



One Source for
Asset Protection
Solutions®

Automated Radiographic Testing (ART) for Corrosion Under Insulation (CUI)

Leon de Ridder – Business Development Manager A-NDT

TECHNOLOGY OVERVIEW



MISTRAS Group

MISTRAS' asset protection solutions support clients with cutting-edge, technology-driven mitigation of risks.

▶ **VISION**

Be the **integrated-solution partner** to solve civilization's unmet asset protection needs

▶ **MISSION**

We will deliver value by developing, integrating, and executing asset protection solutions that **maximize uptime and safety**



Founded in **1978**



NYSE: **MG**; IPO in 2009



Global HQ in Princeton, NJ - USA



Over 106 Locations Worldwide



Over 5,000 Employees

The North Slope of Alaska has over 20,000 kilometers of insulated above ground piping with a large percentage susceptible to CUI and internal corrosion.



GENERATION 3



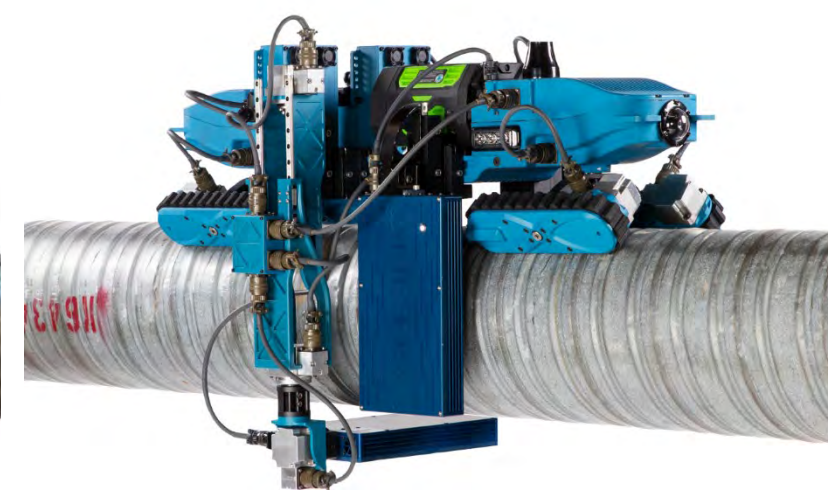
FUNCTION	Internal Corrosion
VIEWS	1
PIPE RANGE (INSULATED)	4"-48"
POWER	225 kV
COMMUNICATION	Wireless
MARKET	Up, Mid, Downstream
WEIGHT	70 lbs.
CLEARANCE	Robotic Arm: Top: 10"; Bottom: 2"; Side 1: 4"; Side 2: 0" Stationary Arm: Top: 10"; Bottom: 2"; Side 1: 2"; Side 2: 0"
DIMENSIONS	54.5" x 7" x 9.75"
EXPOSURE TECHNIQUE	Double Wall Single View (ID+OD)
TEMPERATURE RANGE (F)	-40 to 120
POWER REQUIREMENTS	56V Lithium Ion Battery

GENERATION 4



FUNCTION	Single View CUI (Bottom)
VIEWS	1
PIPE RANGE (INSULATED)	4"-48"
POWER	3 options, 70 kV, 120kV, 160kV (higher power for inspecting supports or saddles)
COMMUNICATION	Wireless
MARKET	Up, Mid, Downstream
WEIGHT	28 lbs.
CLEARANCE	Top: 7"; Bottom: 0"; Side 1: 1.75"; Side 2: 3.5"
DIMENSIONS	32" x 6" x 7"
EXPOSURE TECHNIQUE	Tangential (OD Only)
TEMPERATURE RANGE (F)	-40 to 120
POWER REQUIREMENTS	56V Lithium Ion Battery

GENERATION 5



FUNCTION	4 View CUI (Bottom, Top, both sides)
VIEWS	4
PIPE RANGE (INSULATED)	2"-20"
POWER	70 kV
COMMUNICATION	Wireless
MARKET	Up, Mid, Downstream
WEIGHT	37 lbs.
CLEARANCE	Robotic Arm: Top: 8"; Bottom: 2"; Side 1: 4"; Side 2: 3.5" Stationary Arm: Top: 8; Bottom: 2"; Side 1: 2"; Side 2: 3.5"
DIMENSIONS	36" x 6" x 8"
EXPOSURE TECHNIQUE	Tangential (OD Only)
TEMPERATURE RANGE (F)	-40 to 120
POWER REQUIREMENTS	56V Lithium Ion Battery

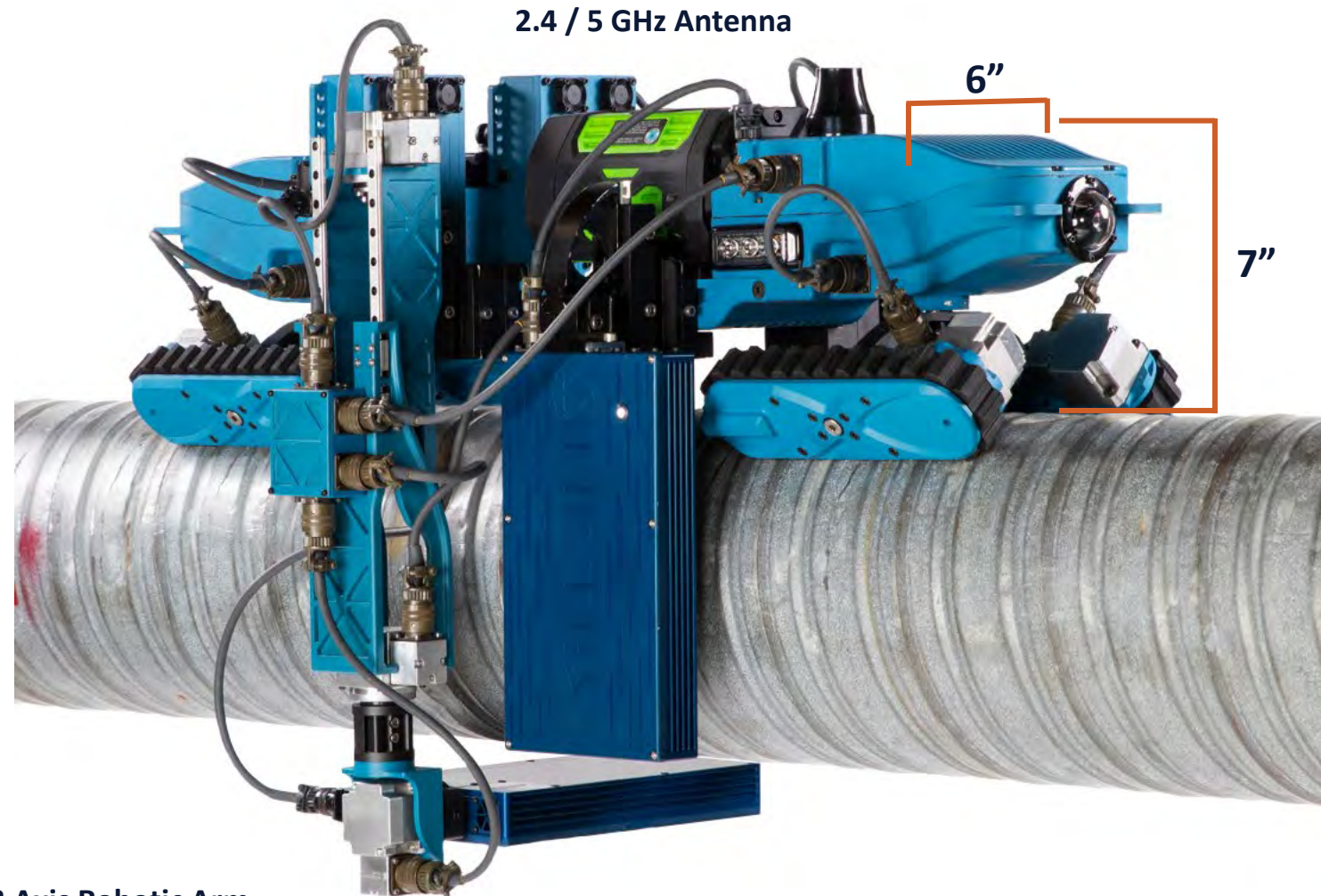


- ▶ Automated RT solutions were **first introduced by MISTRAS in 2018** for use in screening for **internal corrosion** and **corrosion under insulation (CUI)**
- ▶ Designed for use in screening for internal corrosion and corrosion under insulation (CUI)
- ▶ Utilizes x-ray radiation energy and proprietary detectors to produce either tangential or double wall exposure/single wall views

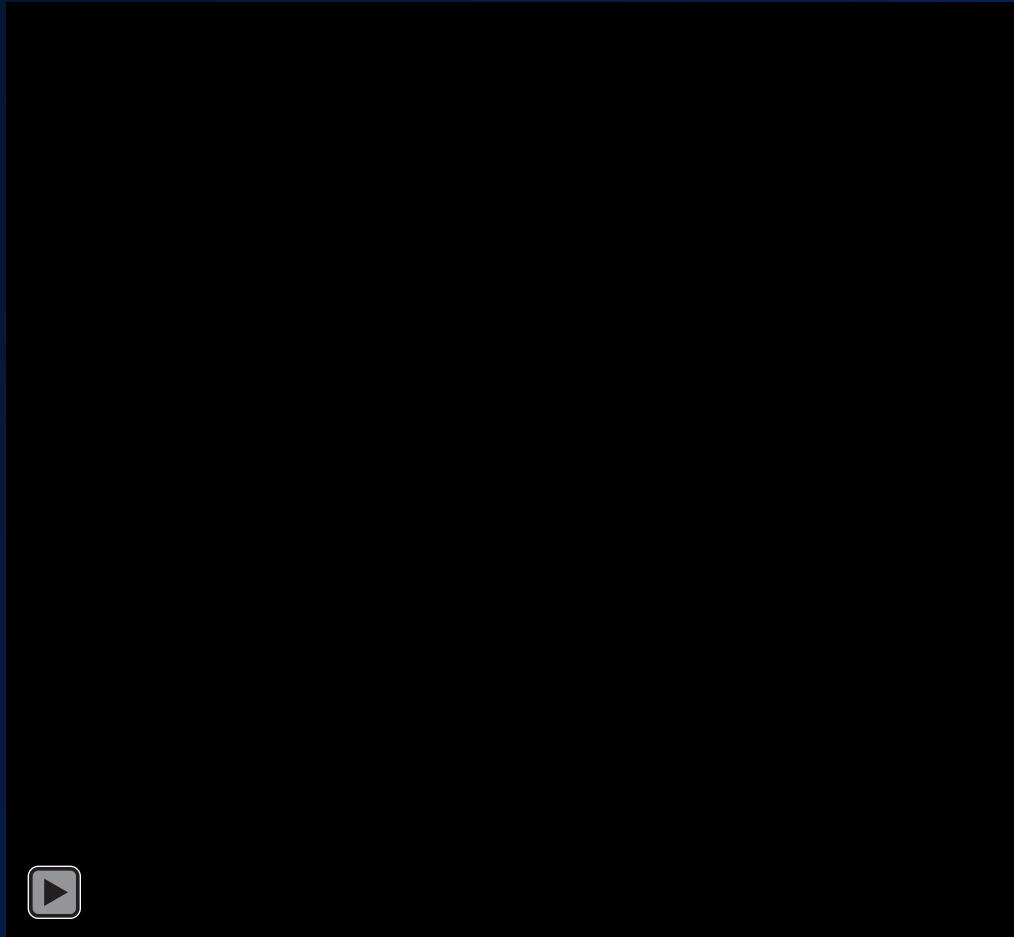
GENERATION 5

MISTRAS ART Crawler Generation 5

- ▶ 4 View CUI Inspection
- ▶ 4 x 70kV, 12W X-Ray Tubes
- ▶ 2 x 100 μ m Photon Counting Detector
- ▶ 37 lbs.
- ▶ Fully Wireless
- ▶ Weatherproof

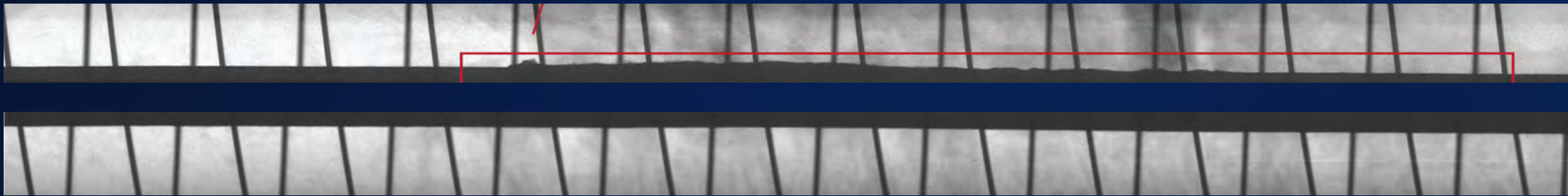


**3 Axis Robotic Arm
Enables Autonomous support traversal**

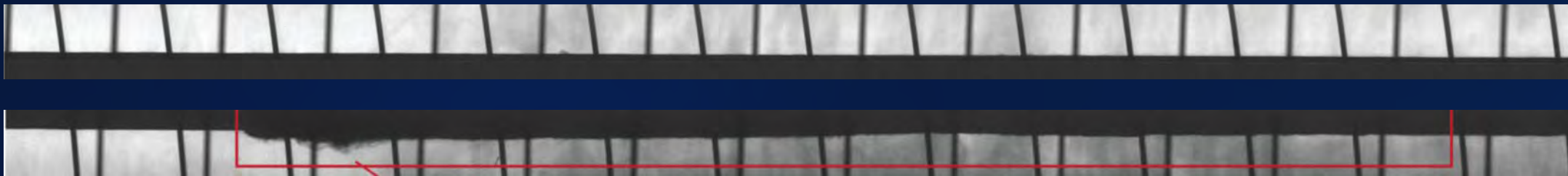


The latest generation CUI crawler is capable of producing imagery of the top, bottom, and both sides of the pipe in one scan. Currently this applies to pipe with OD of 8-inch and less with sufficient accessibility.

Radiographic map of the top and bottom of pipe



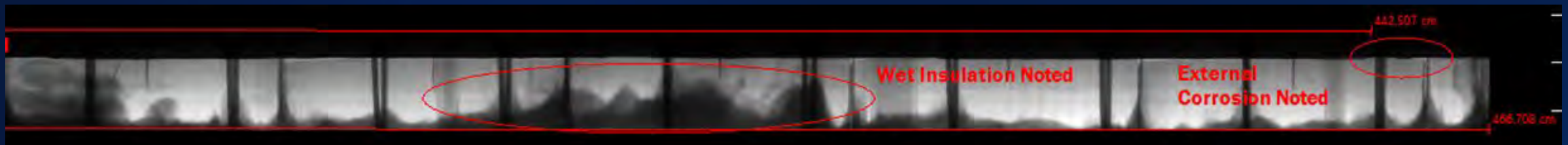
Radiographic map of both sides of the pipe



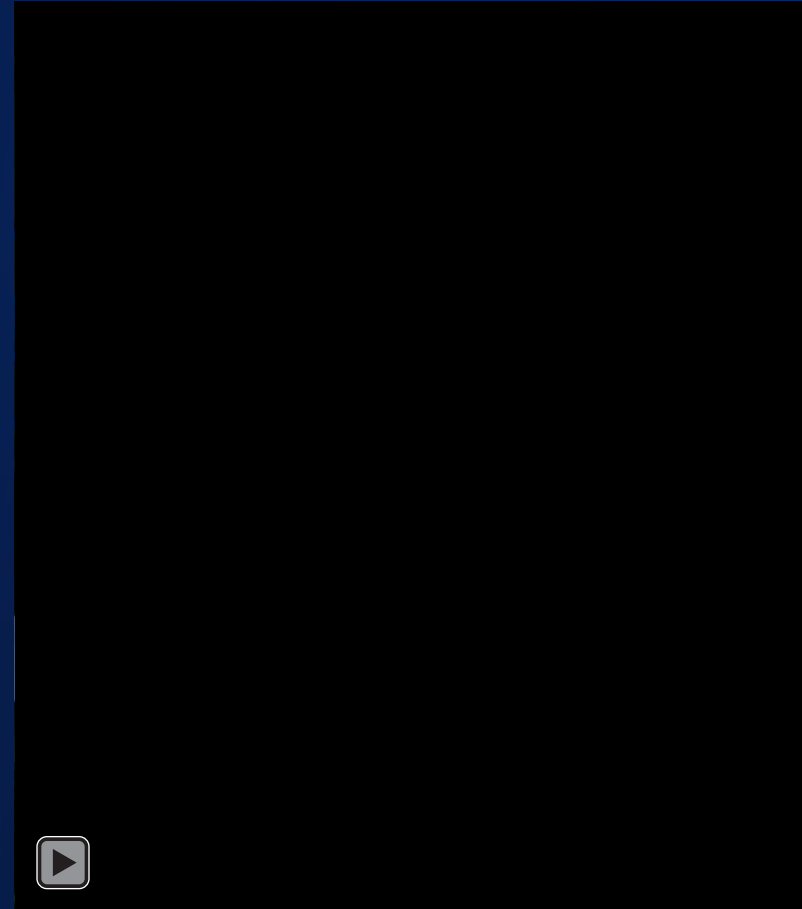
ART systems enable operators to determine the severity of external corrosion and moisture saturation by displaying the pipe wall to insulation interface.



ART systems can also determine the start and stop locations of regions of interest through calibrated encoders and annotate distances and measurements directly on the radiographic map.



Live video capture and
DICONDE RT images save
for record retention and
analysis.



Safer

- Remotely operated X-ray system resulting in less exposure to operators, 70kV – 225kV
- Lightweight rope access deployable, 13kg – 34kg

Faster

- CUI production rates of 230 to 460m per shift
- Internal production rates of 100 to 200m per shift
- ART systems produce readily consumable data

*Time-delay video of 360-degree scanner

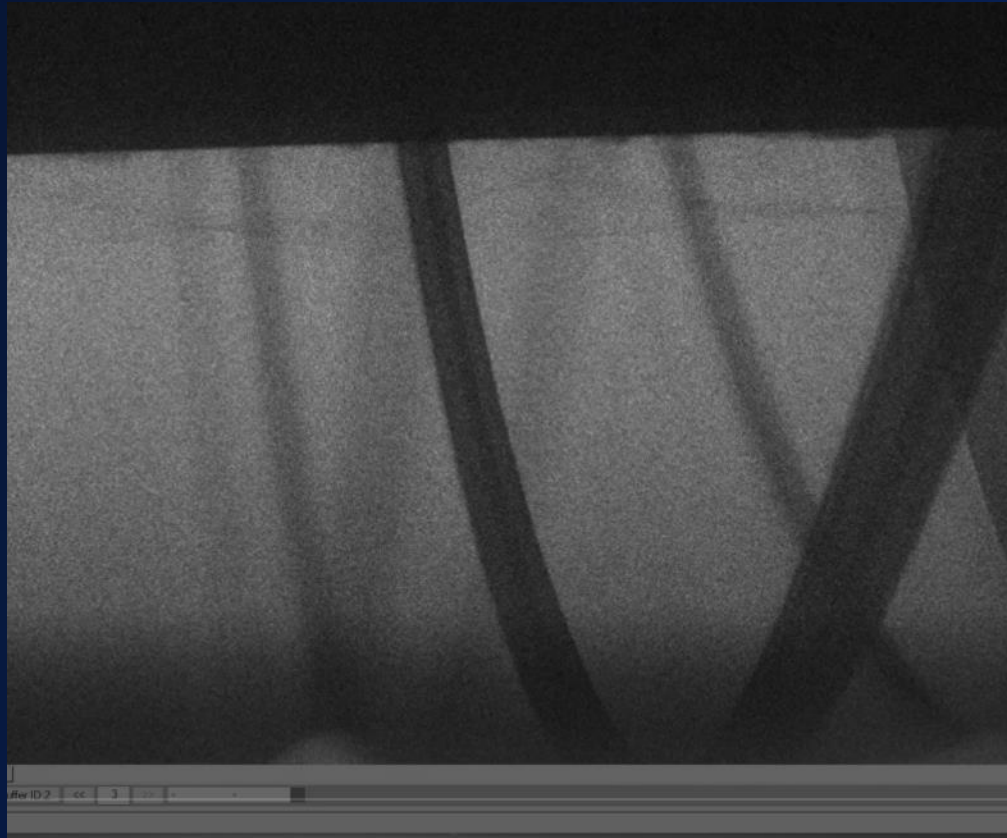
Project: 60-inch OD pipeline

Prototype is currently scanning 30 axial meters per day with each scan equating to 4.75 meters traveled circumferentially and a total surface area inspected of 478 square meters.

A larger imager is under development that will double the field of view per scan effectively reducing the number of circumferential scans required and doubling productivity.



Scanner detected CUI indications and operator estimated wall loss range of 11%-17%



Strip and UT inspection confirmed wall loss of 12%



Automated Radiography Testing (ART) is a proven cost-effective non-invasive method for identifying and evaluating corrosion under insulation and internal corrosion of in-service piping with minimal operational impact.





THANK YOU!

Leon.deridder@mistrasgroup.com
+31 6 36 06 08 74

mistrasgroup.com