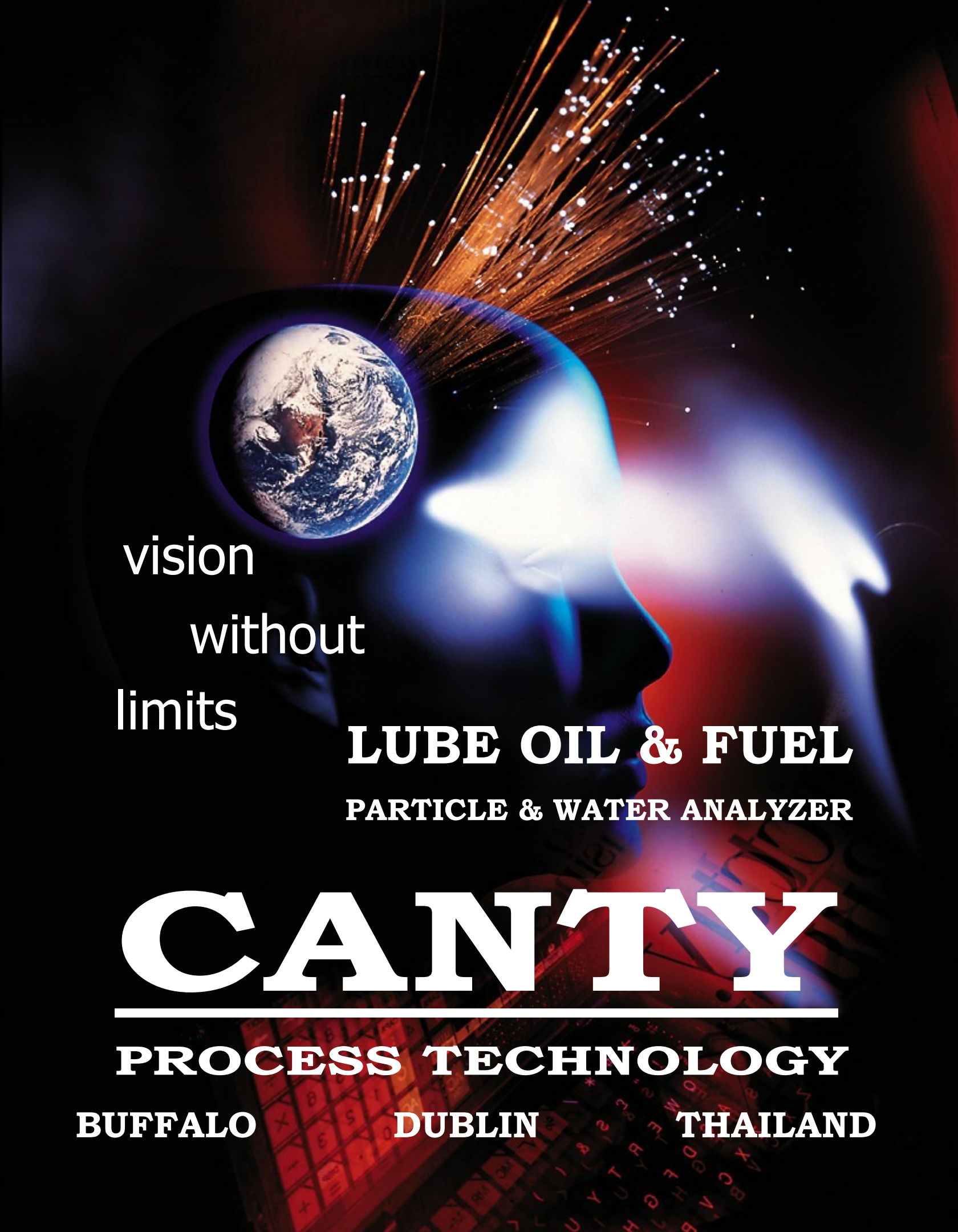




vision
without
limits

LUBE OIL & FUEL
PARTICLE & WATER ANALYZER

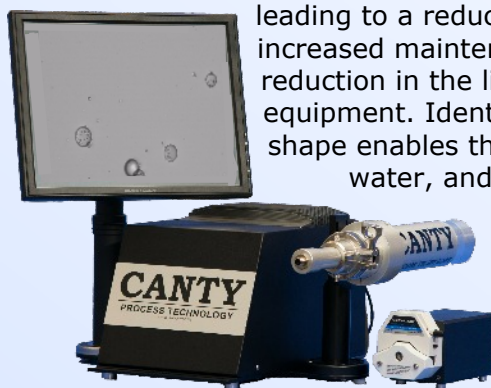
CANTY

PROCESS TECHNOLOGY

BUFFALO DUBLIN THAILAND

LUBE OIL, FUEL, & HYDRAULICS PARTICLE & WATER ANALYZER

The presence of solid particles and water in fuels, lube and hydraulic oils are problematic in that they can cause wear and corrosion, and clog filters leading to a reduction in performance, increased maintenance and a reduction in the life cycle of equipment. Identification of particle shape enables the detection of water, and knowledge of solid particle shape can assist in identification of wear points in mechanical systems.



- Meets ASTM D7596 (lube oil) and D8049 (fuels)
- Data reporting to ISO4406 and D8072
- Detects and identifies solids, water and air in fluids which avoids error in the solid counts as happens in laser and light obscuration analyzers.

Features/Benefits:

- Visual Verification
- Ethernet Connectivity
- Intuitive software interface
- Measurement to 0.7 um
- Can detect additives and water and remove from the solids count

ISO 4406 & D8072 REPORTING

ASTM Fuel & Lube Oil Standards for Imaging

D8049 – Standard Method for analyzing distillate fuels for solid particle and water content.

D8072 – Standard Classification for reporting imaging results for solid particle and water content in hydrocarbon based petroleum products.

D7596 – Standard Test Method for Automatic Particle Counting and Classification of Oils Using a Direct Imaging Tester

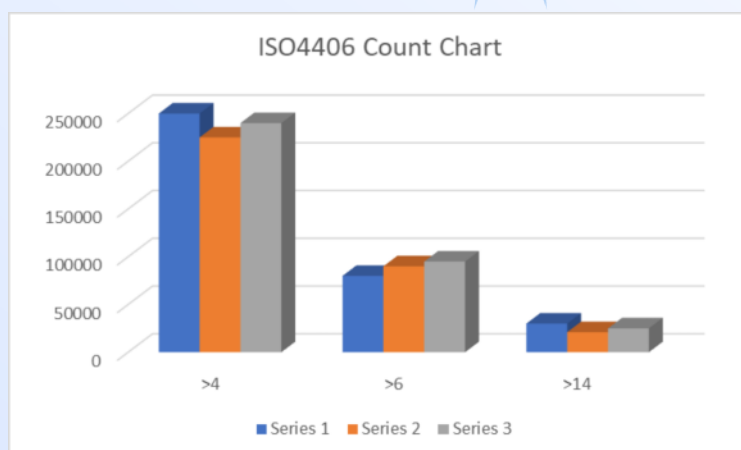
The software interface features continuous real time video for visual verification, and graphical trends for the size and concentration measured, as well as **ISO 4406 & D8072** reporting.

D8072 is similar to ISO 4406 except D8072 includes the ppm reading of water in addition to the ISO4406 number.

Example of Difference Between ISO4406 & D8072		
ISO 4406	Water Count PPM of Sample	D8072
17/17/15	4.76	17/17/15 - 4.76
15/14/12	1.06	15/14/12 -1.06

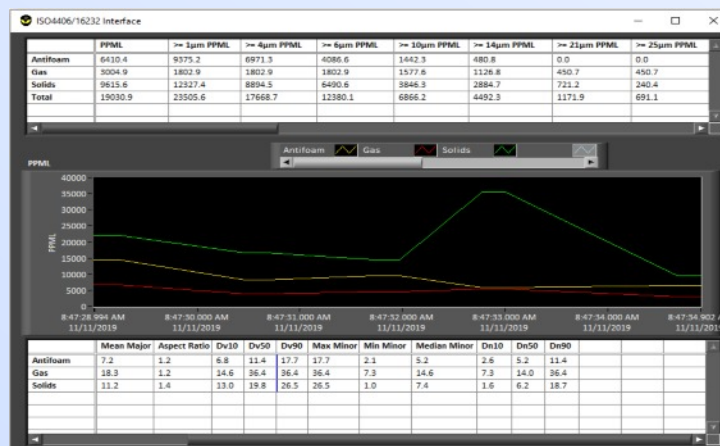
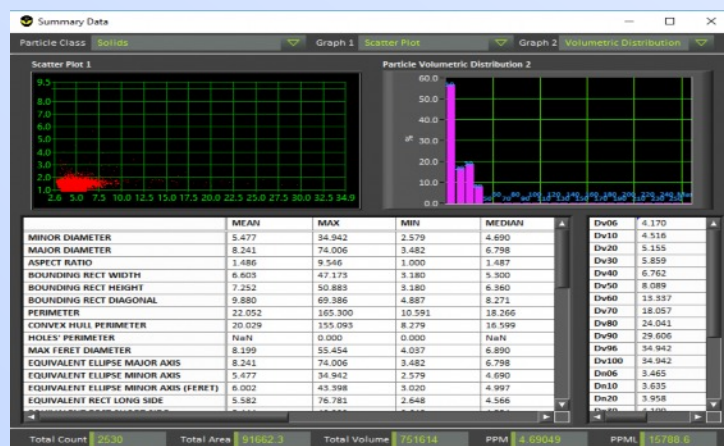
**ISO 4406
DATA
REPORTING**

Count & Size Data Output



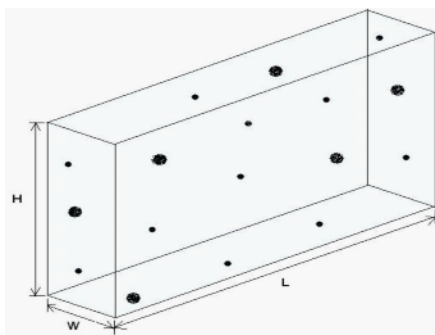
Data Reporting to ISO 4406

ISO ≥ 4	ISO ≥ 6	ISO ≥ 14
25	23	22
25	23	22
25	23	22



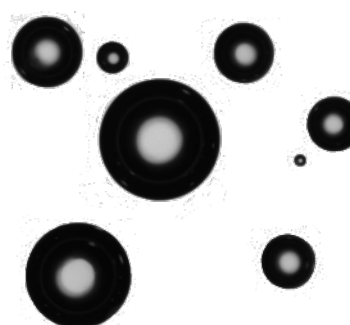
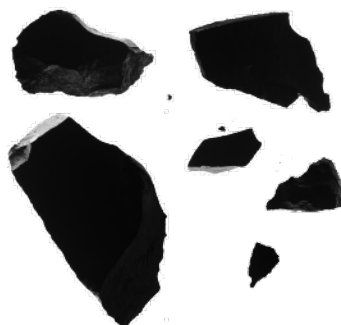
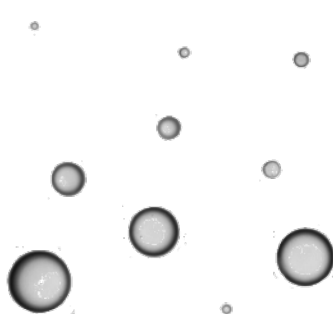
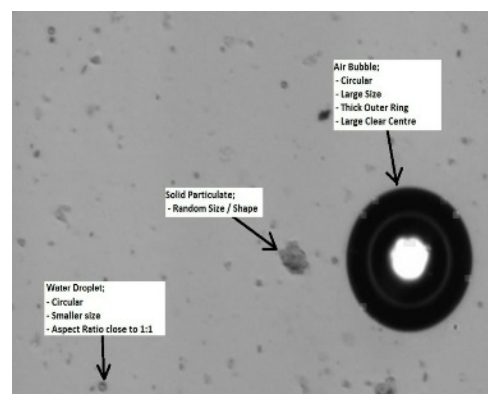
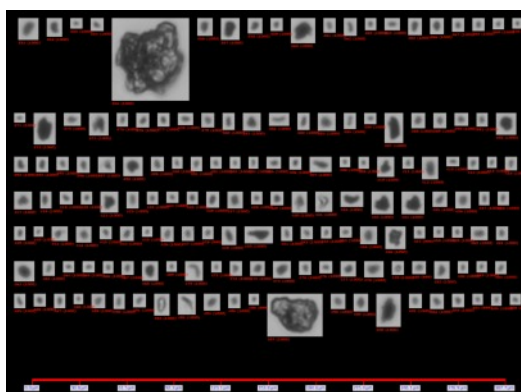
Ability to Output to Excel Datasheet

IMAGE BASED ANALYSIS & HOW IT WORKS



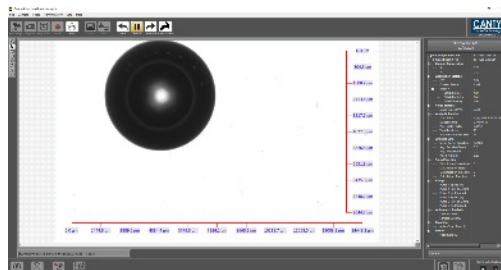
High speed, high resolution and high magnification image capture allow for accurate particle count, size and shape analysis. LED advancements have enabled consistent illumination fields which are critical in accurately defining particle images. The visual component of these systems enables the determination and classification of particle shapes. For instance, simple shape parameters can differentiate between solids, water droplets and air bubbles revealing a more in depth analysis of what actually makes up the particle count. Further, using parameters such as aspect ratio, circularity, solidity, sphericity, roundness etc... solid particle shapes can be differentiated and classified.

Based on visual characteristics, system operators can teach the software various particle type categories. Based on the teaching process, the software learns to identify particle types based on their similarity to the ideal shapes and characteristics desired. In the past, these parameters would be hand programmed into the software. Now, with Canty's AI software, they are programmed ahead of time and visually verified,. See images below.



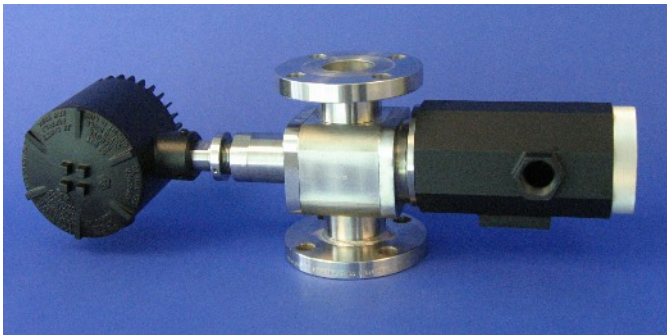
WATER		SOLID PARTICLE		GAS BUBBLE	
<u>Shape Parameter</u>	<u>Value</u>	<u>Shape Parameter</u>	<u>Value</u>	<u>Shape Parameter</u>	<u>Value</u>
Circularity	0.13	Circularity	0.7	Circularity	0.33
Aspect Ratio	1	Aspect Ratio	2.23	Aspect Ratio	1
% Holes Area	0.925	% Holes Area	0	% Holes Area	0.255

ANTI-FOAM, WATER, & BUBBLES



Traditional particle counters count water and Anti-Foam as solid particles. This results in high particle counts which can be mis-read as a problem. This has resulted in many users "cleaning" their oil and removing anti-foam which then causes foaming problems. Canty can provide baseline data information for manufacturers of turbine oils allowing them to measure the droplet size and concentration for additives & water, gas, and solid particles.

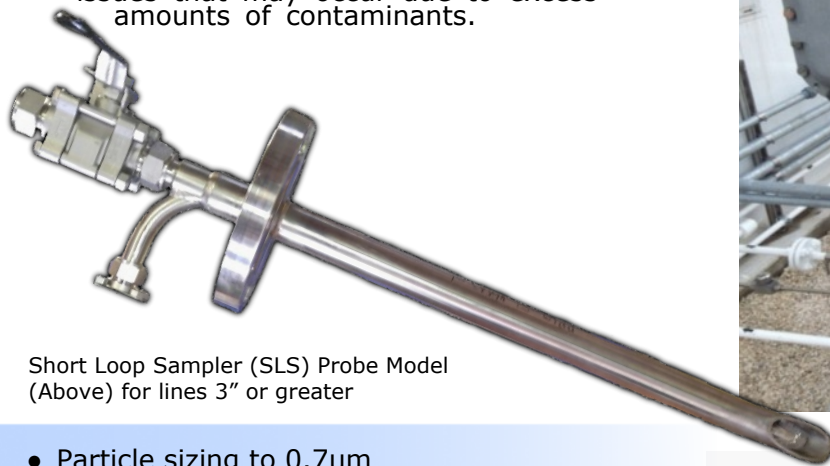
INLINE - INFLOW™ ANALYZER



The InFlow™ Analyzer based on dynamic imaging, features a high speed microscopic camera and high intensity LED light source, positioned on opposite sides of a central flow cell. As fluid passes through the flow cell, images of any suspended particulate are captured and analyzed. Powerful image analysis software can distinguish between **WATER** droplets, suspended **SOLID** particles, **DEFOAMANT**, and **GAS** bubbles to provide simultaneous size, shape and concentration information for each.

WATER CONCENTRATION • WATER DROPLET SIZE • SOLIDS CONCENTRATION • SOLIDS PARTICLE

Available in a number of configurations - **direct online, side stream, or portable** - the InFlow™ can be used at **MULTIPLE** points on a pipeline to avoid any processing issues that may occur due to excess amounts of contaminants.

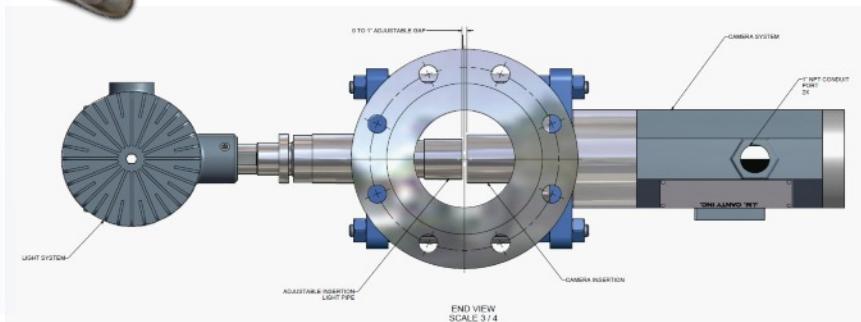


Short Loop Sampler (SLS) Probe Model
(Above) for lines 3" or greater



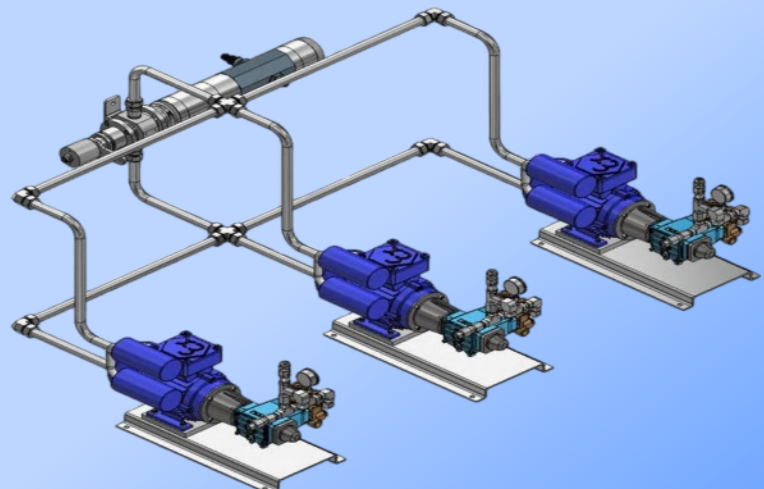
Image above shows our direct online InFlow™ configuration

- Particle sizing to 0.7µm
- Fused Glass Windows - Options to 600 BAR
- High Intensity LED Lighting
- Gigabit Ethernet Camera Technology
- High-Speed Ethernet Technology
- OPC outputs
- Up to eight analog 4-20 mA outputs
- Digital IO



MEETS ASME CODE B31.1 & B31.3 - ASTM STANDARD MEASUREMENT FOR FUEL/LUBE OIL

- One analyzer can be used for multiple pumps
- On line analyzer allows for continuous monitoring
- Data analyzed in real time means no more waiting to run samples in lab

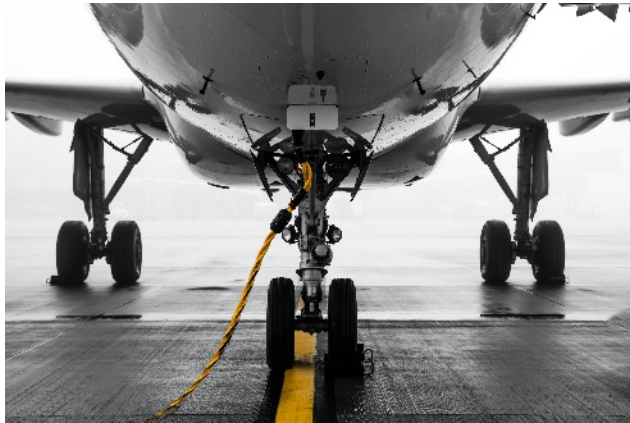


FUEL ANALYSIS

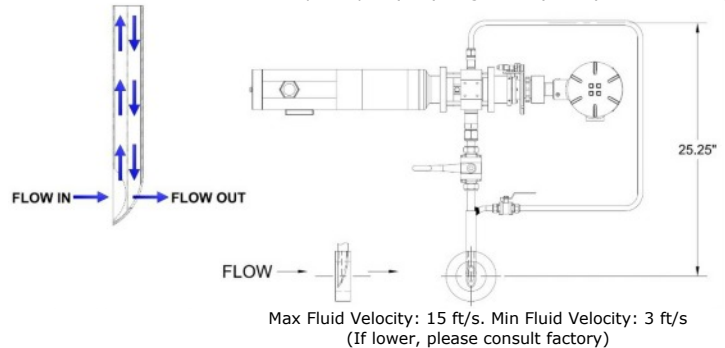
WHAT WE DETECT AND WHY

1. Solid Particles – clog filters and injection ports, pump failure.
2. Water Droplets – can freeze at altitude clogging lines and filters, reduce combustion efficiency of fuel.
3. Air Bubbles – cause error for in-line measurements mostly resulting in inaccurate fuel analysis.
4. Microbial Growth – Increased fuel consumption, reduced engine RPM, increased emissions.

Aside from the worst case scenarios, which are equipment downtime and human safety, fuel contamination can prove to be very costly.



Short Loop Sampler (SLS) Ring Model (above) for lines 3" or greater



COLOR ANALYSIS

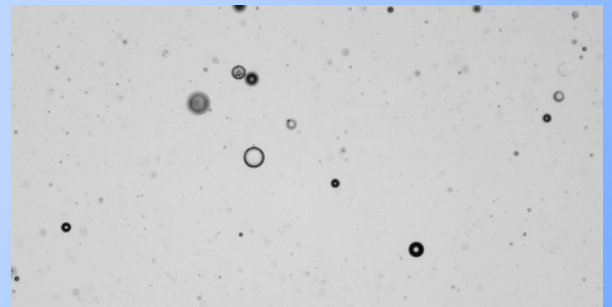
Color analysis is done by using a high resolution CCD/CMOS image sensor that detects color changes in fluids by measuring the transmittance of light. Using advanced software algorithms the system automatically removes gas bubbles from the analysis resulting in highly accurate and repeatable data outputs. This system is designed for inline use with varying pressures, temperatures and pipe diameters.

FEATURES

- Transmitted light microscopy visible to NIR.
- 2.1 Mega-Pixel CMOS Imaging Sensor (45 FPS).
- Measurement capability to 1 μ m.
- LED strobed technology (2 μ s Pulsewidth) allows for flow rates through analyzer up to 15 fps.
- Calibration verification using NIST Traceable polystyrene microspheres.
- High speed software with easy to use graphical using interface.
- 15 ft/s Flow Velocity.

WATER/SOLIDS/GAS INDEPENDENTLY DETECTED

Using the ASTM D8049 method, the CANTY InFlow™ is a vision-based camera system used with the CANTY Vector System image processor for JET FUEL concentration and size measurement in a lab environment/ at-line (Short Loop Sampler) / in-line process. The CautyVision™ Software accurately measures multiple aspects of the JET FUEL from water / solids / gas independent of each other for accurate data. In comparison to a fluorescence monitor or laser unit, which measures only contamination level but cannot determine the difference of water/ solids/gas. The software can then output user defined particle size distribution and particle concentration information.



**BUBBLES HAVE
NO EFFECT!**

FUEL ANALYSIS

Field Testing Experiment in Norfolk

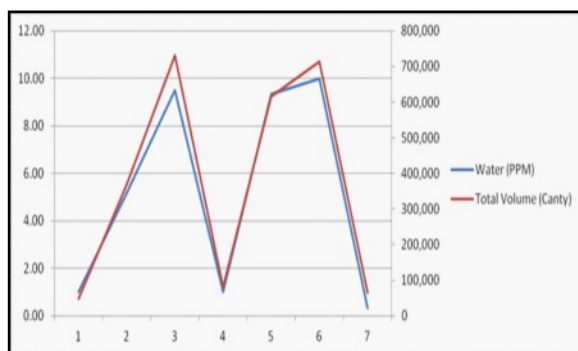
Online and Off-line testing were done with Canty Inflow and compared to a Laser Light Obscuration unit.

It can be seen from the data above that the widest discrepancy in ISO4406 codes from Canty Analyzer to the Laser Light Obscuration unit was seen in samples with some water concentration, indicating that the Laser Light Obscuration unit is not able to distinguish between water and solids resulting in higher ISO4406 numbers as seen in the diagram to the right.

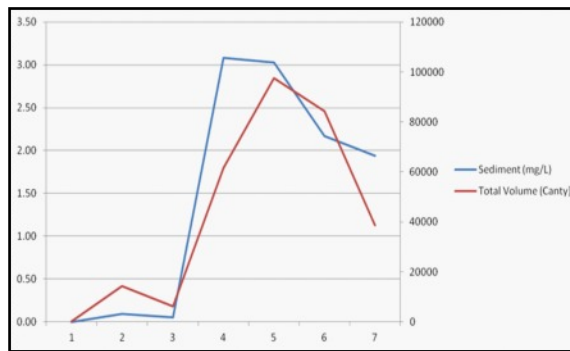
Sample 6A Service Pump Discharge	Sample 6B Service Pump Discharge	Sample 414-1 Service F/S Outlet	Sample 414-2 Service F/S Outlet
ISO 4406 Code (Canty)	ISO 4406 Code (Canty)	ISO 4406 Code (Canty)	ISO 4406 Code (Canty)
17, 17, 15	15, 14, 12	14, 13, 7	13, 12, 11
Water PPM (Canty)	Water PPM (Canty)	Water PPM (Canty)	Water PPM (Canty)
4.76 PPM	1.06 PPM	0.00 PPM	.01 PPM
ISO 4406 Code (Laser Light Obscuration)	ISO 4406 Code (Laser Light Obscuration)	ISO 4406 Code (Laser Light Obscuration)	ISO 4406 Code (Laser Light Obscuration)
19, 18, 14	18, 16, 11	15, 14, 10	15, 13, 10

USN Fuel Test – Pax River Naval Station Testing Outcomes

In-Line Water in Fuel Testing



In-Line Solids in Fuel Testing



CANTY vs. LASER LIGHT OBSCURATION SYSTEMS

We are the ONLY system that reports to D8072 (in addition to ISO 4406). We not only count particles, we analyze particle shape as well as give a PPM of water & identify the presence of additives.

Canty Image Based Analysis

- 2D
- Analyzes Presence and Shape of Particles
- Inline and Lab systems
- Additive Detection
- Show Water Contamination
- Particle Sizing to .7µm
- Reports to ISO4406 & D8072

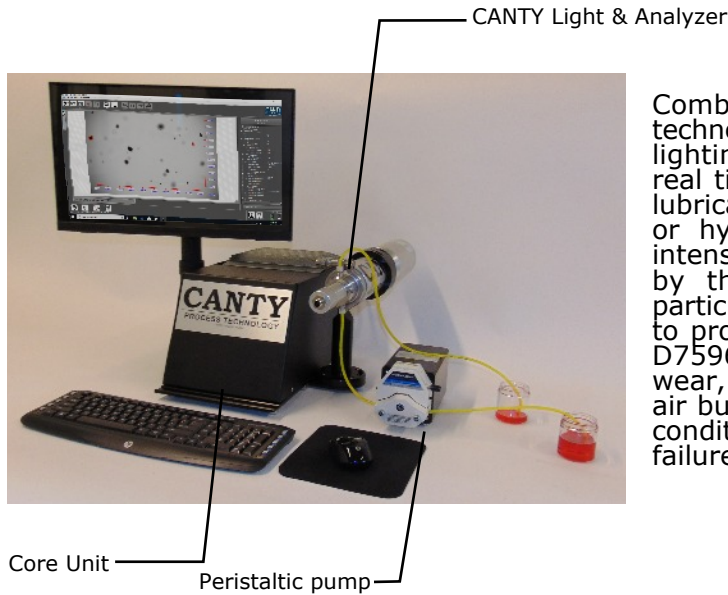
Laser Light Obscuration

- 1D
- Only Analyzes Presence of Particles
- Does NOT Account for Additives Causing Skewed Data
- Does NOT Show Water Contamination
- Particle Sizing to 4µm
- Only Reports to ISO4406

The chart below shows 4 different samples run through a Canty InFlow™ and a competing Laser Light Obscuration device to show the difference that water PPM counting makes in accurate ISO4406 reporting.

Sample A	ISO4406 Solids	Water (PPM)	Sample B	ISO4406 Solids	Water (PPM)	Sample C	ISO4406 Solids	Water (PPM)	Sample D	ISO4406 Solids	Water (PPM)
CANTY InFlow™	17/17/15	4.76	CANTY InFlow™	15/14/12	1.06	CANTY InFlow™	14/13/7	0	CANTY InFlow™	13/12/11	0.01
Light Obscuration	19/18/14	N/A	Light Obscuration	18/16/11	N/A	Light Obscuration	15/14/10	N/A	Light Obscuration	15/13/10	N/A

LAB SYSTEM HARDWARE FEATURES



Combining the latest in CCD/CMOS Ethernet camera technology, with CANTY fused glass technology, high intensity lighting, and CANTYVISION™ software, the system provides real time particle analysis of solids, water and air bubbles in lubrication oils. The method involves flowing the lubricating or hydraulic oil between a microscopic camera and high intensity light source. The captured images are then analyzed by the CANTYVISION™ software, where the suspended particulate is analyzed under a number of different parameters to provide size, shape and concentration data. As per ASTM D7596, particles are classified under sliding / cutting / fatigue wear, nonmetallic particles, fiber particles, water droplets & air bubbles to provide a comprehensive understanding of the condition of the fluid, and indicate where and how possible failures are likely to occur.



PART NUMBER (120 V AC)= LUB - A G 1 K 6 1 B 1 2 A Z

PART NUMBER (240 V AC)= LUB - A G 1 K 6 2 B 1 2 A Z

**CANTY'S GOAL IS TO PROVIDE EQUIPMENT TO ENHANCE PROCESS CONTROL
AND YIELD. WE ACCOMPLISH THIS BY DESIGNING, MANUFACTURING AND
SERVICING THE FINEST EQUIPMENT IN THE WORLD**

SOME OF THE COMPANIES WE HAVE WORKED WITH

ASCOM	PREMIER OIL
BG TECHNICAL	PROLAB NL
BP	SAIPEM
CAMERON	SGS
CETIM	SHELL
CHEVRON	SIEMENS WATER
DALEEL PETROLEUM	SINTEF
EESTI ENERGY	SMS
EXXON MOBIL	SNF
FMC	SOILTECH
FRACTECH	TOTAL
IMPERIAL OIL	TUV NEL
MYCELX	WEATHERFORD
NESTE OIL	WINTERSHALL
OIL PLUS	



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