



QSA GLOBAL.

OPENVISION™ HD

The Problem.



The Problem.

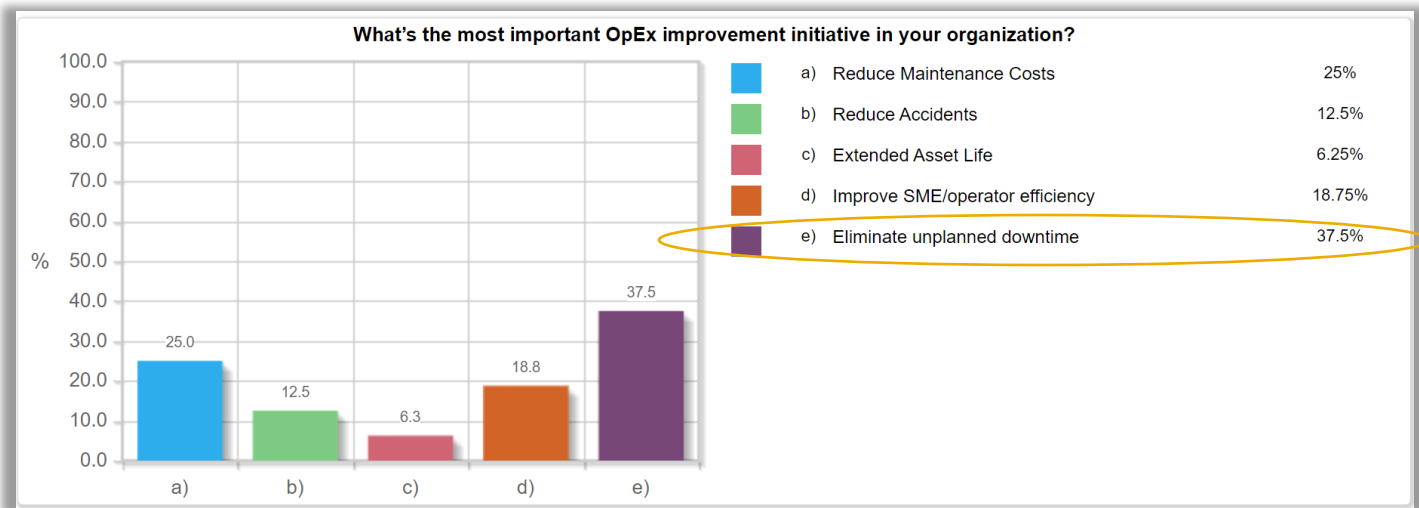
Corrosion costs the global economy around \$2.2 trillion each year...

CUI accounts for 40-60% of a plant piping maintenance expenditure.

All insulated piping and equipment are susceptible to CUI...even on piping and equipment where the insulation system appears to be in good condition and no visual signs of corrosion are present.

CUI is most prevalent in the **chemical/petrochemical, refining, offshore, and marine/maritime industries**. If left undetected, CUI can result in catastrophic leaks or explosions, equipment failure, prolonged downtime due to repair or replacement, and safety and environmental concerns.

Unplanned downtime costs assets 4x-6x more than planned downtime or \$250k per hour / \$2M per event, on average. It costs the O&G industry upwards of **\$47B per year!**



Current State of CUI Inspection Technology.

There are only a few inspection methods to determine the presence of CUI without removing the insulation, and all have certain limitations.

- Visual (i.e., strip insulation -> inspect -> reinsulate)
- Profile Radiography (traditional, CR, DR)
- UT thickness
- Pulsed eddy current (PEC)
- Infrared (IR)
- Neutron backscatter
- X-ray backscatter
- **Real-time radiography (RTR)**

As a rule, the various testing methods aren't used on their own but are combined to complement one another and achieve the best outcome.

[Inspectioneering - Inspection Techniques for Detecting CUI](#)

[Corrosionpedia - The 4 Best Nondestructive Inspection Methods for CUI](#)

[Corrosionpedia - CUI Detection Techniques for Process Pipelines - part 2](#)

RTR for CUI Screening.

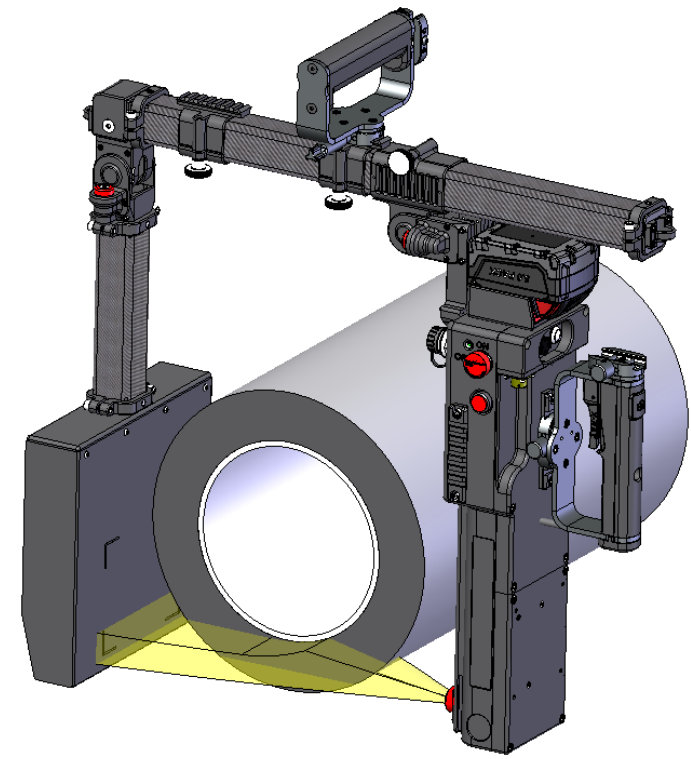
RTR for CUI screening is a form of profile radiography.

A collimated beam of x-ray photons is aimed at the tangent of the pipe OD where it interfaces with the insulation.

The dense pipe wall scatters or attenuates 100% of the x-ray beam.

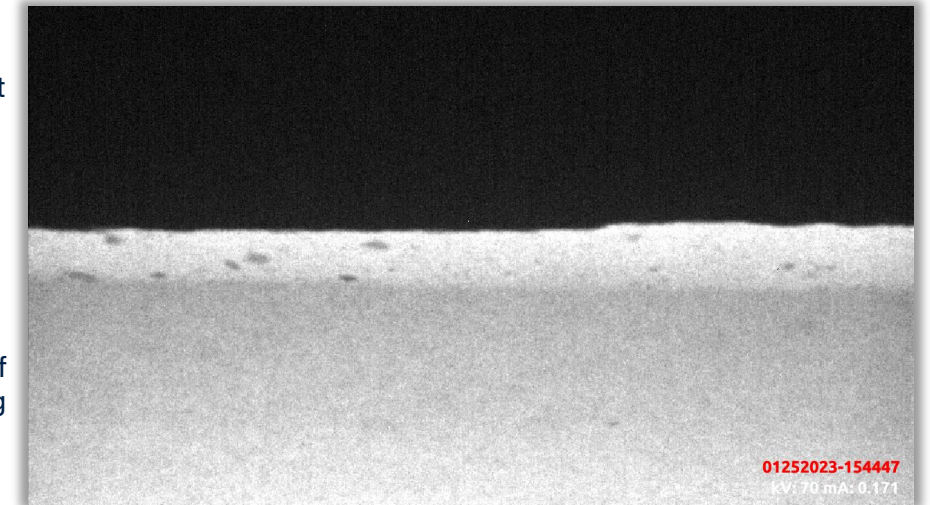
The lower density insulation allows x-rays to pass through to the imager.

The result is a profile of the pipe/insulation interface.



Pipe (dense) no photons get through making it dark

Insulation (not dense) lots of photons get through making it white

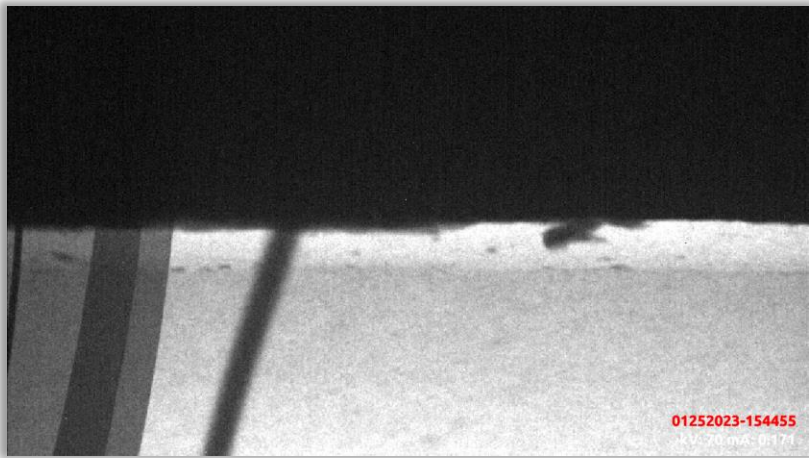


What RTR for CUI Screening Cannot Do.

Flaw or defect sizing

RTR is not viable for flaw or defect sizing. Inability to penetrate the pipe wall still necessitate a quantitative method such as profile RT.

Screening productivity would also be greatly reduced due to setup time for an acceptable profile “snapshot”.

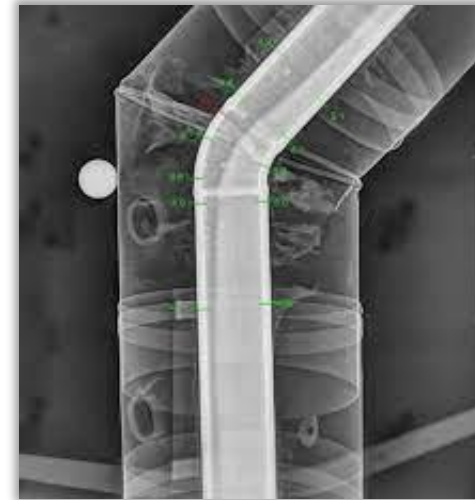


Identify internal pipe wall loss

RTR for CUI only looks at the external pipe surface.

70 kV x-ray energy will not penetrate the wall of most industrial process piping.

Quantitative methods such as profile RT are used to evaluate wall loss and follow up RTR CUI screening to size defects.



Screening with RTR followed by quantitative analysis (e.g., profile RT) is one of the most cost-effective solution to identifying and quantifying CUI risk.

CUI Job Map.

Desired Outcomes from CUI Program:

- Minimize CUI Risk
- Minimize Cost of Risk Reduction
- Maximize Probability of Detection (POD)

COST

\$

1. DETERMINE CUI INVENTORY (e.g., RTR)

- Screening to identify areas of concern
- Screening to exclude good piping from follow up

\$\$

2. QUANTIFY RISK (e.g., profile RT)

- Fitness for service / remaining service life of areas of concern
- Determine risk of stripping to repair

\$\$\$

3a. MITIGATE RISK (planned)

- Strip insulation and apply temporary wrap
- Repair at next scheduled maintenance outage

\$\$\$\$\$\$

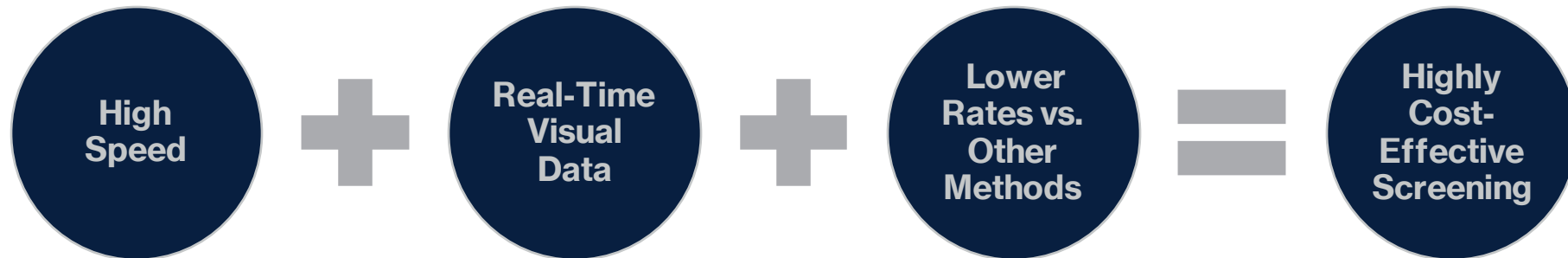
3b. MITIGATE RISK (unplanned)

- Shut down line, unit, etc.
- Repair immediately

RTR Value Proposition.

Minimize Cost of Risk Reduction

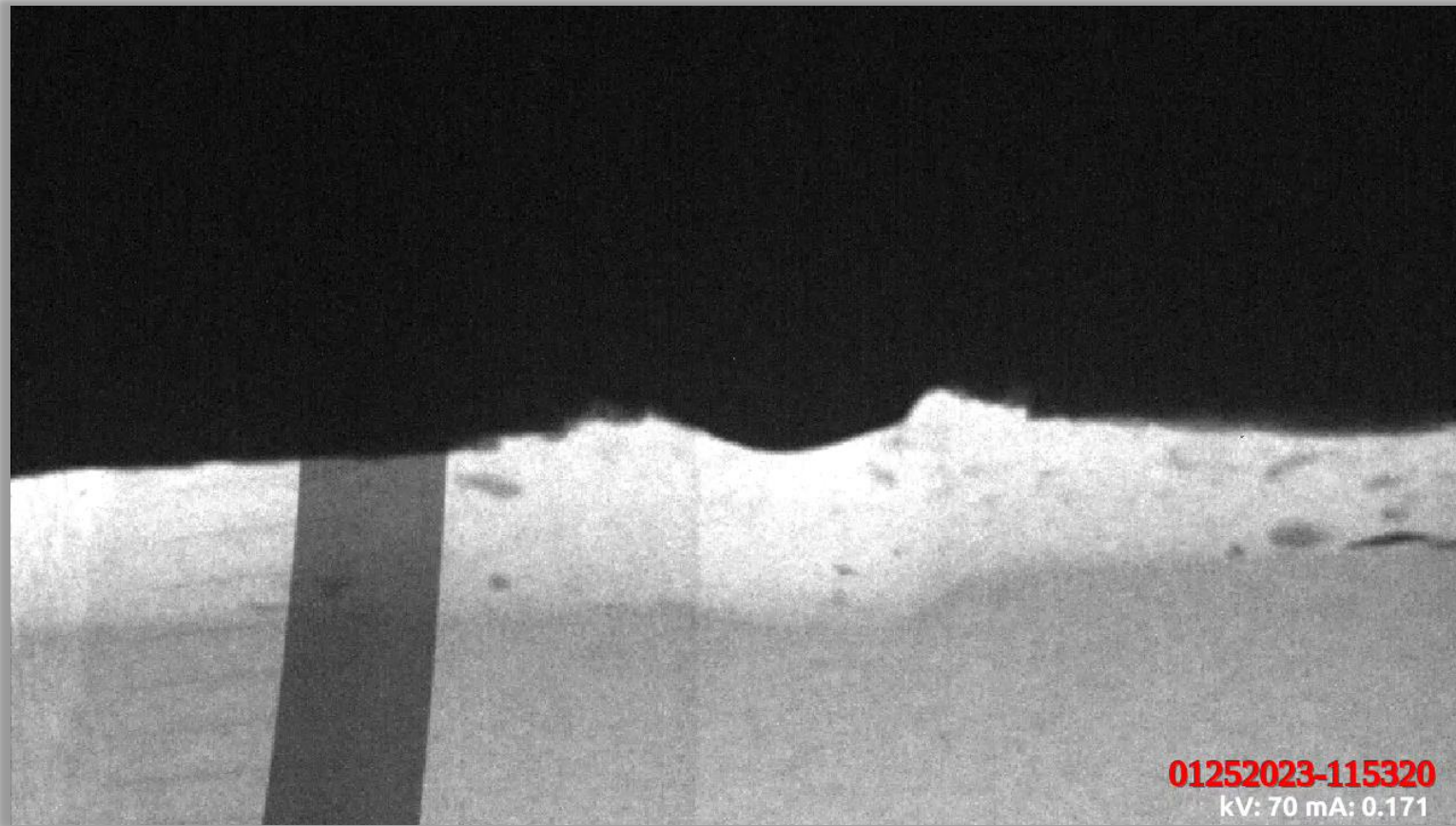
- RTR is a high-speed screening method.
- Real time visual data is easy to interpret.
- RTR rates are generally lower than profile RT, PEC, etc.



- Ideal for quickly screening areas that should be good

RTR Value Proposition – High Speed Screening.

Scanning rates of several feet per minute are readily achievable



OpenVision HD CUI Scan

Scanning rates dependent on myriad variables:

- Access to inspection location
- Sample OD
- Insulation / cladding material
- Inspection requirements
- ...

RTR Value Proposition – Contractor Rates.

Example: RTR vs. profile RT rates

RTR

Tech.	\$78/hr = \$780/shift
Assistant	\$40/hr = \$400/shift
<u>Equipment</u>	<u>\$62/hr = \$620/shift</u>
10 hr shift	\$1800

Profile RT w/ DR

Labor	\$100/hr = \$1000/shift
<u>Equipment</u>	<u>\$130/hr = \$1300/shift</u>
10 hr shift	\$2300

Production

Feet per minute

Cost Effective Screening



Feet per hour

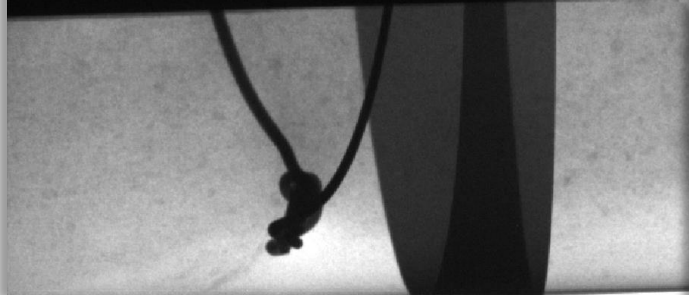


RTR Value Proposition – Easy Interpretation.

No indications of CUI damage:

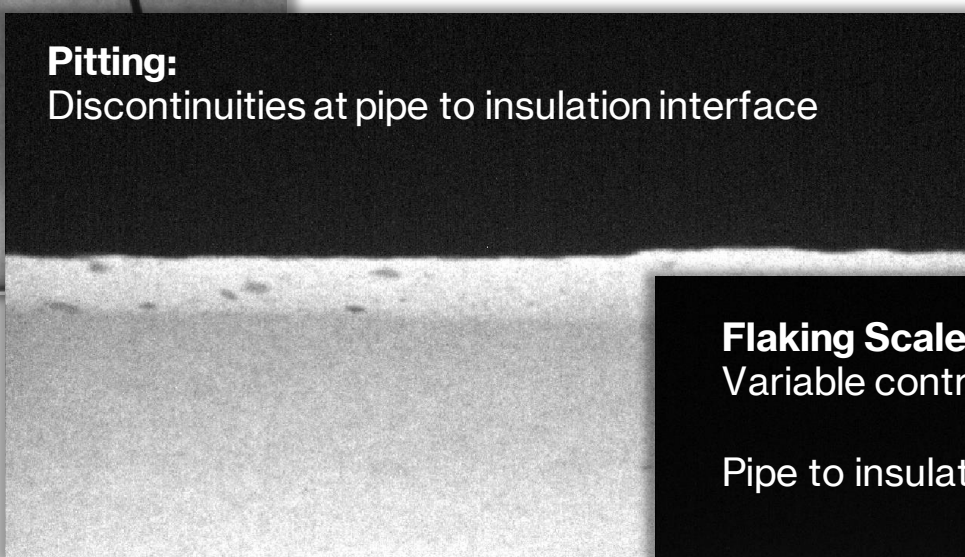
Sharp contrast between the pipe surface and insulation.

Well defined pipe to insulation interface.



Pitting:

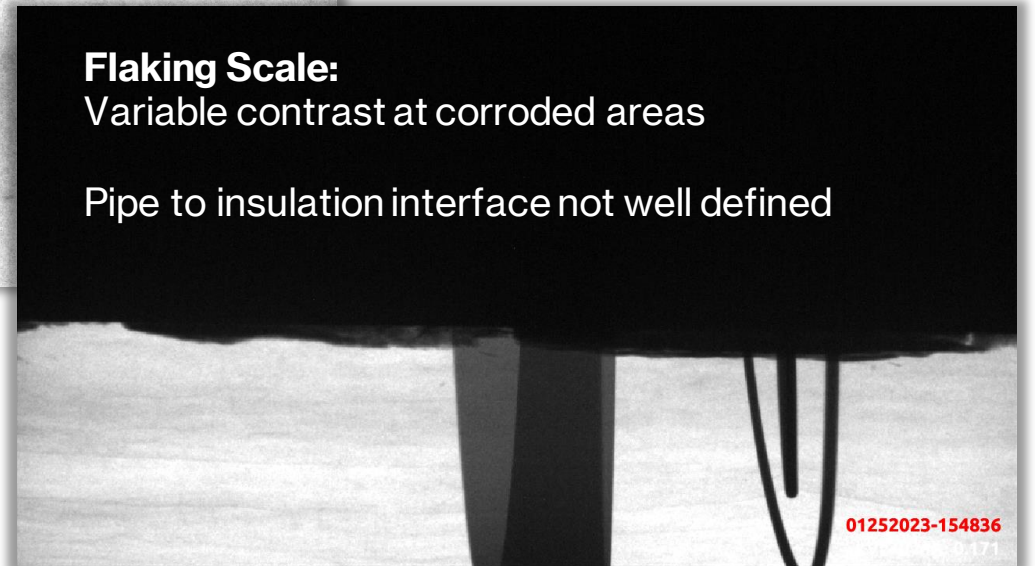
Discontinuities at pipe to insulation interface



Flaking Scale:

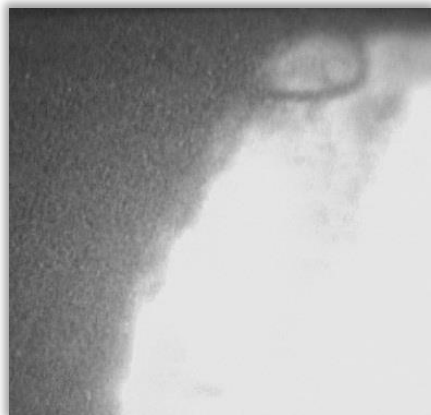
Variable contrast at corroded areas

Pipe to insulation interface not well defined



OpenVision History.

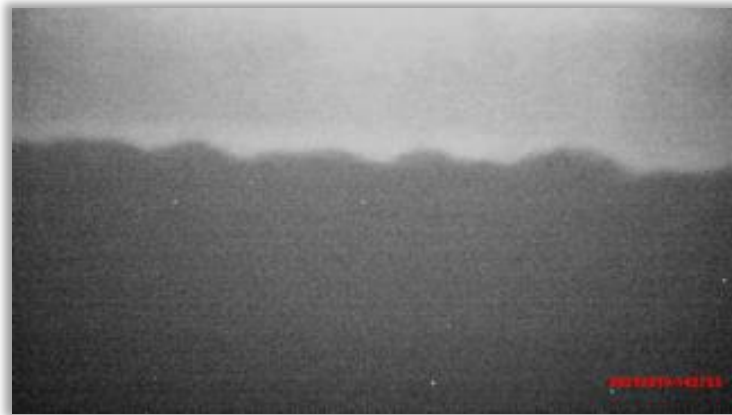
OpenVision LT
(1998)



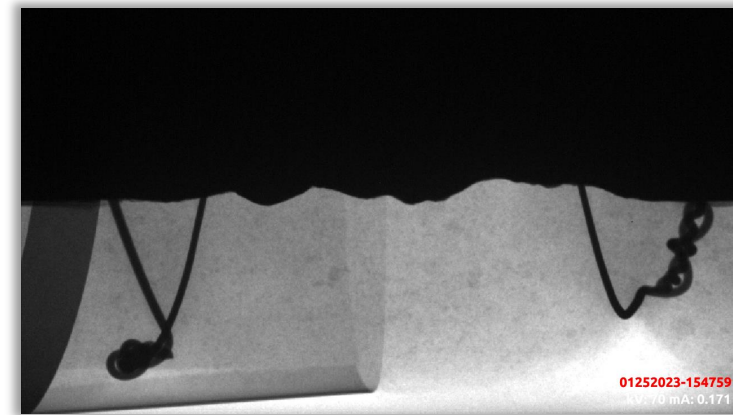
OpenVision CF
(2013)



OpenVision DX
(2018)



OpenVision HD
(2023)



OpenVision HD Value Proposition.

CMOS Imager

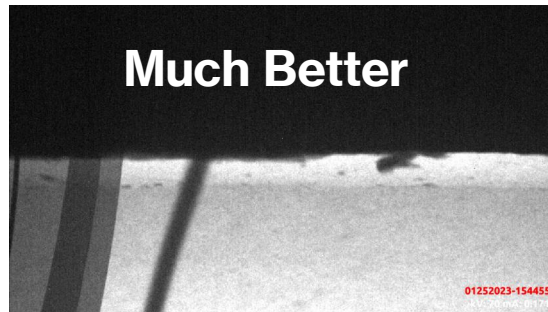
Maximize POD:

OpenVision HD's CMOS imaging technology produces **higher contrast** images allowing for the detection of even subtle changes in material density. This improved contrast makes it easier to detect the early stages of CUI, which can help to prevent more extensive damage and prolong the lifespan of industrial infrastructure.

Additionally, the **high resolution** of OpenVision HD's DR panel allows for a more detailed inspection which can be especially useful in detecting smaller and more subtle defects associated with CUI.



Scintillation Screen

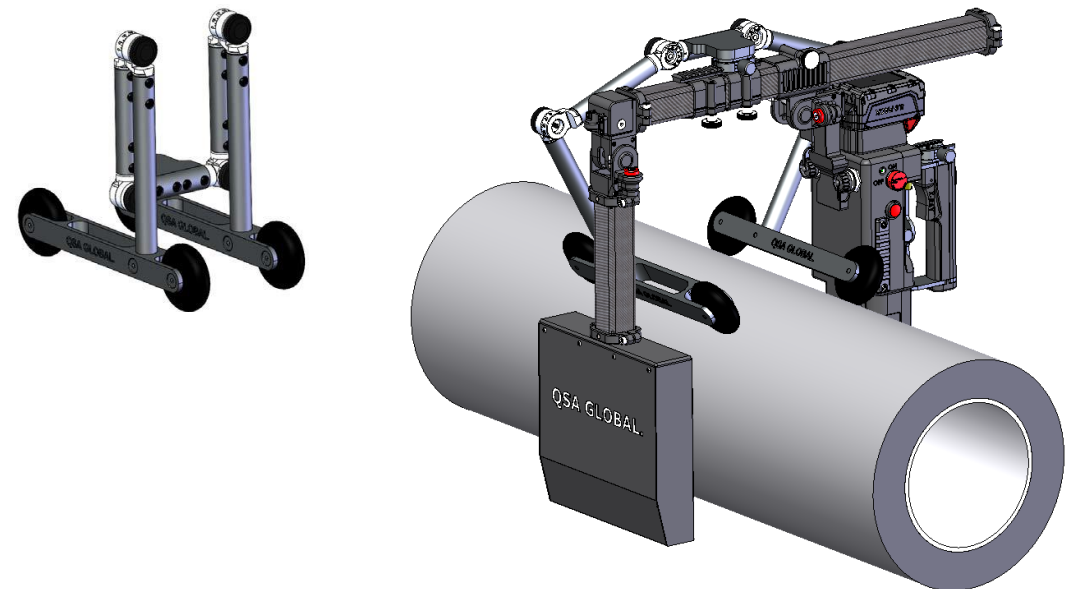


CMOS Imager

Image Stabilizer

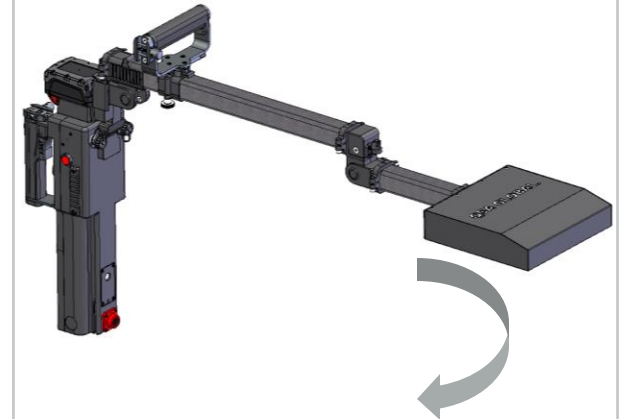
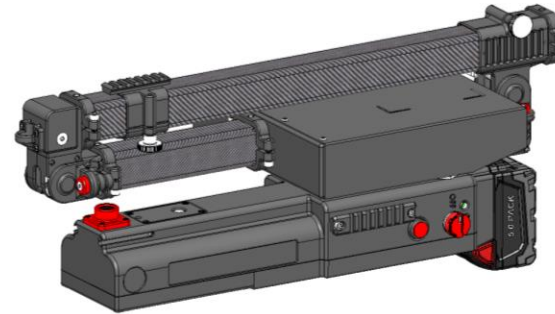
Maximize POD:

Stable in-motion inspection provides higher quality images/videos
Allows operator to focus more on inspection vs. maneuvering equipment
Reduced operator fatigue ensures consistent reliable data from the beginning to the end of the day.

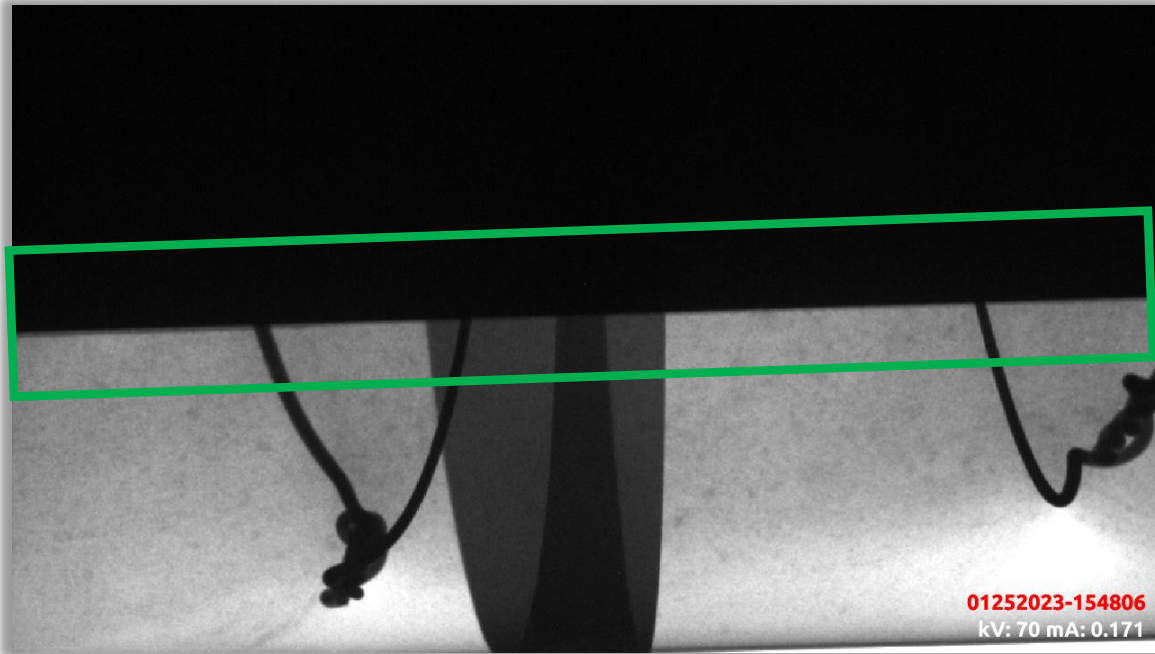


OpenVision HD Value Proposition.

Simplified Handles and Triggers	Rugged Design	Compact Folding Design	Extendable Imager Arm
<p>Maximize Productivity:</p> <p>Redesigned handles and additional mounting points improve ergonomics</p> <p>Integrated x-ray and image capture trigger simplifies operation</p>	<p>Minimize Downtime:</p> <p>Maintain critical schedule with equipment proven to hold up in demanding refinery and plant environments.</p> <p>The OpenVision HD retains hardware and mechanical components with proven reliability / durability from previous versions of OpenVision.</p>	<p>Minimize Downtime:</p> <p>Folding the c-arm down into a compact configuration minimizes opportunities for damage when moving around the plant (e.g, on scaffolding or ropes).</p>	<p>Maximize Inspectable Areas:</p> <p>Increased access to inspection points in complex piping systems</p>

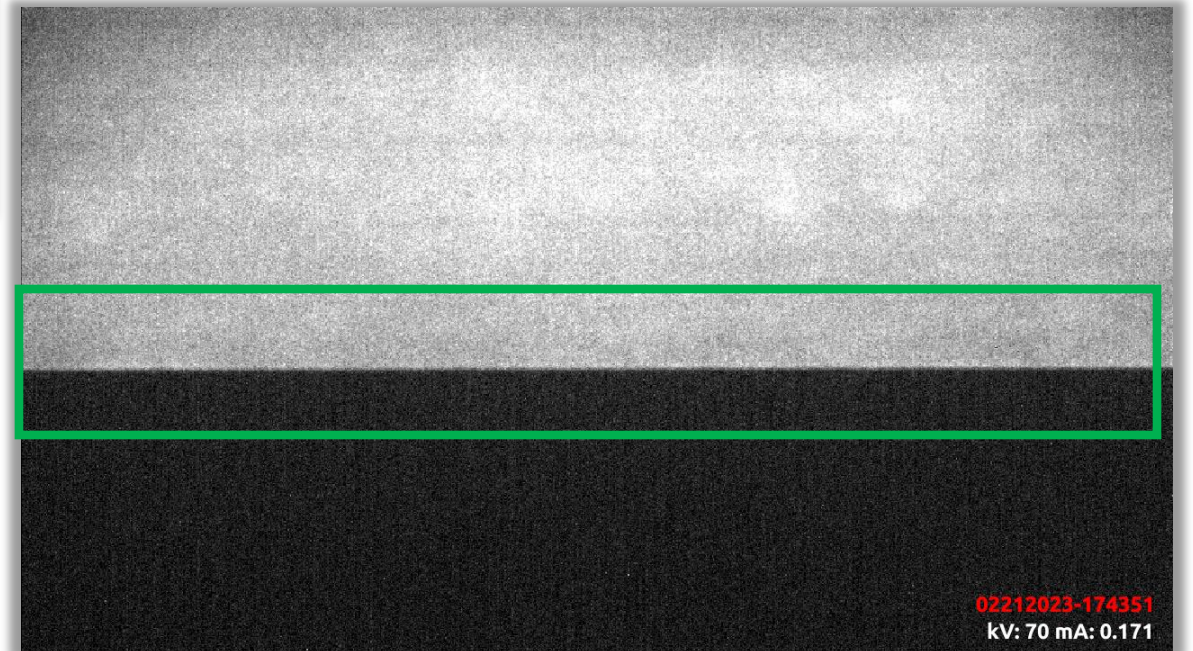


Example: No CUI Damage.

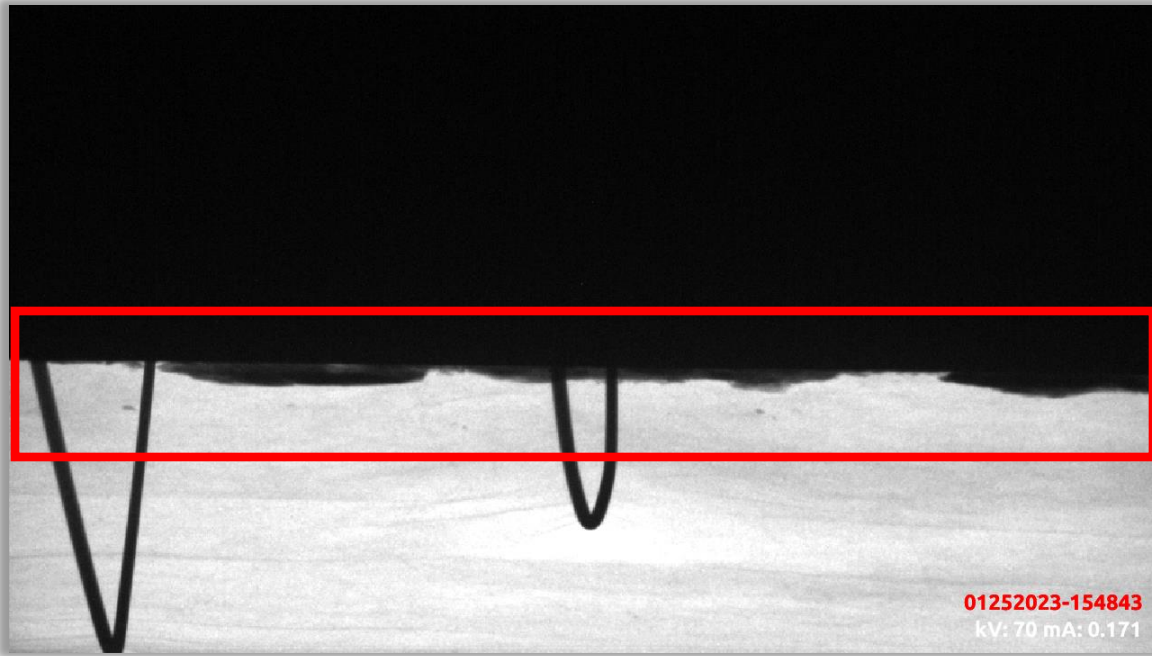


Sharp contrast between the pipe surface and insulation.

Well defined pipe to insulation interface with no indications of CUI damage.

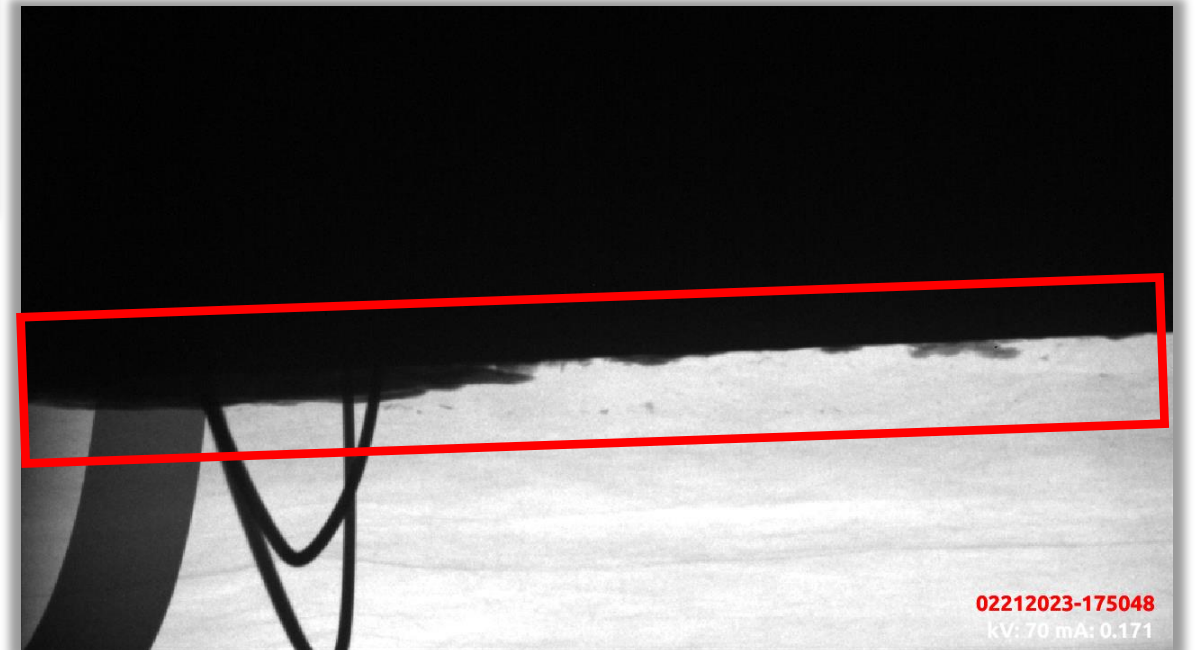


Example: Flaking Scale.

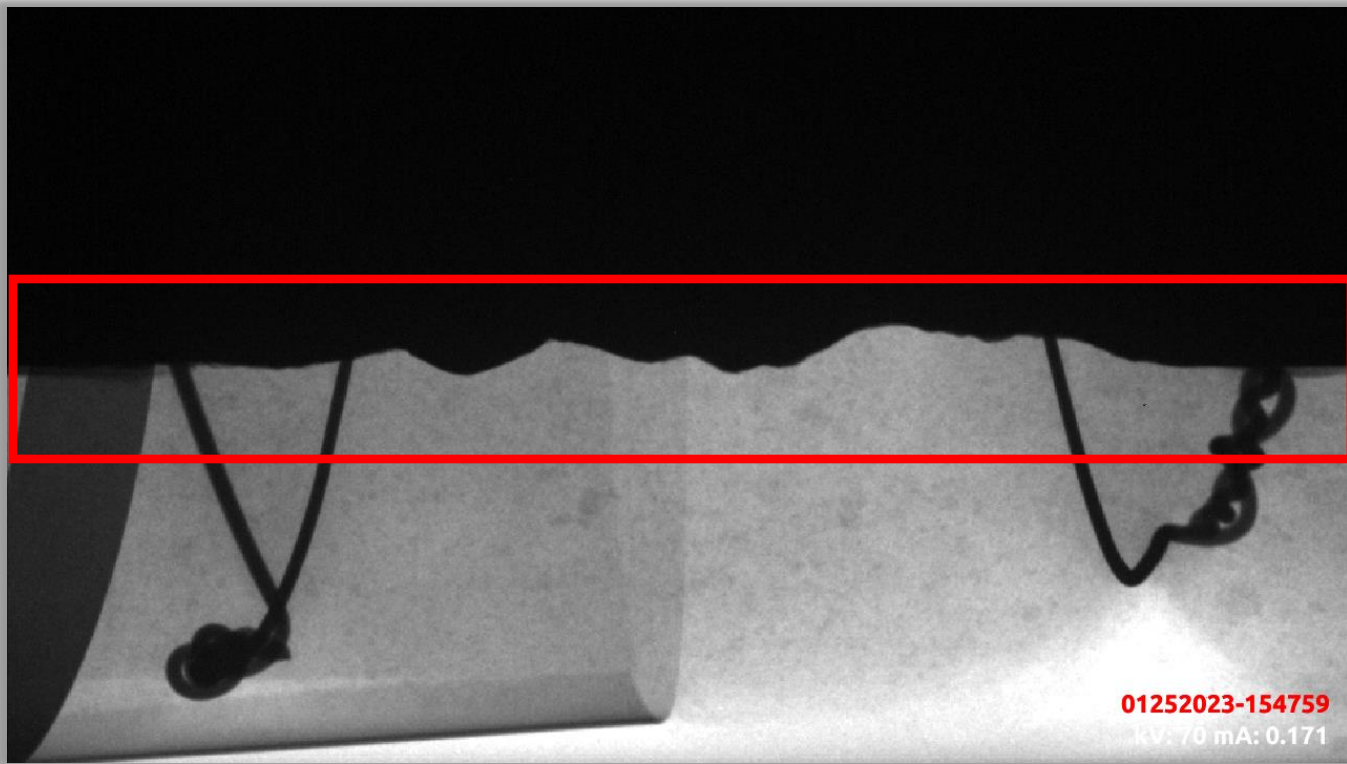


Less contrast at corroded areas.

Discontinuities at pipe to insulation interface.



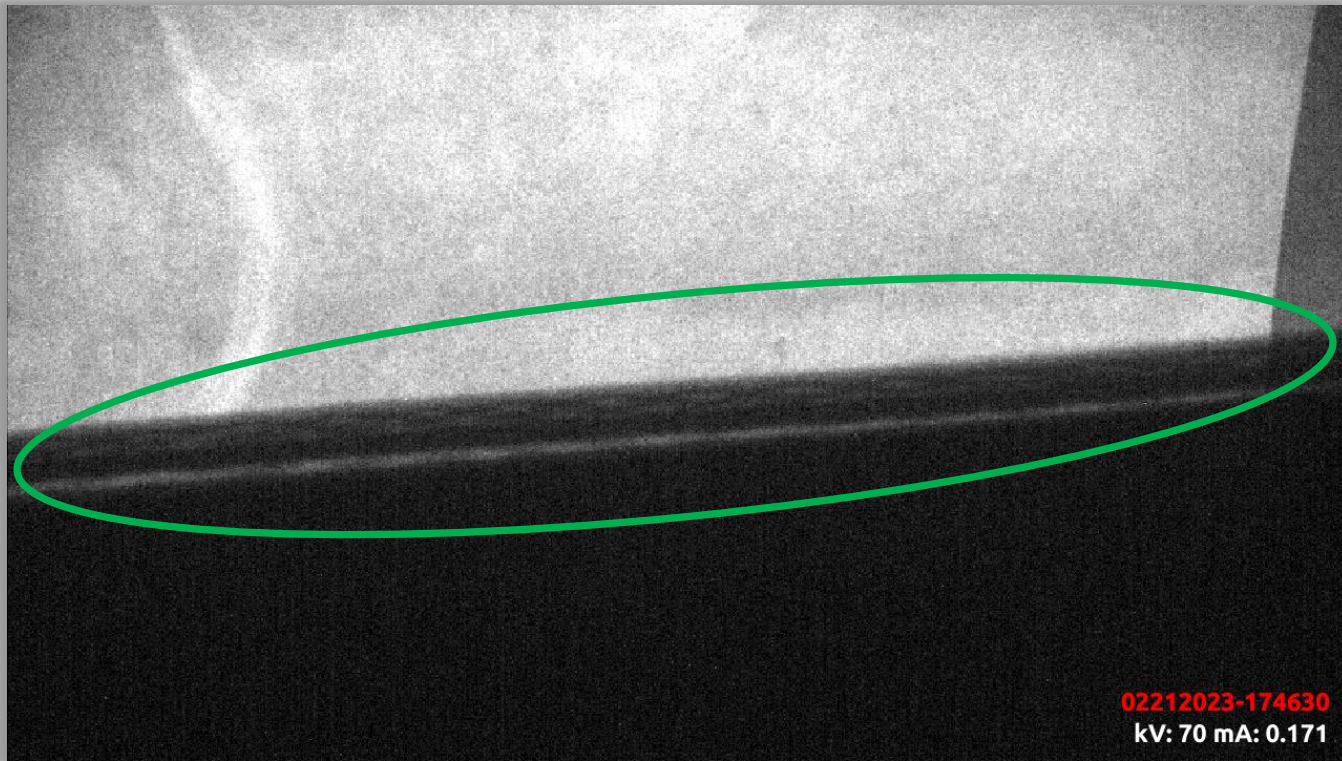
Example: Pitting Corrosion.



Pitting can be found under scale or bare as seen here if the insulation has been previously stripped and cleaned.



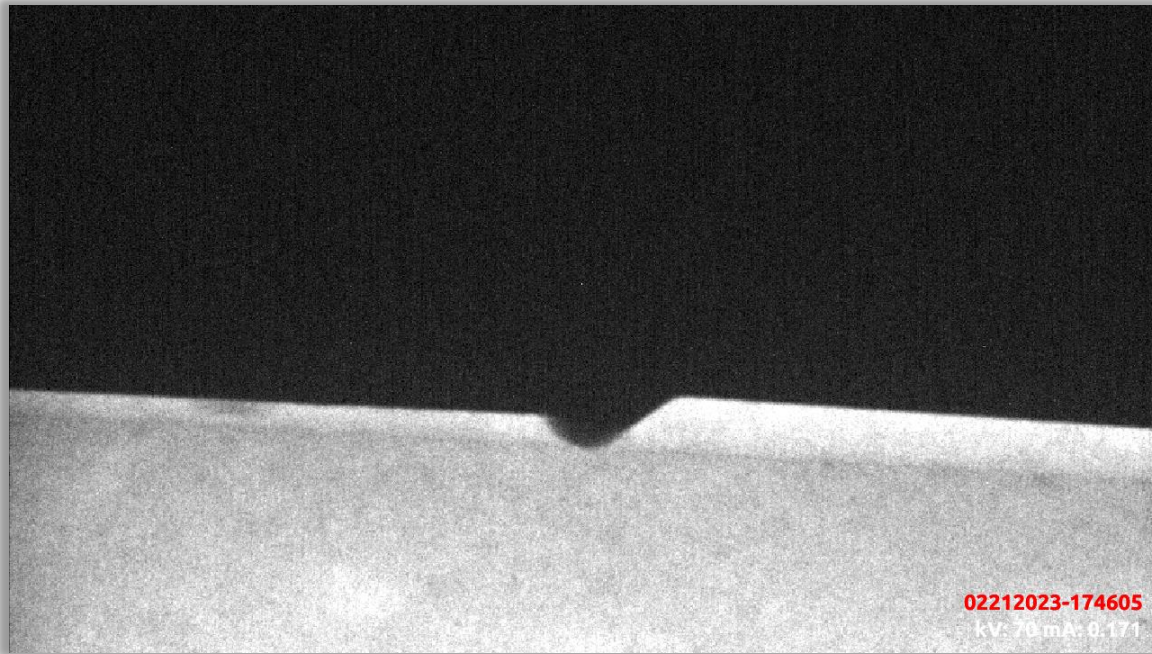
Example: Heat Trace.



Electric heat trace



Example: Weld Mapping.

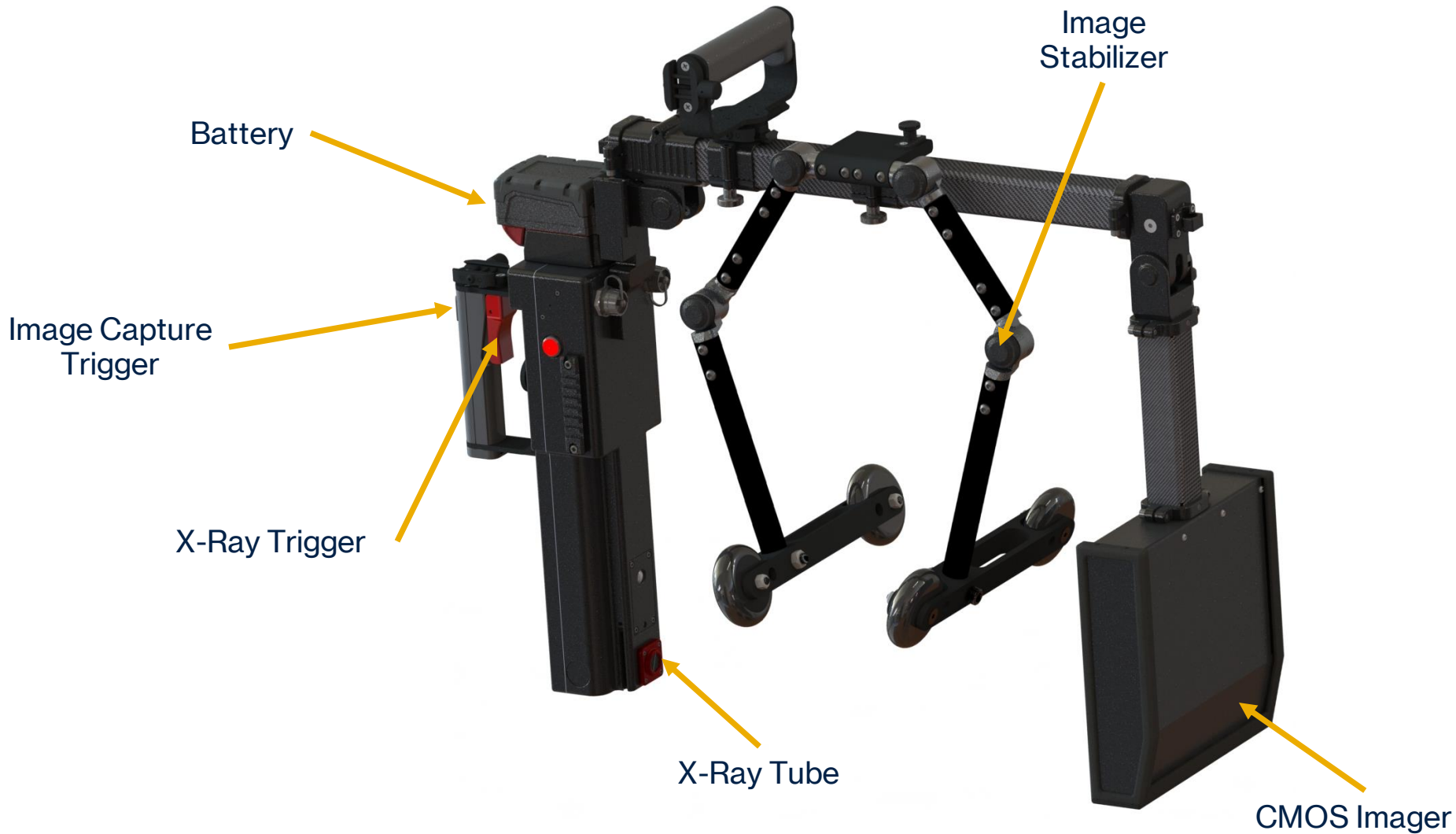


Weld cap

Weld cap with pitting on either side



OpenVision HD System.



7" HDMI Display



Wi-Fi Tablet



Pirate Eye (optional)

Technical Specifications.

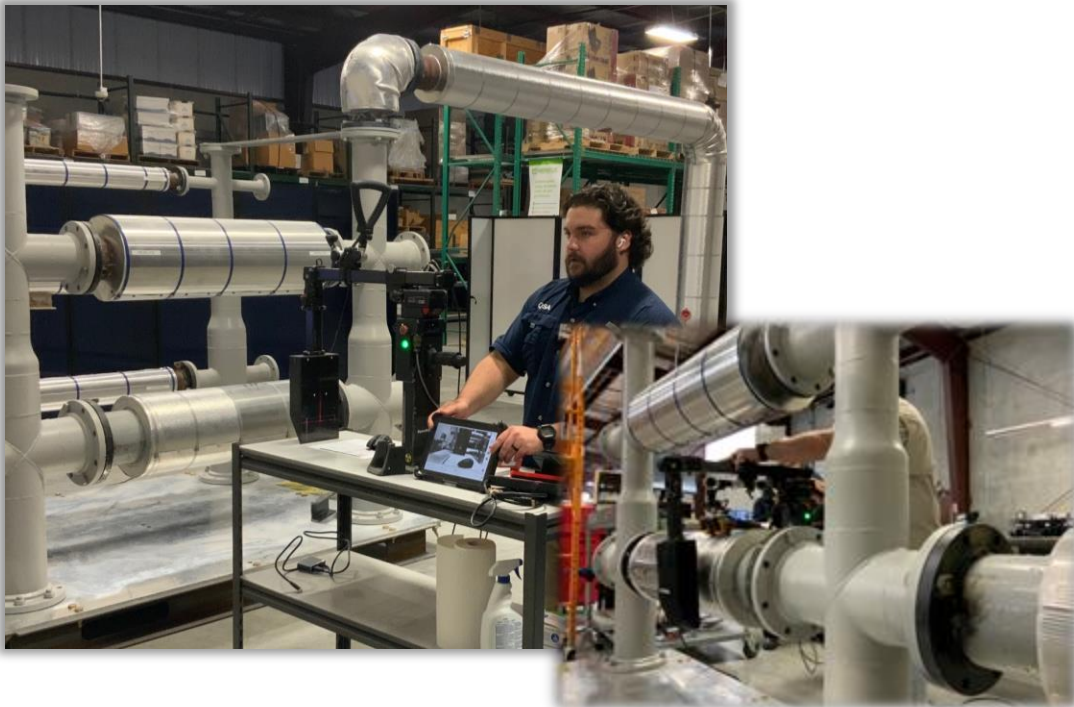
OpenVision™ HD Specifications	
<u>CMOS Detector Panel</u>	
Pixel Pitch	74.8 µm
Pixel Matrix	1944 X 1536
Sensitive Area	5.72" x 4.52" (145.4mm x 114.9mm)
Grayscale	16 Bit
System Resolution	1280 X 720
<u>C-arm Dimensions</u>	
X-Ray Tube to Detector	9.5 in. (24 cm) to 20.9 in. (53 cm)
Throat Depth	21 in. (58 cm)
Detector Thickness	2.5 in. (6.4 cm)
X-Ray Tube Thickness	3.4 in. (8.7 cm)
Startup Time	~30 seconds
Shutdown Time	~5 seconds
Beam Collimation	18° Horizontal / 10° Vertical
<u>Battery Life (5 Ah Battery)</u>	
Continuous Duty	2 hours
Standby	3 hours

OpenVision™ HD Specifications	
<u>System Weight</u>	
C-arm	16 lbs. (7.2 kg)
Wired Monitor	2 lbs. (.9 kg)
Shipping Weight	50 lbs. (23 kg)
Operating Temperature	-20° F to 120° F (-29° C to 49° C)
Storage Temperature	-20° F to 140° F (-29° C to 60° C)
Display Options	Wired HDMI Monitor: 7 in. LCD Wi-Fi Tablet: 10 in Touchscreen PirateEye Any device with HDMI input
Internal storage	128 GB (Transfer via USB drive)
External Storage (Wi-Fi Tablet)	128 GB (Transfer via USB-C)
Shipping Dimensions	32 in. x 20.5 in. x 12.5 in (82 cm x 52 cm x 32 cm)
FDA Accession #	Pending FDA submission

OpenVision Learning Center.

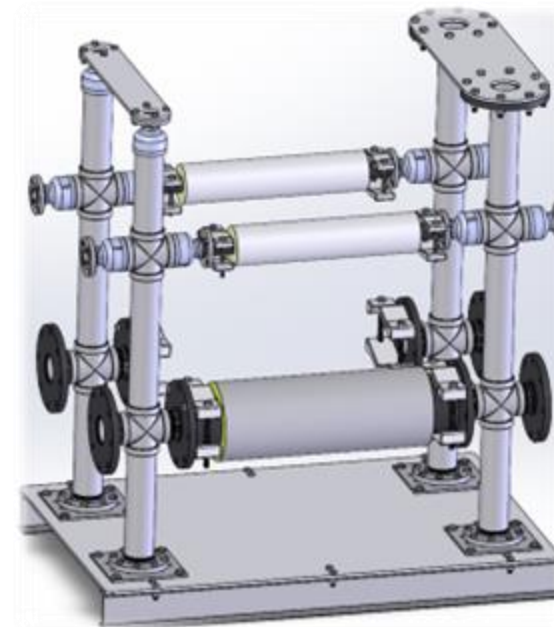
La Porte, TX

- Real and simulated CUI samples
- Piping ranging from 2-8" OD w/ all common insulation materials
- Vertical, horizontal, overhead runs
- OpenVision Method 16 hr training course
- Bring your own sample!!!



Dobruany, Czech Republic

- Real and simulated CUI samples
- Piping ranging from 2-8" OD
- Samples of all common insulation and cladding materials
- Vertical, horizontal, overhead runs
- OpenVision Method 16 hr training course



Coming Q2 2023

X-ray Regulations.

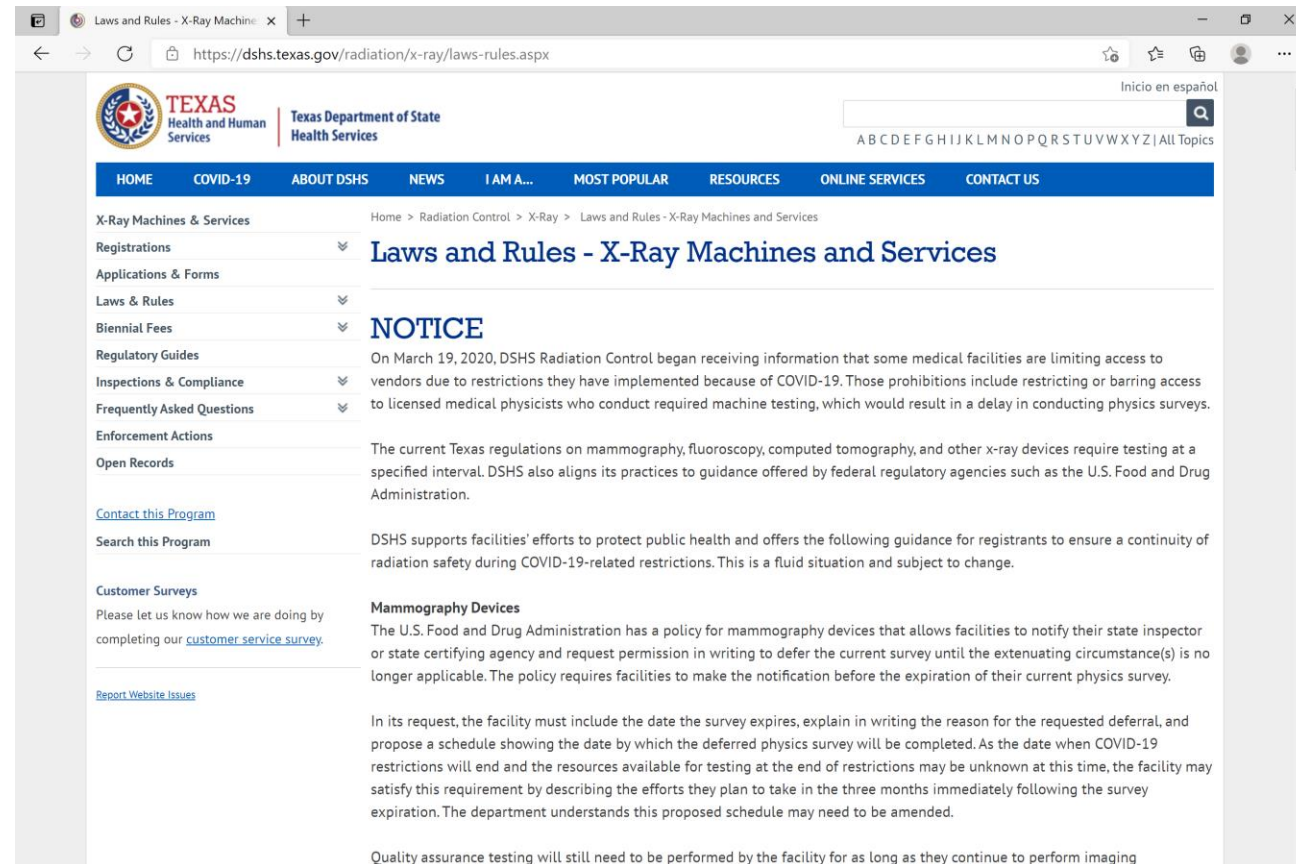
States agencies regulate the use of X-rays. Some county and city health bureaus may also have jurisdiction. Regulations and codes can include:

- Registration of device
- Training requirements
- Safety requirements
- Reciprocity

State regulators are a primary resource for understanding the rules and regulations to operate in the area where the work is being performed.

Find your state's regulatory contact at:

[Conference of Radiation Control Program Directors, Inc. \(crcpd.org\)](https://www.crcpd.org)



The screenshot displays the Texas Department of State Health Services website, specifically the 'Laws and Rules - X-Ray Machines and Services' page. The page features a navigation menu with links to HOME, COVID-19, ABOUT DSHS, NEWS, I AM A..., MOST POPULAR, RESOURCES, ONLINE SERVICES, and CONTACT US. The main content area is titled 'Laws and Rules - X-Ray Machines and Services' and includes a 'NOTICE' section dated March 19, 2020, regarding COVID-19 restrictions on medical facilities. The notice states that DSHS Radiation Control began receiving information that some medical facilities are limiting access to vendors due to restrictions they have implemented because of COVID-19. Those prohibitions include restricting or barring access to licensed medical physicists who conduct required machine testing, which would result in a delay in conducting physics surveys. The notice also mentions that the current Texas regulations on mammography, fluoroscopy, computed tomography, and other x-ray devices require testing at a specified interval. DSHS also aligns its practices to guidance offered by federal regulatory agencies such as the U.S. Food and Drug Administration. The notice further states that DSHS supports facilities' efforts to protect public health and offers the following guidance for registrants to ensure a continuity of radiation safety during COVID-19-related restrictions. This is a fluid situation and subject to change. The notice also includes a section titled 'Mammography Devices' which states that the U.S. Food and Drug Administration has a policy for mammography devices that allows facilities to notify their state inspector or state certifying agency and request permission in writing to defer the current survey until the extenuating circumstance(s) is no longer applicable. The policy requires facilities to make the notification before the expiration of their current physics survey. The notice concludes by stating that in its request, the facility must include the date the survey expires, explain in writing the reason for the requested deferral, and propose a schedule showing the date by which the deferred physics survey will be completed. As the date when COVID-19 restrictions will end and the resources available for testing at the end of restrictions may be unknown at this time, the facility may satisfy this requirement by describing the efforts they plan to take in the three months immediately following the survey expiration. The department understands this proposed schedule may need to be amended. The notice also mentions that quality assurance testing will still need to be performed by the facility for as long as they continue to perform imaging.

Import & Export Regulations.

OpenVision is subject to US export controls laws.

For export from US:

- Import license may be required
- End user statements are required to certify who is using the device and the intended purpose

For import into the US:

- Form 2877 from US DHHS
- Must include manufacturers accession number found in user manual for your model

QSA Global, Inc. can provide guidance on import and export regulations.

End User Statement

User Company Name: _____

Telephone Number: _____

User Contact Name: _____

Address of End User: _____ Address where items are to be used: _____

(NOTE: Product(s) can only be shipped to an address listed above)

have ordered the following item(s) from QSA Global, Inc. on (choose one):
☐ PO#: _____ (for single purchase) OR ☐ As Needed Basis (for blanket purchases / PO's)

Quantity	Description
_____	_____

The item(s) ordered are intended for the following end use(s):

We certify the goods will be used for our own purpose and will ensure our company will comply with the following:

- The goods described above **will not be re-sold and/or re-exported to, nor used in**, the following list of countries as prohibited by U.S. Nuclear Regulatory Commission (USNRC) Regulations and/or U.S. Export Control Laws.

Cuba, Iran, North Korea, Sudan, and Syria
- The goods described above may be shipped to and/or used in Iraq **provided a specific license has been granted from the U.S. Nuclear Regulatory Commission (USNRC)** prior to the goods being shipped. **Goods may not be re-exported to Iraq from another country.**
- The goods will not be used for military purposes.
- The goods will not be used for purposes associated with chemical, biological or nuclear weapons or missiles capable of delivering such weapons, nor will they be re-sold if we know or suspect that they are intended or likely to be used for such a purpose.

We understand that the following countries are classified by USNRC regulations as restricted destinations and order shipment from the U.S. to a country listed below may require QSA Global, Inc. to obtain an export permit (Note: QSA Global, Inc. reserves the right not to apply for such a permit):

Afghanistan, Andorra, Angola, Burma (Myanmar), Djibouti, India, Israel, Pakistan, Libya and South Sudan

Name: _____ Title: _____
(Please Print)

Signature: _____ Date: _____

ACCEPTED BY: _____ DATE: _____
(Name and Title of authorized QSA Global representative)

EUS is valid for a period of _____ years from the date QSA Global, Inc. accepts and signs.
November 2018

Note: This form **MUST** be returned on your company's letterhead and signed by a position of authority.
You may fax or email a copy to us.