

Using Particle Counters for Testing HEPA Filters

Application Note ITI-097

TSI's Optical Particle Counters are a reliable means of checking leaks in negative air machines as well as any other high efficiency particle arresting (HEPA) filtration system. The test that is traditionally done on negative air machines is an industry standard efficiency test that requires upstream and downstream measurement of a generated aerosol (usually DOP) having an average particle size of 0.3 microns. The efficiency usually must meet or exceed 99.97% to pass this test. There are instruments on the market that are specifically designed to perform that test that consist of an aerosol generator and a photometer to measure concentration in milligrams per cubic meter.

TSI's Optical Particle Counter is a laser optical particle counter, rather than a photometer. The difference is that a particle counter counts single particles in a series of size ranges or "bins" and a photometer measures the density of a cloud of particle. Photometers cannot "see" single particles. A negative air machine that passes the DOP efficiency test will sometimes exhibit leaks that can be precisely located and eliminated using TSI's Optical Particle Counters. Often, these leaks are found around the filter gaskets, not the filter itself. The leaks may involve thousands of tiny particles.

HEPA filters are typically certified at 99.97% efficient when manufactured. After that, there are only two things that can happen to the filter:

1. It can load up with particulates and eventually clog.
2. It can develop leaks due to age or physical damage.

In the case of loading, the filter will become more and more efficient over time, but incur higher pressure drop. This can be tested with a differential pressure gauge such as a Magnehelic. Since filters naturally become more and more efficient during use, that leaves leaks as the primary concern. In other words, the only thing that can cause exposure to particle contaminants when using a previously certified HEPA filter is that it can develop leaks (of course, the gaskets around the filter can also leak).

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