

Why Buy an AccuSizer® SPOS System?

There are many reasons why your next particle analyzer should be an AccuSizer® system

WHAT IS THE ACCUSIZER SYSTEM?

A particle counter and size analyzer that uses the technique of single particle optical sizing (SPOS). Many configurations are possible but all systems include an SPOS sensor, a pulse height analyzer (or counter), and fluidics to transport the sample through the sensor. Many of the fluidics systems automatically dilute the sample to the optimum concentration for the most accurate results. Size distributions are reported in up to 1024 size channels.

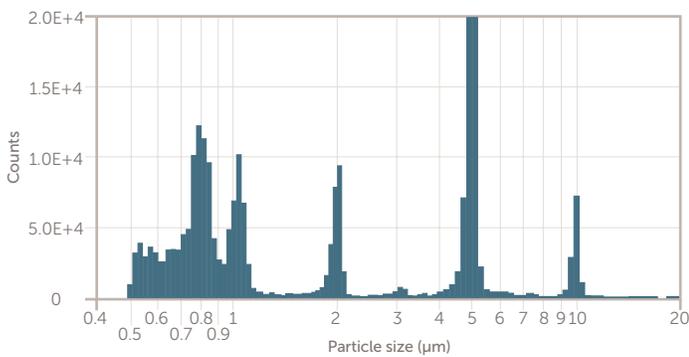


Figure 1. Six peaks resolved between 0.5 – 10 µm.

WHAT IS IT NOT?

This is not an ensemble technique like laser diffraction requiring physical properties like RI and a complicated de-convolution algorithm. Particles are directly sized and counted one at a time, providing inherently more accurate and higher resolution results than light scattering techniques.

WHAT ARE THE MAJOR BENEFITS OF THIS TECHNIQUE?

- Accuracy
 - Each particle is measured directly
- Concentration
 - Accurate particles/mL results
- Resolution
 - No distribution broadening
 - Split multiple peaks to baseline (Figure 1)
 - Detect small concentration of tails

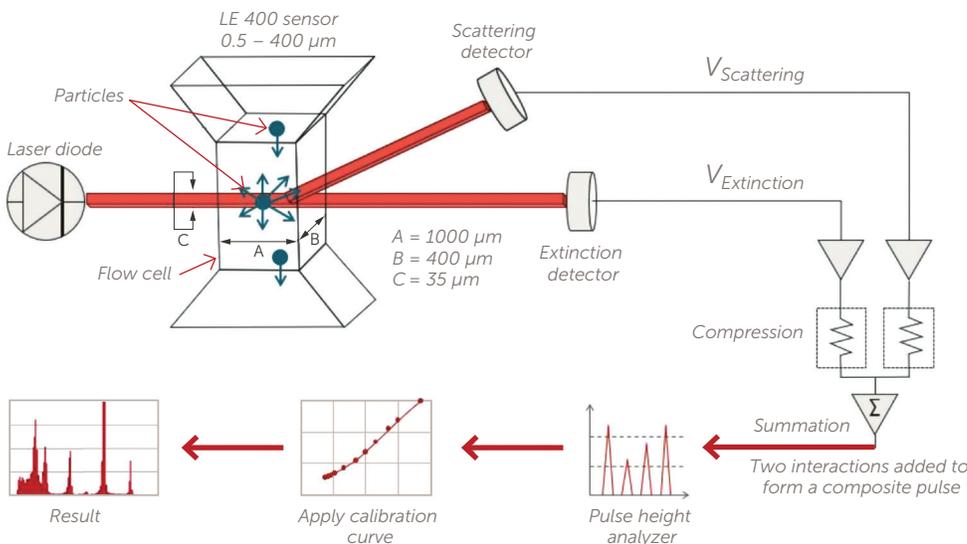


Figure 2. LE400 sensor/counter diagram.

Detection of tails is critical in many industries. If a few large particles outside of the main distribution are detrimental to product performance, why not use the technique with the highest sensitivity to large particle counts (LPC)? The AccuSizer SPOS system outperforms laser diffraction in detecting small concentrations of tail distributions.

The AccuSizer SPOS system incorporates many unique technologies including:

- Auto-dilution, single and multiple stages
- Sensor technology
 - Extinction + scattering LE sensors
 - Focused beam FX Nano sensors down to 150 nm
- Online capabilities custom to your process (AccuSizer Mini FX system, Figure 3)

WHO IS CURRENTLY USING THE ACCUSIZER SPOS SYSTEM?

The AccuSizer SPOS system is the industry standard in detecting tails in CMP slurry. The pharmaceutical industry uses the AccuSizer system to detect large particles (PFAT5) in lipid emulsions, for USP <788> testing, and for protein aggregation studies. Ink for inkjets, the list goes on, with thousands of installations worldwide across a range of industries.



Figure 3. AccuSizer Mini FX system.

ACCUSIZER SPOS SYSTEM ACCURACY

The most accurate way to create a particle size distribution is by measuring each particle individually. The AccuSizer system counts and sizes each particle that passes through the sensor inspection zone and builds the distribution one particle at a time. This creates an accurate, high-resolution result. Figure 4 shows a sample that passed through a 45 µm sieve. The blue AccuSizer SPOS system result clearly shows the truncated distribution while the red laser diffraction result broadens the distribution to include particles >100 µm that do not exist.

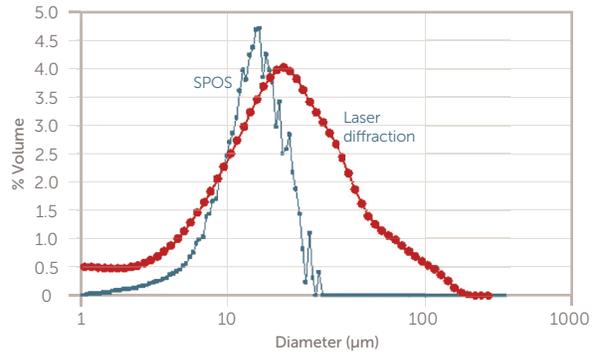


Figure 4. The AccuSizer system builds the distribution one particle at a time, providing accurate results.

A study published for the microelectronic industry¹ shows how the AccuSizer SPOS system performed vs. other techniques on the ability to detect a spike of 1 µm SiO₂ particles into a base silica, oxide CMP slurry. The AccuSizer system perturbation detection limit result was reported to be 0.07 mg/mL while the diffraction result (C) was reported to be 100 mg/mL – a difference of 1428X (Figure 5).

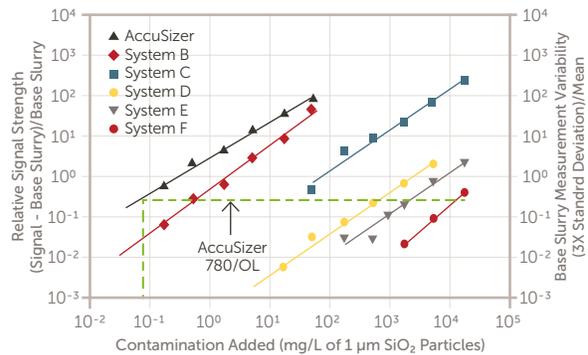


Figure 5. SiO₂ particle detection study.

Particle Concentration Diffraction Distribution

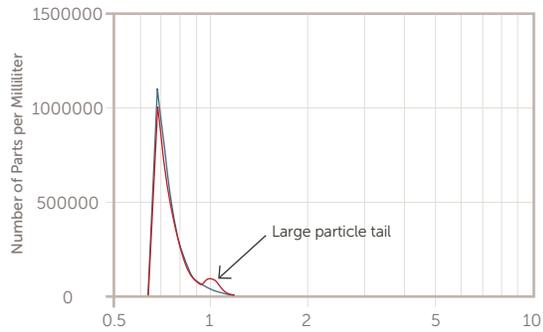


Figure 6a. AccuSizer system spiked CMP result.

Particle Size Distribution

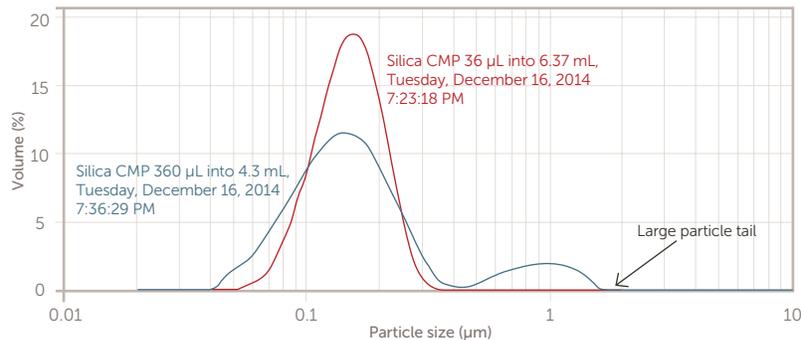


Figure 6b. Laser diffraction spiked CMP result.

In a study performed in 2013 we spiked a silica CMP slurry with a 1.36 μm PSL standard to determine the concentration required to detect the tail of large particles. The AccuSizer FX point-of-use (POU) system could detect the second population when 3.4 μL of PSL was injected into 250 mL of stock CMP slurry (Figure 6a).²

Figure 6b shows data from a laser diffraction analyzer before and after the spike was first detected when 360 μL was injected into 4.3 mL of stock CMP slurry. This represents a difference in detection limit of **615X**. Also note how the laser diffraction result broadens the 1.36 μm PSL standard distribution when it does finally detect the presence.

References

¹ Nichols, K., et. al., *Perturbation Detection Analysis: A Method for Comparing Instruments That Can Measure the Presence of Large Particles in CMP Slurry*, report published by BOC Edwards, Chaska, MN

² *Detecting Tails in CMP Slurries*, Entegris, August 2019 <https://www.entegris.com/content/dam/product-assets/accusizerspossystems/appnote-detecting-tails-cmp-slurries-10527.pdf>

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