

## Particle Counting

It is critical to clean manufactured parts in process. Components that are properly cleaned provide a better finished product and allow the assembled device to operate as it was intended. Many industries have a required cleanliness level their parts must reach. Embracing the task of cleaning has translated into direct economic benefits such as improved production yields, lower service costs, and reduced re-manufacturing time.

Emphasizing clean parts generates a need for a way to objectively test the parts. Many cleanliness tests are subjective in nature, such as the white glove test or the black light test. These will tell if the part has been cleaned, but they offer no objective way to measure cleanliness. Rather, they provide only a subjective measure that can differ from person to person. To ensure quality, an objective test is necessary.

The Millipore test provides objective results that are applicable for both customers and manufacturers. The Millipore process is as follows:

1. Wash the part in an aqueous system
2. Take the clean part and spray it with a solvent
3. Funnel, via positive pressure, this solution through a filtered tube
4. Remove the filter from the tube and dry it
5. Weight the dry filter
6. Subtract the weight of the new filter from the weight of the dried filter- which produces the contaminant level

This system provides a consistent and objective measure of the contaminant level in a part after cleaning. Millipore testing is appropriate for applications that require oil, lubricant, or coolant to be removed from a part.

Millipore is not a perfect test. The limitations of the system sometimes allow for the creation of false assumptions. When weight of the contaminant is measured, the Millipore test can offer no indication of whether that weight is made up of 1 particle, 10 particles or 10,000 particles. It also cannot measure the size of any of those particles. There are some parts which operate the same no matter how many particles are on them, as long as they under a certain size.

Without being able to know the size of the particles on the part, it is difficult to judge it as clean. Microns are the standard measurement of these particles. Microns are incredibly small. Humans cannot see a particle that is smaller than 100 microns. The next smallest unit of measurement is a nanometer, which is measured in light wavelengths. With these small units, it becomes difficult to judge particles on size.

Due to the limitations of the Millipore test, the most effective means of determining an objective level of cleanliness desired is by utilizing a particle counter. Sizing and counting particles with an optical particle counter gives the manufacturer a true reading of what is being washed off, what is still left on the parts after the wash process and what will be acceptable enough to the process. This method is becoming the method of choice for aerospace and the automotive industry due to the speed, simplicity and the repeatability of a typical particle counter.

- A. A particle counter system is comprised of 3 components: a sampler, a sensor and a counter. A sampler uses a positive pressure to bring a sample of the

liquid to the sensor at a constant flow rate. This fluid is then fed into the particle counter through the sensor, which is connected, to the counter/computer. A hard copy of the exact size in microns of the particles and the exact number of these particles is then emitted from the system.

This data allows manufacturers to be assured of cleanliness objectives. They can enter into an agreement, which specifies exactly how clean a part must be. Regular testing, both scheduled and unscheduled, can be conducted to make sure parts are adhering to the standard. Quality is the top goal of all businesses, and this testing method will help achieve that.