

# P-TRAK<sup>®</sup> ULTRAFINE PARTICLE COUNTER THEORY OF OPERATION

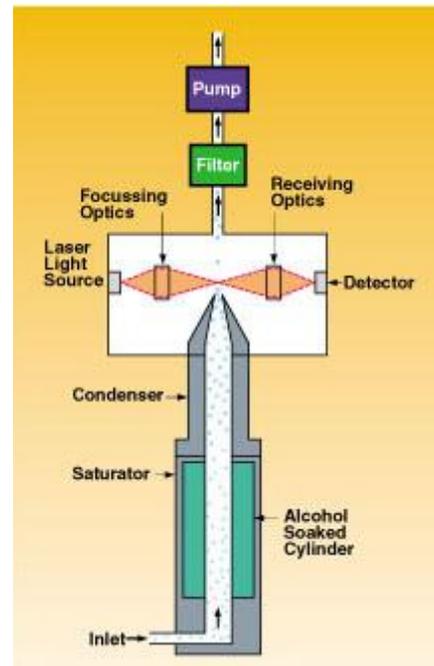
APPLICATION NOTE ITI-071

The P-TRAK<sup>™</sup> Ultrafine Particle Counter (UPC) measures ultrafine particle concentrations in real-time and also datalogs. These measurements are made in units of particles per cubic centimeter ( $\text{pt}/\text{cm}^3$ ) versus traditional aerosol measurements of milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ) made by photometers. The P-TRAK<sup>™</sup> UPC can see single ultrafine particles, making it far more sensitive than other technologies.

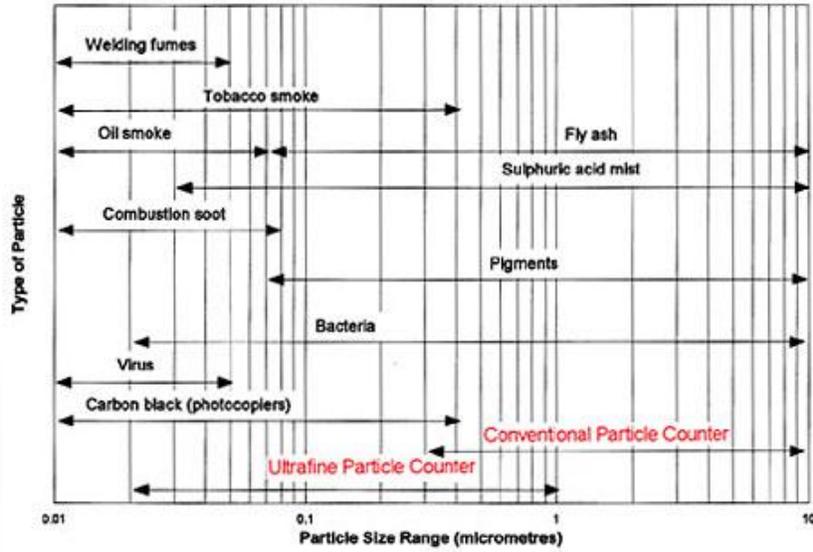
Particles are drawn through the P-TRAK<sup>™</sup> UPC using a built-in pump. Upon entering the instrument, particles pass through a saturator tube where they mix with an alcohol vapor. The particle/alcohol mixture then passes into a condenser tube where alcohol condenses onto the particles, causing them to grow into a larger droplet. The droplets then pass through a focused laser beam, producing flashes of light which are sensed by a photo-detector. The particle concentration is determined by counting the light flashes. If the particles were not "grown" into larger droplets, they would not produce (scatter) enough light to be detected.

This unique single-particle counting capability differentiates the P-TRAK<sup>™</sup> from all other IAQ monitoring methodologies and instrumentation. The P-TRAK<sup>™</sup> UPC counts ultrafine particles (smaller than 0.1 micrometer in diameter) that often accompany or signal the presence of a pollutant that is the root cause of IAQ complaints. The P-TRAK<sup>™</sup> UPC is a totally new approach to eliminating IAQ problems.

The P-TRAK<sup>™</sup> UPC uses the same fundamental technology behind TSI's condensation particle counters (CPCs), well proven instruments that have been used in research and industrial applications around the world for many years. In fact, CPCs have been used for decades to track and record particle sources.



## Examples of Particle Sizes



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