Dynamic Image Analysis

Particle Counting, Water Concentration, Color, Haze Monitoring for Jet Fuels Inline, at-line and Lab

ASTM D02.J0.05

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Buffalo, NY Dublin, Ireland

Outline

1. Applications of Canty Vision Based Systems, Product Quality Control

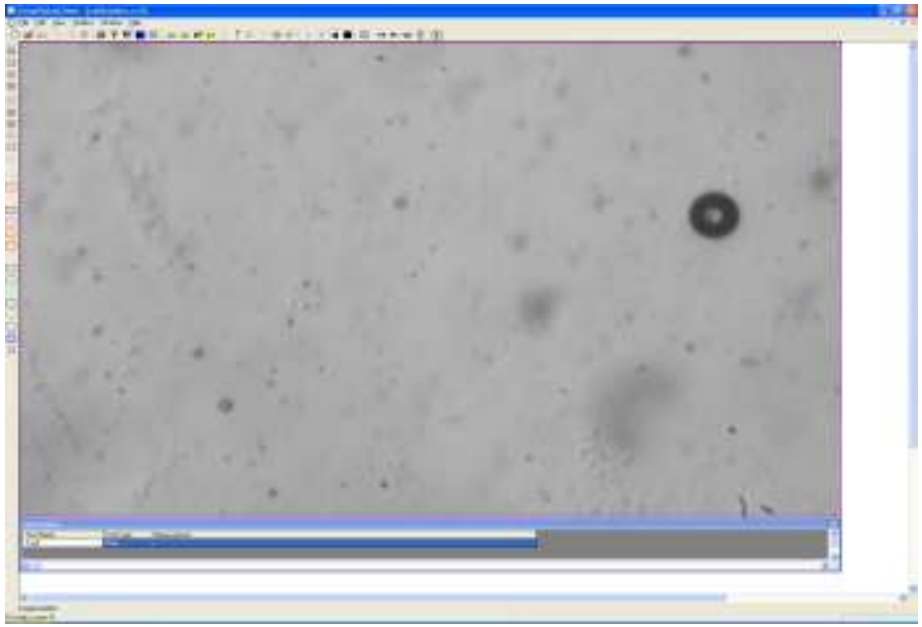
2. Explanation of How the Systems Work
   - Hardware
   - Software

3. Advantages and Reliability

4. Relevant Field Experience

JM Canty's Vision Based Technique

- JM Canty's vision based technique combines the latest CCD Ethernet camera technology, Canty's trademark fused glass and lighting technology, and **Canty Vision Client** software to provide real time measurement of oil in water
- Various systems depending on application retrieve live images from the process
  - Microflow
  - Inflow
  - Particle Probe



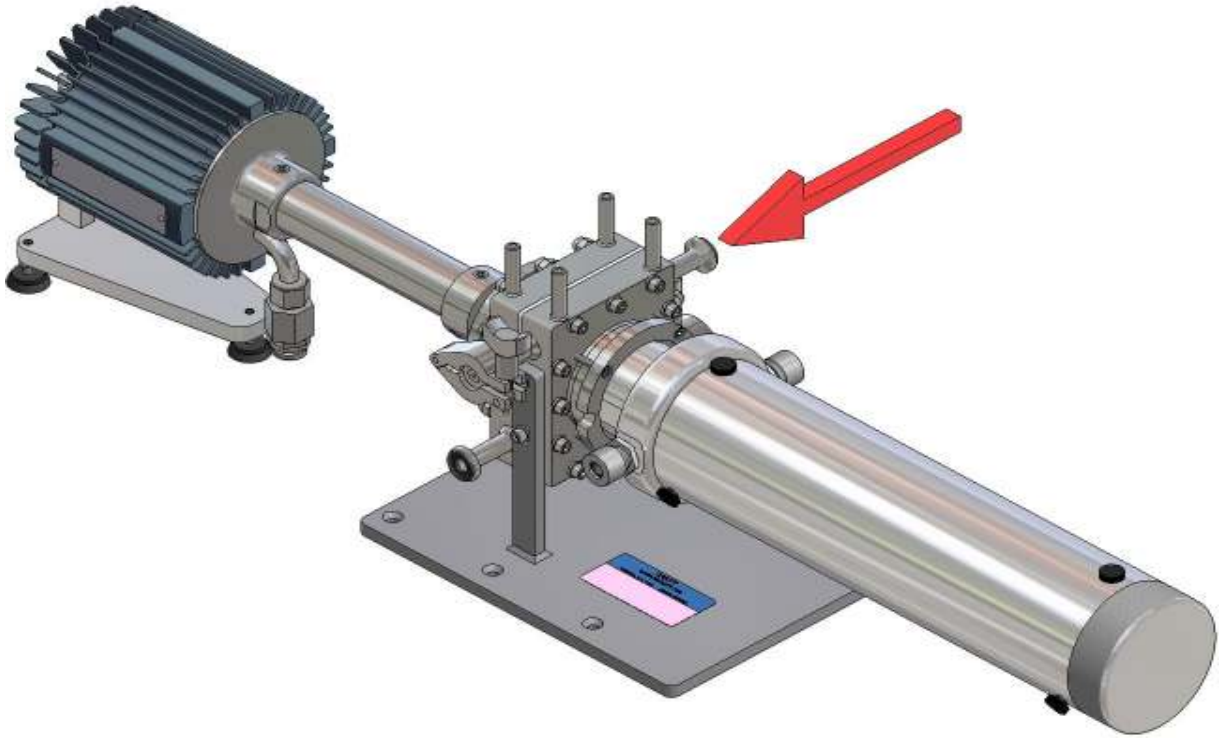
CANTY MICROFLOW
Portable / Lab System

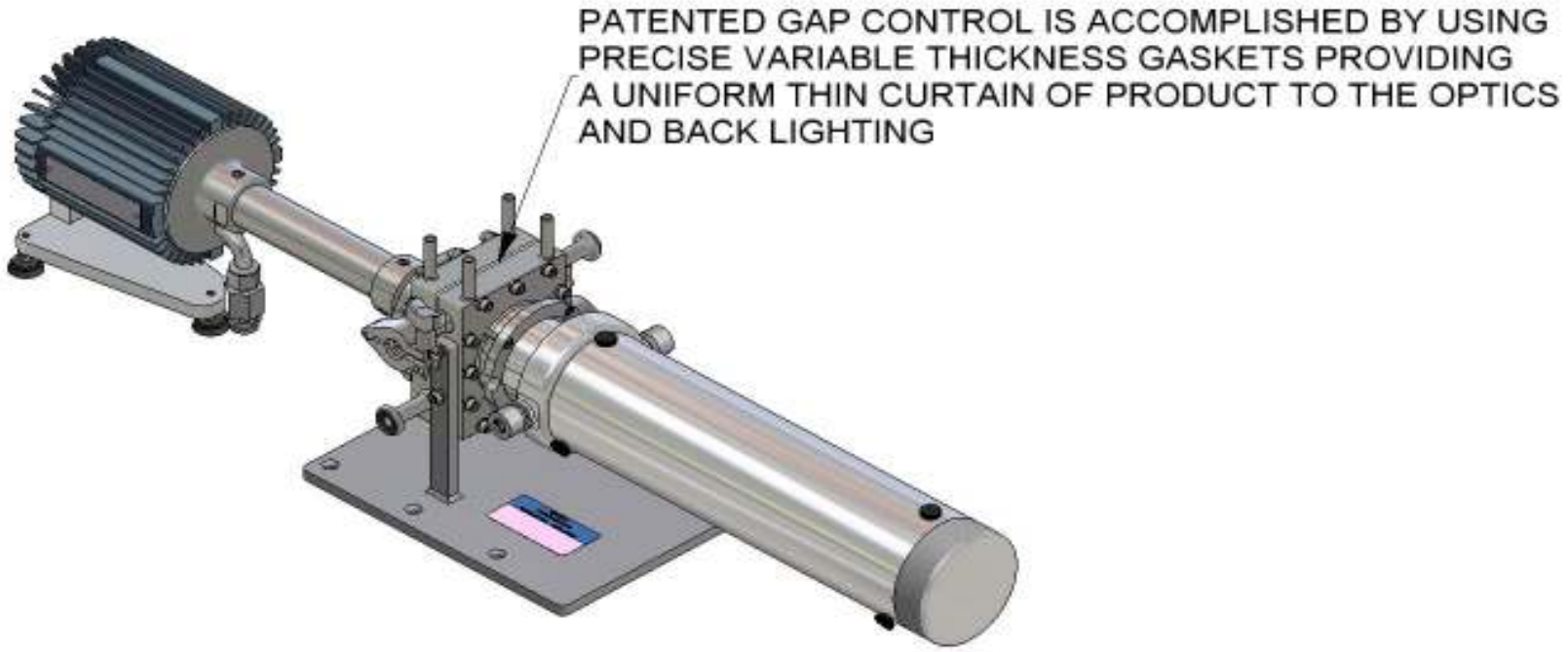
"How it works"

No sampling required

- The lab system lets you run the entire sample bottle.
- You can eliminate the sample bottle and run direct off the sample valve.
- You can run in full pipeline and eliminate sampling altogether.

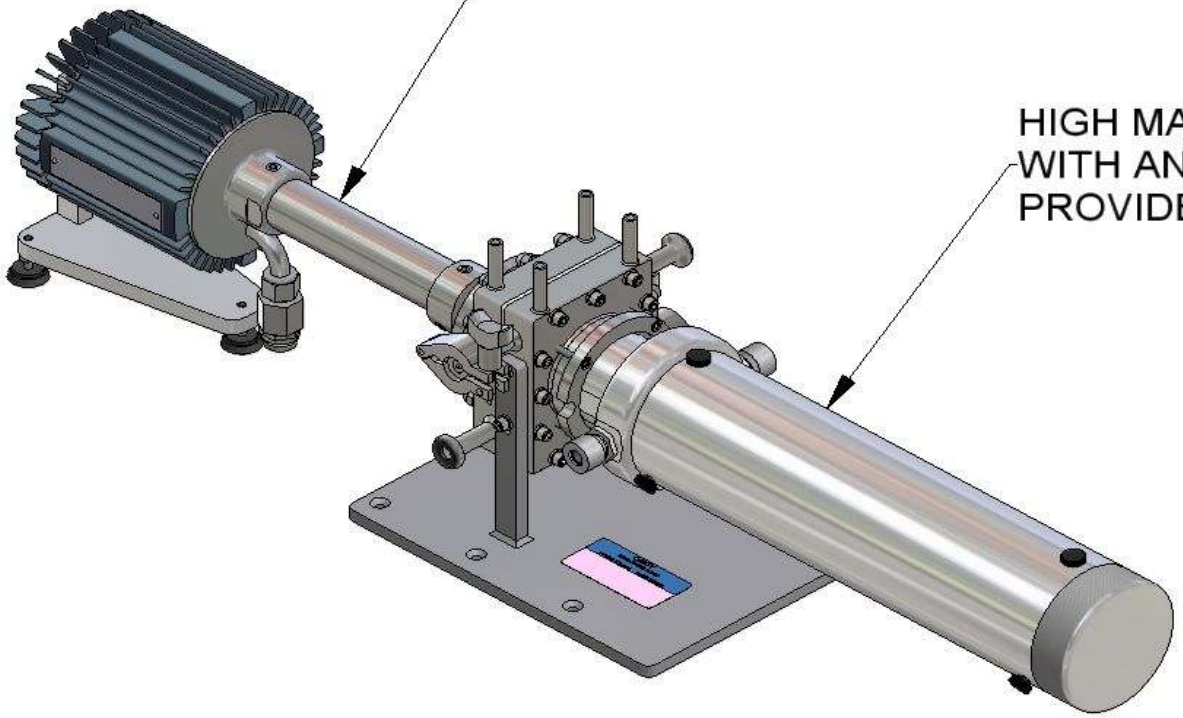
PRODUCT ENTERS THE MICROFLOW

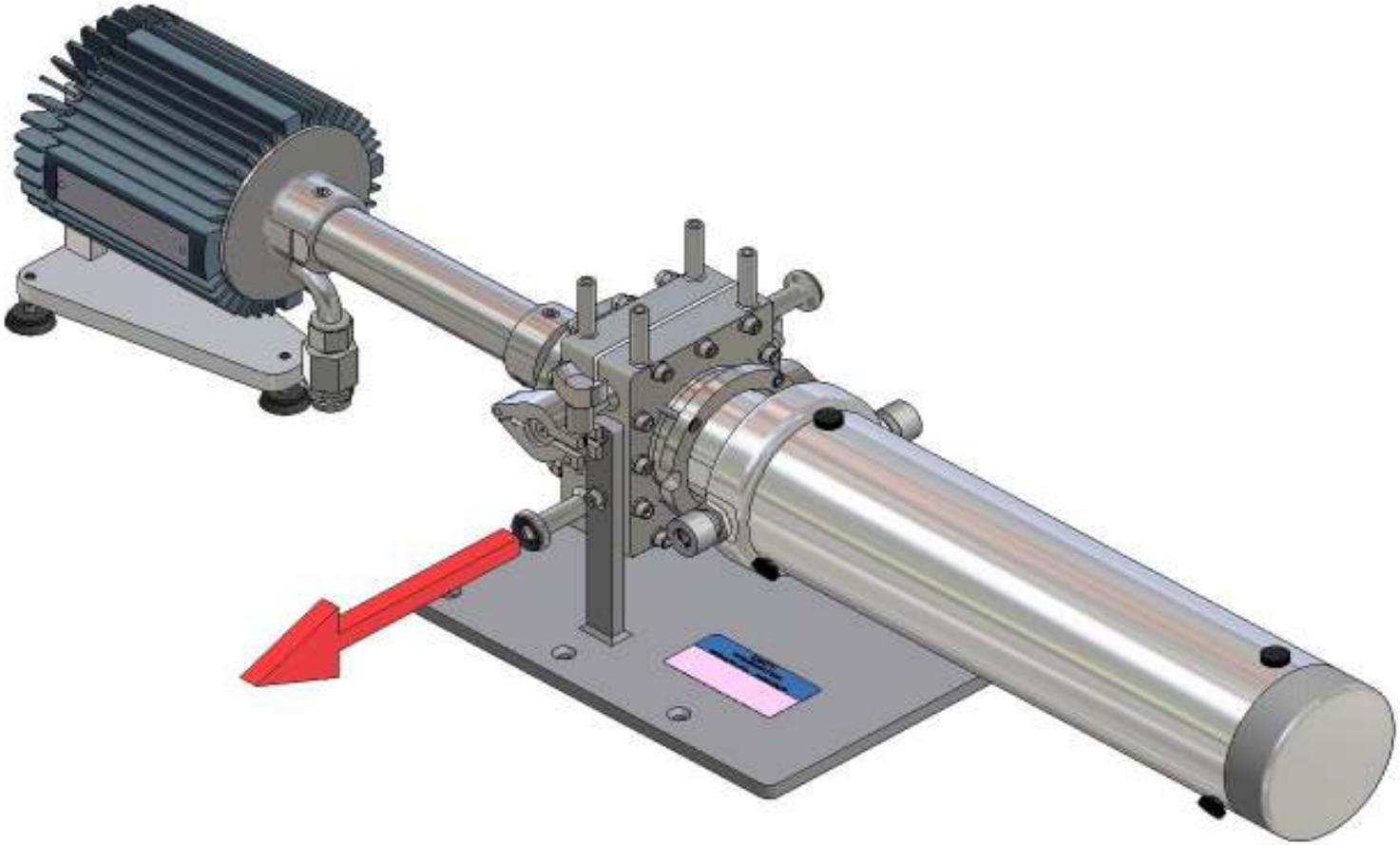



PATENTED GAP CONTROL IS ACCOMPLISHED BY USING
PRECISE VARIABLE THICKNESS GASKETS PROVIDING
A UNIFORM THIN CURTAIN OF PRODUCT TO THE OPTICS
AND BACK LIGHTING

DIFFUSED HIGH INTENSITY
COLLIMATED BACKLIGHTING

HIGH MAGNIFICATION OPTICS COMBINED
WITH AN ETHERNET IMAGING SYSTEM,
PROVIDE SUPERIOR RESULTS





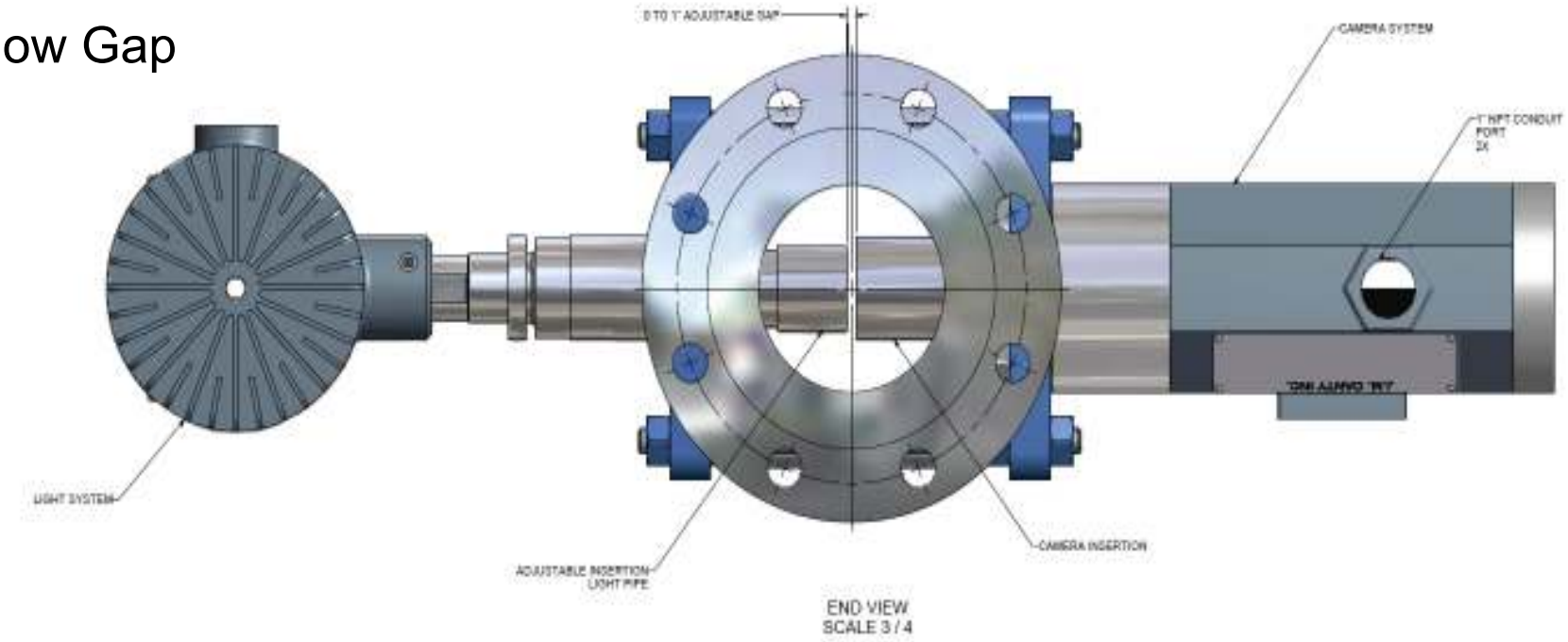
PRODUCT EXITS MICROFLOW

CANTY INFLOW
Inline System

"How it works"

The Inflow works on the same principle as the MicroFlow:

- Lighting
- Camera
- Flow Gap

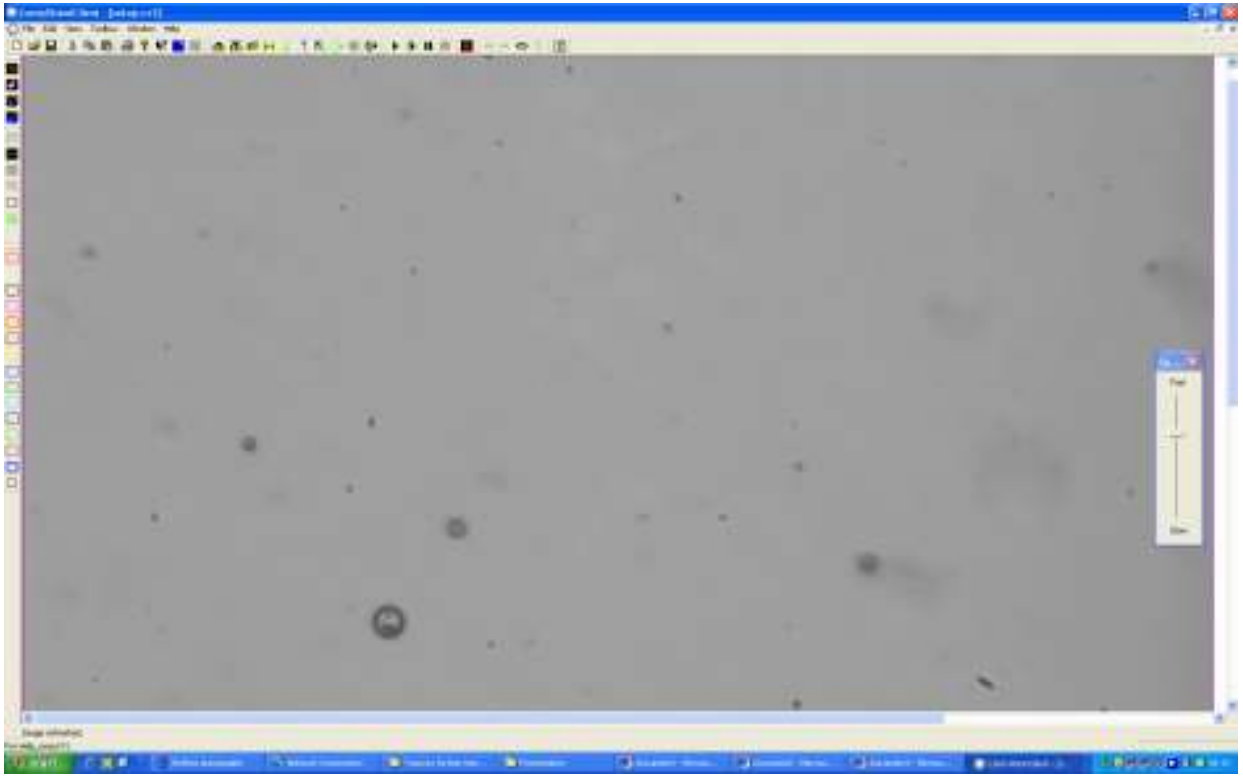


CANTY PARTICLE PROBE

"How it works"

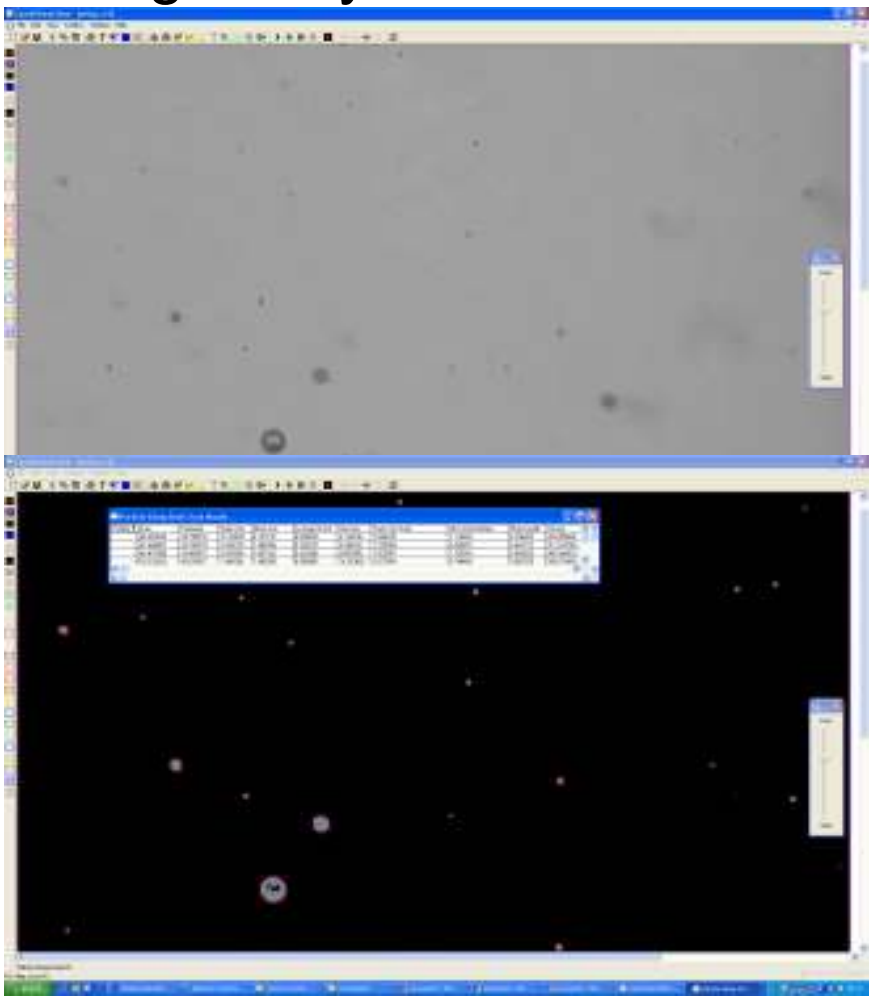
Image Analysis with Canty Vision Client

- Utilizing the latest Gigabit Ethernet camera technology available, users can see particles all the way down to 1 micron.
- The images retrieved from each of the 3 particles sizing systems are analyzed in real time by **Canty Vision Client** Software.

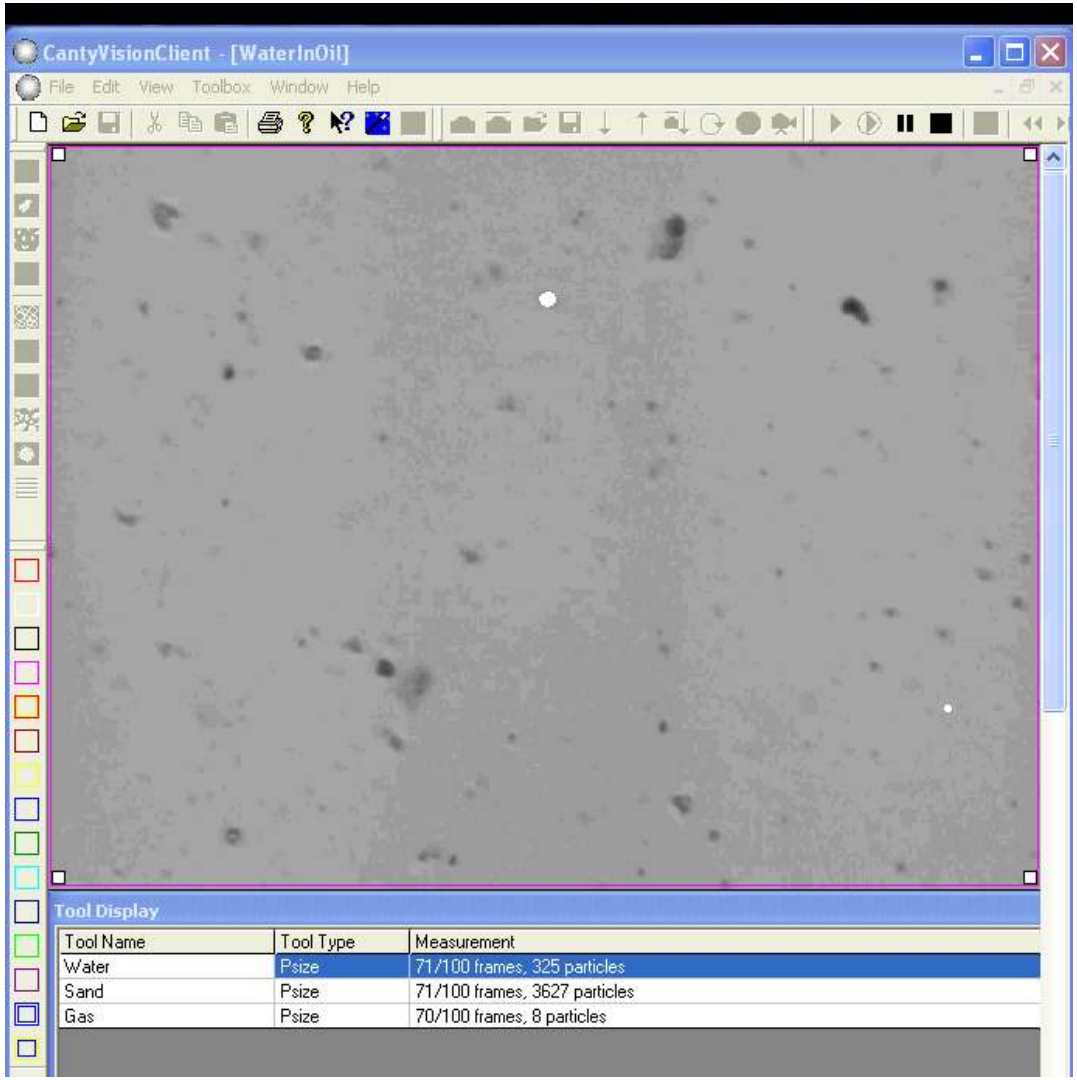


Oil in Water Detection using Canty Vision Client

- Each individual particle within the image is digitally mapped and analyzed.
- Visual verification of particles truly sets Canty apart from all other systems.

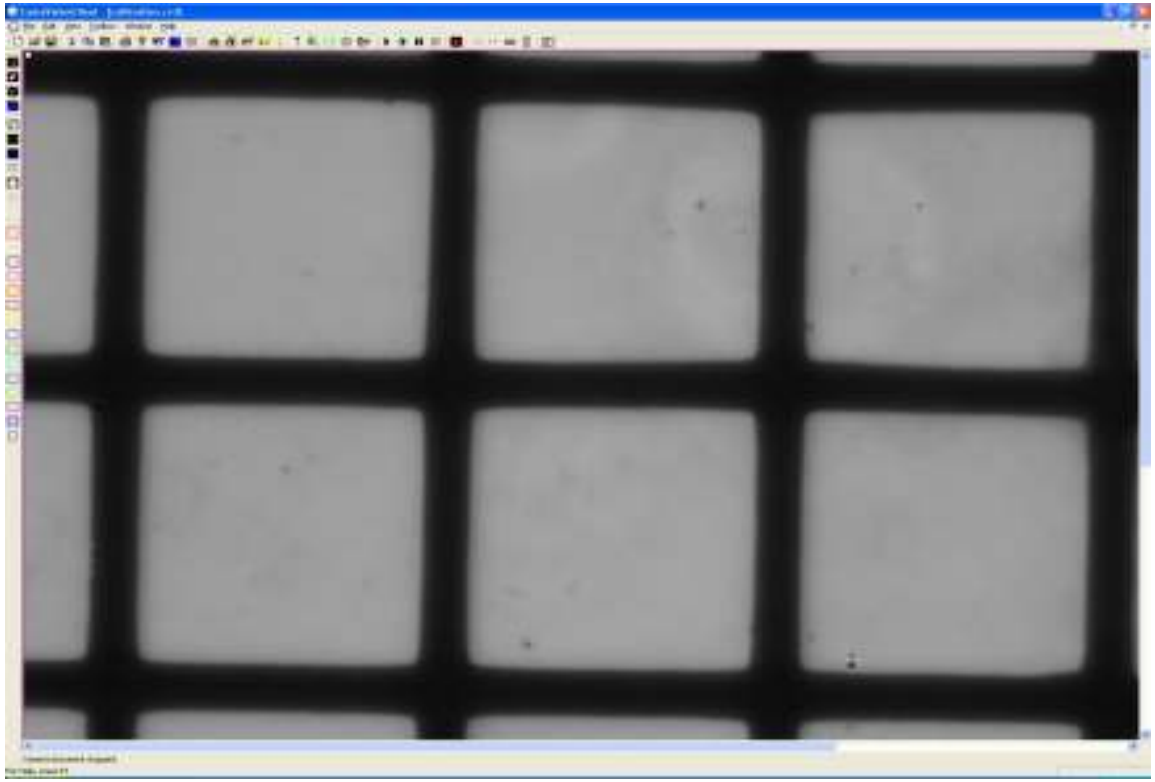


- There is no guessing with a Canty Particle Sizing System.
- Particle filters enable the software to distinguish between oil, air and other contaminants that may be present.



System Setup / Calibration – Particle Size

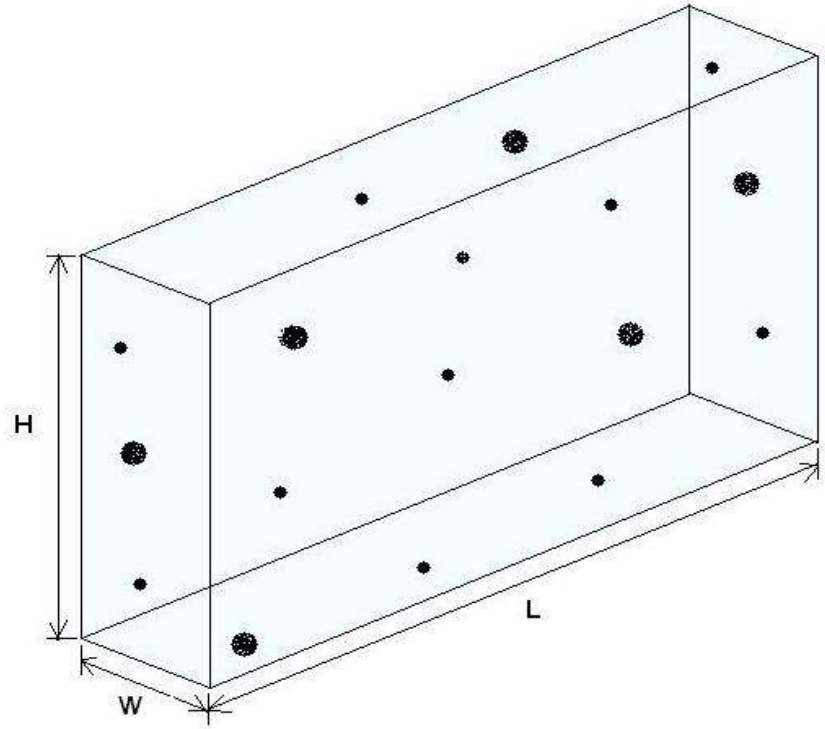
- The system is visually calibrated and programmed to correlate each pixel into a real world measurement value.
- A known size reference or a simple reticule, such as the one shown here, will be correlated providing an accurate scale for particle size analysis.



System Setup / Calibration – Particle Concentration (Theory)

The percent oil in water can be calculated using the formula below:

% Oil in Water = (Volume of oil in water / Volume of water) x 100



System Setup / Calibration – Particle Concentration (Theory)

We can calculate the volume of the oil droplets using the formula:

$$4 / 3*\pi*r^3$$

Therefore we can calculate the concentration using the formula;

$$\text{Percent Oil in water} = \frac{\Sigma \text{ (volume of oil particles)}}{((W * L * H)* \text{number of images}))} *100\%$$

where

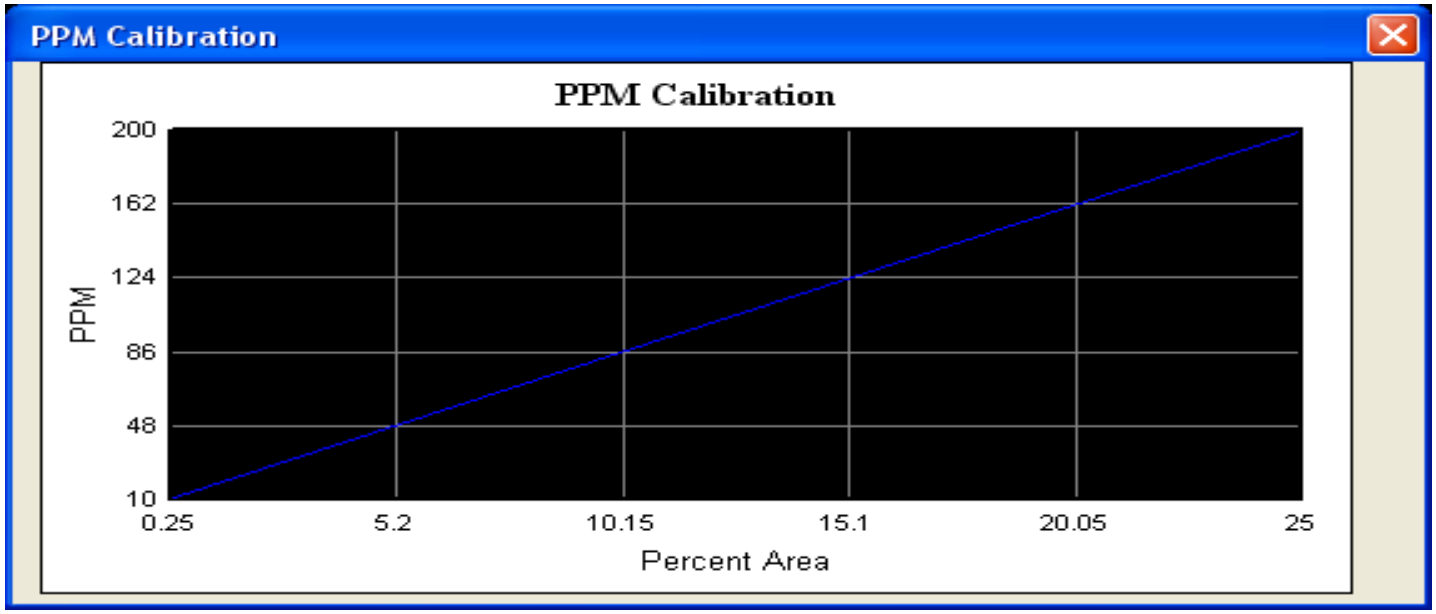
N = Number of oil particles

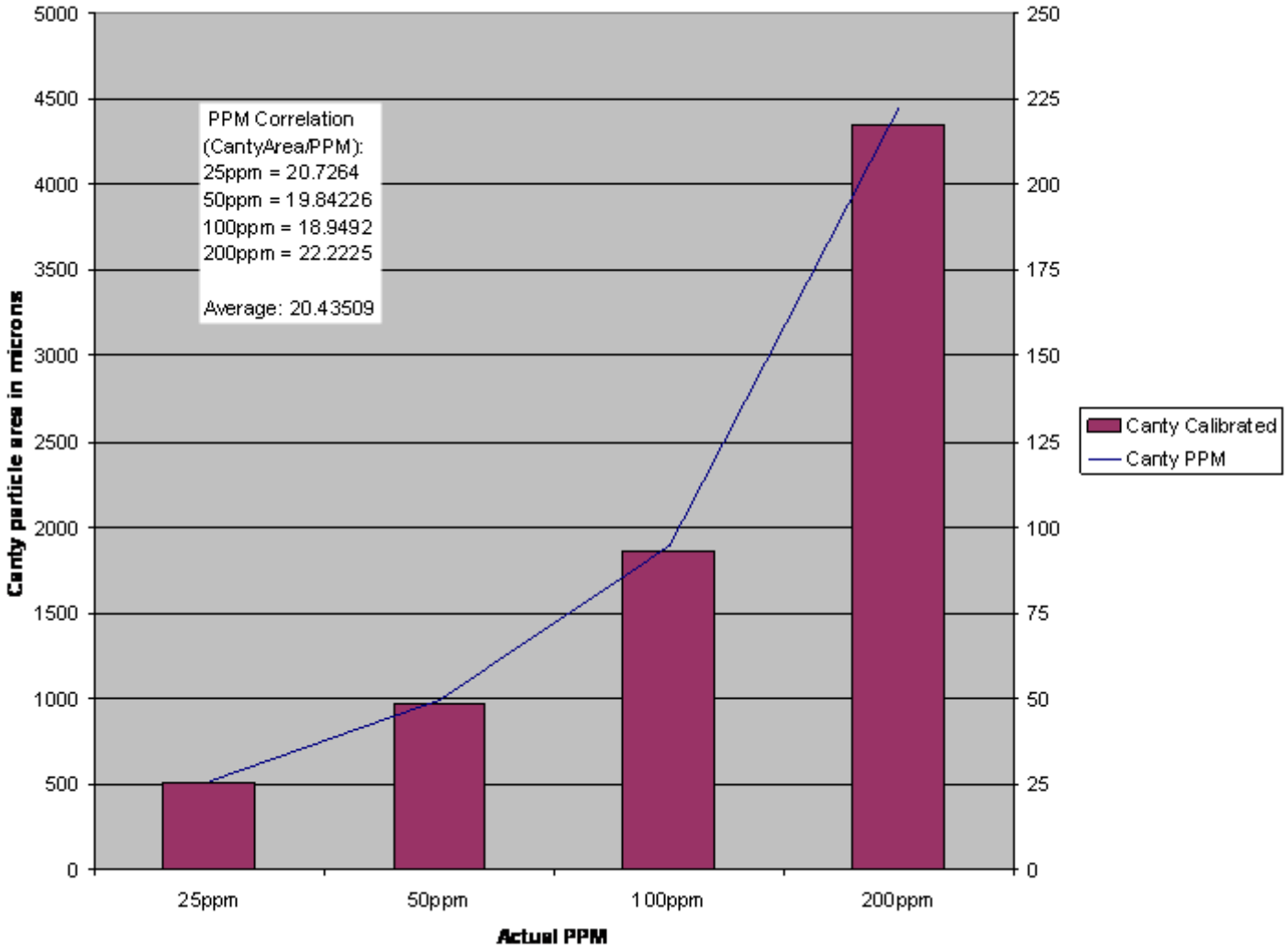
Oil volume = Σ volume of oil particles

Volume of water = W * L * H

System Setup / Calibration – Particle Concentration (Actual)

- Run a sample of known concentration through the unit
- Scan the sample through the unit using the Canty Vision software
- Calibrate the output PPM value using the total area percent value, and the known PPM value in the Canty Vision software.

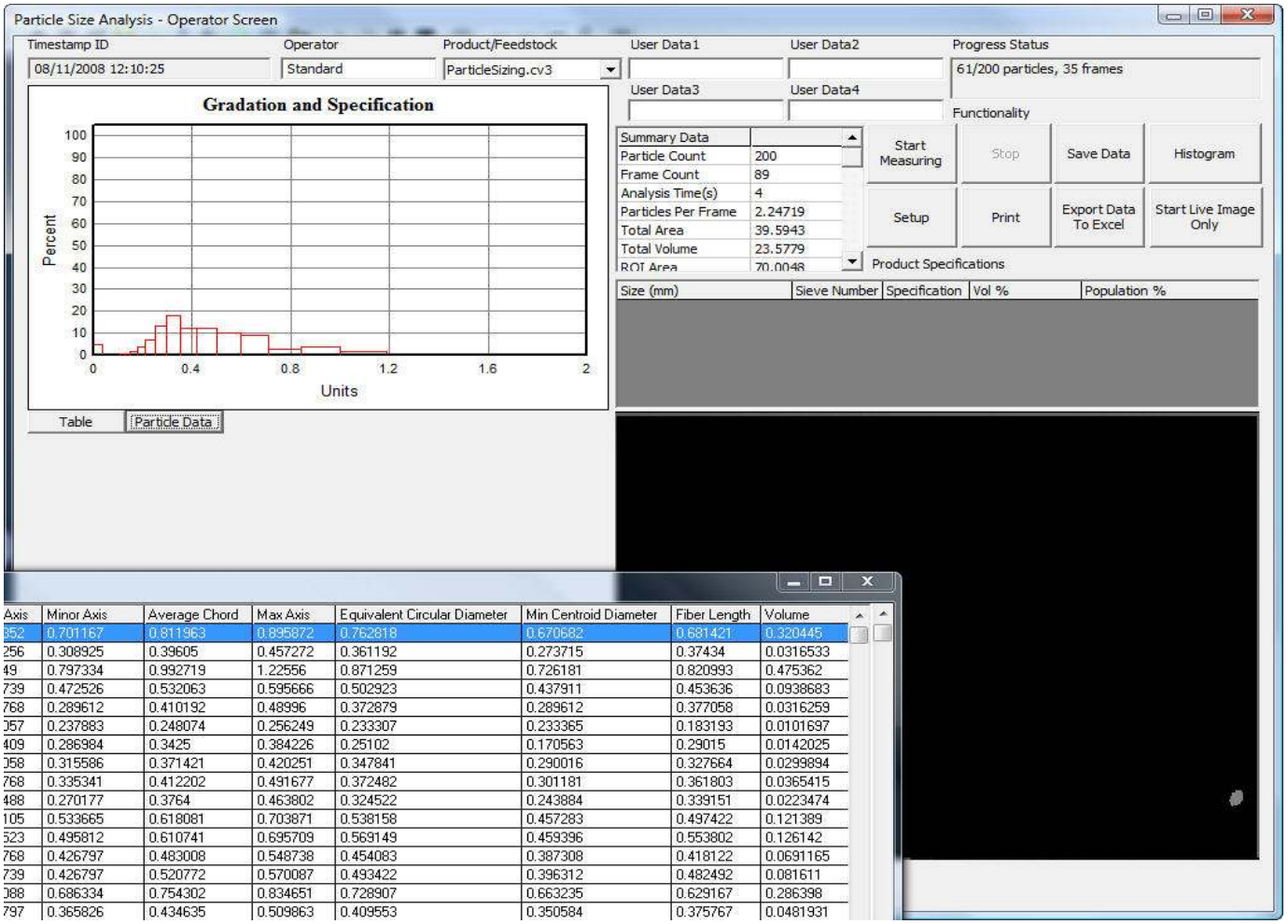



PPM Correlation
(CantyArea/PPM):
25ppm = 20.7264
50ppm = 19.84226
100ppm = 18.9492
200ppm = 22.2225
Average: 20.43509
Canty particle area in microns
Actual PPM
25ppm
50ppm
100ppm
200ppm
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
0
25
50
75
100
125
150
175
200
225
250
Canty Calibrated
Canty PPM

Particle Size Analysis – Operator Screen

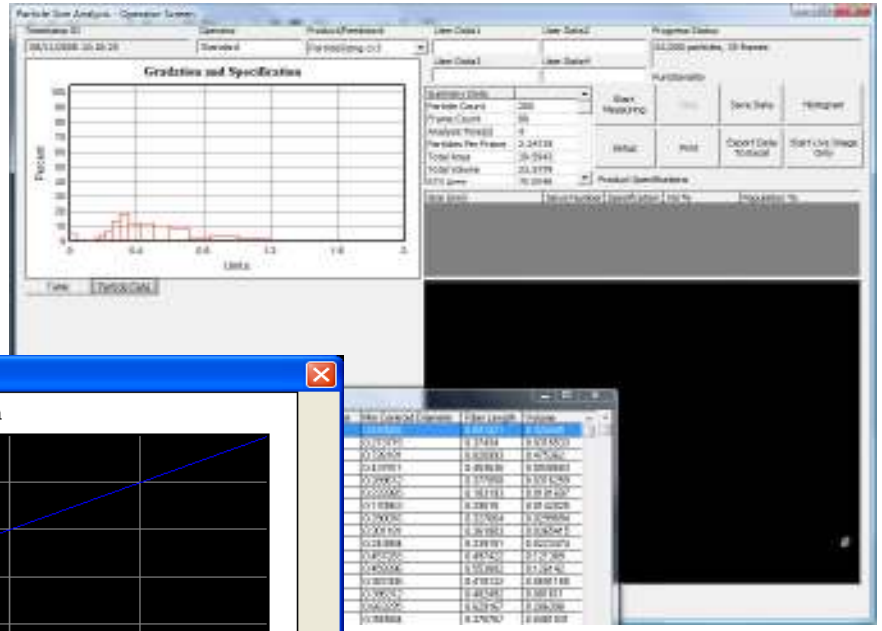
Puts information and configuration in an easy to read format for ease of operator control

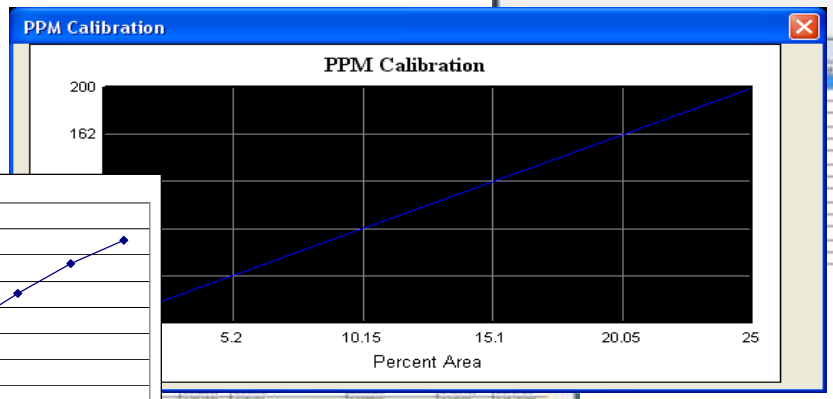
Configurable calculation for client specific products

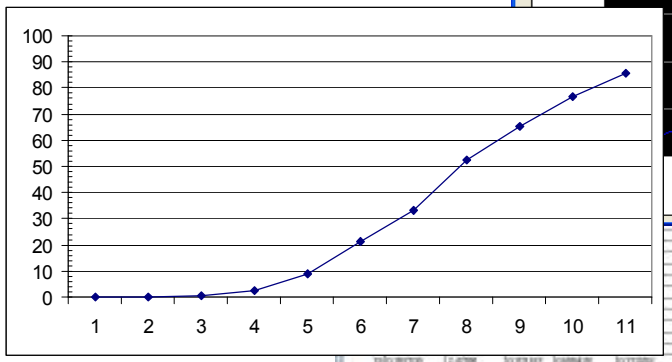


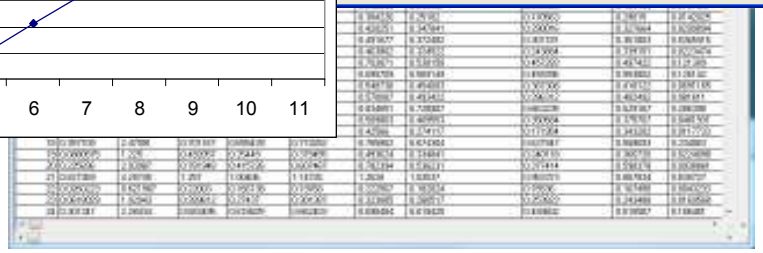
Data Analysis and Graphs

- Calibrated PPM and PPB outputs
- Replaces and correlates to screen analysis
- Particle distribution by major, minor diameter
- Particle area
- Particle perimeter
- Vision camera system establishes size range
- Various spreadsheet templates provided
- Custom analysis using spreadsheet formulas





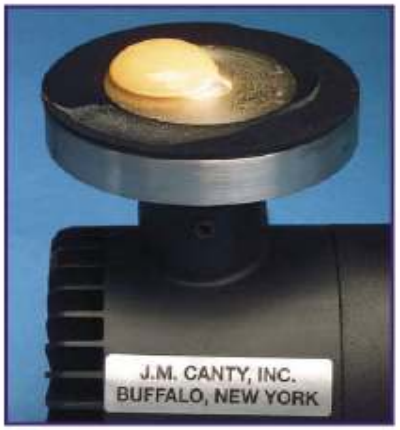




- Several Plot Types: Differential, Cumulative Retained & Passing
- Plot Data By: Minor Axis or a major, Average Cord, Area, Perimeter, Aspect Ratio many more

- Lighting is critical for any vision based system.
- Canty has being doing process lighting for well over 30 years – part of our core business.
- Would not be so confident in our vision based technique without our lighting expertise.

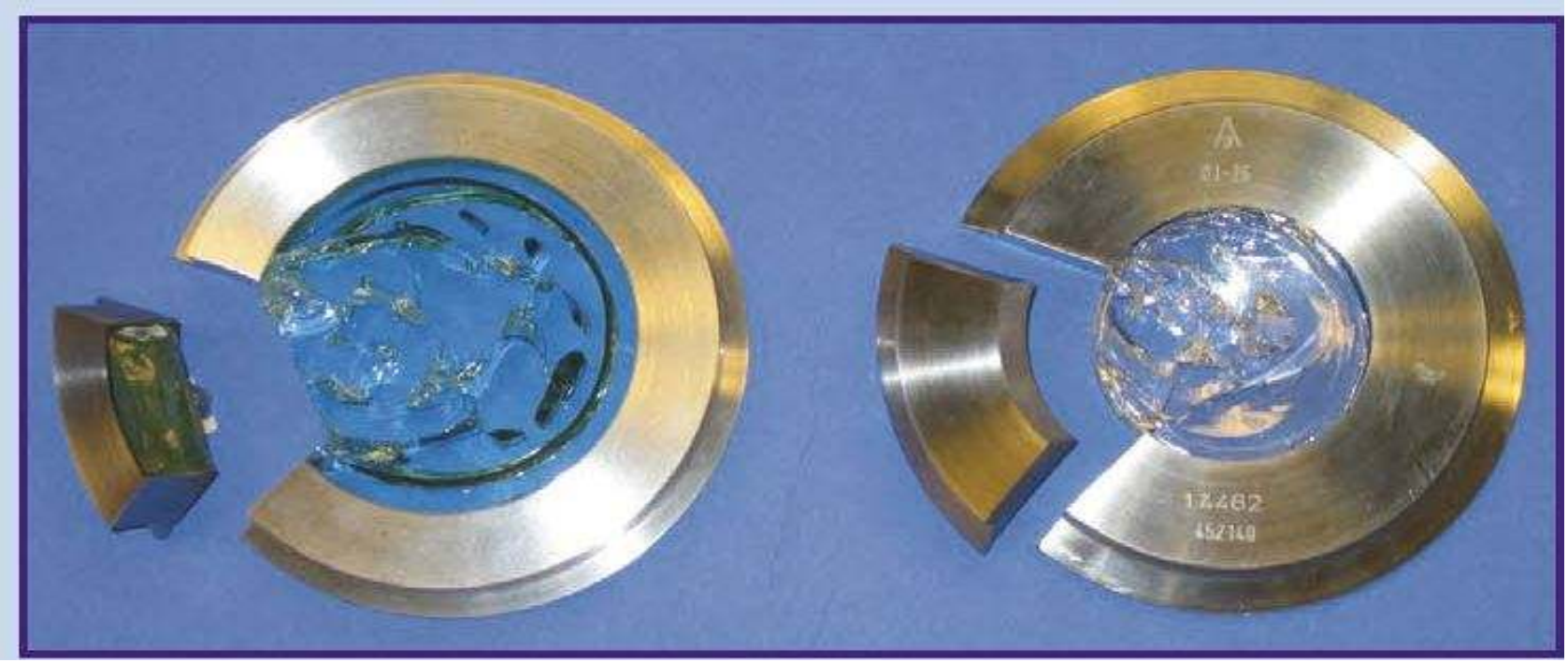
HOUR BAKE-ON TEST



CANTY COLD LIGHT

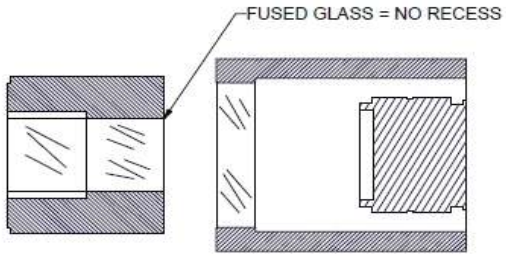
Canty's Fused Glass Technology

- Fusion of glass to metal – one piece construction
- Critical to our vision based technique
- Pressures to 10,000 PSI, Temp -450 to 800ºF

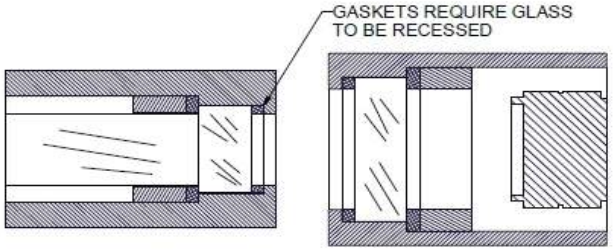


Importance of fused glass technology

- Hermetically sealed one piece construction means no recesses or gaps where product can adhere to and start to build up
- Self cleaning unit



CANTY FUSED GLASS



COMPETITION PLATE GLASS

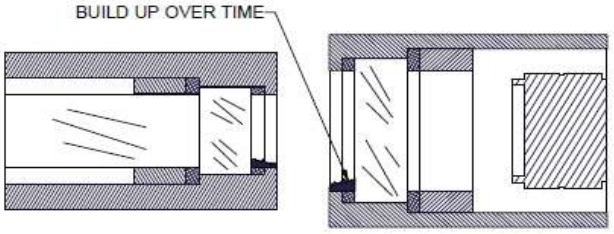


PLATE GLASS WITH BUILD UP

E29 Particle Sizing

- We feel it is important that we integrate the overall work done by E29 particle sizing and avoid duplication of effort and conflicting standards and terminology.

This concludes the Presentation!

Thanks for choosing CANTY!

For Further Information on this product please visit www.jmcanty.com.