

The Basics of Liquid Particle Counters: How Particles are Counted

by Jason Kelly

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Liquid particle counting is used to measure the size and distribution of particles in a liquid sample. The particle distribution and size are measured by irradiating a liquid sample with a laser diode and detecting the scattered light. The properties of the scattered light are related to the magnitude of the particle size. Liquid particle counters may be used for batch sampling or online (continuous monitoring) applications like water treatment plants or used in Pharmaceutical sterile water for injectable (WFI) monitoring.

How Does a Liquid Particle Counter Work?

Liquid particle counters work on the principal of either light scattering or light blocking. A sample is drawn through a chamber with a light source. Today’s modern liquid sensor’s use a laser diode as the source of illumination. Liquid Particle Counters depending on the size sensitivity use either a light blocking or light scattering technique.

The light blocking optical particle counter method is typically useful for detecting and sizing particles greater than 1 micrometer in size and is based upon the amount of light a particle blocks when passing through the detection area of the particle counter

Light scattering uses a high intensity light source to illuminate the particle as it passes through the detection chamber. The particle passes through the light source (typically a laser) if light scattering is used, then the redirected light is detected by a photo detector. If light blocking (obscuration) is used the loss of light is detected. The amplitude of the light scattered or light blocked is measured and the particle is counted and binned into the correct size channel.

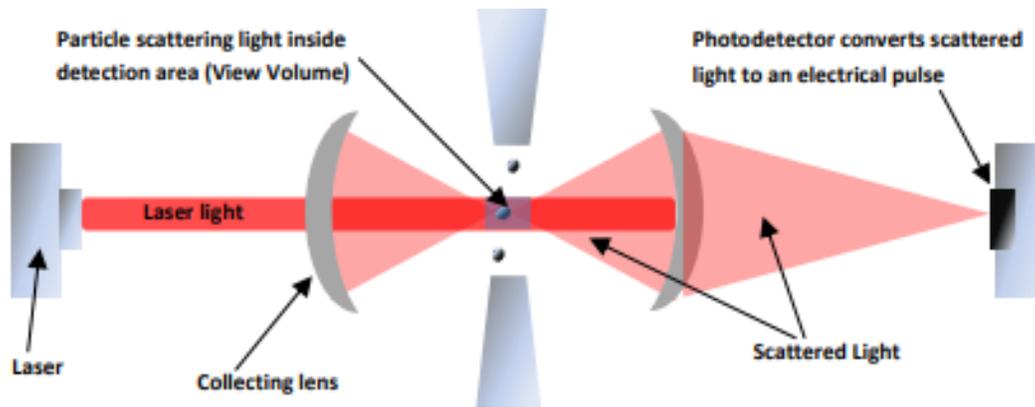
Batch Sampling Liquid Particle Counter



In-line remote Liquid Particle Counter

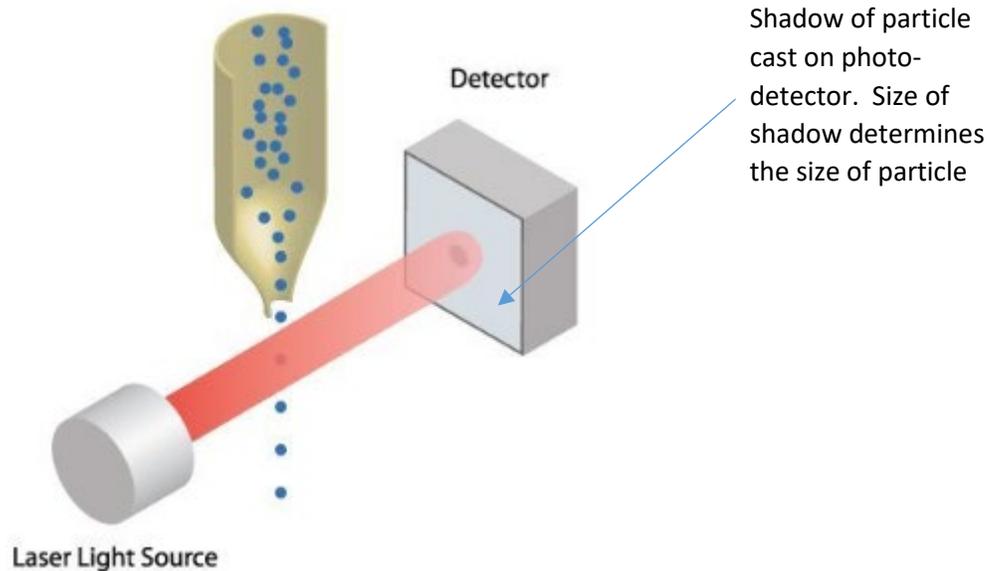


Light Scattering – How it works



A laser illuminates the particle sensor, as particles pass through the laser, the particle reflects light which is scattered and eventually focused onto a photo-detector. The photo-detector converts the light energy into a pulse (voltage) the magnitude of this voltage represents the size of the particle. Threshold circuitry sizes the particle into the correct channel

Light Blockage – How it works



Light blockage uses the absence of light to determine the size of the particle casting the shadow on the photo-detector. The concept is pretty simple with the area of the photo-detector known and the photo-detector voltage calculated. As the shadow of the particle falls on the photo-detector the resistance change causes a voltage drop which equates to the magnitude of the particle. Hence the ability to size the particle correctly.