

Using the Elzone[®] to Detect Low Numbers of Large or Agglomerated Particles

For some materials, determination of the mean and standard deviation of the particle size of a sample may not be sufficient. The presence of even a small amount of large or agglomerated particles can affect the product's performance. For example, many problems are encountered in materials such as abrasives, pigments, blood, inks, toners, and explosives when large or agglomerated particles go undetected.

The electrozone sensing method measures the size and number of particles that pass through an orifice. It is one of only a few techniques that can determine with accuracy the presence and amount of large or agglomerated particles. Other methods include microscopy and sieves, but both are very time-consuming. The Elzone employs the electrozone sensing method and can report data either as population (comparable to data from a microscope) or volume (comparable to sieve data).

The Elzone measures the volume of a particle by suspending the particles in a conductive solution. Into this solution is placed a tube with an orifice. An electrode inside the tube provides a current which passes through the orifice to an electrode on the outside of the tube. A slight vacuum causes the particles to pass through the orifice one at a time. A particle as it passes through the orifice displaces the liquid, causing the resistance between the electrodes to increase. This change of resistance is proportional to the volume of liquid displaced by the particle. The data are sent to a computer and reported as Spherical Equivalent Volume Diameter.

The Elzone's analysis method is unaffected by the sample's optical properties, shape, or density. The Elzone can analyze organic particles, inorganic particles, or a mixture of the two. It can also analyze samples at very low concentrations.

Analysis time, including sample preparation, depends on (1) the type of material being analyzed, and (2) the quantity of data required to show representative results. The majority of the analysis time usually is spent preparing the sample. Actual data collection takes as little as 30 seconds or as much as two minutes.

Data can be reported in many different formats depending on the type of information desired. The most popular type of report is that of a histogram showing the size distribution and percentages above or below certain sizes of interest.

To illustrate the Elzone's capability for detecting large particles, a sample of 40 grams was measured from a batch of processed calcium carbonate. A count of all particles larger than 45 μm was the objective. The sample was dispersed in 100 mL of electrolyte, placed into a beaker, and the analysis started.

The total number of particles in the diluted sample was determined and the population distribution converted to represent the number of particles larger than 45 μm . This count is the number of particles in the original measured portion of 40 grams. Analysis data are shown on page 2.

With this information, a determination of the number of large particles in any specified quantity of material can be made.

The example presented here is for a processed material. Raw or any other form of unprocessed material may require a different procedure.



