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PROCESS TECHNOLOGY

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Lab Test Report

Company:

Canty Glass Beads

Contacts:

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Sample Identity-

Granular glass beads, -1 through -6 described as:

SAM-1	Glass beads, Fine
SAM-2	Glass beads, Medium
SAM-3	Glass beadsCoarse

Purpose:

The glass beads were sized using a Canty Solidsizer sensor and CantyVision Particle Size Analysis software. Measurement results are presented in graphical form for easy comparison of multiple CantyVision runs. Particle Shape information in the form of aspect ratio is presented also.

Lab Setup:

The samples provided were analyzed using a Canty Laboratory Solidsizer™ sensor, shown in Figure 1. The granular material enters the sensor at the input tube seen at the top left in the illustration. The adjustable down tube deposits a thin layer of granules on a vibrating feeder tray. The granules travel along the tray and drop in a thin curtain at the discharge end of the tray. A camera observes the falling curtain of particles. The camera output for the free falling particles is a silhouette image of each particle. The Canty Vector running the CantyVision Software processes these images.

Figure 1, Canty Laboratory Solidsizer™ sensor assembly includes light source and camera-lens

Calibration:

The SolidSizer sensor optical magnification can be adjusted over a wide range. For this application, magnification was adjusted to a magnification to permit detection of the smallest particles. A pixel scale factor of 7.48146 micron per pixel was used for all sample material. The resulting process image field of view is 4.788 mm horizontal by 3.591 mm vertical and the solid particles appear dark with a bright background.

Results:

Figure 2 shows a typical process image captured for SAM-2 medium sized particles in the SolidSizer. The test scan processing for the Figure 2 image in seen in Figure 3 illustrating how the Canty Software separates the particles from the background and measures the Area, Perimeter, Major Axis, and Minor Axis for each detected particle. The table included in this screen image lists the dimensions of the particles imaged in the figure. The image also contains a selected individual particle, which is identified by a yellow box surrounding it. The dimensions of this particular particle are shown on the first row of the table. This data (area, perimeter, major axis and minor axis) is written to a text file during each run time and evaluated using a Microsoft Excel template. From these data measurements, plots can be created using either major or minor axis as a size basis. For comparison to the sieve screen data, minor axis has been selected for reporting here.

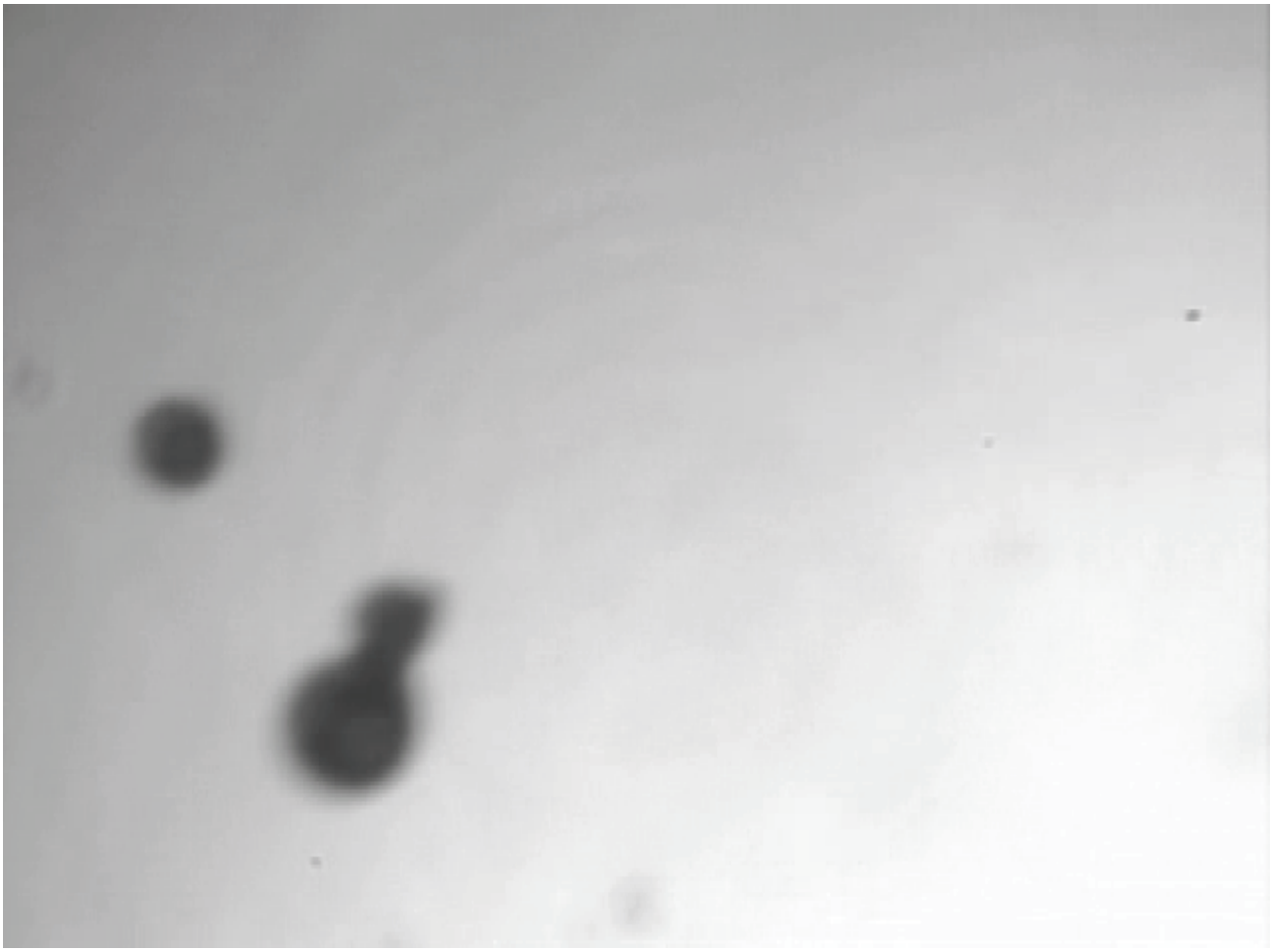

Figure 2, Typical Process Image of SAM-2 medium sized particles

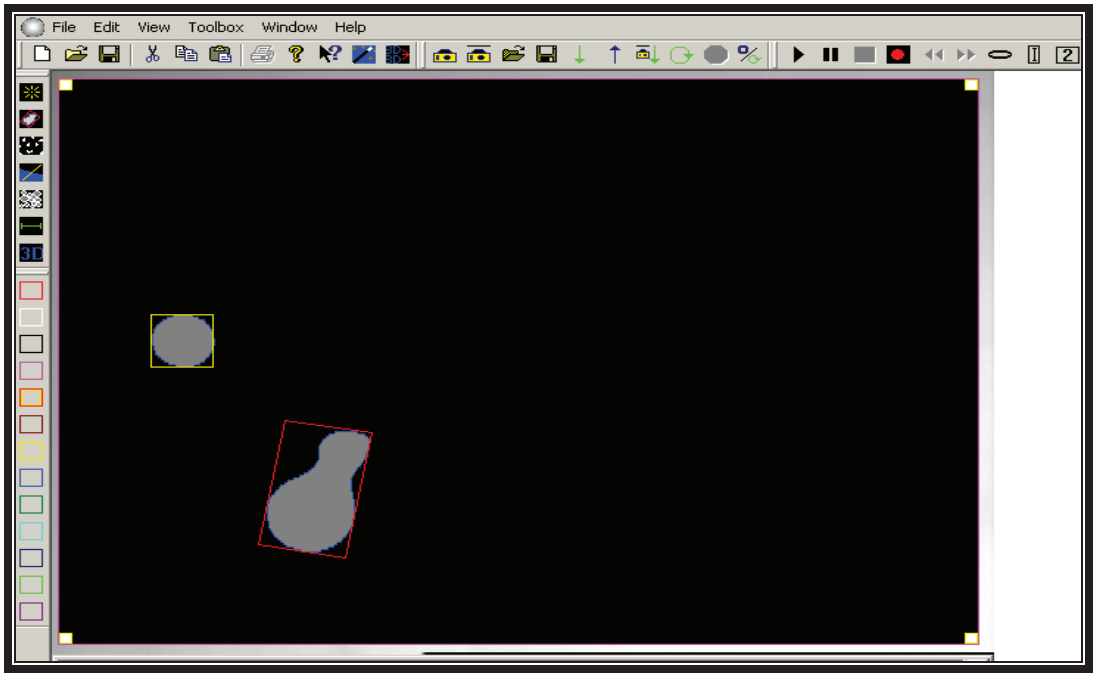

Figure 3, Test Scan of Figure 2 by Canty Vision Software detects seven particles

Particle Sizing Static Scan Results

Particle #	Area	Perimeter	Major Axis	Minor Axis	R	G	B	Y	U	V	Aspect Ratio	Perimeter Gradient	Percent Fill
1	37621.2377	765.0646	219.9160	214.9179	0.0	0.0	0.0	89.28	0.0	0.0	1.0233	56.26	79.60
2	108217.2655	1497.1868	525.2722	305.5710	0.0	0.0	0.0	81.68	0.0	0.0	1.7190	65.84	67.42

Figure 4, Test Scan results seen in Figure 3 show particle size in Micron.

The top left particle was selected by clicking on the particle. Any selected particle is moved to top of Results listing in Figure 4, and is highlighted blue to allow careful identification of each particle. When these visual verify functions seen in Figure 3 and 4 are satisfactory, a measurement data run of the sample is started to gather a full data set for about 3,000 particles.

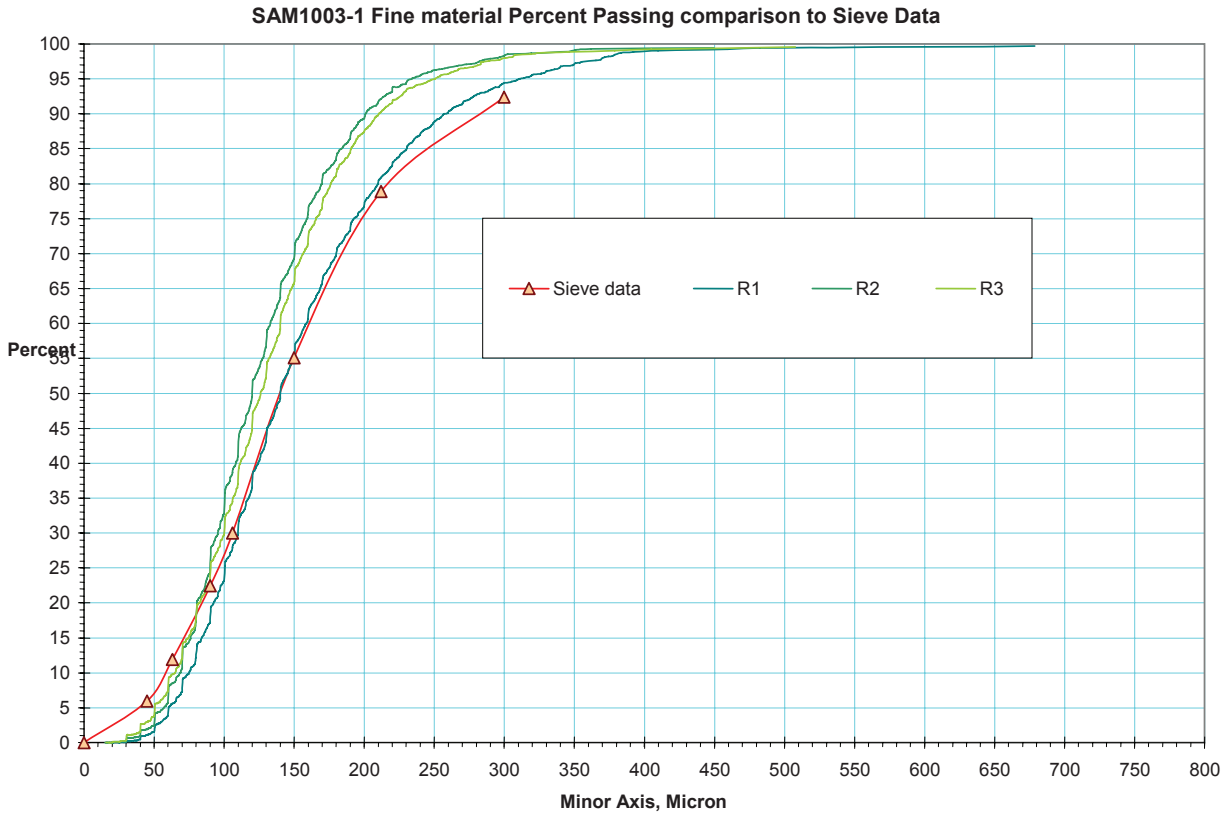

Figure 5, Size distribution Results, SAM-1

Figure 6, Fine Material Aspect Ratio Distribution by Volume Percent Passing

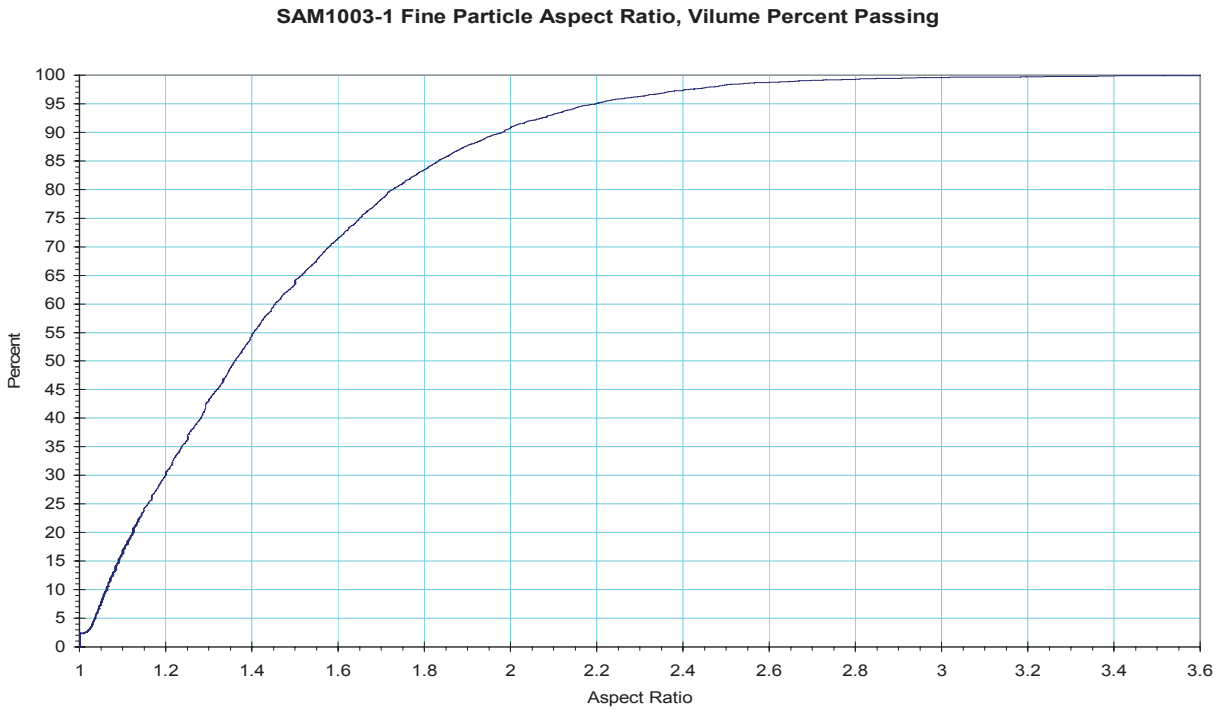

Figure 7, Aspect Ratio distribution, SAM-1

Table 1, Summary for three runs SAM-1, Microns

	Size, Micron at Percent Passing		
Run	**D10**	**D50**	**D90**
R1	74.47	140.44	256.4
R2	68.47	119.95	200.92
R3	64.975	125.95	210.42
Average	69.305	128.78	222.58
STD DEV	4.802	10.534	29.672

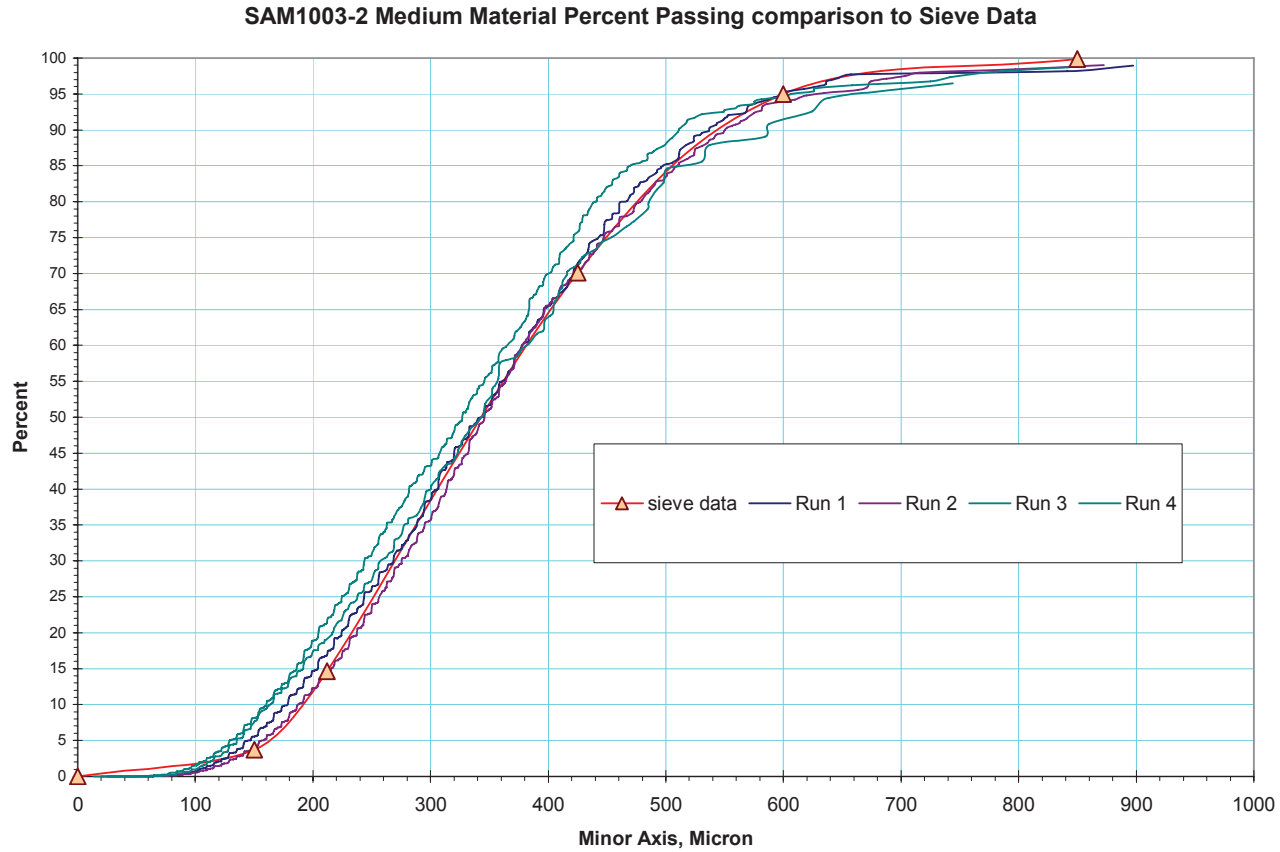

Figure 8, Size distribution Results, SAM-2

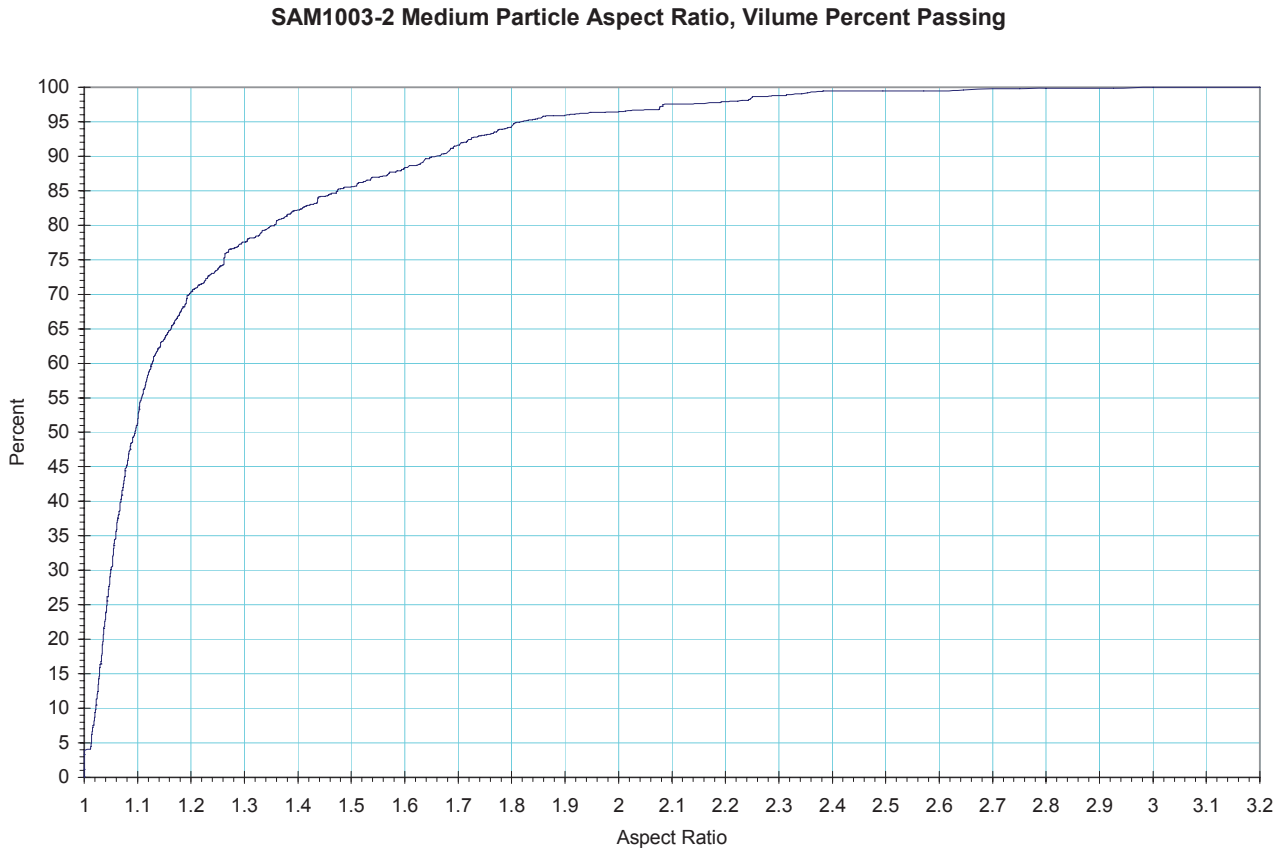

Figure 9, Medium Material Aspect Ratio Distribution by Volume Percent Passing

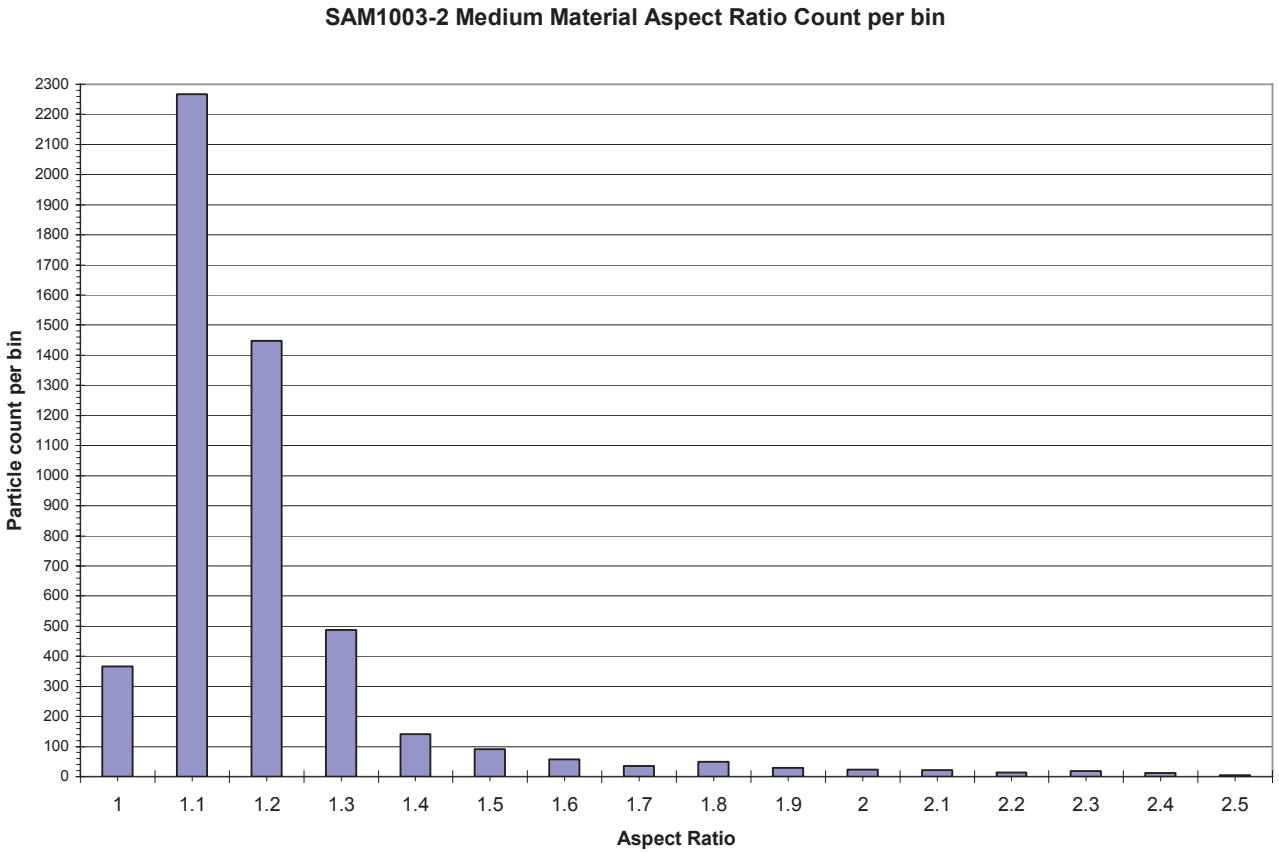

Figure 10, Aspect Ratio distribution, SAM-2

Table 2, Summary for four runs SAM-2, Microns

	Size, Micron at Percent Passing		
Run	**D10**	**D50**	**D90**
R1	178.18	344.23	536.46
R2	187.12	345.51	549.87
R3	160.30	326.35	510.92
R4	162.85	341.68	584.36
Average	172.115	339.440	545.403
STD DEV	13.658	10.712	19.791

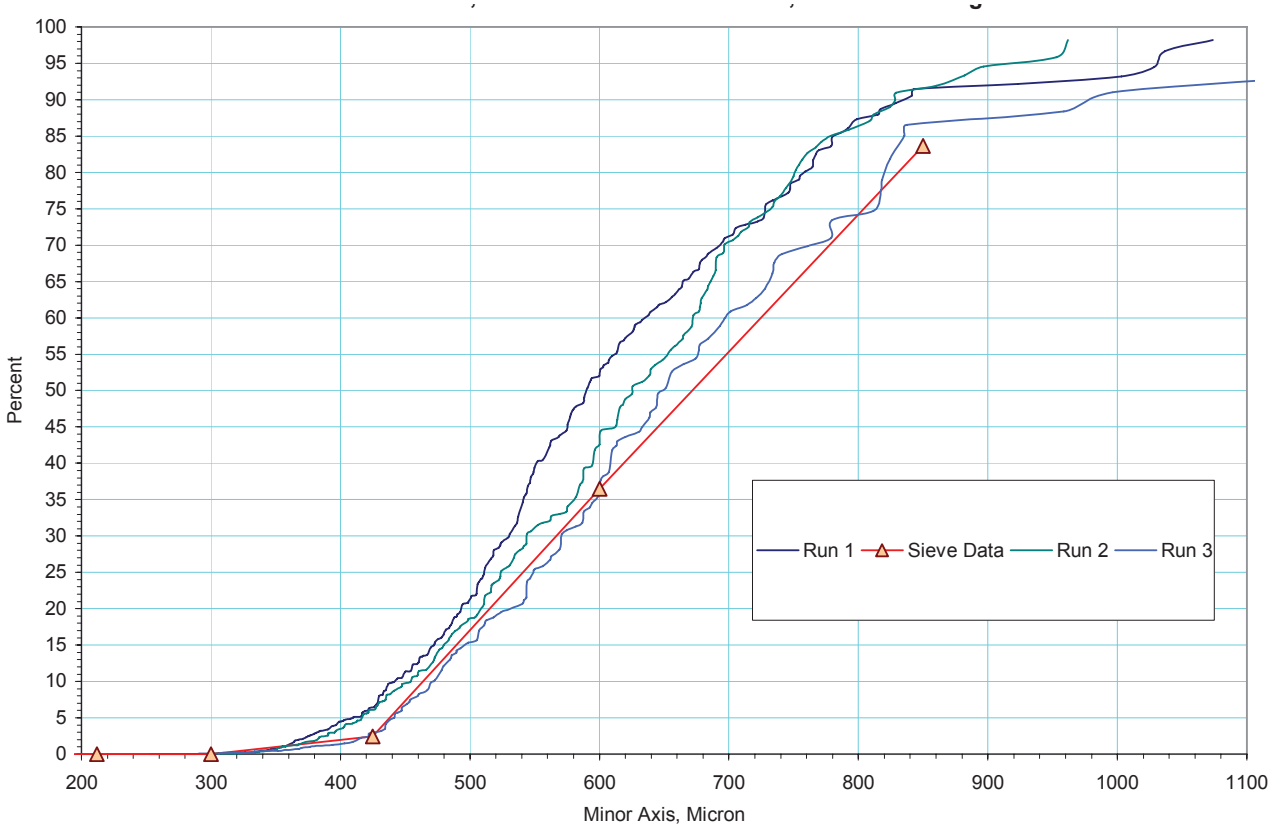

Figure 11, Size distribution Results, SAM-3

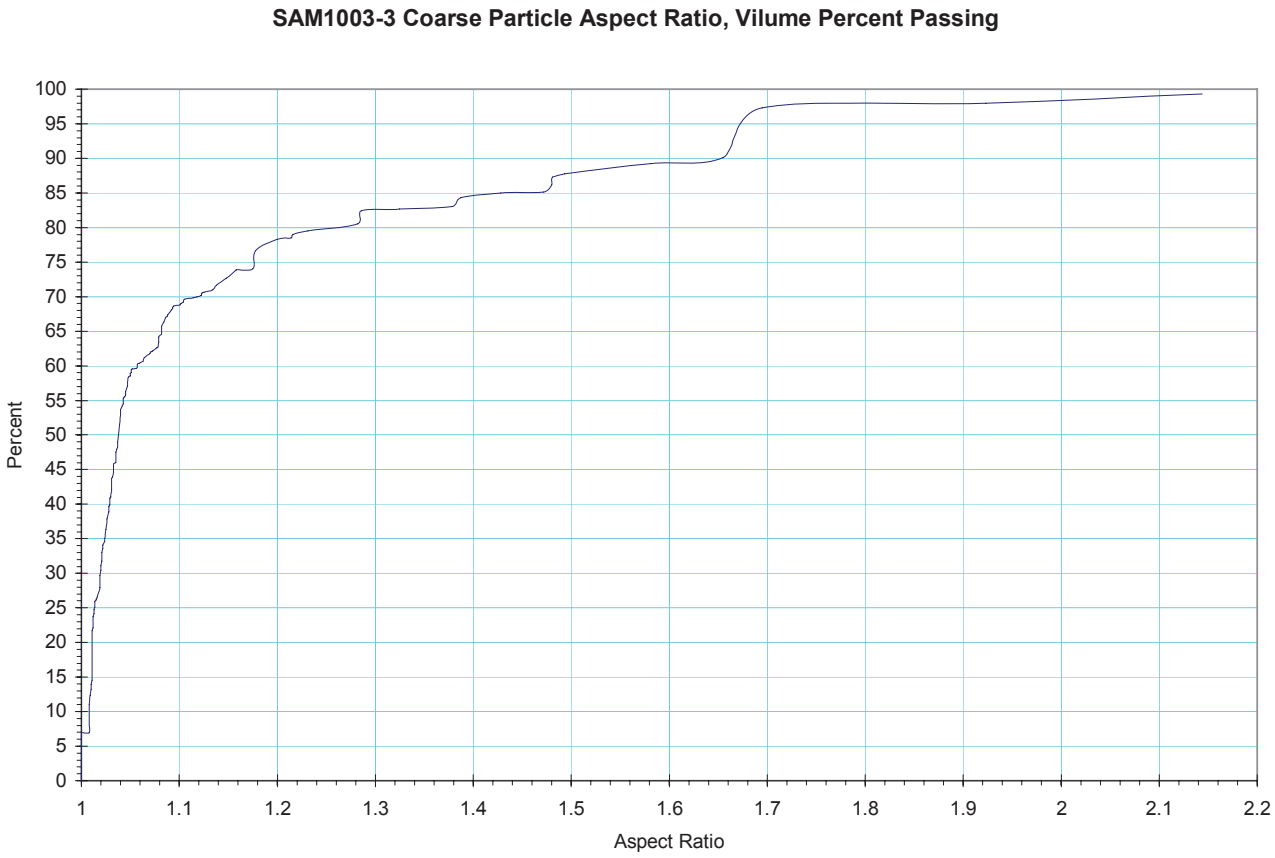

Figure 12, Coarse Material Aspect Ratio Distribution by Volume Percent Passing

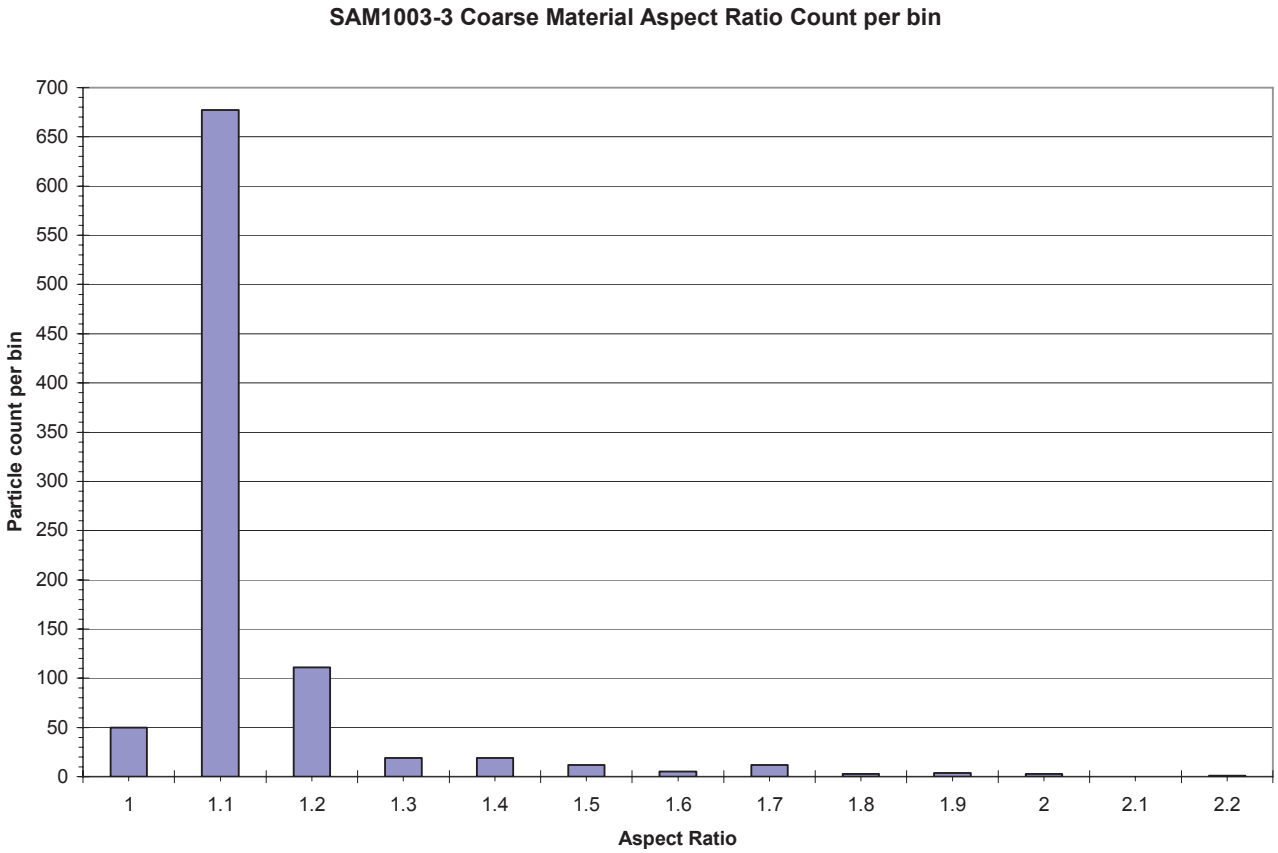

Figure 13, Aspect Ratio distribution, SAM-3

Table 3, Summary for three runs SAM1003-3, Microns

	Size, Micron at Percent Passing		
Run	**D10**	**D50**	**D90**
R1	441.5522	590.0407	834.488
R2	454.1953	625.4871	828.3648
R3	471.3091	648.4539	981.3413
Average	455.6855	621.3272	881.3981
STD DEV	14.93429	29.42793	86.60754

Discussion:

The comparisons between Vector measurement runs for each sample material shows repeatability for the SolidSizer measurement. The summary tables show the Average and Standard Deviation for the D10, D50 and D90 percent passing values. The D10 size is where 10 percent of the material is smaller than the size given, and D50 is the median size where 50 percent is smaller, and 50 percent is larger. The Standard Deviation at these three sizes characterizes the variation seen from curve in the data plots with a numerical value. The plots show close overlay of the sieve and the Vector measurements. The Aspect Ratio measured by the Vector for each of the three materials is shown as both volume basis and count basis format. There is no sieve like data for comparison to these measurements.

Conclusions:

The Canty Vision Technology using the SolidSizer sensor and the Vector vision processor provides a Particle Size Distribution that compares very well with sieve data received with the samples. The CANTY equipment provides excellent images for particle observation and shape analysis and can be used to characterize particles equally well in either online or lab environment.