

Canty SolidSizer™ TS

Sugar Crystal Size Analysis Lab Report

1. Introduction

1.1 Background Information and Research

The Canty SolidSizer™ TS system was selected for the analysis of the Sugar crystals. Below are the details regarding the testing.

1.2 Objective

The purpose of the test with the SolidSizer™ TS was to determine the systems capabilities in analysing and obtaining the crystal size distribution from multiple sugar samples and comparing the data to manual sieving data obtained from the customer. This report will detail the functionality of the SolidSizer™ TS in determining size , shape and sugar crystal size distribution correlating to manual sieving,.

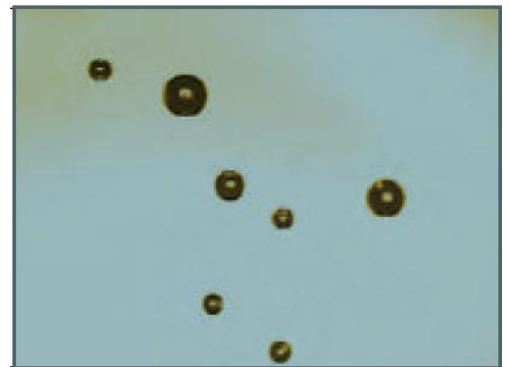
Three sugar samples containing customer sieve analysis data were first tested with the system along with three other sugar samples with no sieve analysis data, as test from the customer to examine how their sieve analysis data corresponds with the Canty SolidSizer™ TS data.

2. How It Works

This portion of the report elaborates on how the SolidSizer™ TS and CantyVisionClient™ software interact and determine a crystal or particle's size and shape.

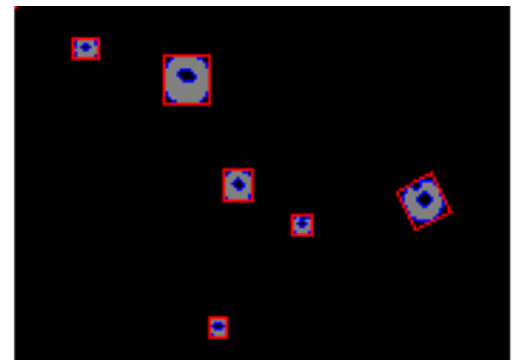
2.1 Image Collection:

Particles are presented in front of the imaging sensor which are back-lit by a light source. The particle images are collected in real time by the CCD camera. The image is then digitally transmitted to a PC with CantyVisionClient™ software for analysis.



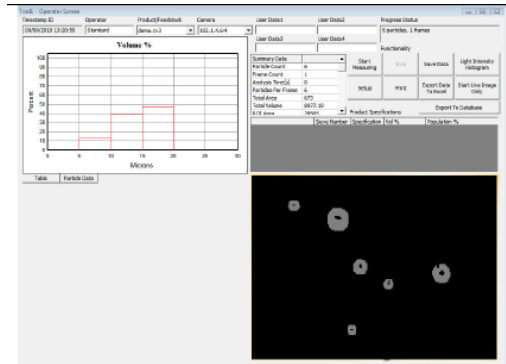
2.2 Binary Images:

The image is then broken down into individual pixels. The intensity difference between the particles and the background allows CantyVisionClient™ software to determine the perimeter of the particle, as well as the major axis, minor axis, area, and other characteristics about the particles dimensions.



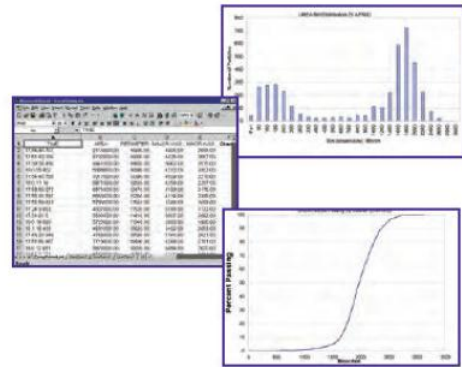
2.3 Analysis:

Once the software determines the particles size and shape, the software can perform further analysis on the individual particles. The analysis includes particle filters to enable users to determine when particles are dissimilar or nonconforming to the entire distribution of particles.



2.4 Output

Once the software has analyzed the particles the information can be stored and/or output to a variety of locations. This includes PC databases, 4-20 mA current loop, OPC and more!



3. Sample Identity

Part #	Description
ESAM 366-1	Sugar Sample 0.85-1.0mm
ESAM 366-2	Sugar Sample Aanvoer
ESAM 366-3	Sugar Sample 0.30-0.40mm
ESAM 366-4	Sugar Sample 4550
ESAM 366-5	Sugar Sample 4200
ESAM 366-6	Sugar Sample 4100

4. Lab Set-Up

A vibrating feed was used to move the sugar crystals from the input funnel to the tilt tray which was set at the desired angle to present the particles to the camera/imaging sensor (perpendicular to tilt tray) for capture and subsequent analysis. Each sample was tested three times to examine the repeatability of the system. ESAM 366-1 to ESAM 366-3 contained manual sieve data provided by the customer. No sieve data included for samples ESAM 366-4 to ESAM366-6.



Fig.1 Solid Sizer™ TS

4.1 Calibration

Calibration was performed using a transparent calibrated rule. The calibration image below shows the calibration used for the sample. Utilizing the calibration a value of 14.6 microns per pixel was calculated. This gives an accuracy of +/- 7.3 microns.

5. Results

5.1 ESAM366-1 (0.85-1mm)

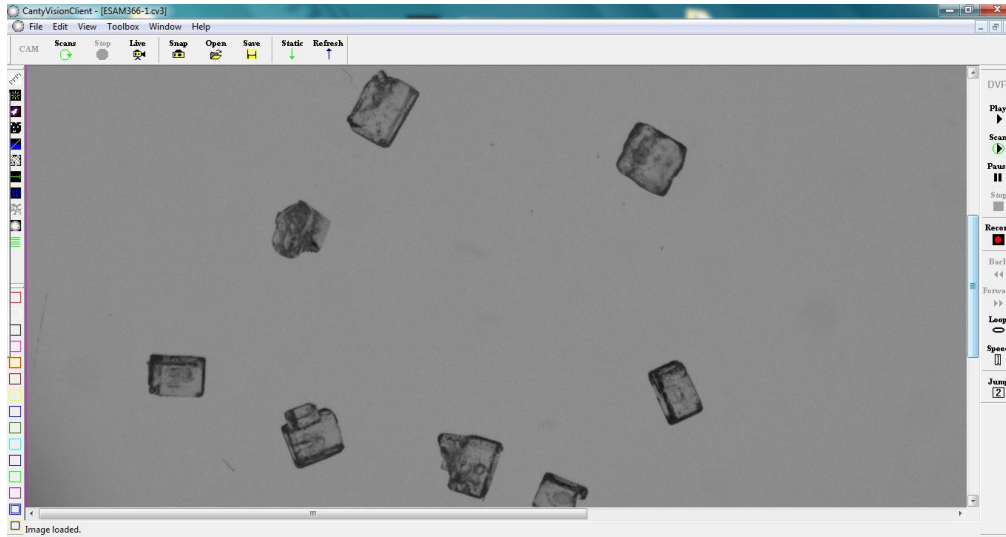


Figure 2 Live Image of Particles in Diesel Prior to Digitization

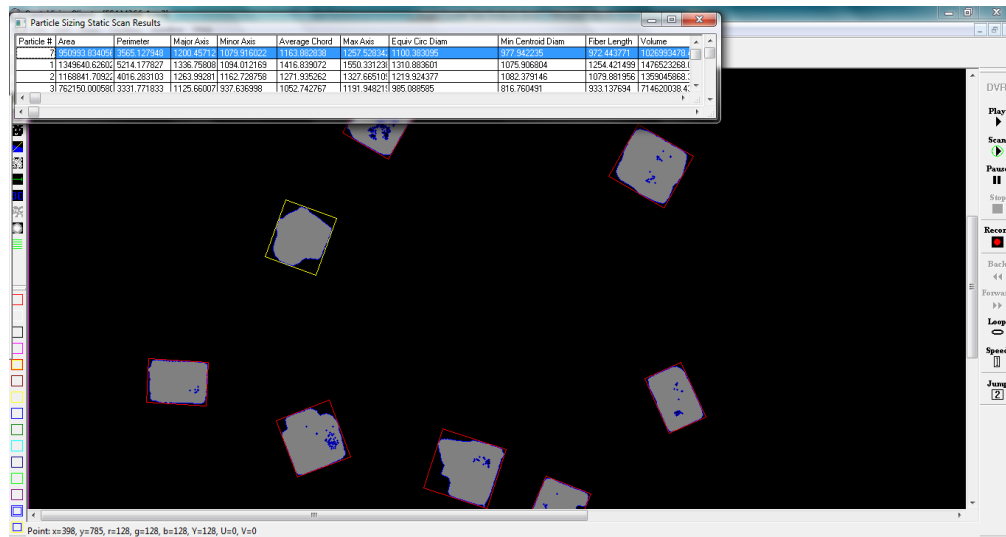


Figure 3 Digitized Image

Figures 1 and 2 on the display a snapshot scan of the sugar crystals before and after digitization. Dimensions can be seen in the table (Area, Perimeter, Major, and Minor Axis) included at the top of Figure 2. Size for highlighted particle (yellow box) is the highlighted row in the table.

As can be seen from Figure 3, data for each particle is calculated.

This data consists of the following:

- Major Axis: Longest length of particle (microns)
- Minor Axis: Narrow length of particle (microns)
- Perimeter: Actual perimeter of particle
- Area: Area of particle (can be used to calculate volume).

After concluding that the system set up was appropriate, the sample was run through the SolidSizer™ TS Solid Particle Analysis System and data was gathered.

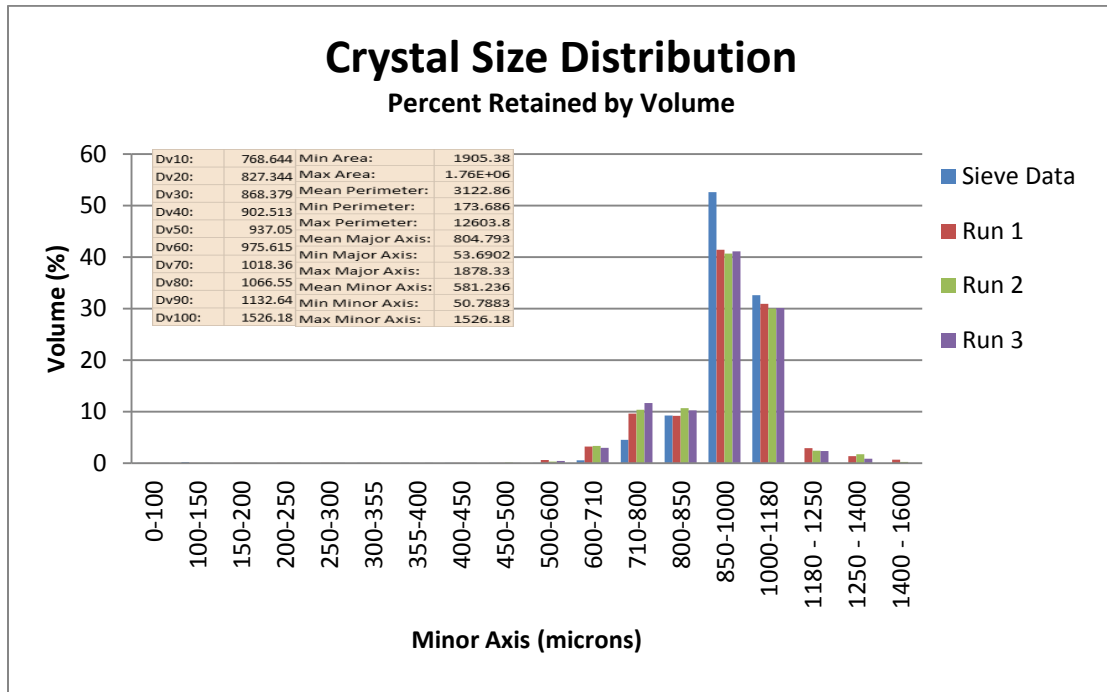


Figure 4 ESAM366-1 (0.85-1mm) Crystal Size Distribution

Figure 4 represents the detection and analysis of ESAM 366-1 (0.85 - 1mm) sugar crystals. The sample was analyzed three times in order to determine repeatability of system. It can be observed from the graph that the data obtained from the testing was repeatable and also displaying a good correlation with the sieve data obtained from the customer. The data values displayed (microns) on the graph were obtained from the series Run 2. Data was plotted based on minor axis as it is most representative of manual sieving. Note: the data can also be plotted based on Minor and Major Axis etc.

5.2 ESAM366-2 (Aanvoer)

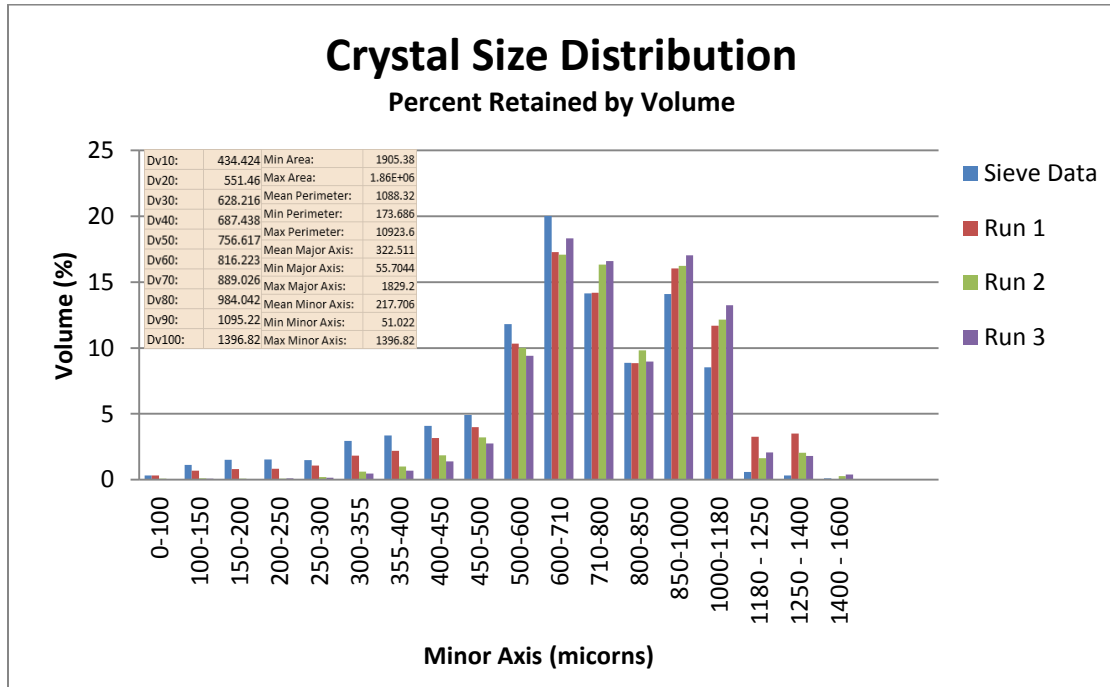


Figure 5 ESAM366-2 (Aanvoer) Crystal Size Distribution

5.3 ESAM366-3 (0.30-0.40mm)

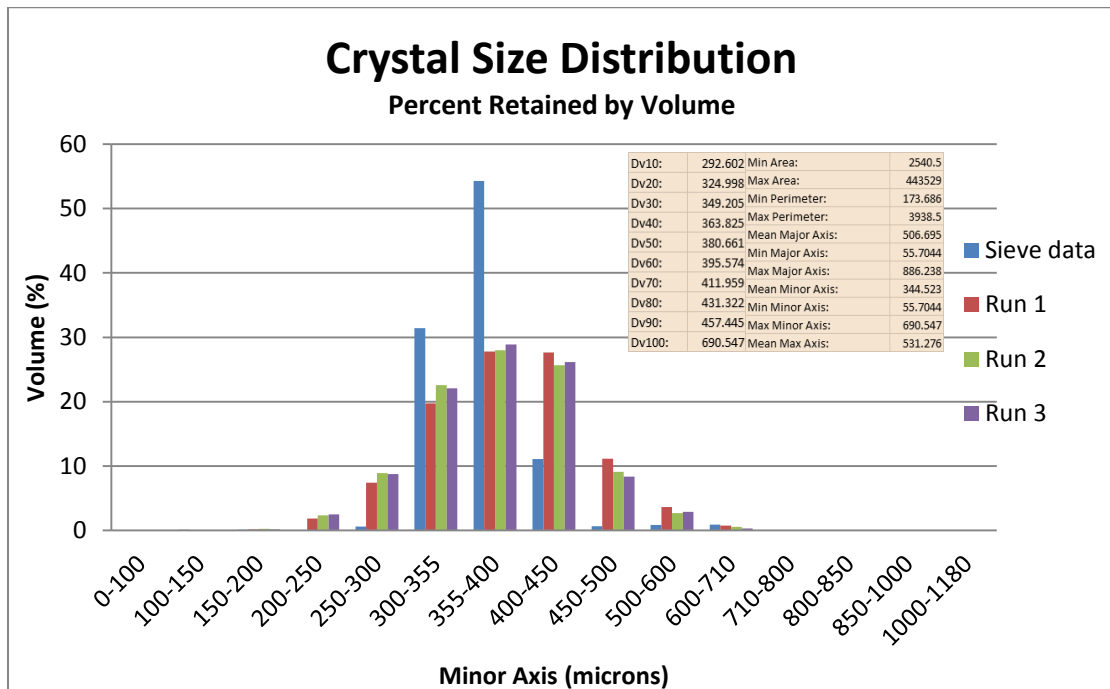


Figure 6 ESAM366-3 (0.3-0.4mm) Crystal Size Distribution

It can be observed from Fig 6 on the previous page that the Canty data displays an increase in volume for particles greater than 400 microns. Each frame of the analysis was visually checked to verify that no touching particles were detected by the software as one particle (filters were set up within the software to filter out false detections). The reason for the deviation in data could be due to the sugar crystal breaking up during the sieving process. Fig 7 -10 display snapshot images of some of the larger particles detected within the sample.

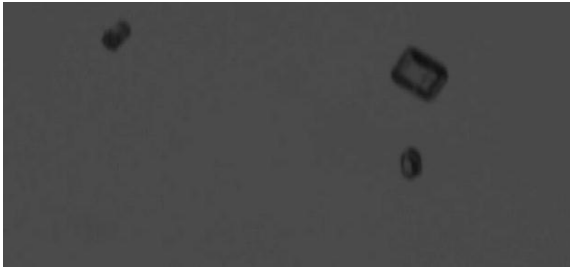


Figure 7 Live Image of Large Sugar Crystal

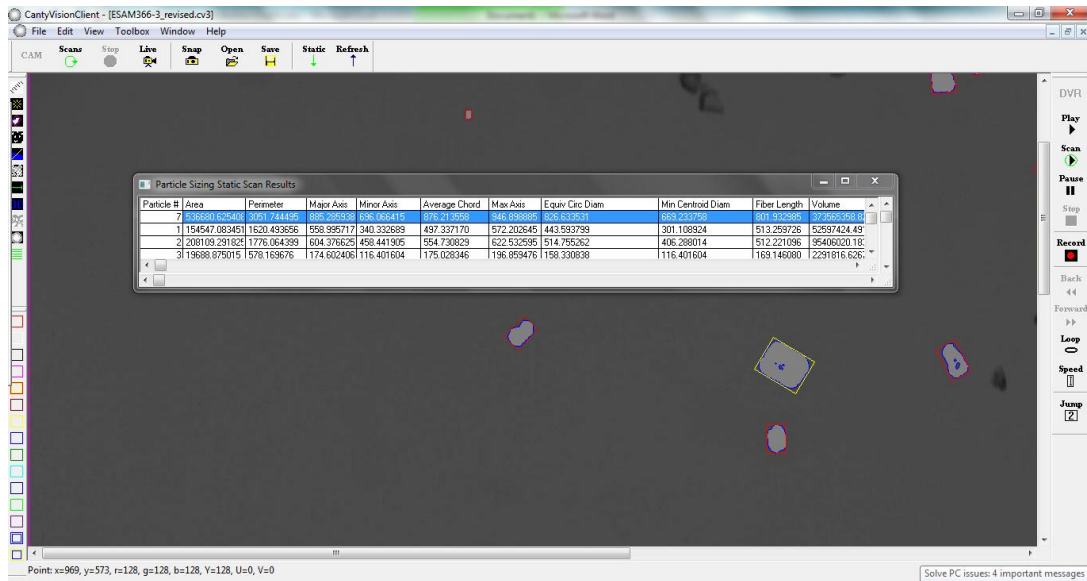


Figure 8 Digitised Image of Large Sugar Crystal from Fig 7

The highlighted row in the table displays the size data for the large sugar crystal (yellow boundary box), which has a minor axis of 696 microns.

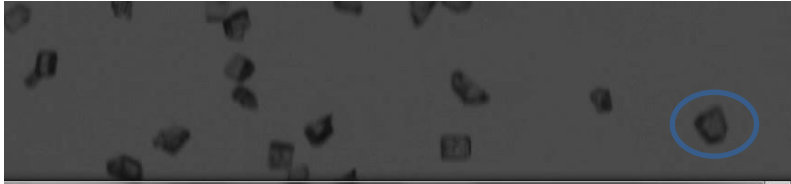


Figure 9 Live Image of Sugar Crystals (large crystal highlighted)

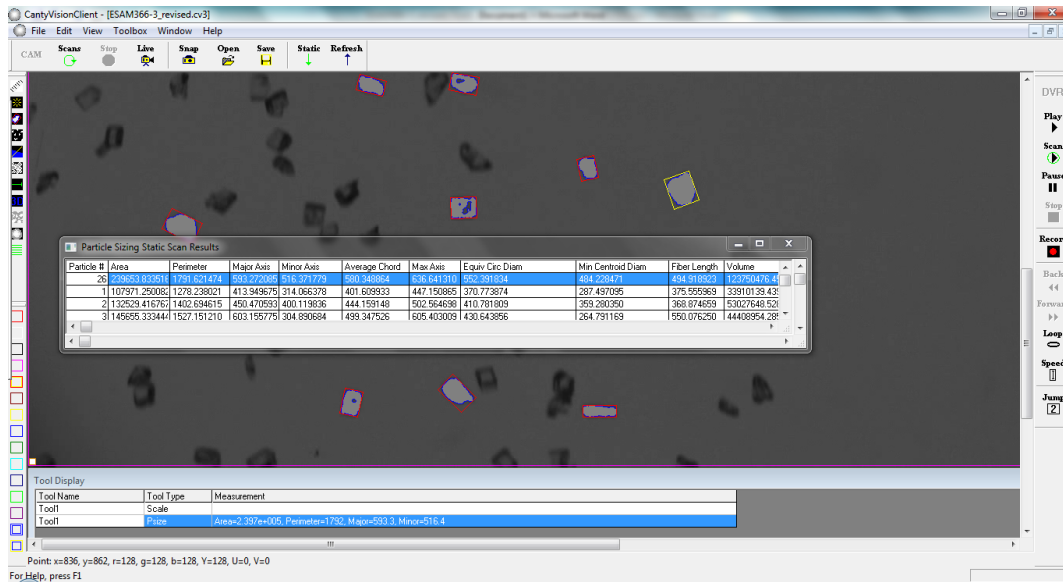


Figure 10 Digitised Image of Sugar Crystal from Fig 9.

The above sugar crystal (yellow boundary box) has a minor axis of 516 microns.

5.4 ESAM366-4 (4550)

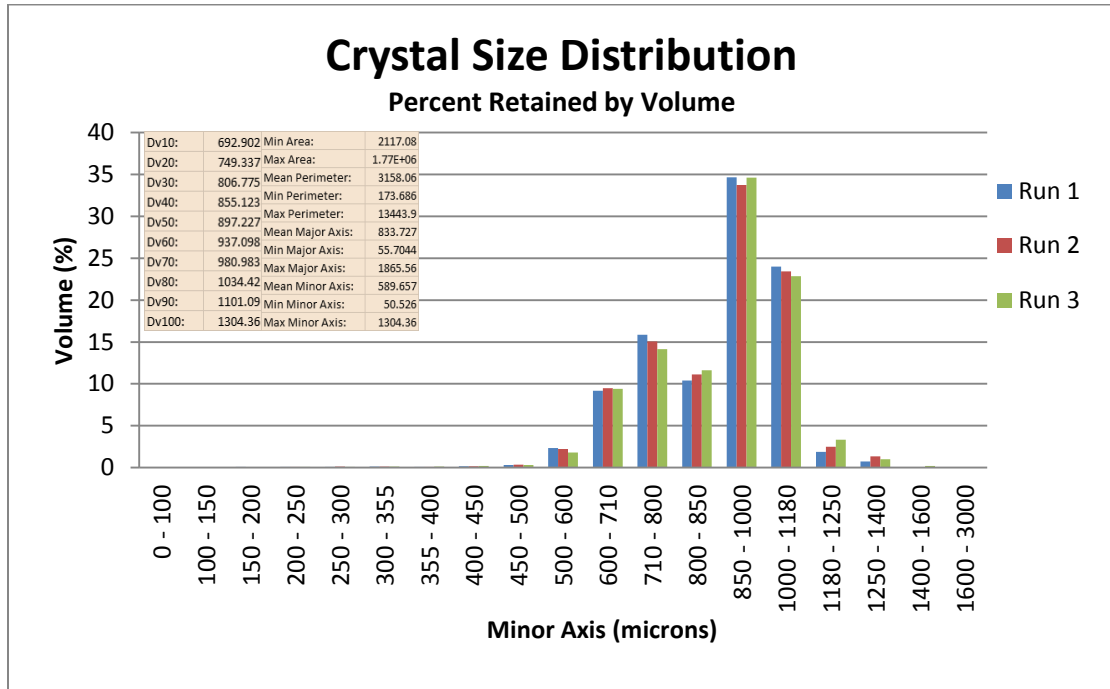


Figure 11 ESAM366-4 (4550) Crystal Size Distribution

5.5 ESAM366-5 (4200)

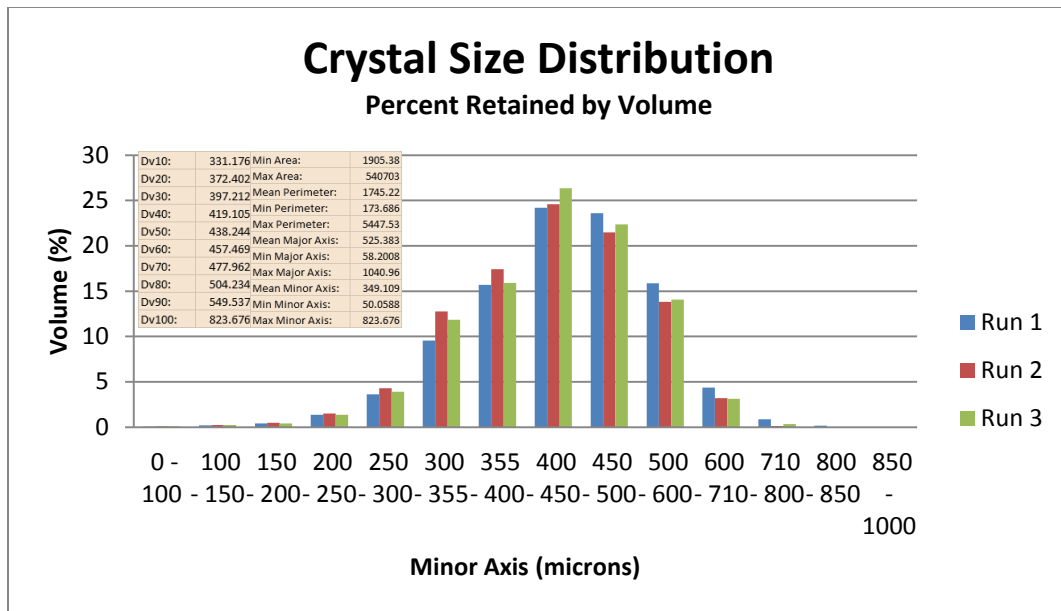


Figure 12 ESAM366-5 (4200) Crystal Size Distribution

5.6 ESAM366-6 (4100)

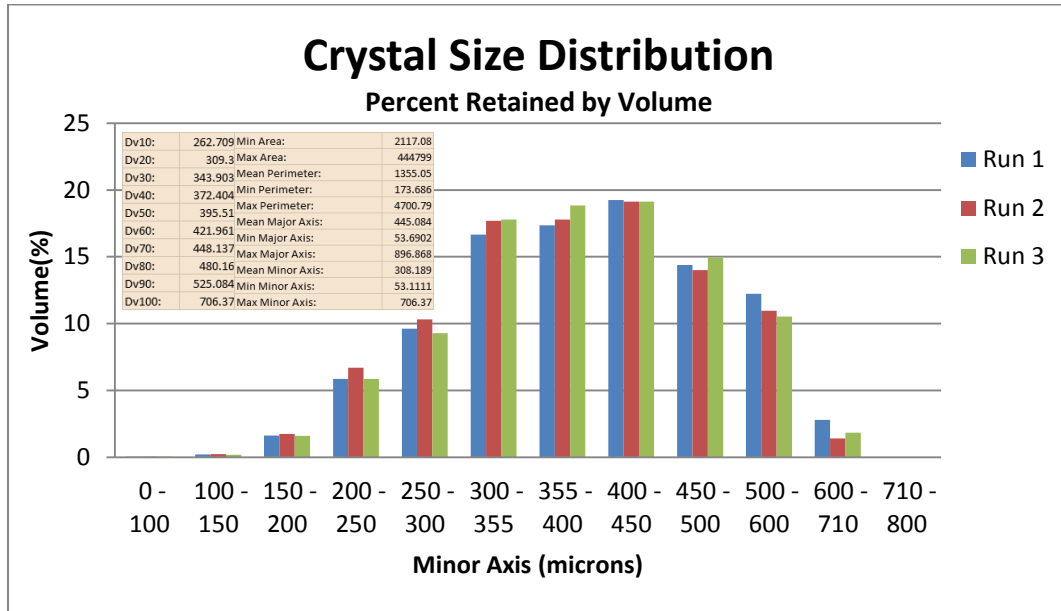


Figure 13 ESAM366-6 (4100) Crystal Size Distribution

6. Conclusion

The dynamic imaging based techniques for particle/crystal sizing supplied high quality images of the sugar crystals on the SolidSizer™ TS stage.

The SolidSizer™ TS Particle Sizing System coupled with the CantyvisionClient™ software shows the ability to accurately and repeatedly measure the size of the sugar crystals particles. The data obtained across the three runs were comparable, highlighting the repeatability of the vision based measurement technique.

The vision based technique gives the operator an unparalleled insight into the process, which allows the user to better understand what is happening and the effect of any changes made.

Results should be reviewed and a conference call set up to discuss. The feedback Canty gets from customer analysis is valuable in configuring the system for best results.