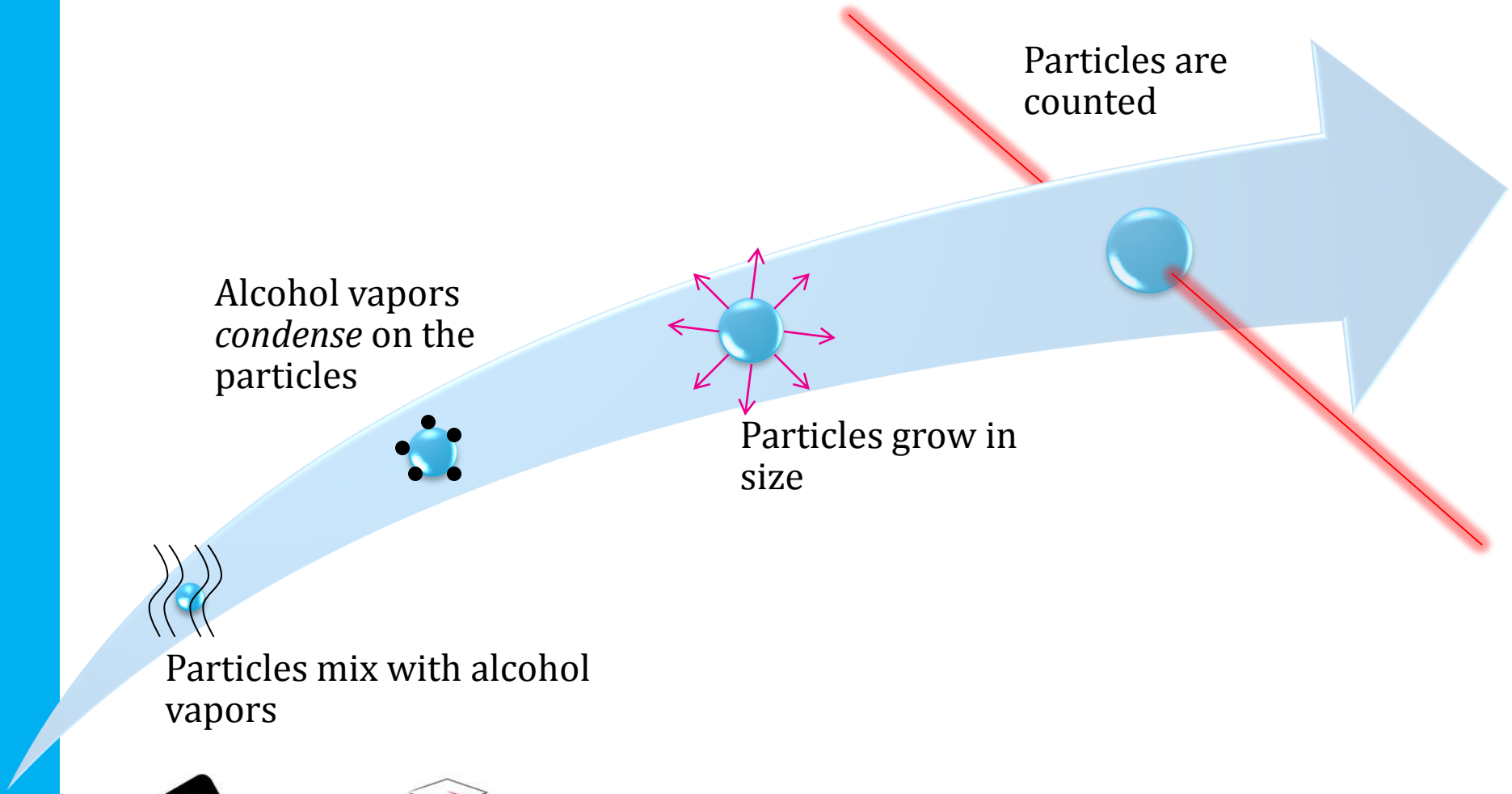
PortaCount Basics

Condensation Particle Counter (CPC)

- Scientific term describing WHAT the PortaCount is; an instrument for enlarging particles, thru condensation, and then counting those particles
- Particles counted, are the *challenge agent* used for fit testing

= CPC

CPC Basics



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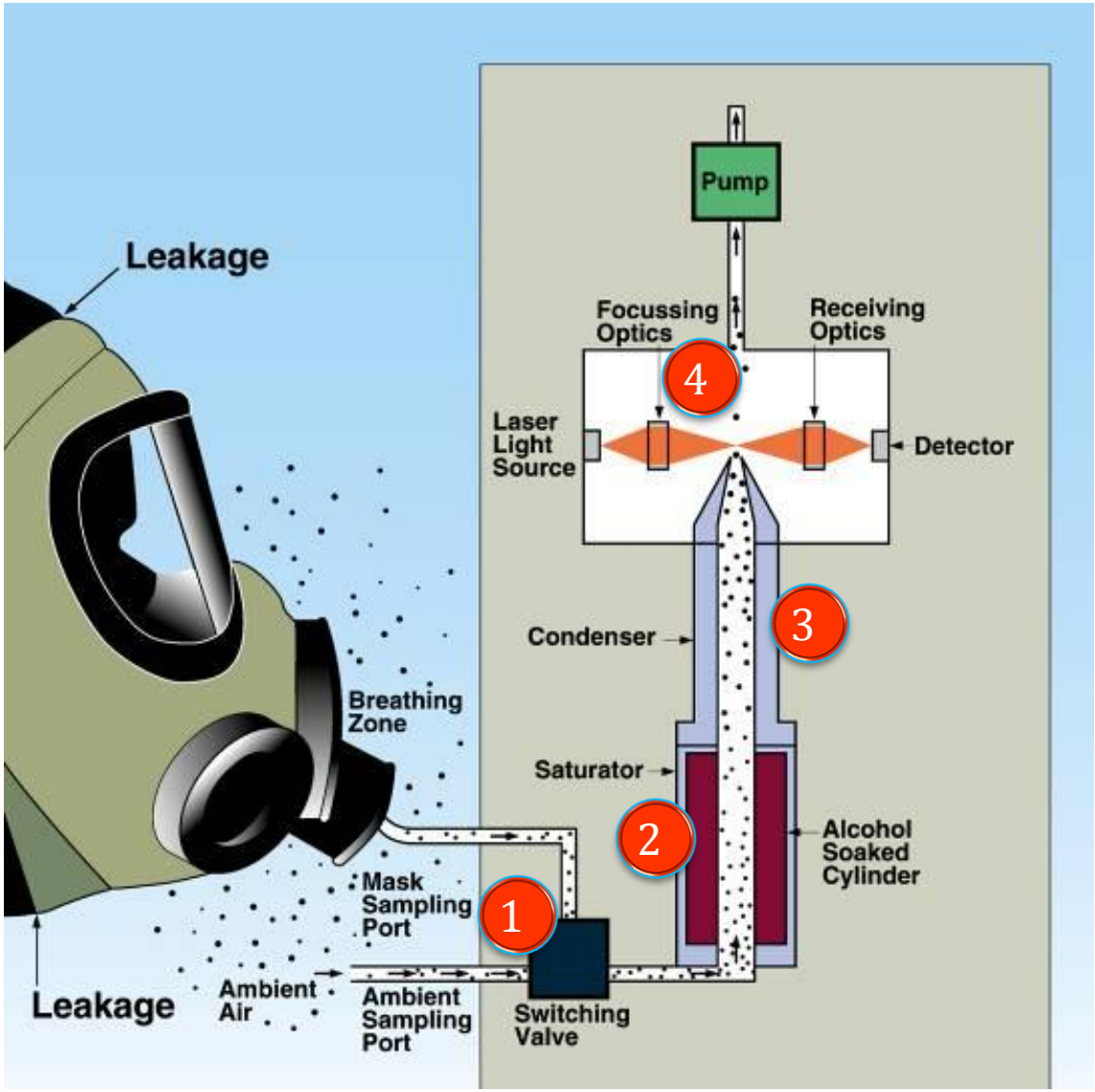
Theory of Operation



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Why 2 models?

8038
PortaCount Pro+

- full- & half-face &
filtering facepieces

8030
PortaCount Pro

- full- & half-face
elastomeric respirators

Because of differences in Filter Efficiency

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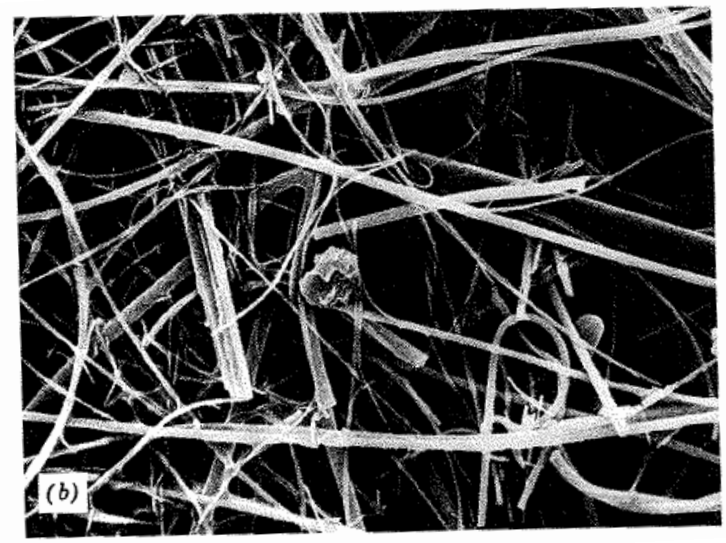
Filter Media 101



Hinds 1999 Wiley & Sons Inc.

Magnification of filter media

- Efficiency
  -how many particles are removed by the filter media
  -graded as 95, 99, or 100 (= % of efficiency)
- Penetration
  -how many particles get through media
- Leak
  -how many particles get around the face seal

Less efficient

3M 8210 N95 Mask

North 7700 Half Mask

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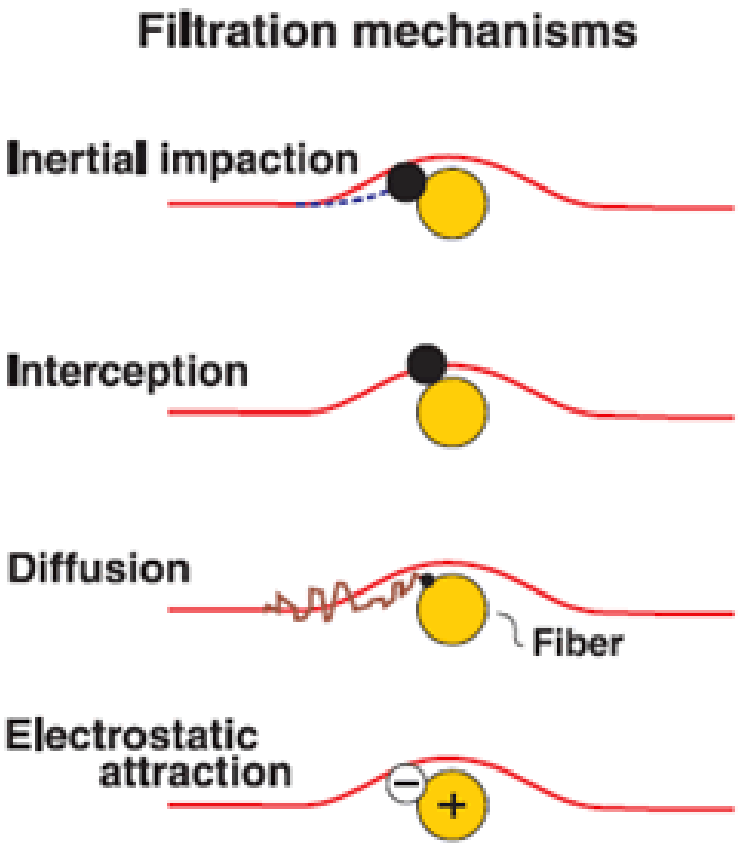
Filter Media 101



Occurs in particles greater than 0.4 µm

Occurs in all particle size ranges

Occurs in particles smaller than 0.1 µm

Occurs in all particle size ranges

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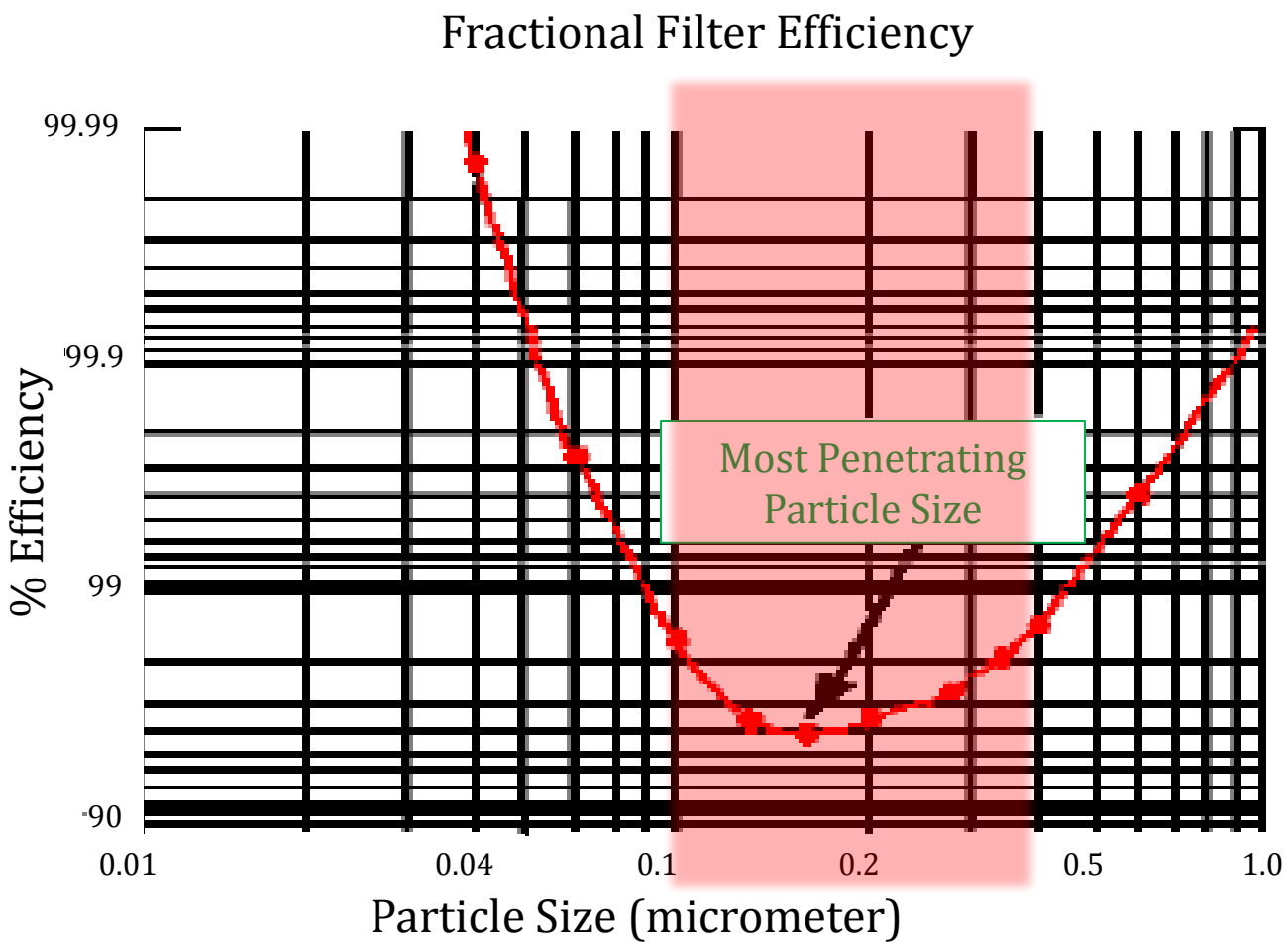
Particles between 0.1 and 0.4 µm will penetrate the filter media



Especially a filter that is less than 99% efficient

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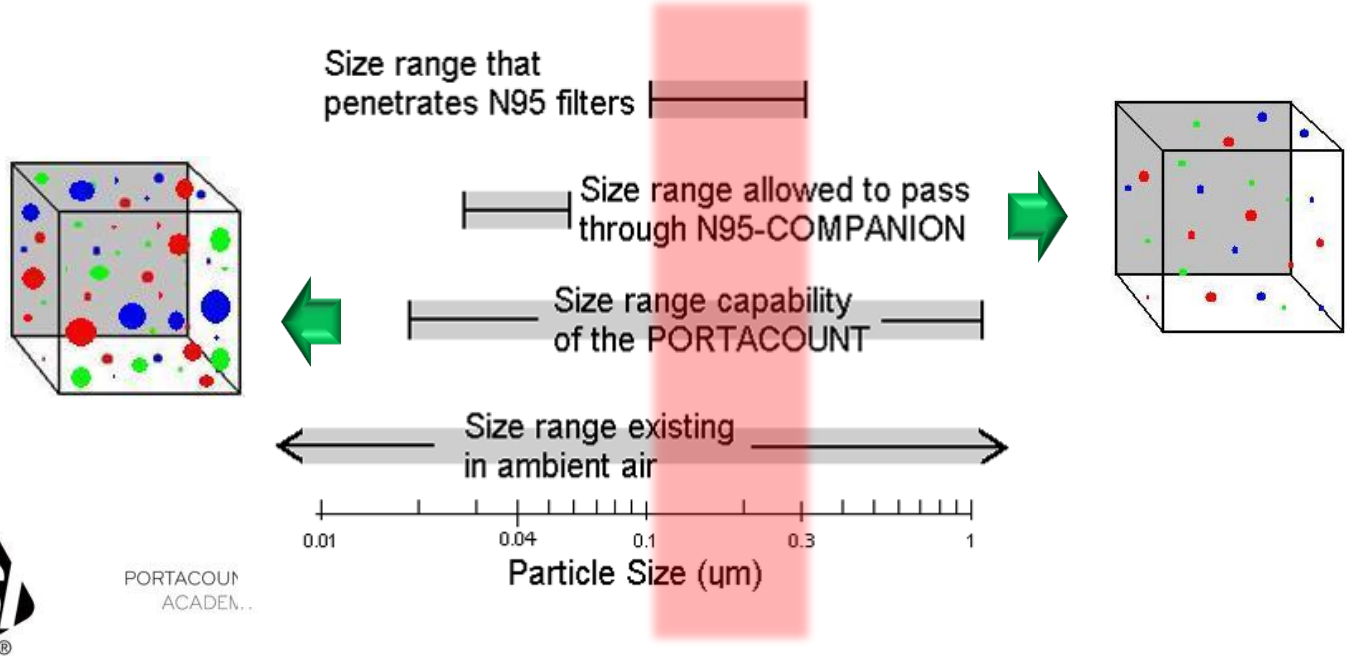
N95 Operations

Ambient Particle Concentrations

An 8038 with N95 Enabled counts far less particles because we ignore the “Most Penetrating Particles”



Summary

+ All employees who are required to wear elastomeric respirators or filtering facepieces shall be fit tested
+ The PortaCount Pro/Pro+ is a method of quantitative fit testing
+ The PortaCount Pro/Pro+ uses ambient particles as the challenge agent
+ Understanding the N95 Companion capability

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Online Training Center

- Available at the PortaCount Academy website; www.tsi.com/PCacademy

Answers

- Available at www.tsi.com/PCacademy and www.tsi.com/portacount