Corrosion & Erosion
Inspection solutions for detection, sizing & monitoring

DATA ➔ INFORMATION ➔ KNOWLEDGE ➔ DECISION

GE Inspection Technologies
GE Inspection Technologies is a leading innovator for inspection solutions that deliver accuracy, productivity and safety to customers in a wide range of industries, including oil & gas, power generation, aerospace, transportation and government infrastructure.

Our advanced nondestructive testing and imaging technologies utilize the electromagnetic, radiographic, ultrasonic or visible energy spectrum to test and inspect a wide range of components. We have enormous depth and breadth of know-how which can be applied to your needs.

Corrosion & Erosion
The negative effects of corrosion and erosion cost the oil & gas and power generation industries billions of dollars every year in unscheduled plant or pipeline shutdowns, inefficient or lost production, high maintenance repair costs or imposed fines. Experts believe that 20% to 25% of corrosion-related costs could be avoided. Corrosion and erosion detection, sizing and monitoring technologies are important elements toward realizing those savings.

Multi-Modal Offering
GE Inspection Technologies offers the most comprehensive selection of testing and inspection capabilities and other products for industrial applications. Our strength lies in the use of field experience and customer feedback to build the most productive-inspection products in the market. With the industry’s broadest complement of nondestructive test methods to ensure our customers can be confident they are getting the optimal solution to meet their needs.

Our NDT technologies help you collect important data and convert it into useful information. Coupled with historical plant data, intelligent software, image enhancement, databasing, applicable codes and additional knowledge, asset owners can make better-informed decisions regarding treatment, mitigation, remaining life, component replacement or plant operating parameters.

Overview

1. Remote visual inspection of pitted boiler tubes
2. Ultrasonic phased array profile of boiler tube ID pit
3. Digital X-ray image of insulated pipe elbow
4. Real-time, on-stream monitoring of pipe wall thickness
5. Computed Tomography of hydrogen-attacked boiler tube
6. Eddy current map of wall thinning

*These images were captured and/or stored using Rhythm Software.
Oil & Gas Application Solutions

GE Inspection Technologies addresses all major inspection needs for our oil and gas customers. We strive to deliver high-quality products & services that detect, size and monitor corrosion and inspect welds in a variety of situations and field conditions. Our leading-edge inspection solutions boost productivity, help you improve safety and solve your toughest oil and gas inspection challenges.

No other supplier can match GE’s breadth of capability and depth of experience in the field of corrosion detection, sizing and monitoring of fixed and rotating equipment.

Upstream

Rightrax™ installed sensor system continuously monitors wall loss due to sand erosion at critical elbows on production platforms.

Midstream

Digital radiography detects and measures corrosion under insulation (CUI) without removing the insulation.

Downstream

Ultrasonic phased-array inspection assists in quickly scanning, detecting, profiling and sizing of isolated pitting in pipes.

Remote visual inspection of compressor blades can help identify erosion and thinning.

Phasor® XS is a proven tool for characterizing safety-critical flange faces for refineries and refineries for corrosion and cracking.

Apollo is a multi-channel, multi-frequency eddy current instrument useful to locate and size corrosion, erosion and cracking in heat exchanger tubes.
Power Generation Application Solutions

We provide nondestructive testing and inspection solutions for key power generation corrosion applications, including those for fossil, nuclear, renewable generation as well as transmission and distribution. Our reliable, advanced technology and support services enable power generation customers to help maximize efficiency, minimize downtime and enhance productivity with unyielding integrity.

In addition to a broad product and service offering, GE has vast experience and expertise in BWR, PWR and Candu nuclear power applications, gas, coal and oil-fired fossil stations, gas turbines and hydro-electric assets.

Remote Visual Inspection with Menu Directed Inspection™ for turbine blade viewing.

LightGo is an ultra-portable, light-weight pulse-echo flaw detector for general purpose testing.

Apollo™ eddy current test instrument performs volumetric interrogation of heat exchanger tube bundles for corrosion and erosion.

Phased array ultrasonic testing of reactor vessel and piping systems.

Remote visual inspection of service water piping systems for MIC using robotic crawlers and high-resolution video cameras.

Fossil Power

Gas Turbine & Combined Cycle

Nuclear Power
Remote Visual Inspection (RVI)

RVI is a cost-effective inspection technique used to capture real-time views and images from inside voids such as tubes, pipes, rotating machinery, engines, heat-exchangers, trays, tray towers, refractory-lined vessels and enclosed structures. RVI can be a perfect complimentary technique to other NDT disciplines and is frequently used as the primary or initial inspection screening method to find localized corrosion and erosion.

Video Borescopes

We offer an array of technologically advanced video borescopes, from the most portable to the most capable, all designed for ease-of-use while delivering video images of unsurpassed quality.

On-site Remote Visual Inspection Service

Our staff of experienced remote imaging specialists, equipped with the latest remote visual inspection equipment, is available around the clock. We can assist during planned and unplanned outages, preventive maintenance, emergency services or with state or federal compliance issues.

Nuclear plant containment building steel liner is visually inspected with a custom 5-megapixel imaging system to meet ASME’s IWE code requirements.

Menu Directed Inspection™ (MDI)

MDI is the first software tool in the NDT industry to standardize the inspection process. A GE video borescope operating MDI software helps guide inspectors through the inspection process and intelligently autogenerates a report, saving time, improving quality and increasing productivity.

Pan-Tilt-Zoom (PTZ) Cameras

GE has a full range of rugged industrial PTZ cameras for remote viewing in large areas. Three interchangeable zoom camera head diameters with high-intensity lighting, pan-and-tilt mechanisms and industrial waterproof packaging for protection from extreme environments.

Rhythm® Software

Rhythm Visual software combines advanced image acquisition, review and data management tools for remote visual inspection. Its advanced data sharing capabilities allow significant improvements in productivity and enable faster identification of quality problems, leading to reduced production defects or better in-service asset management.

Flexible NDT equipment rental structure program – daily, weekly, monthly, or annually – to suit your needs. We also have lease-to-own arrangements available.

NDT Equipment Rental

Access to GE’s vast selection of nondestructive testing and remote visual inspection equipment is a phone call away. Regional field offices provide application expertise, equipment selection assistance and timely deliveries to your facility. Daily, weekly and monthly rates are available.

Pan-Tilt-Zoom (PTZ) Camera system is used to inspect the integrity of glass- and refractory-lined vessels.

MDI can be customized to guide inspectors through any remote visual inspection process.

Flexible NDT equipment rental structure program – daily, weekly, monthly, or annually – to suit your needs. We also have lease-to-own arrangements available.

Rhythm provides a solution to analyze assets over time to increase asset life. Rhythm utilizes AIPM standard image file format DICONDE.

Corrosion & Erosion

Our XSS2 videodrive is commonly used to diagnose operational problems with heat exchangers and other fixed and rotating refinery assets.

A PTZ camera system is used to inspect the integrity of glass- and refractory-lined vessels.

Rhythm® Software combines advanced image acquisition, review and data management tools for remote visual inspection.
Ultrasonic Testing (UT)

Ultrasound technique has been used in non-destructive testing for almost 50 years and is used to find a variety of defects or non-conformities within almost any kind of solid material. The Krautkramer name has been synonymous with excellence in ultrasound during this period and is now part of our heritage at GE Inspection Technologies.

Conventional Flow Detectors
Flow detection is a fast and accurate inspection method to evaluate internal product integrity. Ultrasonic penetrates deeply into materials searching for metal loss and material degradation associated with corrosion and erosion.

Corrosion Thickness Gages
These useful and productive tools are designed to help improve safety and ensure reliability of equipment and materials subject to corrosion or erosion. Data can be imported and exported from these devices for mapping and trending.

Conventional Flaw Detectors
Flaw detection is a fast and accurate inspection method to evaluate internal product integrity. Ultrasonic penetrates deeply into materials searching for metal loss and material degradation associated with corrosion and erosion.

Phased Array Flow Detectors
Ultrasonic phased array inspection continues to evolve rapidly and can be applied to many corrosion and erosion applications for upstream, midstream and downstream plant assets.

Phased Array Flaw Detectors
Ultrasonic phased array instruments dedicated to locating and sizing pits can significantly improve inspection productivity.

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Transducers
GE manufactures a wide range of standard and custom ultrasonic testing transducers including conventional, phased array and permanently installed for corrosion and erosion applications.

Phased-array and dual-element transducers are optimized for performance extended wear-and-tear, elevated temperatures and detection of isolated pitting.

Rhythm® Software
Rhythm UT offers the same advanced viewing and measurement tools as the Phasor XS so you can work offline without sacrificing capabilities. Rhythm UT is a DICONDE image management platform with additional tools to enhance reporting and analysis of corrosion/erosion data to assist in better decision-making.
Radiographic Testing (RT)

Radiography is one of the oldest, most reliable and proven nondestructive testing methods and offers unique benefits, such as revealing changes in thickness, internal and surface defects, large-area coverage and more. We offer conventional film radiography, digital technologies, including computed radiography and direct radiography, portable or stationary X-ray sources, 3D computed tomography and analytical X-ray.

**Film Radiography**

We offer a comprehensive range of radiographic films, processing equipment and chemicals, perfectly geared to one another. No object is too large or too small—a radiographic film of the appropriate size is available for almost every exposure.

**Computed Radiography (CR)**

Our wide range of CR scanners, imaging plates and software solutions provide an overall imaging solution to our customers. In addition, we offer proprietary high-performing CR imaging plates for a wide range of NDT applications including corrosion, erosion and crack detection.

**Direct Radiography (DR)**

GE utilizes a variety of digital detector arrays to ensure optimal image quality and throughput for each application. We have the unique advantage of designing and manufacturing custom systems, allowing us to influence every stage of the process, to provide a solution tailored specifically for field and shop industrial applications.

**Industrial X-ray Tubes & Generators**

160-300kV portable and 160-450kV stationary equipment with directional or panoramic tubes and different combinations of focal-spot sizes provide the appropriate X-ray source to meet your specific requirements. In addition, we offer a complete line of micro- and nanofocus X-ray generators and tubes.

**AGFA Structurix film** remains a global industry standard for quality and reliability with corrosion applications.

**DXR250V** is a 16 in x 16 in active area, field-hardened portable imaging digital detector array with a detachable cable. This product plugs directly into a laptop computer for direct radiographic testing and imaging analysis.

**3D Computed Tomography (CT)**

3D computed tomography machines are laboratory instruments and can be applied to many materials engineering and failure analysis applications. "Point cloud" data from 3D scans can be measured very accurately and sliced with software imaging tools.

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**Rhythm® Software**

Rhythm can acquire image data from CR and DR sources or from film digitizers. This data can be displayed on the monitor of a standard PC. Rhythm offers standardized reporting capability in easy-to-understand formats, with DICONDE-tagged images. This allows fast historical and meaningful comparison of reports from different inspectors.

**Flash! Filters™ for welds** provides one-click image optimization, improving the speed and accuracy of defect detection and sizing by using the Wall Thickness Measurement Tool (WTMT) software.
GE Inspection Technologies offers advanced and user-friendly software that improves productivity by helping you make smarter and quicker decisions in the field and in the office. Our software covers all Nondestructive Testing (NDT) applications and methods, including software for data input, analysis, image review, reporting, data management, remote collaboration and storage.

**Menu Directed Inspection™ (MDI)/Reporting**
- MDI guides inspectors through the inspection process and generates automatic reports.
- Rhythm Reporting does the same for all NDT modalities on a PC.

**Rhythm® - Remote Expert**
- Rhythm makes it easy for experts to share images and information simply and quickly via removable media, LAN connections, or on the web.

**Rhythm - Data Management**
- Manage all your NDT inspection data in one platform.
- Rhythm makes querying and retrieving previous inspection data as simple as a few clicks. All data is stored in DICONDE, an industry standard, reducing any risk of data or information loss over time. Rhythm can tie directly to your ERP system.

**Eddy Current Testing (ET)**
- Eddy current is a fast, accurate and cost-effective electro-magnetic NDT method for detection of surface or near-surface flaws such as metal loss due to corrosion or erosion. It is commonly used for the inspection of heat exchanger tubing and piping, shell-side components such as support plates and rotating equipment such as turbine blades.
  
- **Probes**
  - GE designs and manufactures a complete line of eddy current tubing probes for many heat exchanger tube diameters and materials including ferrous and non-ferrous. Custom probes are also available.
  - **Multi-Channel/Multi-Frequency Instrument**
  - These systems are laptop compatible for easy data capture, viewing, analysis and mapping.
  - **Area Coverage**
  - Special eddy current array probe technology allows for wide-area scanning on metal surfaces of unusual or complex geometry.

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  - Special eddy current array probe technology allows for wide-area scanning on metal surfaces of unusual or complex geometry.

- **Probe heads allow for quick change and re-use of the probe’s push-pull cable. This unique design and construction increases field crew productivity, while lowering operating cost for heat exchange inspection.**

**Multi-Channel/Multi-Frequency Instrument**
- These systems are laptop compatible for easy data capture, viewing, analysis and mapping.

- **Apollo is a multi-channel/multi-frequency digitized eddy current instrument, which can drive some handheld eddy current testing, remote field as well as large array probes.**

- **Detachable probe heads allow for quick change and re-use of the probe’s push-pull cable. This unique design and construction increases field crew productivity, while lowering operating cost for heat exchange inspection.**

- **GE’s unique eddy current array probes increase coverage while improving probability of detection of complex geometries, such as turbine rotor dovetails.**

**Rhythm provides image inspection labels and one-click professional reporting.**
- By moving data instead of people, Rhythm allows real-time sharing of information with experts anywhere in the world.

**Whether you’re reporting, archiving or sharing, Rhythm provides a consistent platform for your NDT data.**

**Apollo is a multi-channel/multi-frequency digitized eddy current instrument, which can drive some handheld eddy current testing, remote field as well as large array probes.**

**MDI provides image inspection labels and one-click professional reporting.**

GE’s Rhythm Software plays a key role in enabling asset owners to integrate NDT data and other information with additionally available knowledge in order to make well-informed decisions regarding plant components and their remaining life.
GE’s Rightrax™ LT and Rightrax HT systems are changing the way that critical corrosion data is measured and managed. This breakthrough technology helps increase safety and productivity while reducing overall inspection costs. The Rightrax system uses permanently-installed sensors that permit remote monitoring of restricted, hard-to-access and/or high-temperature areas up to 350°C (662°F). Once fitted, the system provides continuous real-time access to corrosion data via direct & acquired wall thickness data, eliminating the need to erect scaffolding, remove insulation or shut down plant systems. Online monitoring also reduces labor-intensive traditional inspection routines by providing data that can be used for proactive maintenance planning.

- Non-intrusive inspection—Sensors simply bond or are clamped onto the inspection area
- Remote locations—Offshore platforms (manned and unmanned), remote pipeline sites or inaccessible areas
- No scaffolding or rigging costs—Once installed no need to revisit the site (fit & forget)
- Early warning systems—Software provides trending, warning and alarm information with data on demand
- Accuracy—Measurement repeatability to 0.2 mm (0.008") (low temp) or 0.0025 mm (0.0001") (high temp)

More Than Just “Wall Thickness Measurement”

- Provide accurate feedback to manage opportunity crude processing in a refinery by monitoring effects on pipe wall thicknesses
- Drive down probability of failure with data on demand/data on PCs
- Make well-informed decisions; reduce total corrosion costs
- Provide reliable and highly repeatable data that can be used to drive maintenance planning activities to save cost on unexpected material orders and spare inventory
- Provide support for chemical injection programs by supplying accurate and reliable pipe wall thickness data
- Interface with plant asset management systems, such as GE O&C System 1, viewing fixed and rotating asset conditions in a single system
- Real-time, highly accurate thickness data
### 3 Rigtrax Solutions for Many Applications

#### Rigtrax Portable Low-Temperature (LT) Installed-Sensor Manual System (-40°C up to 120°C / -40°F up to 248°F)

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Transducer Type</th>
<th>Temperature Range</th>
<th>Measurement Range</th>
<th>Resolution / Accuracy</th>
<th>Max Cable Distance</th>
<th>Interface / Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2 Pad sensors</td>
<td>M2 pad</td>
<td>-40°C to 120°C</td>
<td>-40°F to 248°F</td>
<td>+/− 0.1 mm (+/− 0.004 in)</td>
<td>70 m (230 ft)</td>
<td>RS-485, SCADA, System 1, OPC, 3rd Party</td>
</tr>
</tbody>
</table>

#### Rigtrax Low-Temperature (LT) Sensor Automated System (-40°C up to 120°C / -40°F up to 248°F)

<table>
<thead>
<tr>
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<th>Transducer Type</th>
<th>Temperature Range</th>
<th>Measurement Range</th>
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<th>Max Cable Distance</th>
<th>Interface / Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2Pad sensors</td>
<td>M2 pad 14 elements</td>
<td>-40°C to 120°C</td>
<td>-40°F to 248°F</td>
<td>+/− 0.2 mm (+/− 0.008 in)</td>
<td>70 m (230 ft) for single sensor. 450 m (1476 ft) max for all attached sensors.</td>
<td>RS-485 or ethernet</td>
</tr>
</tbody>
</table>

#### Rigtrax High-Temperature (HT) Sensor Automated System (-10°C up to 350°C / -40°F up to 662°F)

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Transducer Type</th>
<th>Temperature Range</th>
<th>Measurement Range</th>
<th>Resolution / Accuracy</th>
<th>Max Cable Distance</th>
<th>Interface / Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsically safe</td>
<td>Single element delay line sensor</td>
<td>-10°C to 350°C</td>
<td>-40°F to 662°F</td>
<td>+/− 0.0025 mm (+/− 9.8x10−5 in)</td>
<td>5 m (16.4 ft) max single coaxial cable</td>
<td>RS-485 or ethernet</td>
</tr>
</tbody>
</table>
• Insulation and fireproofing can accumulate moisture and cause accelerated corrosion
• Breaches of weather jacketing increases with age and mechanical damage
• Extensive stripping and abatement needed for visual testing and ultrasonic testing
• Digital X-ray can give general condition in a specific thickness in recordable format for prioritization of additional inspection/remediation can be scheduled.
• See pages 11 - 12 for general description

• Heat exchanger tubing can suffer specific damage that can be precisely qualified by ET
• Localized corrosion damage in carbon steel can be confirmed using visual methods
• Contact and solids cause severe damage to rotating and stationary blades
• Solid particles can generate rapid wall loss under proper conditions in offshore risers
• HF scale and corrosion can significantly compromise flange integrity
• See pages 15 - 18 for general description

• Hydrogen damage can be caused by condenser in leakage and failures can lead to unit outages
• External UT/EMAT scanning can be used to identify suspected areas of wall loss
• RVI can rapidly confirm external inspections for exact location and severity of boiler tubes for ID damage
• See page 7 - 8 for general description

• Turbine blade erosion can lead to decreased performance and blade failure
• Pitting may occur before vibration analysis can detect a problem
• RVI can rapidly assess blade condition and equipment can be scheduled for more detailed preventative maintenance
• See page 7 - 8 for general description

• Sand erosion can occur at change in direction/diameter in offshore production risers due to solids ingestion, typified by a smooth surface with a sand dune pattern
• Riser locations where sand erosion may occur are difficult to access and inspect with conventional ultrasonic and X-ray testing
• Permanently-installed sensors can be applied to suspect areas for accurate monitoring without the need for repeated mobilization of inspection personnel
• See pages 15 - 18 for general description
Corrosion & Erosion

Compressor blade rubbing and damage can lead to loss of efficiency and potential catastrophic failures.
Tip damage may be significant before serious vibration damage is noted.
RVI can allow rapid, recordable assessment of compressor blade condition for evaluation by experts in remote locations.
See pages 7 - 8 for general description.

Many refractory lining conditions cannot be evaluated by UT or RT.
Manual inspection requires staging, scaffolding and proper confined space entry precautions.
RVI can be used to obtain refractory condition assessment to prioritize internal inspection and repair execution to expedite turnaround resources.
See pages 7 - 8 for general description.

Flow-assisted corrosion can occur in all piping that contains water and water/steam mixtures.
Single liquid phase or dual (phase heat steam) as shown below can cause severe local metal wastage.
Water treatment, design and metallurgy can help prevent for damage.
Digital radiography can be used for volumetric examination of specific suspect locations.
See pages 11 - 12 for general description.

Flow-assisted Corrosion Utility Steam Pipe (Radiographic Testing (RT))
Creep of High-Pressure Steam Pipe (Ultrasonic Phased Array (UT-PA))
Air Fin-Fan Tube ID Condition (Remote Visual Inspection (RVI)/Eddy Current Testing (ET))
Compressor Blade Damage (Remote Visual Inspection (RVI))
Refractory Vessel Damage (Remote Visual Inspection (RVI))
Weld Heat-Affected-Zone Inspection (Radiographic Testing (RGT & DR))

Carbon steel piping has failed catastrophically from FAC. Elevated temperature damage can occur with increasing age and operation severity.
Air fin heat exchanger tube damage can cause significant operational problems.
Tip damage (rubbing) can be identified by vibration analysis and monitored off line with RVI.
Refractory damage can be unexpected and lead to significant turnaround repair.
Weld defects can cause significant equipment inspection challenges.

Greatly enhance weld inspection and flaw sizing with digital radiography.
Digital radiography is both qualitative and quantitative.
Digital radiography produces fast scanning and can go through insulation.
See pages 11 - 12 for general description.
Hydro-Processor Effluent Air Cooler

- Reactor Effluent Air Coolers have suffered numerous Erosion/Corrosion incidents due to Ammonium Bisulfide erosion and Ammonium Chloride corrosion.
- Rigorous monitoring of operating conditions must be followed by extensive UT and RT surveys.
- Phasor DM can rapidly ‘prove-up’ scanning results with greater detail than conventional UT.

Service Water Piping Corrosion

- Extended downtimes and idle service water systems have promoted microbiological corrosion.
- MIC can be highly localized and cause complete penetration in a short period of time.
- Use RT or UT in a complementary mode.

High-Pressure Piping Ring-Joint Cracking

- Ring joint flanges have had significant cracking from mechanical and Stress Corrosion Cracking.
- Typically discovered by PT or manual UT after flanges have been opened during Turnaround.
- May extend unit downtime.

Tank Bottom Pitting

- API-653 mandates periodic internal tank floor inspection with volumetric assessment.
- Magnetic Flux scanners provide rapid general floor condition assessment.

Injection Point Corrosion

- Chemical and Process injection without proper control has been responsible for significant industry incidents.
- API 570 mandates enhanced inspections of specific locations downstream of these injections.
- Rightrax permanently mounted sensors can be installed in these locations and provide continuous thickness and profile readings in these locations.

Bottom Mounted Instrumentation (BMI)

- Instrument Penetrations have caused significant reliability concerns at nuclear plants.
- Difficult access and need for detailed inspection data required a multi-modal approach for proper integrity assessment.
- Combination of RT, UT and Eddy Current techniques help assess BMI guide tubes to prioritize repair need for reactor service.

- See Pages 7 - 10 and 13 for general description.

- See Pages 7 - 10 for general description.

- See Pages 7 - 10 for general description.

- See Pages 9-10 for general description.

- See Pages 15 - 18 for general description.

- See Pages 15 - 18 for general description.

- See Pages 15 - 18 for general description.
**Nuclear Containment Building: IWE/IWL**

**Remote Visual Inspection (RVI)**

- **Dead-End Dead-Leg Corrosion**
  - Digital and Computed Radiography (DR & CR)
  - Intentional and unintentional stagnant piping legs and connections may have significantly higher corrosion rates than adjacent pipe components.
  - Pipeline TMK’s and spot UT may be misleading as to connection condition.
  - DR and CR images provide measurable, recordable, remotely accessible, high-quality documentation of condition.
  - Images can be archived in typical plant Data Management systems.
  - See Pages 11 - 12 for general description.

- **Crude Unit Overhead Corrosion**
  - Righttrax Installed Sensor (UT)
  - Crude Unit Overhead lines may suffer high intermittent corrosion rates due to crude slate changes coupled with inadequate chemical corrosion control application.
  - Periodic piping TMK’s and spot UT may be not capture events that could cause significant wall loss of piping.
  - Remote/inaccessible locations generally allow for periodic monitoring with Crane/scaffold access.
  - Righttrax permanently mounted sensors provide recordable, remotely accessible, high quality documentation of wall condition.
  - See Pages 15 - 18 for general description.

- **Naphthenic Acid Corrosion**
  - Righttrax Installed Sensor (UT)
  - Crude Unit Convection Cross-Over’s may suffer severe corrosion due to crude slate changes to higher TAN Crudes.
  - Rightrax permanently mounted sensors provide recordable, remotely accessible, high quality documentation of wall condition.
  - See Pages 11 - 12 for general description.

- **Heat Exchanger Tubing Failures**
  - Remote Visual Inspection (RVI)
  - Phased Array capability in readily portable equipment.
  - Assess damage extent and improved sizing from field personnel.
  - Improved inspection productivity in a sharable format.
  - Obtain better information for RBI and FFS Evaluations.
  - See Pages 9 - 10 for general description.

- **Corrosion Damage Sizing**
  - Ultrasonic Testing (Phase CV/DM)
  - Phased Array capability in readily portable equipment.
  - Assess damage extent and improved sizing from field personnel.
  - Improved inspection productivity in a sharable format.
  - Obtain better information for RBI and FFS Evaluations.
  - See Pages 9 - 10 for general description.

**Remote Visual Inspection provides recordable, indexed, high quality documentation.**

**Dead Ends/Dead Legs may suffer significantly higher corrosion rates than adjacent piping components.**

**Crude Unit Overheads may suffer severe corrosion due to crude slate changes.**

**Crude Unit Convection Cross OVER’s may suffer severe corrosion due to crude slate changes to higher TAN Crudes.**

**RIV with experienced personnel can provide rapid damage mode identification.**

**Phasor CV/DM has dual channel. Phased Array capability for accurate, rapid damage sizing.**
Global Contacts

**Americas**

**United States**
Lewistown, PA
+1 866 243 2638 (toll-free)
+1 717 242 0327

**Brazil**
São Paulo
+55 11 36141840

**Europe**

**Germany**
Huerth
+49 2233 6010

**Belgium**
Berchem
+32 3 456 2853

**Russia**
Moscow
+7 495 937 1111

**Asia**

**China**
Shanghai
+86 800 915 9966 (toll-free)
+86 (0) 21-3877 7888

**Japan**
Tokyo
+81 442 67 7067

**United Arab Emirates**
Dubai
+971 43131234

www.geit.com