Analysis: My plant handles several materials. What types of particle size analyzers can handle a range of particle sizes?

Several particle techniques handle a range of particle sizes

Several particle analysis techniques can handle a wide range of particle sizes. For dry, flowable powders, digital image processing is a new particle sizing technique that can measure particles from 30 microns to over 30 millimeters in size. This automated technique can also provide shape information, which allows close correlation with existing techniques, such as sieving. It can also provide a dramatically increased understanding of material performance characteristics.

Laser diffraction particle sizing is a very flexible technique, covering a size range from 20 nanometers to 2 millimeters in 30 seconds. With the appropriate sampling systems, the samples can be tested either as a dry powder or as a slurry. Either approach includes the ability to disperse agglomerates. In addition, analysis can be automated to provide high throughput analyses or allow unattended operation.

Other techniques can be considered, depending on the sample material and the information desired.

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Optical particle sizing techniques

Twenty-five to 30 years ago particle measurements were typically taken in sieve sizes (22 to 1,000 microns). Today, advances in materials science, ceramics, nanotechnology, and biotechnology have stretched demands for measurements to a range as low as 1 nanometer and as high as many thousands of microns. Optical particle sizing techniques include electron microscopy, diffraction, and dynamic light scattering and imaging. Each technology's strength lies in a different particle size range.

Electron microscopy, offering an approximate measurement range of 0.0001 to 50 microns, is primarily used as a research tool because of its high investment cost. Scanning electron microscopes can be less costly than transmission electron microscopes, but then sacrifice the nanometer range capabilities. Both technologies offer information on the smallest size present, agglomeration, topography, elemental analysis, and aspect ratio.

Diffraction is best used for particles in the 0.2 to 3,000 micron size range. Configuration issues (optical focal length) as well as the need to suspend the particles in a fluid impose the upper size limits on these instruments. Systems that can measure particles in a dry state offer greater versatility. Some manufacturers extend their instrument's low-range capabilities (0.04 microns) by using multiple light sources, detectors, and complex mathematical formulas.

Dynamic light scattering is primarily used for particles in the size range of 0.001 to 1.0 microns (nanometer range). This is because most particles larger than 1 micron will settle and be removed from the sensing area before a measurement is completed. However, the ability to measure to 1 nanometer allows you to measure a vast array of new materials borne from specialized elemental atomization, biosynthesis, and developing pharmaceutical applications.

Imaging techniques using CCD cameras are especially useful for large particle sizes from 30 to 15,000 microns. In some cases, these devices can provide aspect ratios as well as particle size and other particle-size-related computations.

Optical technology has advanced to make measurements in any particle size range quite easy, affordable, and available to most companies that deal with material technologies. You must make a careful evaluation of your application to select the proper instrument to meet your company's needs.

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