

Lab Test Report

Company:

Canty Ore Processing

Sample Identity- Granular Metal Powders, -1 through -7 described as:

1	fine metal powder, lot 49654
2	fine metal powder, lot 40875
3	fine metal powder, lot 50210
4	fine metal powder, lot 49892
5	fine metal powder, lot 51342
6	fine metal powder, lot 37595
7	fine metal powder, lot 36611

Purpose:

Particle information desired from the analysis includes particle size and aspect ratio. Data provided as standard includes minor diameter, major diameter, aspect ratio, perimeter and area. Canty software provides additional filters to assess particle shape that may reveal more information about the particle; i.e. roundness factors can be used to judge the abrasiveness of particles better than aspect ratio.

Lab Setup:

The samples provided were analyzed using a Canty SolidSizer sensor, shown in Figure 1. The granular material enters the sensor at the flange fitting seen at the top left in the illustration. An 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 in front of a lighted panel. The Canty Vector running the CantyVision Software processes these images.



Figure 1, SOLIDSIZER™ Industrial Solid Particle Analysis System 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 12.939 micron per pixel was used for all sample material. The resulting process image field of view is 8.28 mm horizontal by 6.21 mm vertical and the solid particles appear dark with a bright background.

Results:

Figure 2 shows a typical process image captured for sample-2 in the SolidSizer. The test scan processing for the Figure 2 image is 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.

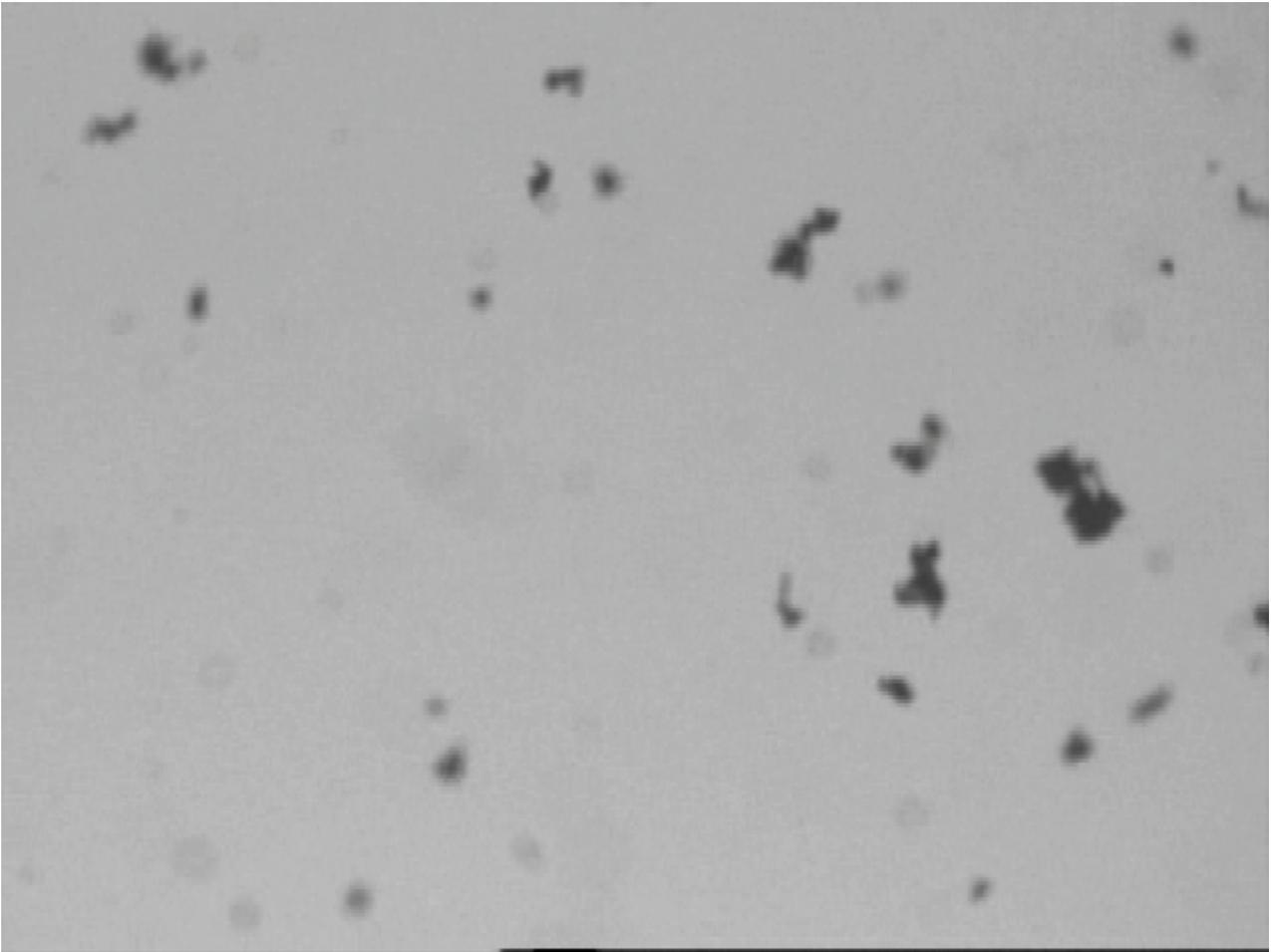


Figure 2, Typical Process Image of Sample 2 Particles Taken During Analysis

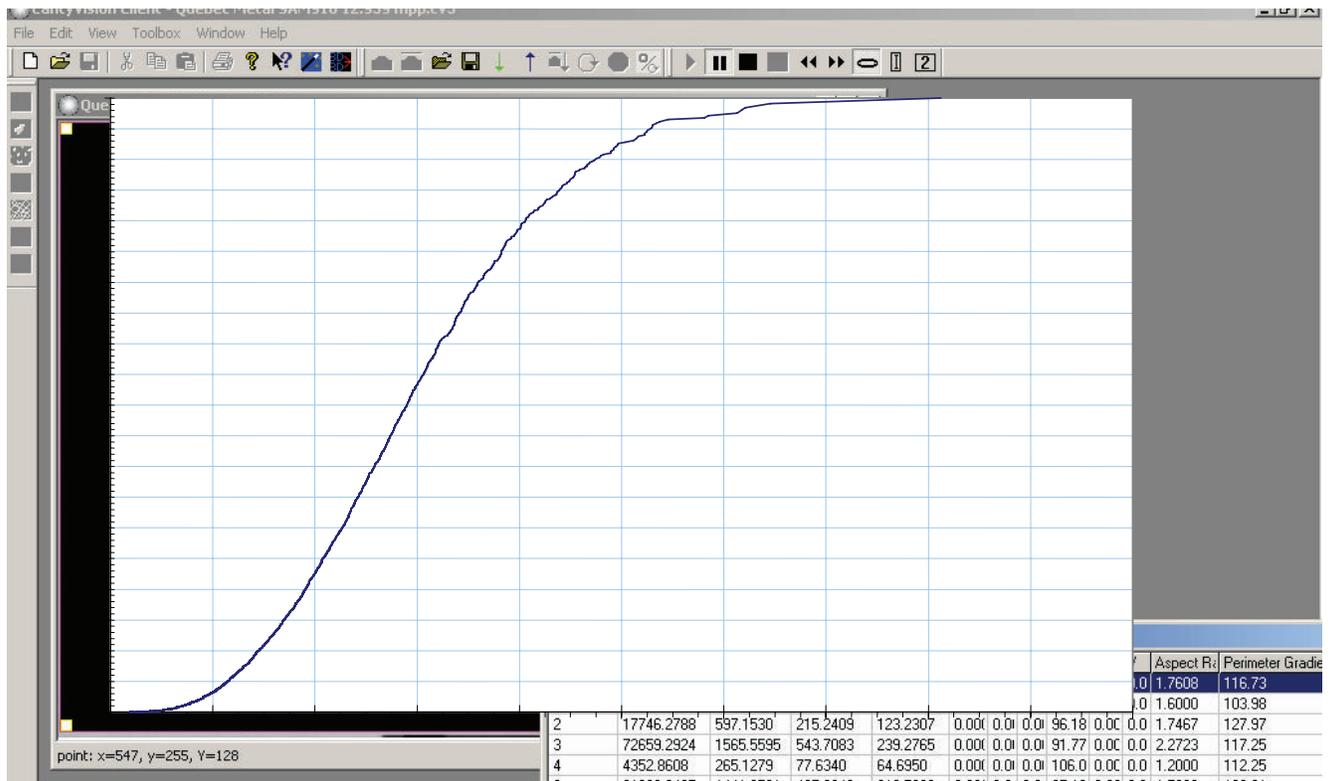


Figure 4, Test Scan of Figure 3 by Cauty Vision Software detects seven particles

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	20090.1269	666.3249	207.0240	129.3900	0.00	0.00	0.00	102.3	0.00	0.00	1.6000	103.98	75.00
2	17746.2788	597.1530	215.2409	123.2307	0.00	0.00	0.00	96.18	0.00	0.00	1.7467	127.97	66.91
3	72659.2924	1565.5595	543.7083	239.2765	0.00	0.00	0.00	91.77	0.00	0.00	2.2723	117.25	55.85
4	4352.8608	265.1279	77.6340	64.6950	0.00	0.00	0.00	106.0	0.00	0.00	1.2000	112.25	86.67
5	169761.5725	2160.4378	650.5081	369.4416	0.00	0.00	0.00	81.80	0.00	0.00	1.7608	116.73	70.64
6	81699.8495	1441.0501	465.8040	310.5360	0.00	0.00	0.00	87.12	0.00	0.00	1.5000	133.81	56.48
7	19085.6206	610.9873	213.7636	138.6752	0.00	0.00	0.00	95.47	0.00	0.00	1.5415	131.00	64.38

Figure 5, Test Scan results seen in Figure 4 show particle size in Micron.

The largest particle was selected by clicking on the particle. The 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 4 and 5 are satisfactory, a measurement data run of the sample is started to gather a full data set for about 10,000 particles.

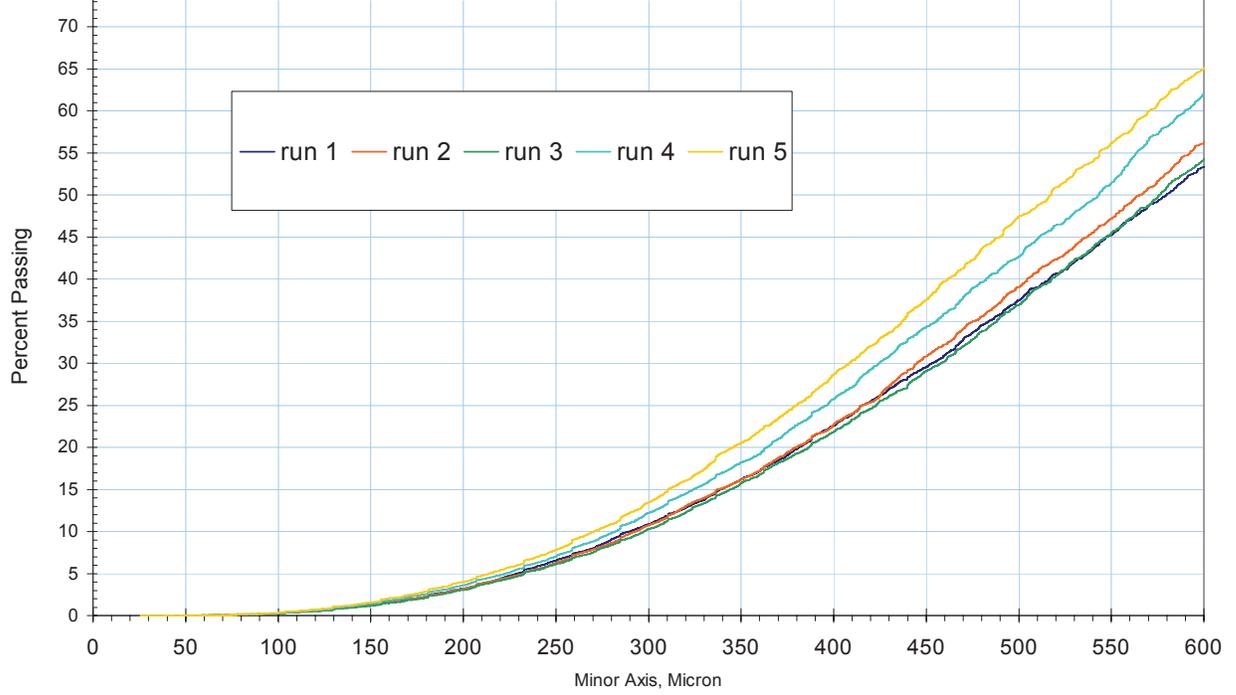


Figure 6, Size distribution Results, smallest size range only

Table 1, Summary for five runs SAM918-1, Microns

Run	D10	D50	D90
1	290.2	579.7	946.9
2	294	565	912.9
3	299.1	575.7	1015
4	283.2	543.1	877.4
5	269.9	517	834
AVG	284.0667	545.2667	908.8
STD DEV	14.61928	29.40992	94.4972

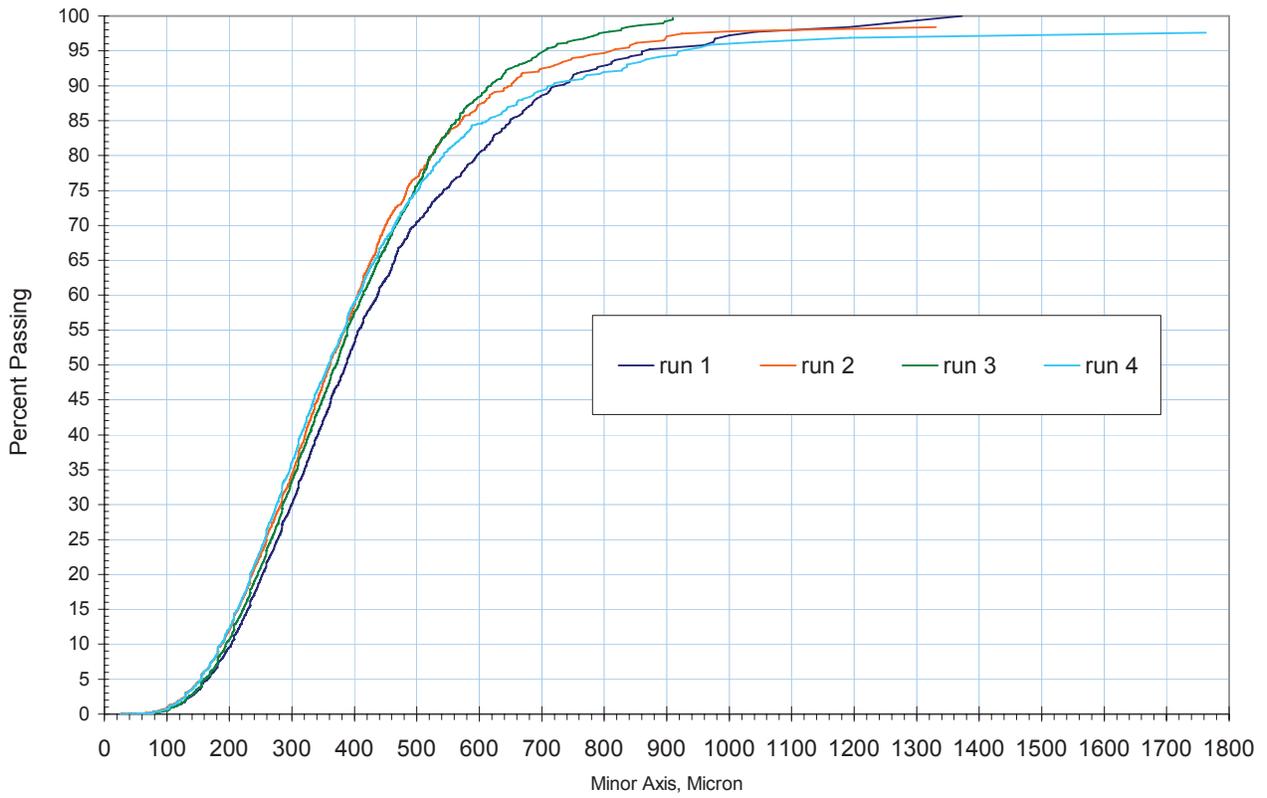


Figure 8, Size distribution Results, SAM-2

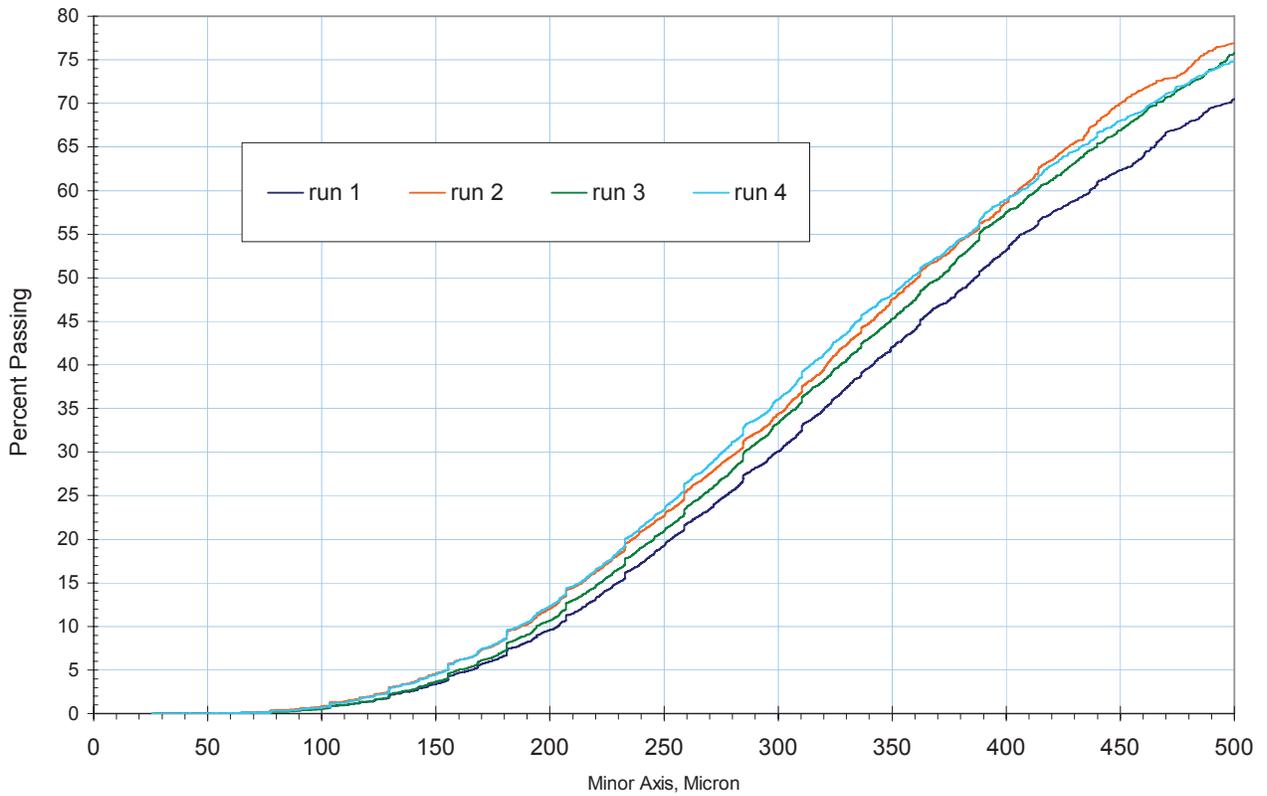


Figure 9, re-plot of Figure 8 Chart expanded to show smallest size range only

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

Run	D10	D50	D90
1	204.1	386.3	723.3
2	187.9	361.1	645.2
3	194.9	370.7	618.3
4	186.8	358.8	709.3
AVG	190.85	364.75	663.8
STD DEV	5.727565	8.414571	64.34672

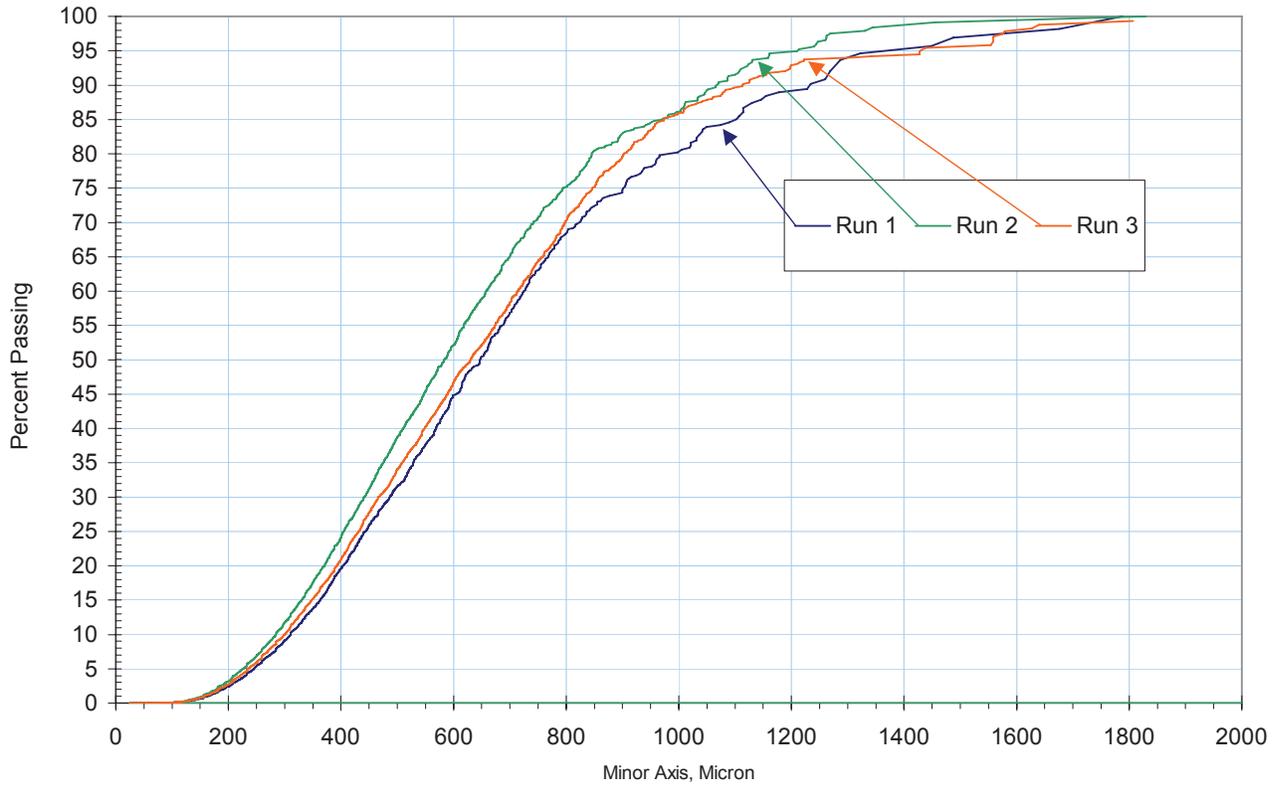


Figure 10, Size distribution Results, SAM-3

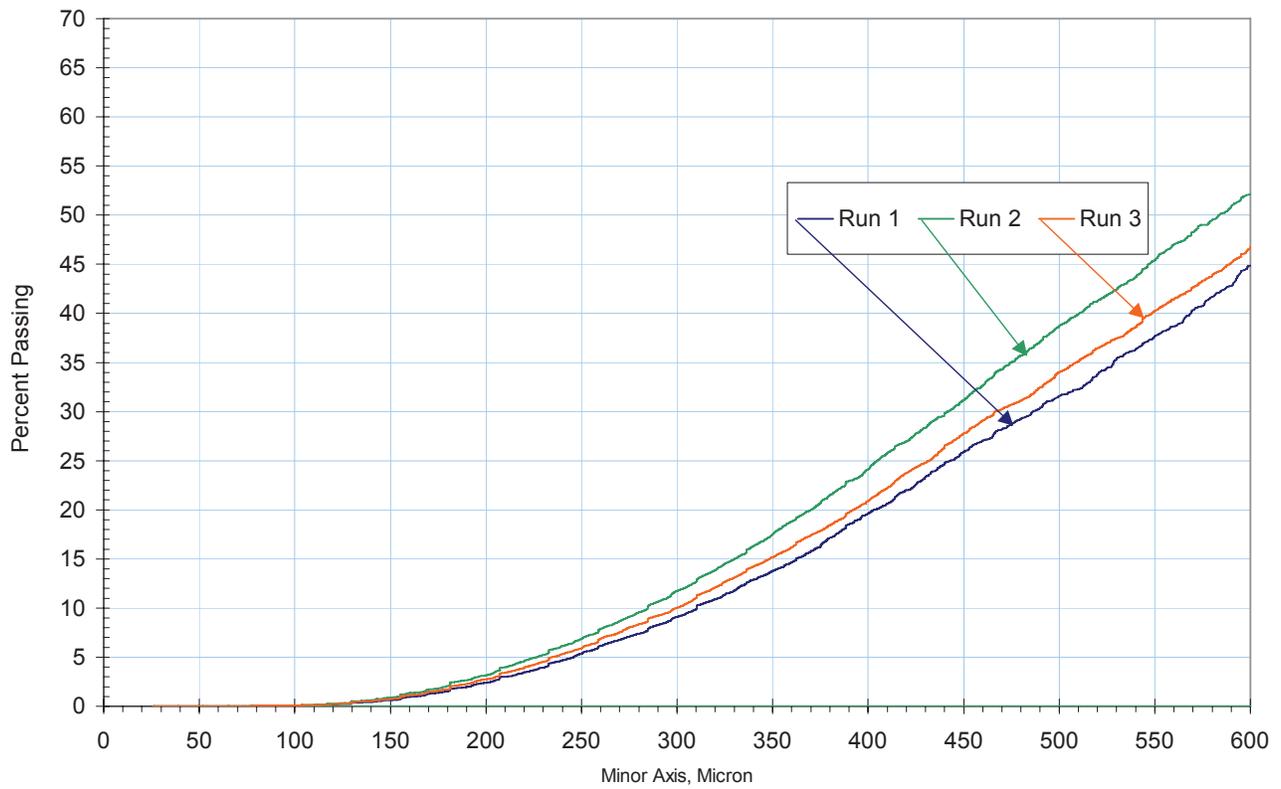


Figure 11, re-plot of Figure 10 Chart expanded to show smallest size range only

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

Run	D10	D50	D90
1	284.7	583.7	1070
2	299	630.3	1113
3	311	647	1234
AVG	298.2333	620.3333	1139
STD DEV	13.16675	32.80584	85.03529

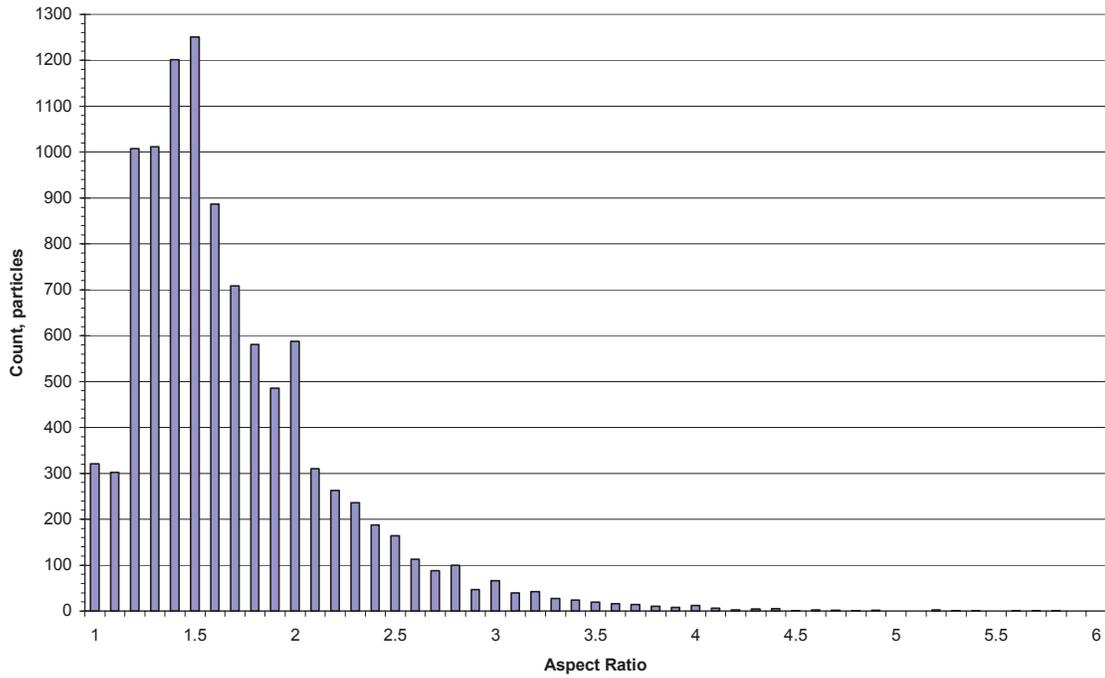


Figure 12, Aspect Ratio distribution, SAM-1

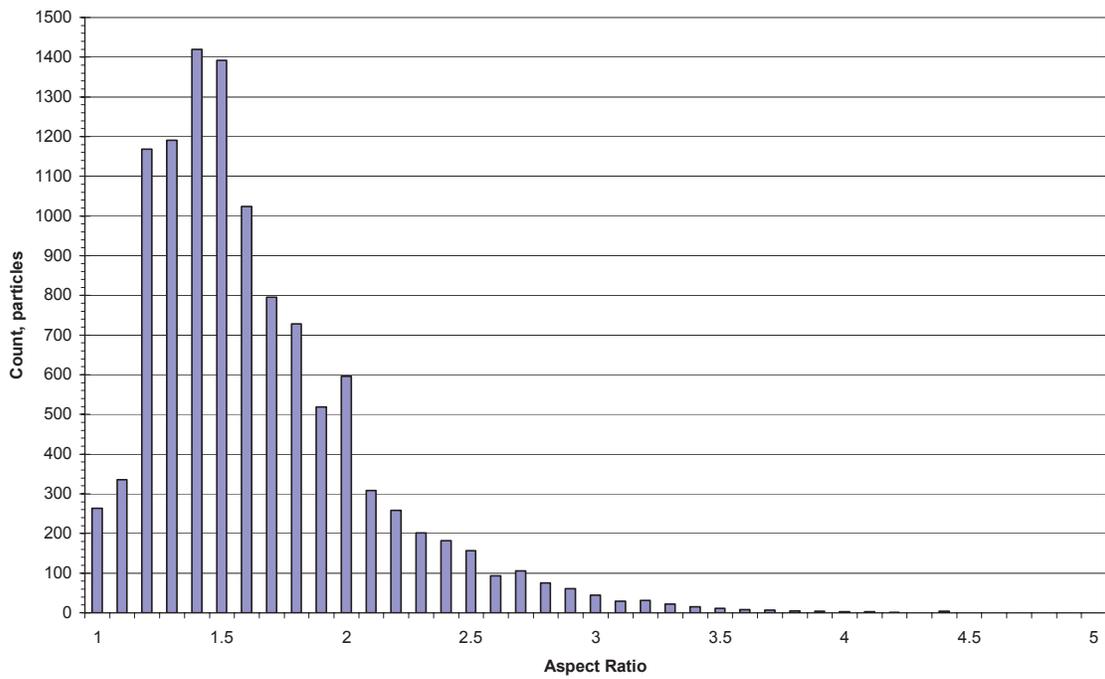


Figure 13, Aspect Ratio distribution, SAM-2

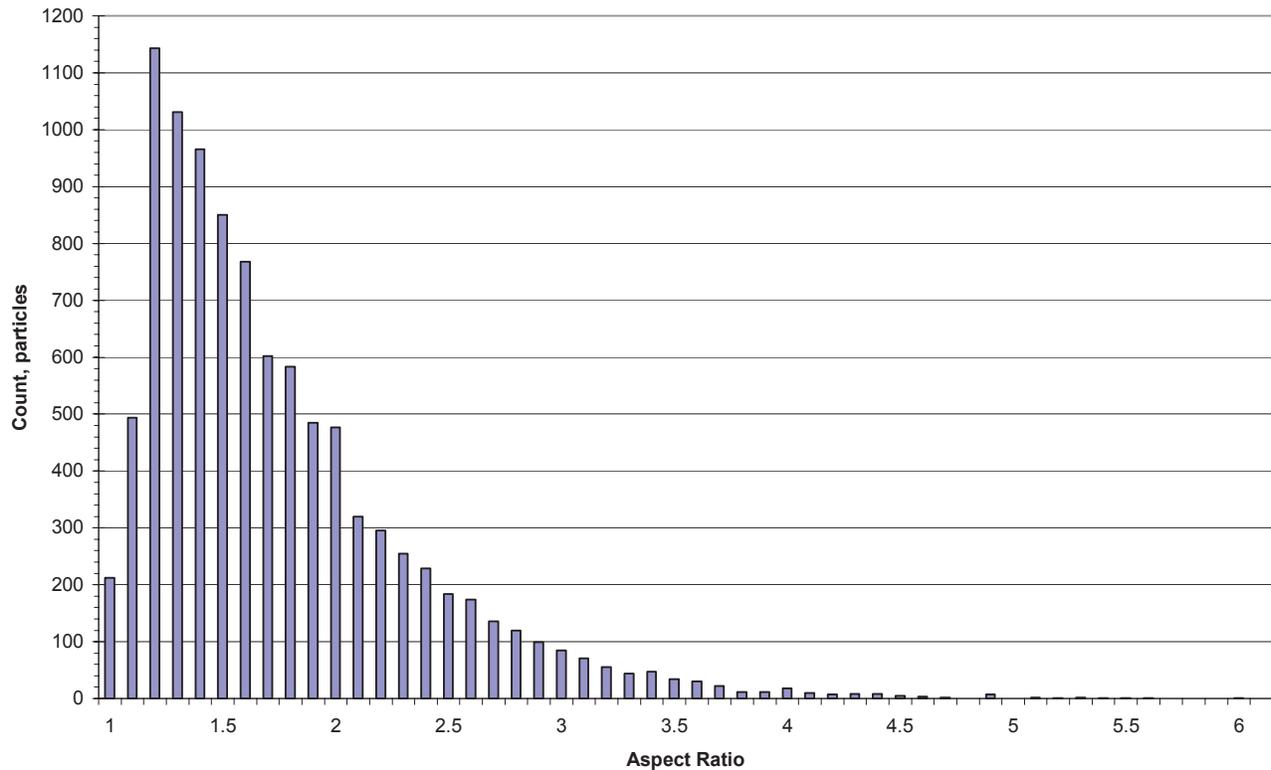


Figure 14, Aspect Ratio distribution, SAM-3

Discussion:

The SolidSizer results show good repeatability between runs and distinguish the individual samples from each other. Repeatability for the unit is greater than 1% for spherical particles. When dealing with odd shaped particles, the visual aspect of the Cauty system allows a much more complete analysis of the particle character; i.e. aspect ratio, roundness, perimeter, area and countless ratios (perimeter/area for example) that can be detailed to specific processes to allow much more specific information to be drawn for control purposes.

Conclusions:

The Cauty Vision Technology using the SolidSizer sensor and the Vector vision processor provides a Particle Size Distribution that compares very well with ASTM-E-11 sieve data for similar granular materials. 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.