The CNP Advantage of the Quantifit

QUANTIFIT®

The Gold Standard of Respirator Fit Testing

- Highest Reliability – Fastest Results – OSHA Accepted – NFPA Compliant -

To help you better understand the advantages of using CNP technology, let's take a look at the shortcomings of the most-used quantitative fit test method, particle counting.

To determine respirator fit, a particle-counting device alternately samples the aerosol concentration both inside a mask and in the ambient air surrounding the mask.

The particles in these samples are then coated with alcohol to make them detectable by a light beam counting device.

The particle-counting device estimates a fit factor by dividing the average count from an approximate 40 second in-mask sample by the average count from an approximate 10-second ambient air sample. Let's look at some of the reasons aerosol measurements tend to misread respirator fit.

Potential Counting problems with Aerosol

If the ambient air particulate concentration is too low (requiring burning incense or candles), there may be problems with count statistics. Ambient air particulate concentrations that are too high could result in dirty optics that lead to miscounted particles. There are other documented problems with particle counting as well, called sampling biases.

Sampling Biases with Aerosol Measurement

A particle counting device cannot detect respirator leakage unless its challenge agent (ambient aerosol particles) can reach its detector. If an ambient particle leaks into the respirator but has no chance of physically migrating to the detector, an error or bias is introduced into the measurement.

Documented sources of aerosol system measurement bias include, but are not limited to, leak site penetration losses, streamlining, and lung deposition.

1) Penetration Losses Bias with Aerosol Measurement

First, the variety of sizes and shapes of respirator face seal leaks can strongly influence the ability of an ambient air particle to leak into the mask (see Figure 1). Just because a particle can't penetrate a leak site, we cannot be certain that a gas or vapor molecule could not penetrate the same leak site. At present, we can only assume that aerosol-based fit tests provide good estimates for gas or vapor contaminants.

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2) Particle Streamlining Bias with Aerosol Measurement

There is also the case of particle streamlining (see Figure 2). During inspiration, the ONLY time contaminants leak into the respirator, the lungs take in air at a flow rate of 50,000 ml/min or MORE, depending on work rate. Aerosol-based quantitative systems typically sample at rates of ONLY 700 ml/min.

Which direction--lungs or sampling probe--do you think a particle is more likely to go? This streamlining phenomenon causes poor in-mask mixing and prevents a large number of particles from reaching the aerosol-sampling probe. If the particle doesn't reach the probe, the aerosol-based fit test device remains oblivious to the leak. In essence, a system that can't see a particle can't count it either.

3) Lung Deposition of Particles Bias with Aerosol Measurement

Particles that enter a respirator through a leak site have a very high probability of being carried by inspired air into the respiratory system. Once there, a significant number (50% or greater) of those particles may become deposited on lung surfaces and are no longer present in the exhaled air stream, when a particle counting device would have its best chance of detecting them. As a result, such devices have a big tendency to under-estimate respirator leakage and over-estimate fit, since you may be exhaling cleaner air than you inhale. Take a moment to think about the incredibly high fit factors routinely reported by aerosol-based quantitative fit test systems, and the validity of the preceding statement becomes obvious.

The CNP Advantage!

Since the particle counting sampling biases mean elevated fit factors with a significant margin of error, that could make the difference between a respirator that is protecting an employee's health and one that is not. OHD Quantifit's advanced Controlled Negative Pressure technology uses pressure wave propagation instead of particle migration to measure mask leaks, so there are no aerosol particles to worry about losing before they can physically migrate to the sampling probe and particle detector. Instead, CNP technology gives you a direct measurement of respirator leakage quickly and accurately regardless of the source. The sampling biases related to aerosol concentration, lung deposition, and streamlining, are completely eliminated, giving you a greater degree of confidence in your fit test decisions.

The Controlled Negative Pressure technology of the OHD Quantifit allows the mask to be challenged in ways that are impossible, or at least impractical, for other systems. Because we use negative pressure to replicate the negative force of inhalation, the OHD Quantifit can be set to increase the negative force in the mask to replicate breathing rates of over 100 liters of air exchanged per minute and measure the leak effect in only 8 seconds. Other systems might only be able to test at this level if you get the wearer to actually breathe at this high rate continuously for several minutes. Doing so with other systems would create great stress on the mask wearer!

CNP puts the PRESSURE on the MASK... NOT ON YOU!