

# Jet Fuel

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Particle Detection

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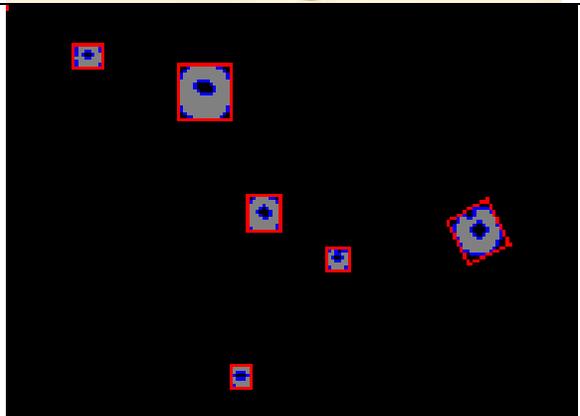
## Introduction

### Objective

This test was undertaken to compare the particle detection capabilities of vision technology with light obscuration technology. Different technologies often measure different particle parameters differently and thus the data gathered is not identical. Vision offers a wealth of particle shape information in addition to size which can aide in controlling or improving a process through more accurate and timely analysis of process variables.

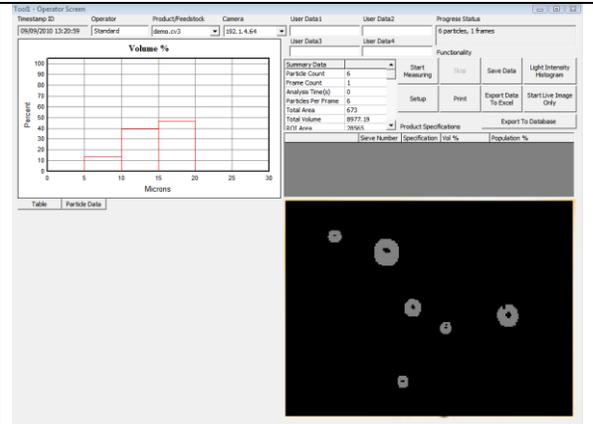
### How It Works

This portion of the report elaborates on how the InFlow™ and CantyVisionClient™ software interact and determine a droplet or particles size, shape, and PPM level.

<p><b>Image Collection:</b> Particles are sent through the flow cell body and back-lit with a high output CANTY Light. 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.</p>	
<p><b>Binary Images:</b> 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.</p>	

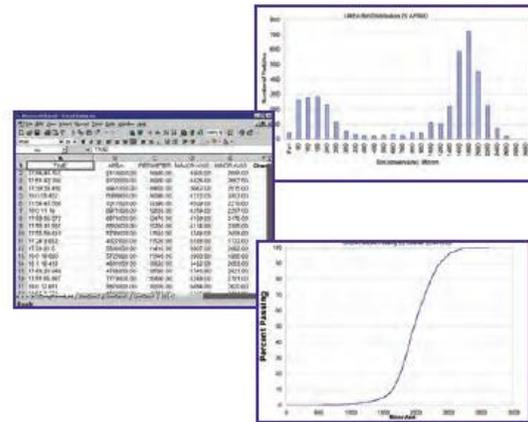
**Analysis:**

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.



**Output:**

Now that the software has analyzed the particles data, 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!



## Typical Images

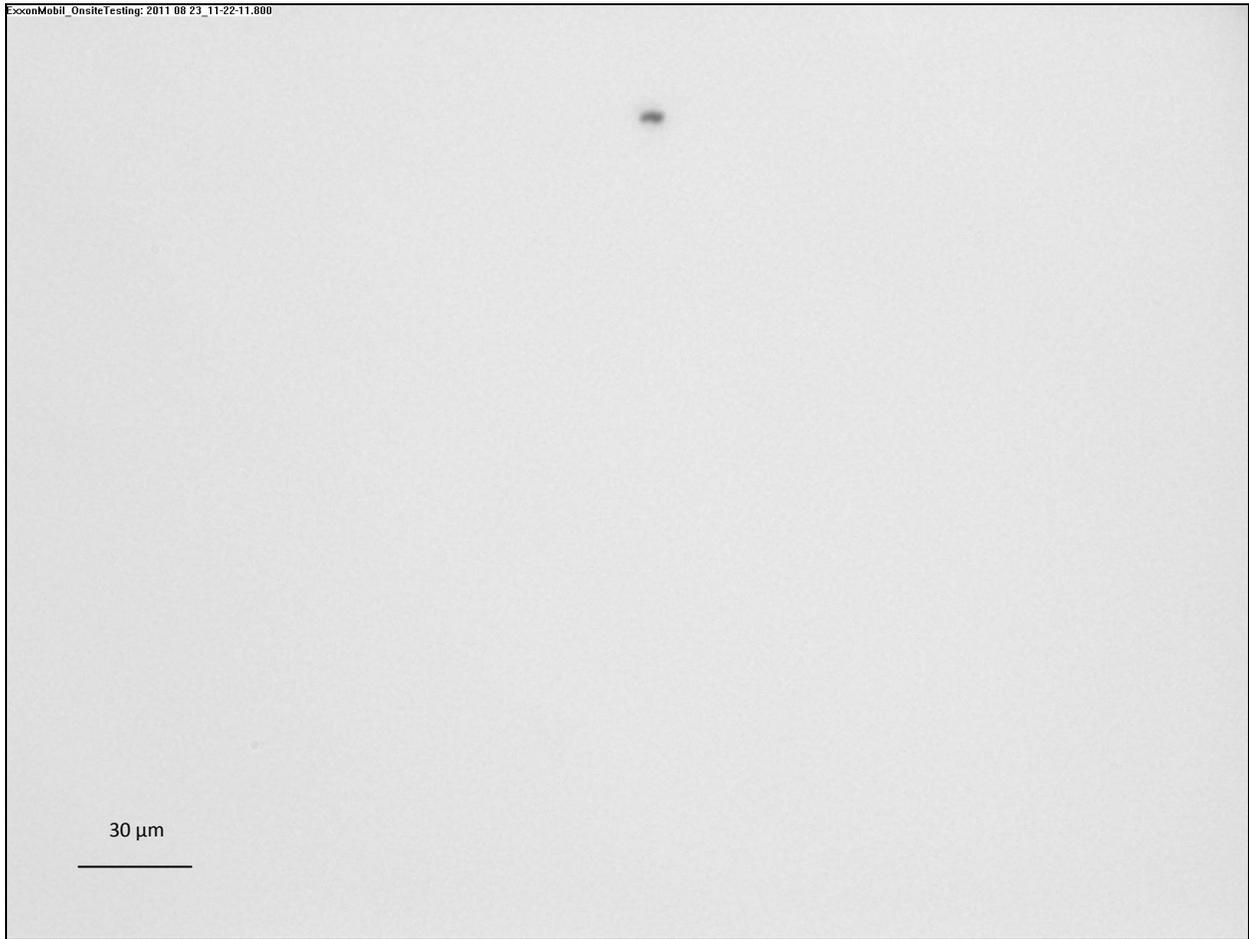


Figure 1 - Dust Particle



Figure 2 - Water Droplet

**Particle Detection in Jet Fuel Data**

**Particle Counts:**

<b>Light Obscuration</b>	<b>Sample 1</b>	<b>Sample 2</b>	<b>Sample 3</b>	<b>Sample 4</b>	<b>Sample 5</b>
≥4 μm( c )	9446.594	6718.651	19710.034	4286.316	8553.557
≥6 μm( c )	2002.766	2084.298	3680.712	1307.455	1359.448
≥14 μm( c )	48.069	47.633	79.243	66.599	63.874
≥21 μm( c )	13.734	11.99	29.539	27.904	28.231
≥25 μm( c )	6.322	5.014	14.497	14.388	15.696
≥30 μm( c )	2.507	2.071	7.739	8.175	9.156

<b>Canty</b>	<b>Sample 1</b>	<b>Sample 2</b>	<b>Sample 3</b>	<b>Sample 4</b>	<b>Sample 5</b>
≥4 μm( c )	6618.0935	3033.2929	7721.1091	2206.0312	5239.324
≥6 μm( c )	3309.0468	0	1654.5234	1378.7695	1103.0156
≥14 μm( c )	1103.0156	0	551.50779	275.7539	551.50779
≥21 μm( c )	827.26169	0	551.50779	0	551.50779
≥25 μm( c )	551.50779	0	275.7539	0	551.50779
≥30 μm( c )	551.50779	0	0	0	551.50779

**Figure 4 – This table details the particle counts per micron range as seen by the Canty InFlow™ system and the Light Obscuration method.**

## Water in Jet Fuel Data

As an indication of water detection capabilities of vision samples of 5, 15 and 30 ppm water in fuel were prepared for measurement. The Canty results are shown in Table 1.

Prepared Mixture (ppm)	Canty Result (ppm)
30	27.6
15	18.6
5	3.2

Table 1

## Observations

All five of the samples run trended in the correct direction with accordance to the amount of spiked material that was added to the jet fuel. Contents of each size category vary due to the difference in measurement technique. The model used for the CantyVision software is to size the particle by major and minor diameters (includes area, perimeter, aspect ratio etc.) and then report data based on the minor diameter which is quite common in particle analysis. Light obscuration generally uses an equivalent circle technique whereby a thin, long particle having a small minor diameter would be reported as a circle or sphere having a larger diameter. This generally results in misleading particle information.