

FlowCAM®: Particle Analysis for the Food & Beverage Industries

What's in your recipe? No matter what part you play in the food chain, knowing your ingredients is critical. Most particle analyzers show you a distribution of particle size only. FlowCAM® is the imaging-based particle analysis system that gives you a picture *and* data for every particle measured. VisualSpreadsheet® software allows you to interactively view every particle image contained in the distribution.

Filter and sort particle images just like you would in a spreadsheet. Use powerful pattern recognition algorithms to identify and quantitate individual particle types in a heterogeneous sample. Ensure the contents of your product, detect process flaws early, and enhance R&D efforts using the FlowCAM.

FlowCAM can be used in both R&D and production settings for analysis of:

- Hydrocolloids
- Encapsulated products
- Carbohydrates
- Emulsions
- Gums
- Fibers
- Beverages
- Stabilizers
- Extraneous matter
- Flavorings

FlowCAM automatically captures microscopic digital images of particles in a fluid stream. Each particle is stored as a separate image and indexed to a row in a spreadsheet containing up to 26 discrete measurements, both morphological (such as length, width, transparency, and circularity) and spectral (gray-scale, color, transparency, etc.) collected from the image. This large number of measurements made for each particle enables sophisticated pattern recognition algorithms to identify subtle differences between particles, much like the human eye can discern through a microscope. But unlike traditional microscopy, the FlowCAM can perform this type of analysis automatically on thousands of particles per minute, greatly increasing the statistical confidence of the results.

Figure 1 shows an example of typical particle images captured by FlowCAM. The sample in this case was a

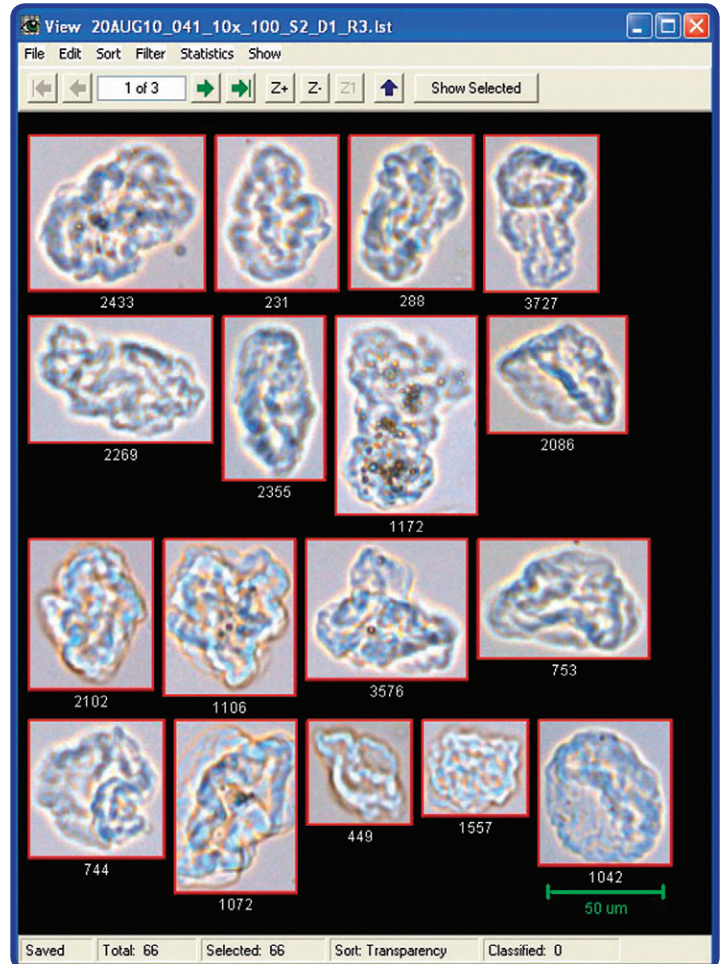


Figure 1: FlowCAM images of barbecue sauce pulp

barbecue sauce, and the manufacturer was interested in quantifying these particular particles, which are pulp from one of the ingredients. It is desired that these particles be relatively uniform in size and shape after mixing and homogenization, as this greatly affects taste and mouthfeel.

In order to isolate these particles from all of the others in the sample, a “library” of typical particles of the desired type was built and stored. The VisualSpreadsheet® software is then used to perform a statistical pattern recognition operation, in which every particle in the heterogeneous sample is compared against the library, and only particles which “match” the library are returned. **Figure 1** shows the result returned from this analysis, where 55 particles out of several thousand total were determined to be of the desired type. This yields concentration and summary statistics for the desired particles only, omitting the other particles in the sample.

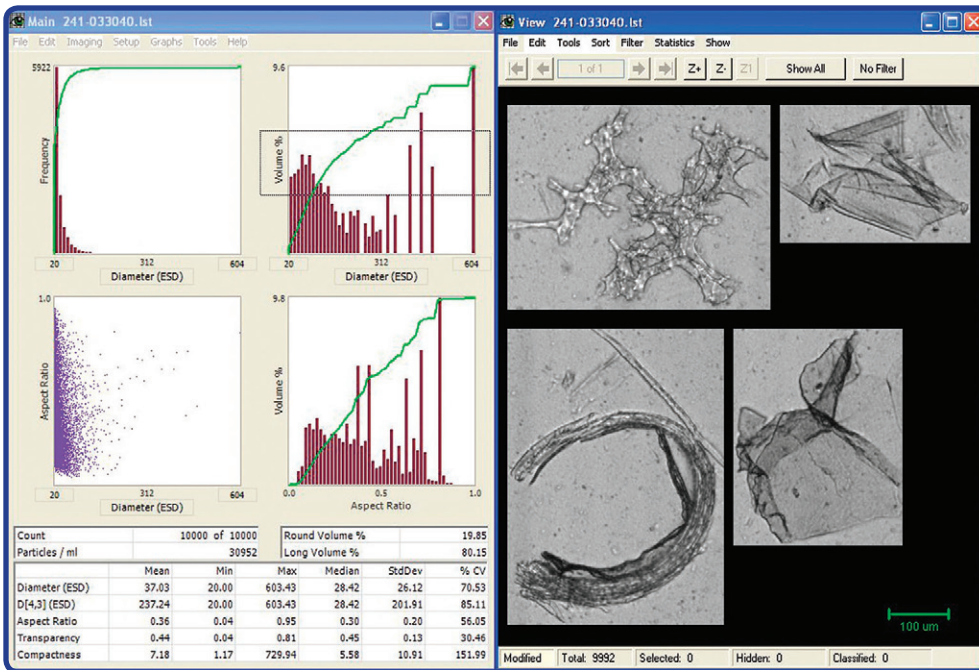


Figure 2: Results of FlowCAM run with fruit juice sample. Left-hand window shows summary statistics and graphs. Right-hand window shows selected images of juice pulp.

FlowCAM® Basic Features:

- Particle Size Range: 2µm to 2mm
- Basic Measurements: size (ESD), length, width, aspect ratio, volume, area
- Advanced Measurements: circularity, elongation, compactness, perimeter, convex perimeter
- Gray-Scale or Color (optional) measurements: average intensity, sigma intensity, transparency, average red/green/blue, color ratios
- System options: cross-polarized illumination, laser-scattered triggering, fluorescence triggering, high-precision syringe pump, front and back illumination

This same statistical comparison can then be performed on other samples for comparison, eliminating the operator bias and error found in manual microscopy. Additionally, since many more particles can be counted in much less time, the statistical confidence of the results will be much higher. By using this type of automated analysis with FlowCAM, the manufacturer can rapidly study the effects of several different variables in the manufacturing process, such as mixer speed, homogenization time, temperature, etc.

Figure 2 shows the results of a FlowCAM run with a fruit juice concentrate. In this example, the beverage manufacturer was interested in characterizing size, shape and concentration of large pulp particles in the concentrate. This was formerly done manually by hand, and was very time-consuming.

Figure 3 shows the results of a FlowCAM analysis of raw sorbitol. Sorbitol has many uses, the most common being as a sugar substitute, and its application is often dependant upon particle size and shape. FlowCAM permits rapid QA of incoming raw materials such as sorbitol.

These are just a few examples of how FlowCAM is being used in the food & beverage marketplace. Our laboratory has experience with many different food and beverage products. We invite you to submit a sample to us today to see how imaging particle analysis can help you in formulation R&D and quality applications.

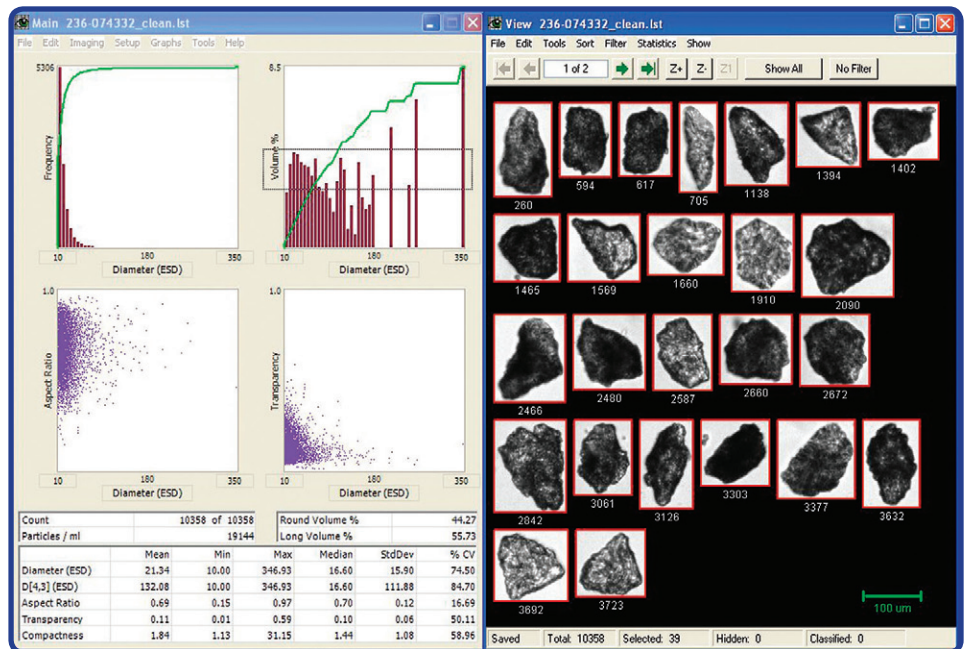


Figure 3: Results of FlowCAM run with Sorbitol sample. Left-hand window shows summary statistics and graphs. Right-hand window shows selected images of sorbitol particles.