

vision  
without  
limits

**PHARMACEUTICAL**

# **CANTY**

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## **PROCESS TECHNOLOGY**

**BUFFALO**

**DUBLIN**

**THAILAND**

## CANTY LIGHTS

### LED Process Lighting



#### OPTIMUM VIEWING

CANTY HYL lighting systems are designed to illuminate for optimal viewing. Our patented design transmits an intense beam of LED light into a process or pressure vessel.

Bundles mount direct to FuseView™ -  
No light loss due to reflection!



CANTY 12" bundle models mount directly to a sight glass with an optional bracket.

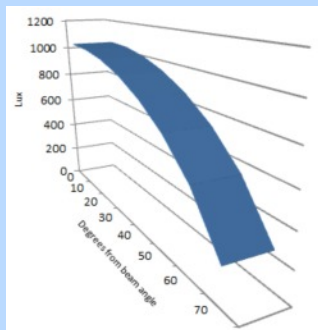
- View and illuminate through one nozzle
- Maximum LED illumination
- Cool light output - there is no product bake-on



Flexible fiber optics allow for mounting in any convenient location!  
CANTY 24" and longer bundle models mount remote from the sight glass with an optional bracket for increased accessibility.

- High Intensity LED Lighting
- NEMA 4, IP66, Explosion proof, Flame proof models
- Fused glass seal provides a safe, reliable, hermetic seal between electronics and the process area.

CANTY lights feature a unique, high output LED array and reflector assembly that focuses the light from the bulb into the process vessel or tank. An optional UV filter is used to protect product from harmful wavelengths, providing only cool light into the process and eliminating sight glass bake-on.



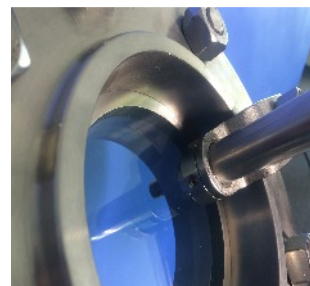
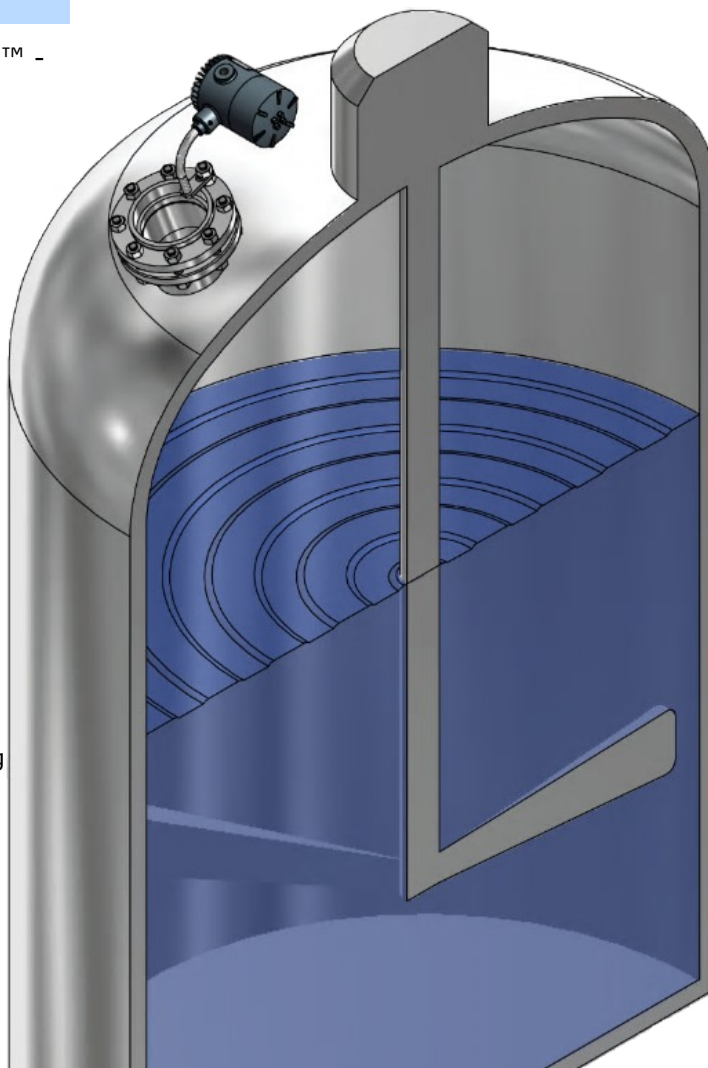
#### ADVANTAGES OF THE CANTY UNIQUE LED ARRAY

- Redundancy - LED array with numerous diodes
- Highly efficient. Maximum lumens with minimal power draw.
- More lumens per square inch than standard LED bulbs.
- More uniform, dispersed compared to a single emitter to allow for optimal illumination.
- Solid-state lighting for rugged industrial applications.
- Uniform consistent white light.

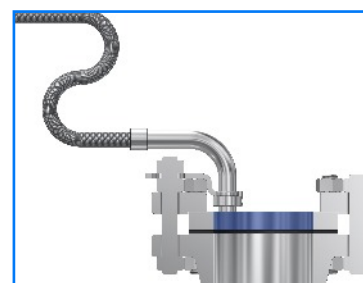
# Fine Chemical LED Lighting

CANTY provides a combined LED light and sight glass to optimize viewing and minimize total package cost. Illuminate through an existing sight glass or a newly installed FuseView™

THE INDUSTRIES  
BRIGHTEST FIBER OPTIC  
AND DIRECT MOUNT LED!



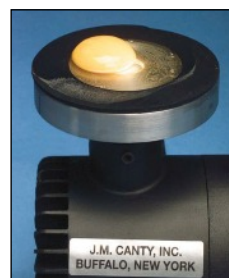
Unique bracket maintains bundle contact to eliminate reflection!



- Minimal bend radius - 2.5"
- Minimal area of sight glass is consumed by fiber optics.
- Industries largest view - FuseView™

Consult factory to easily upgrade your existing halogen lights to LED!

#### 1 HOUR BAKE-ON TEST



CANTY COLD LIGHT



COMPETITOR'S LIGHT  
NOTE: EGG IS BAKED ON

CANTY IS MEASURED AND MEETS THE NEW DIRECTIVE WHICH LIMITS THE AMOUNT OF RADIATION TO AVOID PROBLEMS IN THE FIELD.



# High Purity LED Lighting



PureView™ Sanitary sight glass/light

The CANTY PureView™ is a sanitary / hygienic fiber optic LED light and fused sight glass combination. The PureView™ combines the maximum viewing area through a CANTY FuseView™ sanitary sight glass with a CANTY high output LED light, providing the best view possible while minimizing space and connections.



Unique bracket maintains contact to eliminate reflection

## SANITARY LED LIGHTING

### APPLICATIONS

- Biotech Applications
- Fermentors
- Food Applications
- Sterile Process Applications
- Sanitary Areas

### FEATURES

- Meets ASME/BPE Standards
- 316L and Hastelloy® Materials
- NEMA 4X / IP66
- Cold light, high output LED
- Fused glass - Safe Light
- CIP/SIP Process Compatible



HYL 52 LED Lighting System

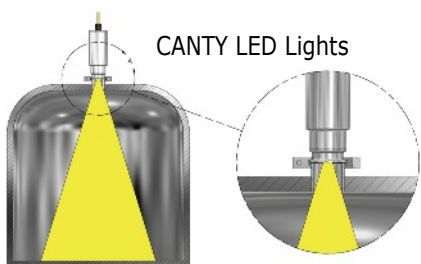
All CANTY LED lights feature a hermetic, fused glass, high pressure / temperature seal to completely seal the light from the process. The 316L SS or Hastelloy® design and variety of mounting connections make CANTY Lights ideal for any application.



## CANTY Direct Mount

- Directly connects to sight glass to maximize light introduced to the vessel (no gap that would result in light loss & material/dirt build-up).
- Compact hygienic design with integral fused glass mount (no additional sight glass needed)
- Low power consumption
- Extended Life (low-maintenance)
- Long Warranty
- Available in 2000 Lumens and 4000 Lumens
- For ordering information see TA11500-1007 and TA11500-1016.

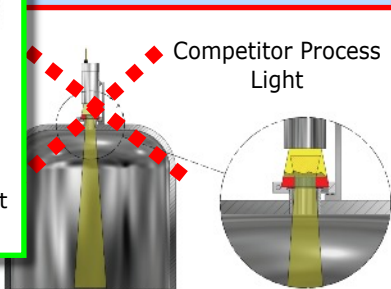
## DIRECTIVE LIGHT



- CANTY Direct Mount LED
- No light lost due to reflection
- Compact hygienic design with integral fused glass mount (no additional sight glass needed)

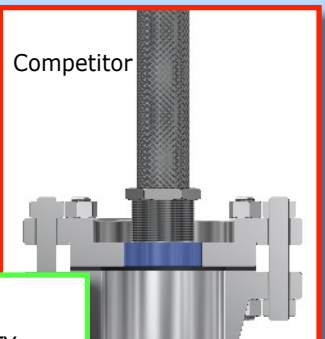
## The CANTY Advantage

### REFLECTIVE LIGHT

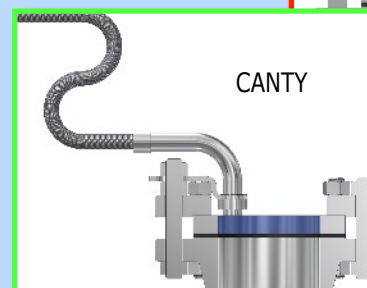


- 50% of Light output is lost due to reflection
- Results in dirt/dust build up

### Competitor



### CANTY



- Limited bend radius
- No View
- Bulky fiber optics and mounting

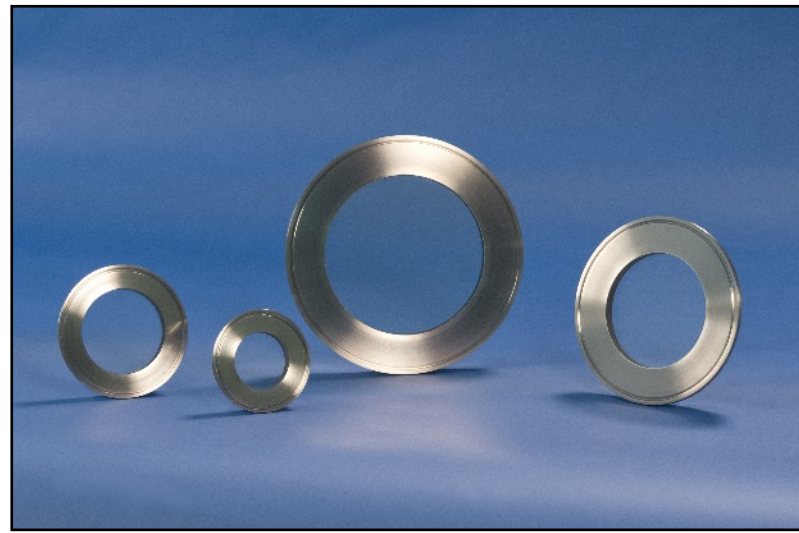
- Minimal bend radius - 2.5"
- Minimal area of sight glass is consumed by fiber optics.
- Industries largest view - FuseView™

# CANTY Sanitary Sight Glasses & Sight Flows



CANTY sanitary FuseView™ sight glasses are fused, one-piece sight glasses, featuring a hermetic fused glass to metal seal. The CANTY high pressure, fused glass design requires no special gasketing or torque requirements. CANTY Sanitary sight glasses have been designed and tested to ensure the safest product available.

CANTY can provide certification of material and testing if required, following ASME code and TUV requirements for process vessels. FM approval is available on some models.



## TRI-CLAMP® FuseView™



Available in full view and flush mount styles, the hermetic sanitary design is ideal for sanitary applications. CANTY features the

largest viewing area of any fused sight glass on the market today.

## SANITARY FLANGE FuseView™



Incorporate a through hole bolt pattern in the sight glass, eliminating the need for a retaining flange. The low profile design and hermetic, fused seal provide a high strength, sanitary sight glass free of air pockets or pockets for material accumulation.

## ASEPTIC NA-CONNECT® FuseView™



Designed for sanitary, CIP/SIP applications. The sanitary design eliminates air pockets and trapped material and

is designed for full torquing. The cannot be over-torqued.

## HEATED TRI-CLAMP® FuseView™



Designed for use with a heater to eliminate Condensation from forming on the glass. Provides a high pressure, hermetic fused glass seal with additional mounting space for heating accessories.



## Sanitary Sight Flows



CANTY sanitary sight flows are designed with the same attention to safety as industrial units. They are available with Tri-Clamp®, butt weld, TS, or any available sanitary connection.

### How It Works

To manufacture a FuseView™ we heat the glass to it's molten point where it flows to the wall of the metal. At that point the glass fuses or bonds to the metal. Then we slowly cool the FuseView™ until the glass solidifies. The metal has a higher coefficient of expansion than the glass and the metal compresses on the glass. This squeezing prestresses the glass and puts it under radial compression. Glass is strong in compression but not under tension or shear. When the FuseView™ is pressurized the glass bends and relieves the compression and avoids tension. This is the same as is done with concrete - it is prestressed in compression in order to take bending.



## The CANTY Advantage



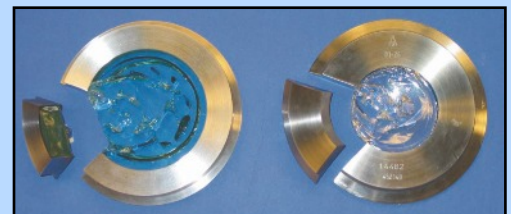
### CANTY

- Full 3.0" [76 mm] view (4" Tri-Clamp®)
- Hastelloy® C, Hastelloy® C276 and Hastelloy® C-22®

### Metal Glass

- 2.17" [55mm] view (4" Tri-Clamp®)
- DIN 1.4462 = Duplex SS NOT 316L SS

**CANTY provides the largest view possible!**



### CANTY

- CANTY model is hermetically fused. Note - glass is still fused to the ring after cutting.

### Metal Glass

- Not actually fused! Metal section breaks away cleanly.

(Comparable models shown cut with band saw)



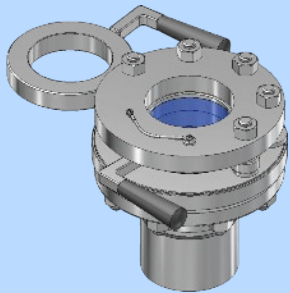
# CANTY QuickPort™ Closures



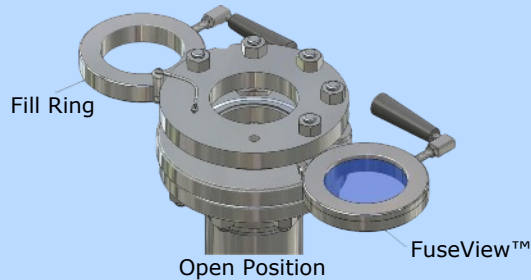
The CANTY QuickPort™ is a patented, safe, quick opening closure for process vessels. Originally used in the offshore diving industry as a transfer lock on decompression chambers, QuickPorts™ are used with no additional interlock by the tank to be pressurized or evacuated. A pressure differential holds the door securely in place and no bolting is involved. Meets ASME code section VIII for quick opening closures. Optional positive interlocks for hazardous or lethal service are available.



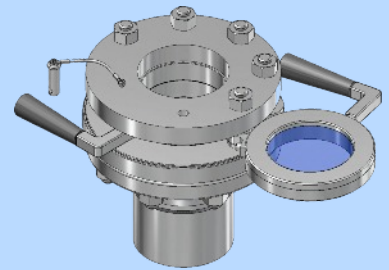
The QuickPort™ features a hinged door or window that opens laterally to provide full port access. The closure consists of a pad and a retaining flange held apart by spacers, a floating seal ring, and a door in the form of a FuseView™ sight glass. As the door is pivoted into the closure, the spring loaded seal ring is deflected back to allow the door to fit tightly between the flanges. The spring force creates an air tight seal on the door face, and allows the tank to be pressurized or evacuated.



Closed Position = Complete Containment



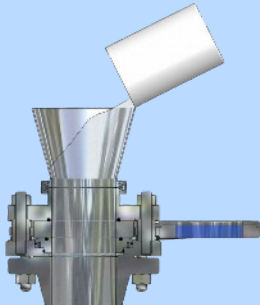
Open Position



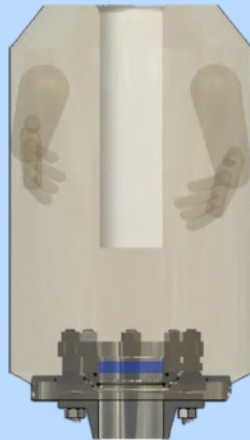
Fill Ring = Prevents Spillage

## QuickPort™ APPLICATIONS

- Powder charging
- Sampling
- Pilot Plant Vessels



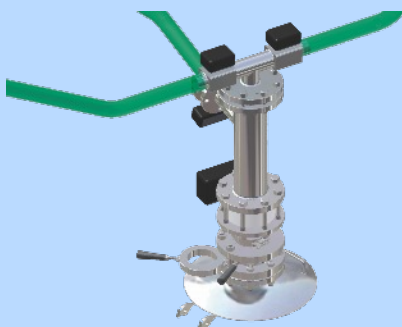
Funnel = Clamp-On or Drop In



Sprayball = No Additional Nozzle Needed

## QuickPort™ HAZOP OPTIONS

- Air Cylinder Locking Pin
- Spring Loaded Locking Pin
- Interlock Available for Hazardous Operations - not needed for pressure safety
- Limit Switch



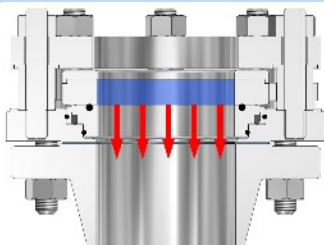
Vessel Charging with DEC PTS System



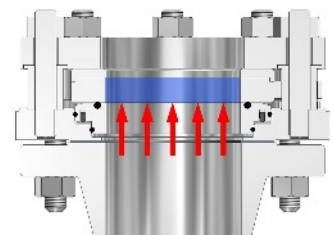
Vessel Charging and Sampling with Dover Pac®

## HOW IT WORKS

The zero leak design has been proven through a combination of air/liquid submergence testing. This cycles the QuickPort™ through external pressure, no pressure and ultra high internal pressure leak testing where a constant o-ring seal is maintained.



Seal Under Vacuum



Seal Under Positive Pressure

# Process Vessel Cameras



CANTY's process vessel cameras with integral light source allow for high quality remote viewing of a process vessel from the operator control room.

- Integral fiber optic guided lighting ensures uniform illumination in the viewing area.
- System hard-mounts directly to the process vessel, so it does not have any reflection issues.
- Camera and light combination through one port.

**Eyes in the Process • Visual Verification • Integral Lighting**



## BioCam™ - High Purity

CANTY Camera & Light Vision Systems are a patented design to view and illuminate the inside of a pressure or process vessel through a single connection. There is no need for multiple ports! CANTY can supply an integrally mounted camera and light (optional) in flanged, sanitary or NPT threaded process connections. CANTY fused glass technology provides a safe, high pressure, hermetic fused glass barrier between the process and the camera electronics.

The key to CANTY Camera & Light Vision Systems is the CANTY LED Light. CANTY uses fiber optic light guides to focus cool, effective light into a process or pressure vessel. Cool light eliminates product bake-on, adding no heat to the process. Fiber optic light guides deliver the maximum amount of light into the tank.

The resulting live, remote image from a CANTY Camera & Light Vision System is unparalleled!

- NON-CONTACT Foam Control
- Strobed LED Light
- Percent Foam
- Verify Empty



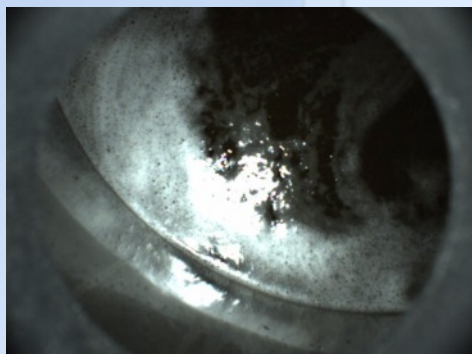
### Empty / Low Level



### Non-Contact Level

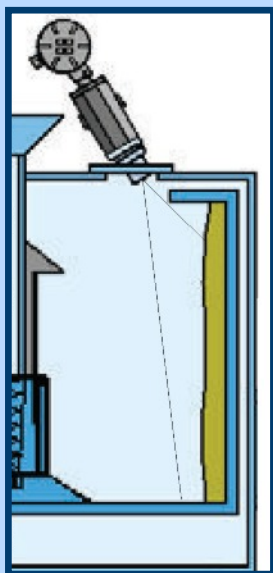


### Foam Detection



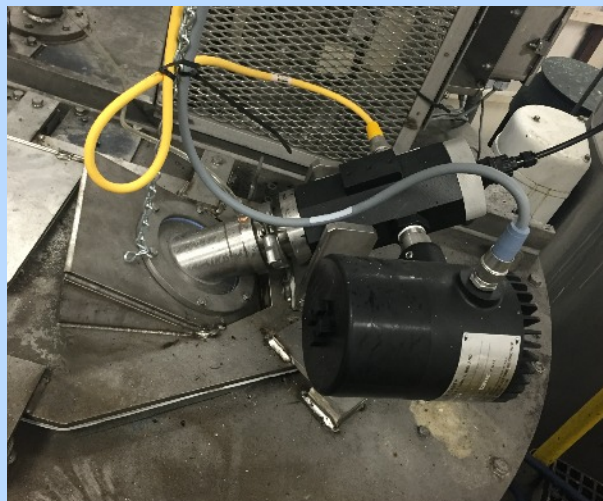


# Centrifuge Camera Control



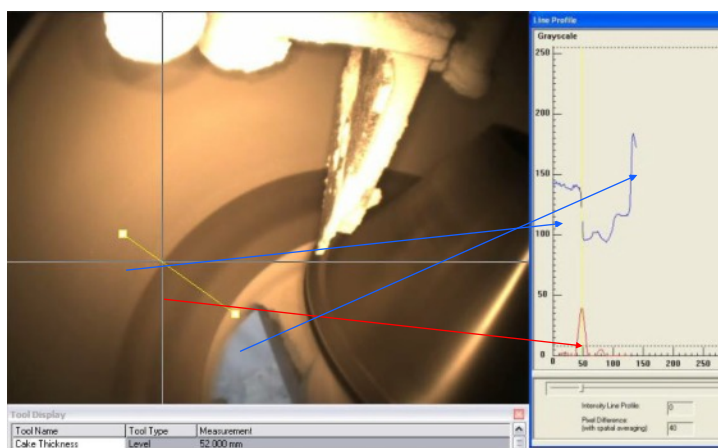
A camera light combination system is mounted to the centrifuge using the CANTY angled mounting plate. This allows for continuous monitoring from the control room, of initial product filling, the various washing and spinning cycles, and product discharge, therefore enabling greater operator control and efficient identification of any process issues.

CantyVision™ image processing software can be used to measure and detect various process parameters on both batch and continuous centrifuge systems.

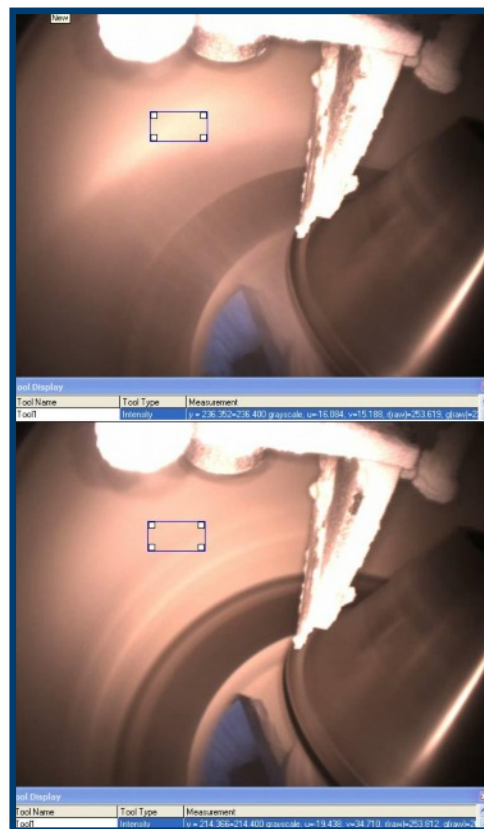


## Cake Thickness • Color Line Control • Wash Optimization

The CantyVision™ Level / Edge tool, can be configured to track any edge based on the difference in color or grayscale of 2 materials / components. In a batch centrifuge, this edge is the intersection between the product cake, and the centrifuge base plate. This edge tracking is a direct measurement of the cake thickness.



In a continuous centrifuge, the same Level / Edge tool can be configured to track the position of the color line. This allows the operator to adjust the feed conditions to maintain a constant color line position, and avoid washing above the color line, which is inefficient due to spacing on screen and subsequent liquid carry over.



The CantyVision™ Intensity tool can be used to optimize the product washing & spinning phases of the centrifuge process.

If there is overstanding liquid present on the surface of the cake during washing, it indicates less than optimal filtration, which could be due to too high a wash fluid feed rate, or possibly fine particles plugging the filter mesh (indicative of a problem with crystallization).

This overstanding liquid is detected by CantyVision™, as when liquid is present, there is a higher than normal intensity reading due to the reflection of the imaging system's light source from the surface. In addition to detecting the initial presence of overstanding liquid, a subsequent drop in intensity reading indicates that all wash fluid has eventually been filtered through. This can be used to control the introduction of additional wash cycles, or to determine when the washing process is complete and the product can be discharged.

# Filter Dryer Optimization

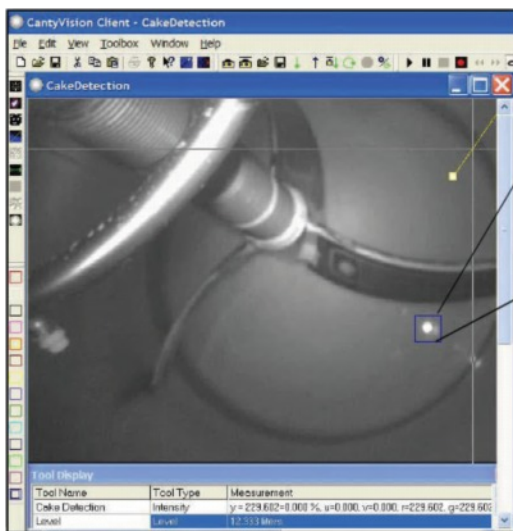
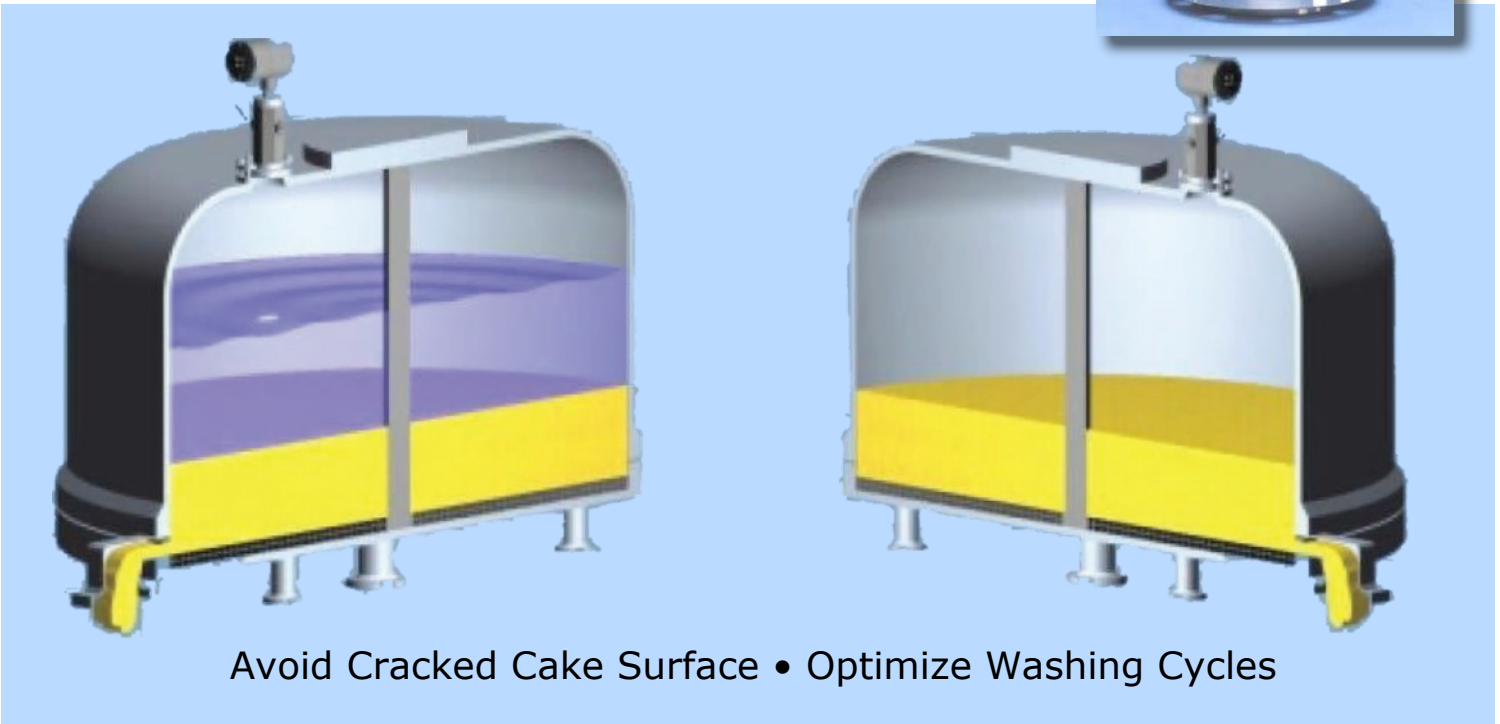
The latest in imaging camera technology, combined with high intensity LED lighting, is mounted to your filter dryer vessel to provide an unrivalled remote view from the control room into your process.

A jet spray ring system is incorporated to ensure the camera view through the fused glass process barrier is clean at all times, ensuring a continuous clear view of your process.

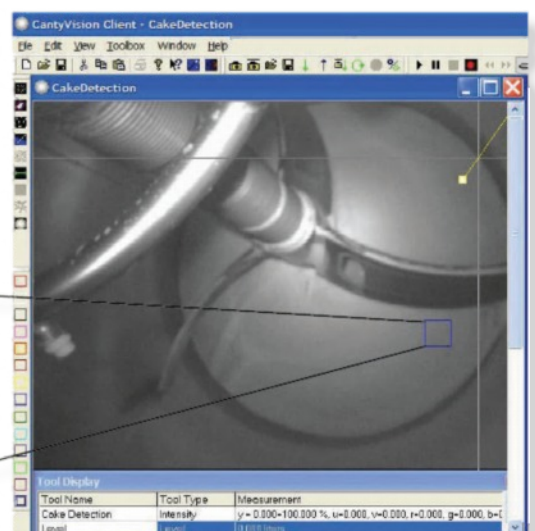
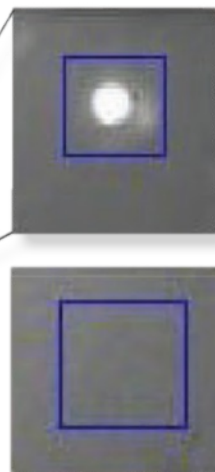
Using an intensity measurement algorithm, CantyVision™ imaging software can be configured to determine the exact filtration end point, and send a signal to the DCS via OPC or 4-20mA.

The liquid surface reflects a bright spot created by the vision system's integral light source. The wet cake surface does not, and so the exact transition point at which the cake emerges is determined.

This avoids the possibility of a cracked cake surface due to drying out of the product, and also allows for a more efficient washing regime, which in turn increases throughput by reducing the number of washing cycles required.



**LIQUID SURFACE**



**CAKE SURFACE**



# Spray Dryer Monitoring

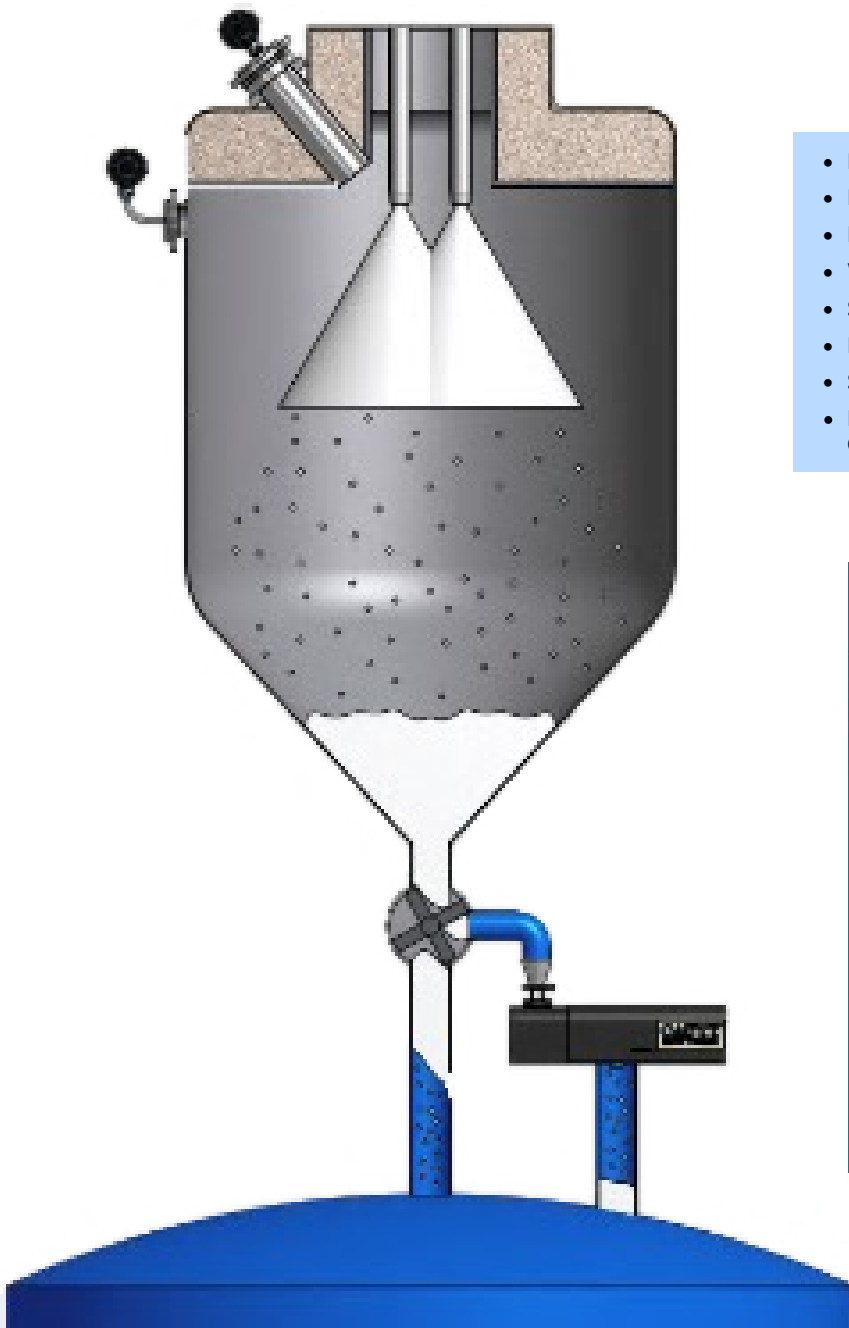
CANTY Spray Dryer Monitoring Systems are vision based, industrial camera / light combinations used to view spray nozzle patterns in real time. This allows operators to see changes in the profile of the spray pattern, and detect clogging before it becomes a problem. Operators can easily view for product build-up before there is a chance for fire.

This Vision System can be automated by the CANTY Vector™ Image Processor to measure the size and shape of the spray pattern profile. Alarms can then be sent to the control system if nozzles clog or the spray pattern changes.

The CANTY SolidSizer™ and Vector™ System can be used simultaneously with the spray nozzle monitoring system to determine the final product size. Particles ranging from .002" to .24" (50 micron - 6mm) are analyzed using 2 dimension imaging software for true size and shape information.

Results can be sent to the control system, allowing pressure adjustments to be made automatically.

A full particle size distribution can be obtained or just critical measuring points. All results can be saved to a file for a historical record.



- Fiber Optic "Cold" Light Means No Product Bake-On
- Fused Glass Interface
- Multiplexing Video Inputs
- World Wide Approvals to FM, CSA, and ATEX
- Single Nozzle Viewing / Illuminating
- Remote Dimmer
- Spray Rings Available For Cleaning
- Multiple Outputs Such As 4-20mA, Or TCP/IP Interfaces Can Be Used

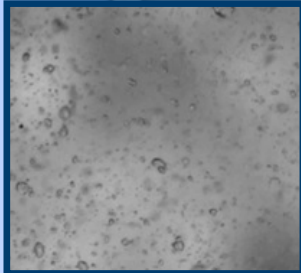


# Crystallization

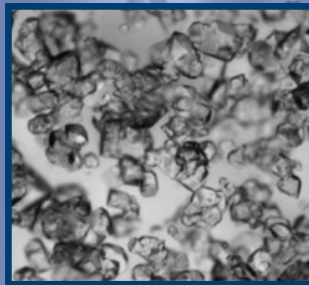
Control of Crystallization is one of the most important factors effecting product yield and quality. Image based particle size and concentration uses high speed imaging sensors with a resolution down to .7 micron to capture the particulate in real-time. Analysis can be accomplished in pipeline or in a crystallization reactor.

## CrystalScope™ Advantages:

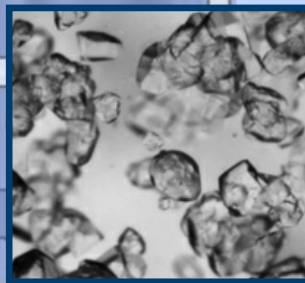
- Real-time crystal size analysis
- Crystal distribution by major, minor diameter, area, perimeter, aspect ratio, circularity.
- Crystal size & shape
- Crystal count
- Density of crystals
- Detection of seeding problems
- Automated temperature & vacuum controls during crystal growth



Seeding - Sizing from 0.7µm



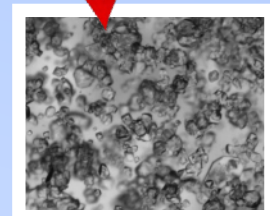
Crystals Growing



Full Crystal Growth



The CrystalScope™ (above) mounts to the head of the vessel, and features an insertion length based on the depth of the reactor. Light is guided via fiber optic to the tip of the insertion probe, where a microscopic camera is positioned to capture images of the crystals from the nucleation stage, through to growth completion.



## Continuous Crystallization / Fines Killzone

The fines killzone is monitored using the InFlow™ to optimize the continuous crystallizer. If the process is too high in temperature, the crystals will start to dissolve. If there is not a high enough temperature present, it will not resolve the fines and it will create spontaneous nucleation.

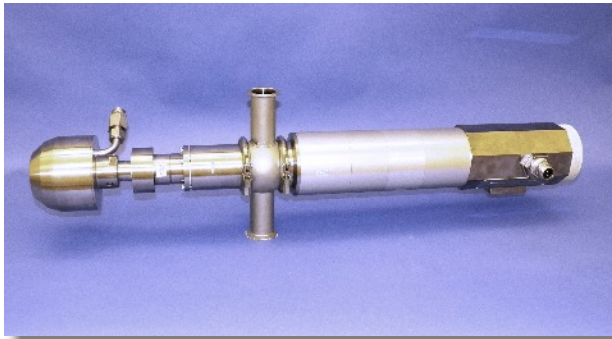
## Glass Reactor Microscope

The Glass Reactor Microscope - GRM (right) allows for full visualization of smaller lab scale crystallization processes. It features a unique optical flat section for representative image capture. The reactor itself is jacketed reactor to allow for controlled heating & cooling, while the lid includes several spare ports for additional instrumentation that may be used during any tests or experiments.





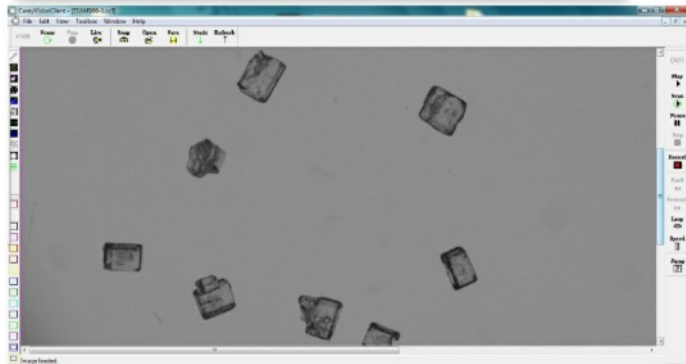
# Liquids Particle Sizing



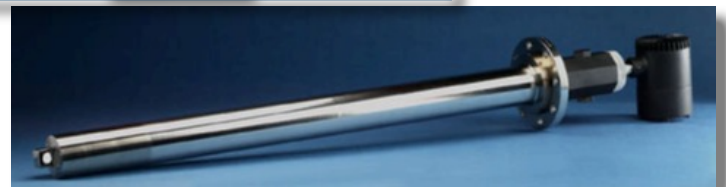
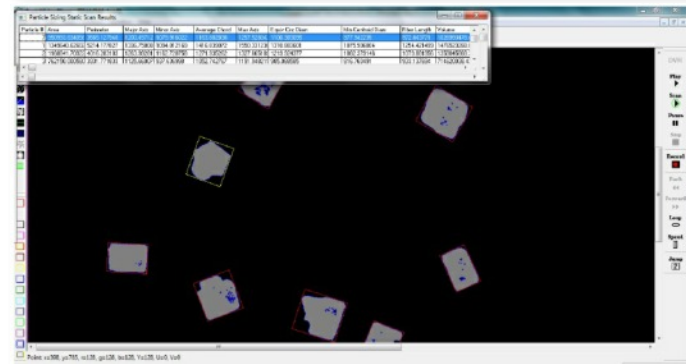
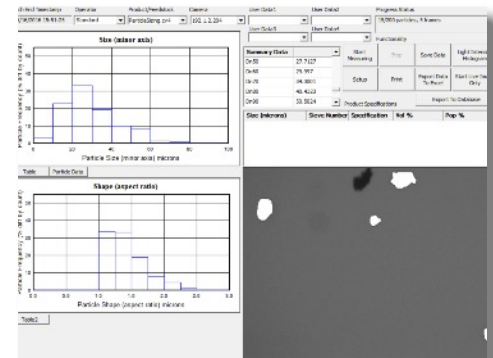
The liquid slurry to be analysed passes through the analyzer flow cell, which incorporates a microscopic camera, and high intensity back lighting system. High resolution 2D images are captured and sent to CantyVision™ software for realtime analysis. Each particle is measured under a range of size and shape parameters including major axis, minor axis, area, perimeter, aspect ratio circularity and equivalent circular diameter, to provide a truly comprehensive particle characterisation. The imaging principle allows for visual verification of any results, and aids the user in developing a greater understanding of their process or product.

**Particle Size from 0.7µm to no upper limit\***

• Particle Shape • Particle Concentration

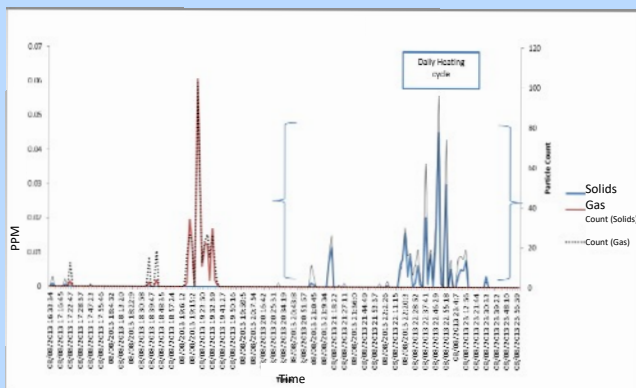


Various options are available for pipeline (in-line or at-line), vessel and off-line (lab) measurement, all of which include fused glass technology allowing for use on **HIGH PRESSURE & HIGH TEMPERATURE** applications.



## WFI - Water for Injection

The PharmaFlow™ is designed to be installed in-line to monitor WFI so the manufacture can have longer run times and can verify constant compliance with the USP. CANTY can output the particle concentration continuously so that if an upset does occur the operators are aware of it and take samples to the lab for further testing. What's more, CANTY's unique vision based system allows for differentiation between particles and gas bubbles. Visual verification is provided and 4-20mA signals or OPC can be used to alarm to an upset condition.



## Sub-Visible Particles

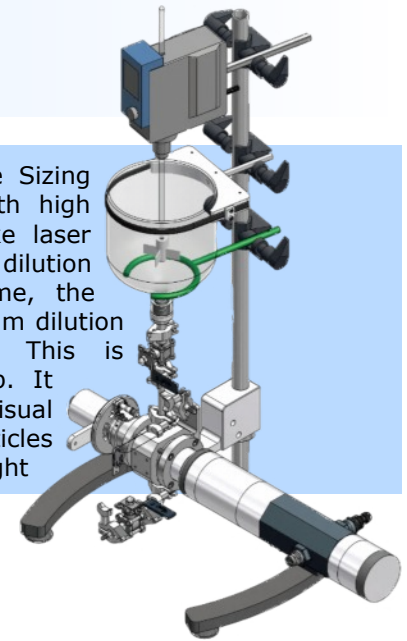
The FDA has put a recent focus on measuring and quantifying SVP to look for particles in product and process streams. The CANTY system is an invaluable tool in the lab and in-line. The LED light source with the Ethernet gigabit camera and the imaging-based software can analyze both size and shape as well as count and concentration of particles. Both continuous and lab options are available.



# Slurry Particle Sizing



The CANTY Lab Dilution Particle Sizing System is used for slurries with high concentration of solids. Unlike laser analysis which requires the dilution amount to be exact every time, the CANTY system requires a minimum dilution but no maximum dilution. This is demonstrated by the basin on top. It is achieved because visual measurement detects the particles unlike laser which detects light



## MDI Product

The CANTY InFlow™ can be used to monitor particle size inline at process temperature and pressure for inhalation drugs that normally vaporize at atmospheric pressure and room temperature.

CANTY can safely measure, size, and record particulate and agglomerates that are normally dispensed in chlorofluorocarbon-free (CFC-free) propellant HFA-134a from a pressurized metered-dose inhaler (MDI) inline before the canister fill station.

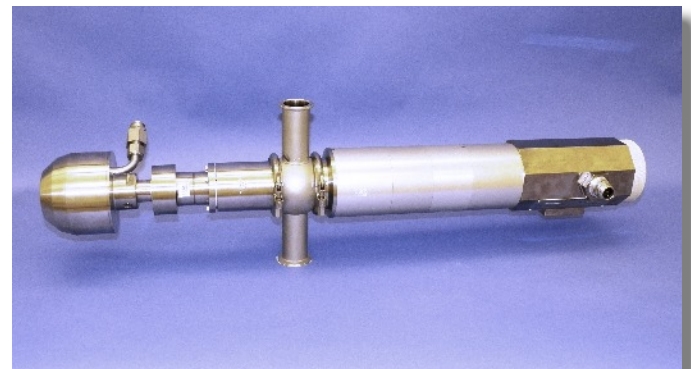
# Turbidity

## Turbidity / CIP

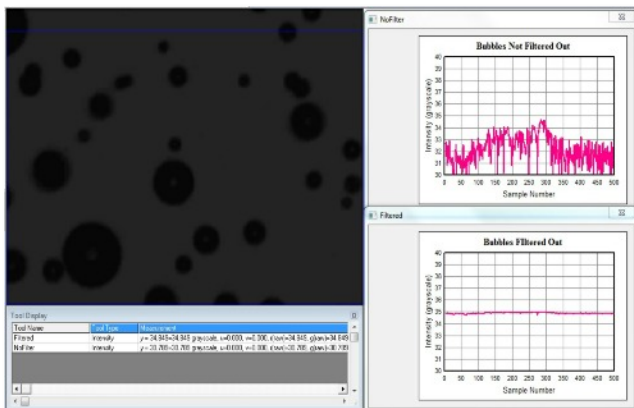
- Monitor for TOC and Particle Level
- Reduce Lab Time
- Monitor for TSS

### Turbidity

Turbidity analysis using a high resolution CCD/CMOS image sensor that detects turbidity 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.



## Effect of Gas Bubbles



### Features

- Ethernet Connectivity
- Real Time Monitoring Of Process In Flow
- Solid One Piece Central Hub
- Supplied With Internal O-Ring Seals
- Easily Installed Modular Unit
- Fused Glass Process Barriers
- Regulated Light Source Emits Cold Light To Prevent Product Bake-On
- OPC, 4-20mA Current Loop, EXCEL Spreadsheet And Relay Outputs Are Available
- Single-Use Options Are Available
- Visual Verification
- In-Line Analysis

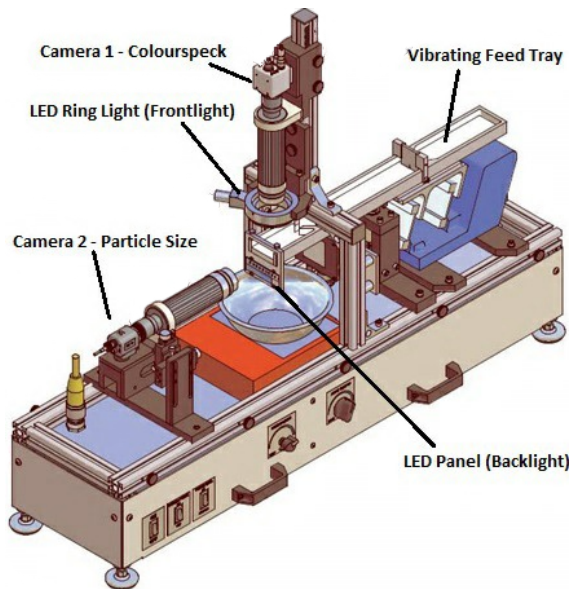
## Turbidity (NTU)



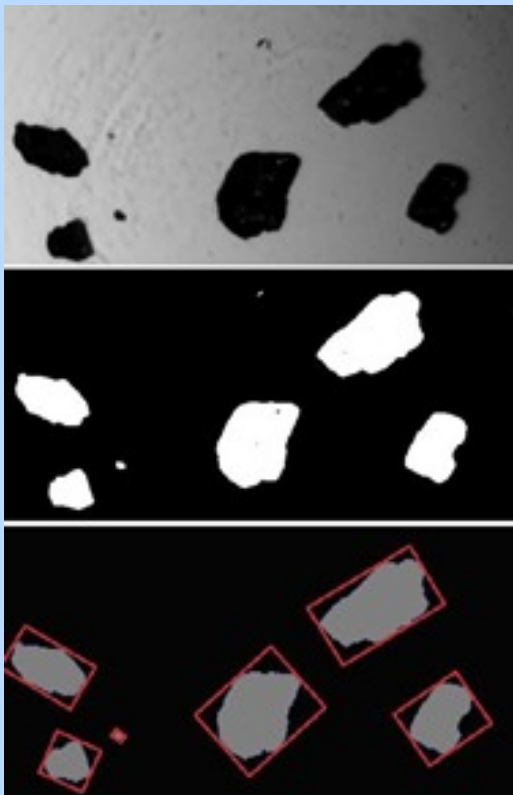
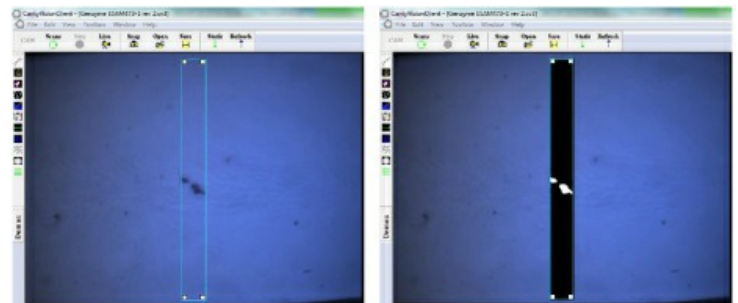


## Particle Size & Defect Detection

CANTY's dynamic imaging technology can be employed in two areas of final product QA/QC. A SolidSizer™ system can be used to measure the particle size distribution of the finished product, and / or the concentration of defect powders. The process works by loading a sample into the system hopper, where it lands onto a vibrating feed tray. This separates and transports the product in one even layer to the analysis zone.

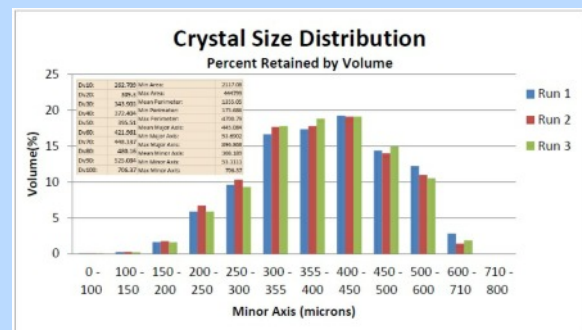


The first camera uses a front lighting system and captures images which are sent to the analysis software for defect detection. This provides a repeatable, subjective detection method, which requires limited operator / lab technician input.

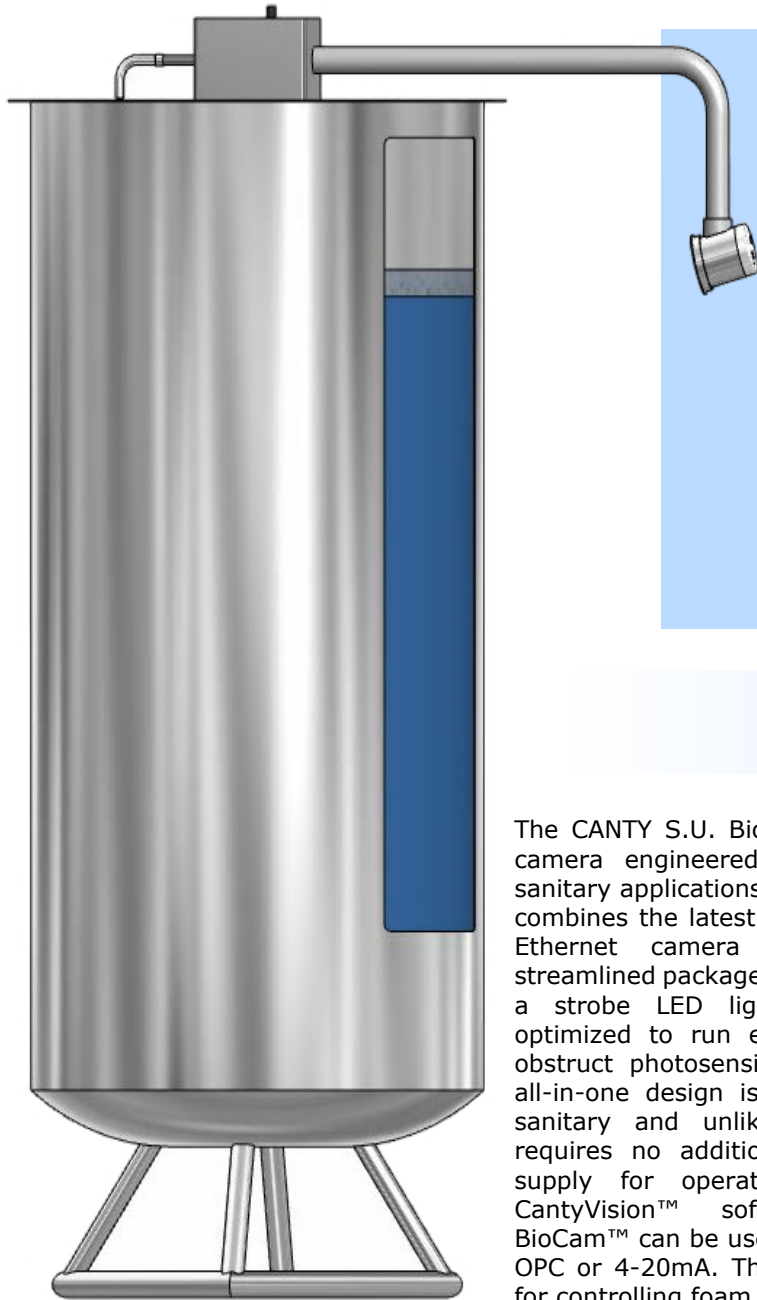


After passing the first camera, the powders reach the end of the vibrating feed tray where they free fall, or slide over and angled stage between the second camera and an LED panel. This results in sharp images of the powder shapes being captured, which are then processed by the analysis software to provide size distribution and shape characterization data

As the system measures the powder size under a large number of size and shape parameters, including minor axis (width), the data can be directly correlated to sieve analysis which is often used in labs. Using the SolidSizer™ system however, minimizes the input required from the operator / lab technician and automatically generates the relevant data avoiding time consuming activities such as weighing sieve screens, and performing manual calculations.



# Biotech - Single Use



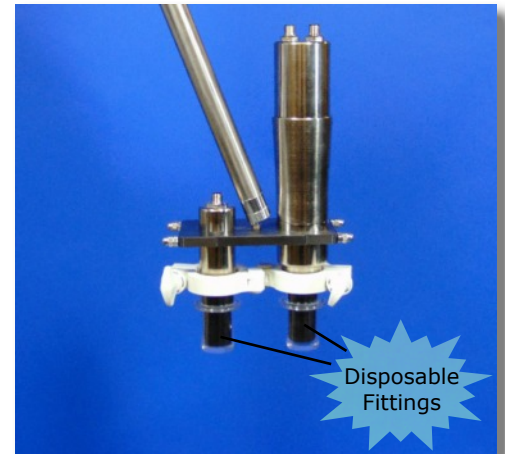
## Single Use - Vessel Level

- Non-Contact
- Any Size Vessel or Bag
- Visual Verification

The single use vessel level system from CANTY allows operators to track the level inside a single use container by way of a camera. The allows for non-contact of the product and visual verification of the level. CautyVision™ software can output via 4-20mA or OPC to a PLC or DCS for complete control. The system utilizes the CANTY LED light with fiber optic bundle so the any size bag or container can be accommodated using the same system. The LED light is a cold white light with no heat transfer to the process so zero effect on the process conditions. Multiple control points can be set to alarm at various stages in the process.

## Single Use - BioCam™

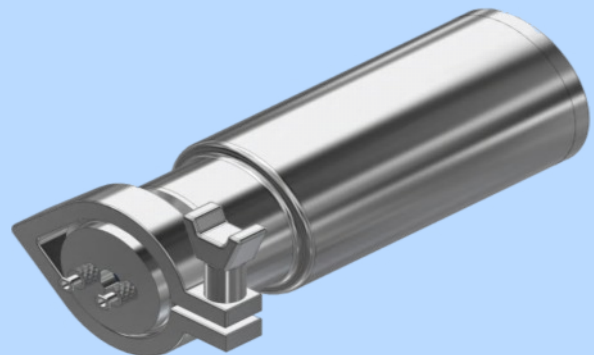
The CANTY S.U. BioCam™ is a process camera engineered and designed for sanitary applications. The S.U. BioCam™ combines the latest in LED lighting with Ethernet camera technology in a streamlined package. The camera utilizes a strobe LED light that has been optimized to run efficiently as to not obstruct photosensitive processes. The all-in-one design is both compact and sanitary and unlike its predecessors requires no additional external power supply for operation. Coupled with CautyVision™ software, the S.U. BioCam™ can be used for full control via OPC or 4-20mA. This system is perfect for controlling foam in a single use bag.



## Single Use Turbidity



Visual Display To Verify Product





# Biotech Cell Analysis

## Cell Count & Viability

CANTY's vision based technique works on the basic principle of presenting the product between a high intensity LED light source, and a microscopic camera. The captured images are then sent to CantyVision™ cell detection software for analysis, where they are measured under a number of different size & shape parameters:

- Cell Diameter and Radius
- Area and Volume
- Nucleus
- Circularity
- Intensity

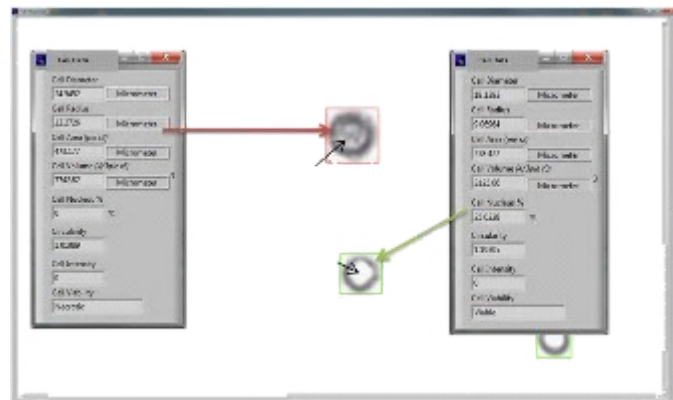
**NO DYE  
NEEDED**

The software can then output user defined particle size distribution and particle concentration information as well as cell viability percentages. Features include:

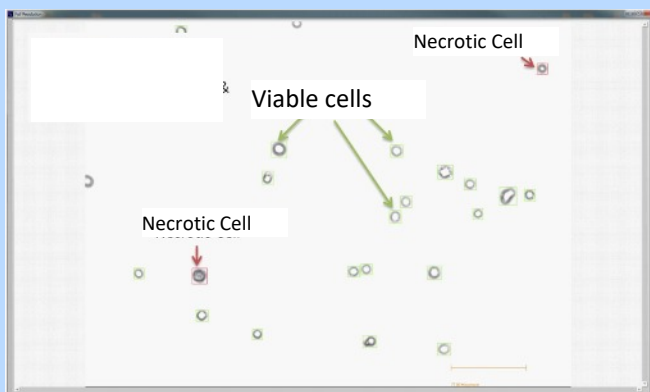
- Gigabit Ethernet technology for optimum image retrieval
- Analyze suspended cells down to .7 micron
- Auto dilution with peristaltic pump or syringe pump done through the software
- Software analysis up to 15 FPS
- 2.5 minutes to run an 8mL sample
- Auto cleaning / flushing cycle with cleanliness determination



PharmaFlow™



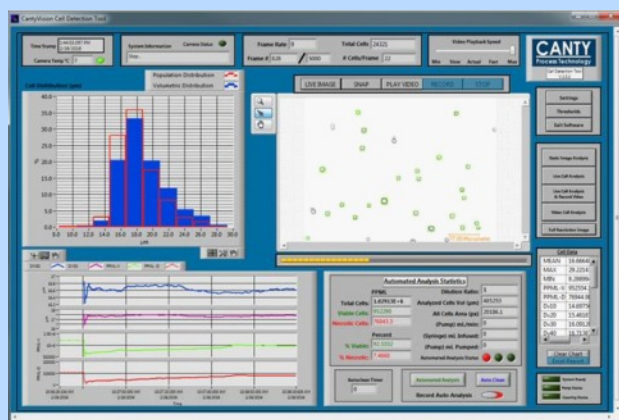
Individual cell information - distinguishes between live and dead cells



Cell viability determination using cellular intensity, cell nucleus area, and circularity



Automated syringe pump feed mechanism & dilution pump



## Cell Concentration Determination

The CANTY Cell Analysis Software along with a syringe pump and peristaltic pump automatically dilutes concentrated cells to the appropriate optimal imaging density. The software then calculates a dilution ratio based on the amount of the cells to the amount of dilution buffer. The dilution process is performed automatically at a rate of up to 15 frames per second.

With auto dilution of samples it was found that no saturation point was reached for the cell densities tested up to  $30 \times 10^6$  cells per milliliter.

**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.**

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HUMAN GENOME  
JOHNSON & JOHNSON  
MALLINCKRODT  
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MERCK & CO.  
NOVARTIS  
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AND YOU!!!



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