INSPECTION INTELLIGENCE IS OUR PHILOSOPHY

NDT Global is a leading supplier of ultrasonic pipeline inspection and data analysis services. We use a state-of-the-art inspection fleet to provide the entire in-line inspection (ILI) service spectrum for onshore and offshore pipelines worldwide.

The full range of services includes crack, metal loss, geometry and mapping inspection, in combination with data analysis and integrity assessment.

We are committed to continuous technical improvement, innovation and excellence. We call our unique approach “Inspection Intelligence”.

First run success, best data quality and on-time report delivery are our key benchmarks. All of our projects are completed by skilled engineering and project management teams, complemented by the most experienced ultrasonic data analysis team in the industry.

OUR PURPOSE

“TO ENSURE A SAFE ENVIRONMENT THROUGH PRECISE MEASUREMENT AND ASSESSMENT.”
OUR CORE VALUES

At NDT Global, we believe that to be truly successful, we must always be honest and open with our customers, our partners and our employees. Seven core values define who we are. These values serve as our guiding principles and are integral to everything we do.

ACCURACY AND PRECISION
We strive to deliver the most accurate measurement possible, we take pride in being precise about the exact size and location of pipeline anomalies. The processes we utilize are repeatable, ensuring that our findings are always highly accurate.

ALWAYS DEPENDABLE
We do not make promises we cannot keep. Our customers can always rely on us to deliver on our commitments.

ENABLE AND TRUST OUR PEOPLE
We enable our people through training and encourage them to act independently. We trust our people to make good decisions that align with our core values.

HONESTY AND TRANSPARENCY
We strive to always be honest and transparent with each other and with our customers. We do not hide uncomfortable truths or mistakes that are made.

IMPROVEMENT THROUGH INNOVATION
We continuously look for new ways to improve what we do. We embrace innovation in ideas, technology and processes to make this a reality.

PASSION FOR EXCELLENCE
We strive to be the best and always offer an excellent service to our customers. We go above and beyond our commitments and actively seek opportunities to excel at what we do.

SAFETY THROUGH MEASUREMENT
Pipeline safety can be significantly improved by enhanced measurement and assessment. This knowledge drives us to find more accurate measurement and reporting techniques for our customers.
FIRST RUN SUCCESS

We place significant focus on collecting the most accurate information for inspections. Analyzing high-resolution data in a single run allows for a more proactive pipeline integrity management program for our customers.

Ensuring inspection projects go smoothly and deliver accurate data is our utmost priority. To achieve these goals, we meticulously plan every project and continuously monitor and evaluate our own performance.

NDT Global currently has a first run success rate of over 90%, placing us firmly among the leaders in our field. In keeping with our philosophy of continuous improvement, we have set the long-term goal to increase this figure to 100%.

ON-TIME REPORTING

NDT Global understands the importance of on-time report delivery to pipeline operators. As pipeline inspection data is paramount to integrity management procedures, we commit to deliver reports when required. Our track record consistently shows 100% on-time delivery.

To achieve quality on-time reporting, our data analysis department adheres to strict project management procedures.

A team of dedicated project leaders oversees the entire data analysis process. To ensure ongoing service improvements, project cycle times are regularly reviewed and analyzed to identify areas that may require further development.
THE MOST ACCURATE AND RELIABLE ILI TECHNOLOGY

Ultrasonic technology (UT) is considered to be the most accurate and reliable ILI technology available on the market for crack, metal loss and geometry inspection of liquid pipelines. NDT Global utilizes ultrasonic technology across its entire tool fleet, delivering a high probability of detection (POD) as well as highly accurate sizing results, providing the most accurate data available today.

The Evo Series 1.0 tools offer inspection velocities of up to 4 m/s (9 mph), removing the need to reduce flow rates during inspection.

Available for pipeline sizes 6" to 48" diameter, these tools deliver the highest axial resolution available in the market.

BETTER DATA THROUGH DIRECT MEASUREMENT

Ultrasonic technology provides absolute measurement and requires no calibration. It is highly versatile, which means that it is suitable for challenging inspections such as thick walled pipe or CRA pipe.

The absolute measurement data provides excellent input for accurate pressure calculations, e.g. based on river bottom and crack depth profiles, or even 3D finite element modeling.

Ultrasonic technology provides greater accuracy than other non-destructive methods in determining the depth of metal loss or cracks and the (remaining) wall thickness. Apart from standard pipeline steels, ultrasonic technology can also be applied for special pipeline materials including high-alloy steels or combined structures (e.g. clad pipe).
Cracks and crack-like features can occur during pipe manufacture, pipeline construction or operation. Whatever the origin, these flaws can seriously compromise the integrity of a pipeline, making it essential to detect, size and locate them before severe damage occurs. Most cracks are invisible to the naked eye, and can weaken a pipeline causing catastrophic failure.

NDT Global’s range of ultrasonic ILI tools ensures accurate identification of cracks and crack-like anomalies in the base material as well as in the weld area of pipes. In order to detect cracks, our ultrasonic crack detection tools use the proven 45° shear wave method.

NDT Global was the first to introduce Enhanced Sizing for UT crack inspection. This service provides a more precise crack assessment for depths above 4 mm (0.16 in).

Of particular interest is the orientation of the cracks. Due to the typical stress situation in pipelines, hoop stress causes cracks to grow in an axial direction. In some instances, additional stresses may cause circumferential crack orientation. Whether new cracks will be generated or already existing cracks will grow depends on the local stress conditions.

In comparison to axial cracks, circumferential cracking is not so common in pipelines as the hoop stress is usually twice the size of the axial stress component. With the occurrence of additional bending moments, or in the case of manufacturing related girth weld cracks, the ILI for circumferential cracking might be required.

By using a modified sensor carrier design that is sensitive to circumferential cracking, the same ultrasonic technology used for axial cracks can be applied to circumferential ones.
**EVO SERIES 1.0 UC**

Ultrasonic crack inspection enables early detection and sizing of cracks or crack-like anomalies. This allows the pipeline operator to take appropriate measures to avoid pipeline failures caused by cracks.

The principle of the ultrasonic crack inspection tool is based on the 45° shear wave method. Due to the so-called corner reflection, even minor cracks with depths as small as 1 mm (0.04 in) give a strong reflection signal. The Evo Series 1.0 UC offers:

- Reliable detection of axial cracks in the pipe body and the long seam
- Designed specifically for high-precision inspection of axial cracks welds
- Inspection for diameters from 6" to 48"
- Inspection for bend radius ≥ 1.5 D

Circumferential cracking defects can be addressed with ILI tools, utilizing the same ultrasonic technology used for axial crack inspection. The Evo Series 1.0 UCc offers high-precision inspection for circumferentially-oriented cracks and is available for diameters from 6" to 48".

**DETECTION OF CRACKS AND CRACK-LIKE ANOMALIES**

**Key performance specifications (referring to API 1 163)**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specified for UC</th>
<th>Specified for UCc</th>
</tr>
</thead>
<tbody>
<tr>
<td>POD for axial cracks, crack-like anomalies and linear indications</td>
<td>≥ 90%</td>
<td>≥ 90%</td>
</tr>
<tr>
<td>Min. depth of crack with L ≥ 20 mm (0.79 in) for UC</td>
<td>1 mm</td>
<td>2 mm</td>
</tr>
<tr>
<td>Min. depth of crack with L ≥ 30 mm (1.18 in) for UCc</td>
<td>0.04 in</td>
<td>0.08 in</td>
</tr>
<tr>
<td>Depth sizing accuracy at 80% certainty</td>
<td>±1 mm</td>
<td>±1.3 mm</td>
</tr>
<tr>
<td>1 ... &lt; 4 mm (0.04 ... &lt; 0.16 in)</td>
<td>±0.04 in</td>
<td>±0.05 in</td>
</tr>
<tr>
<td>≥ 4 mm (0.16 in)</td>
<td>±1.5 mm</td>
<td>±0.39 in</td>
</tr>
<tr>
<td>Length sizing accuracy at 90% certainty</td>
<td>±10 mm</td>
<td>±10 mm</td>
</tr>
<tr>
<td>Location in pipe wall</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Metal loss is one of the main threats to a pipeline. A pipeline’s integrity plays a critical role in the overall success of an operator’s business.

Metal loss by corrosion or gouging, for example, can significantly reduce pipe wall thickness. Precise measuring of the wall thickness provides appropriate input data. This information is used to determine the safe operating pressure, which is of the utmost importance.

When each project commences, NDT Global identifies which solutions best fit with an operator’s need. Its environment, the medium it transports, the type and state of its coating, how effective its cathodic protection is, as well as the parameters in which it operates, influences a pipeline’s integrity. Over time, these factors cause flaws and anomalies to appear in pipelines. They can grow from within a pipeline’s interior walls, or its exterior and may appear during the manufacturing process or during its operational life.

The measurement of minute corrosion changes enables pipeline operators to safely plan and manage the integrity of their asset. The corrosion growth assessment process is based on the correlation of metal loss anomalies detected by the several inspections. Often, the number of reported anomalies increases between inspections. Possible reasons are corrosion growth but also improved tool resolution (higher POD) or different reporting thresholds.

For newly reported features, the integrity team analyzes the corresponding locations from the initial inspection data and compares them to the latest data. Based on this data comparison, the team concludes whether these new locations represent new corrosion anomalies or if they were previously not detected/reported due to other reasons (e.g. resolution, reporting threshold, and limited data quality).

The team then calculates the corrosion growth rates from the change in depth of metal loss features detected in both compared inspections and from the depth of newly identified corrosion anomalies.
PINHOLE AND PITTING INSPECTION

Pipeline operators have long recognized pinhole defects as a significant risk factor in their integrity management programs. NDT Global offers high-resolution metal loss inspection, allowing reliable detection and sizing of metal loss defects even in the pinhole sizing region.

High-resolution tools detect tiny corrosion pinholes with dimensions ≥ 5 mm (≥ 0.20 in). They also pinpoint the true deepest point of a pinhole morphology within a larger area of corrosion with an overall shallower depth. The service offers a depth sizing accuracy of ±0.4 mm (±0.02 in).

EVO SERIES 1.0 UMp

Innovative technology offered by NDT Global’s Evo Series 1.0 significantly improves tool performance by enhancing speed, resolution and reliability. The Evo Series 1.0 UMp offers:

- Metal loss inspection, quantitative wall thickness measurement with pinhole/pitting resolution
- Circumferential sensor spacing of 4 mm (0.2 in)
- Minimal axial sampling distance of 0.75 mm (0.03 in)
- Inspections for diameters from 6" to 48"

DETECTION OF CORROSION AND METAL LOSS FEATURES

Key performance specifications (referring to API 1163)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Min. diameter</th>
<th>Min. depth</th>
<th>Depth sizing accuracy</th>
<th>Wall thickness determination</th>
<th>Mid-wall features, laminations and inclusions</th>
<th>Location in pipe wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>POD for corrosion and metal loss features ≥ 90%</td>
<td>5.0 mm</td>
<td>0.8 mm</td>
<td>±0.4 mm</td>
<td>±0.4 mm</td>
<td>10.0 mm</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>0.20 in</td>
<td>0.03 in</td>
<td>±0.02 in</td>
<td>±0.02 in</td>
<td>0.39 in</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
**PIPELINE DEFORMATION & MAPPING INSPECTION**

**PRECISE MEASUREMENT THROUGH COMBINED INSPECTION**

Mechanical deformation of a pipeline can occur in a variety of different manners - during initial construction or through third-party influence.

If undetected, the resulting flaws can seriously damage pipeline coatings and lead to cracks and corrosion. The safe operation pressure of a pipeline is impacted significantly by the presence of a dent, which acts as a stress riser itself. Ultrasonic technology ensures precise direct measurement of dents with depth resolution down to 0.1 mm (0.004 in).

Combined inspections enhance the identification of combined defects as the data is fully aligned. Data analysis now utilizes this data to provide improved identification of corrosion associated with dents.

**PINPOINT INSTALLATIONS, WELDS AND ANOMALIES**

By having precise location information, operators can save valuable effort and resources with less disruptions to their management processes.

Regulations require pipeline operators to systematically register the specific location information of their assets. For older pipelines there may not always be legacy documentation available, highlighting the need for the creation of this data.

Leveraging high-end exploration technology and leading-edge software products, allows NDT Global to pinpoint installations, welds and anomalies in pipelines at the preliminary reporting stage.

All data can be exported to a geographic information system (GIS), to better understand and visualize identified anomalies.
EVO SERIES 1.0 ATLAS INS

Atlas INS inspection gives a true picture of the current location of a pipeline and provides a sound basis for decision making. High-accuracy GPS information presents a reliable reference to relate pipeline data and at the same time, reduces verification costs. The Evo Series 1.0 Atlas INS delivers:

- 3D coordinates with sub-meter accuracy
- Bend quantification like deflection angle, direction and bend radius
- Direct GIS input & flexible output formats, including ESRI® SHP files, spreadsheets and Google Earth compatible files
- Essential components of any baseline assessment and integrity management plan

EVO SERIES 1.0 ATLAS UG

Accurate pipe geometry measurement and detection of dents are essential for pipeline integrity management. Using ultrasonic technology ensures precise direct measurement of dents. The use of high-resolution ultrasonic geometry ensures complete coverage of the pipe wall. This coverage is maintained in bends with no loss of data. The Evo Series 1.0 Atlas UG delivers:

- Contactless sensing - no risk of damage to pipeline and tool
- Detection, identification and sizing capabilities of deformation anomalies
- No tool calibration required before/after the run
- Inspections for diameters from 6" to 30", larger sizes on request

DETECTION OF DENTS AND OVALITIES

Key performance specifications (referring to API 1163)

<table>
<thead>
<tr>
<th>Metric</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. dent depth</td>
<td>2 mm</td>
<td>0.08 in</td>
</tr>
<tr>
<td>Min. ovality</td>
<td>2 mm</td>
<td>0.08 in</td>
</tr>
<tr>
<td>Dent depth sizing accuracy</td>
<td>±1 mm</td>
<td>±0.04 in</td>
</tr>
<tr>
<td>Dent length sizing accuracy</td>
<td>±10 mm</td>
<td>±0.39 in</td>
</tr>
<tr>
<td>Corrosion depth sizing accuracy</td>
<td>±0.4 mm</td>
<td>±0.02 in</td>
</tr>
</tbody>
</table>

Depth in percent can be calculated dividing the depth (mm/in) by OD (mm/in), absolute value is provided as direct measurement UT method.
Pipeline inspection is the cornerstone of the pipeline integrity management process. Accurate and up-to-date insights into a pipeline’s structural integrity afford operators the opportunity to prioritize maintenance tasks, helping to optimize costs. As part of its offering, NDT Global provides Fitness-for-Purpose (FFP) services in order to assess a pipeline’s integrity.

A dedicated in-house assessment team that has extensive experience and knowledge of assessment methods, delivers precise and reliable integrity assessments. NDT Global provides clear, succinct information to clarify any issues operators may have with their pipelines and offers the following assessments, depending on the requirements of the customer:

- Immediate integrity assessment
- Run comparisons and corrosion growth analysis
- Future integrity assessment
- Bend and dent strain assessment

Following the completion of an inspection, NDT Global assesses the current condition of a pipeline based on its inspection data. The pressure capacity of all detected anomalies (metal loss, crack-like anomalies, laminations, dents) is calculated and compared to the MAOP of the pipeline. This enables a severity-based ranking of all reported flaws. After this immediate integrity assessment, operators know whether the pipeline can be safely operated at the current MAOP or whether remedial actions such as repair of anomalies or a pressure reduction are required.

Future integrity, or remaining life assessment, examines the possible effects of corrosion or crack growth concerning the integrity of the pipeline at a future date. The expected repair date for all anomalies is calculated by the extrapolation of the feature dimensions. An anomaly requires reparation when its size is no longer tolerable at the pipeline’s established MAOP. If repair of anomalies is impracticable (e.g. in case of deep offshore pipelines), the future pressure de-rating required for a safe operation of the pipeline can be calculated.
TAILORED SOLUTIONS FOR YOUR PIPELINE REQUIREMENTS

No two pipelines are identical. They can have varying diameter, length, material, age, configuration, operating temperature etc. With this in mind, modifications to pipeline systems can be an extremely costly prospect and are understandably avoided when possible.

NDT Global treats each pipeline individually from the outset. Before a project begins, a feasibility study of the pipeline detail is conducted to determine the appropriate tool and required modifications are selected to complete the inspection. NDT Global has an extensive engineering capability in this regard and a proven track record in providing tailored solutions to deal with a wide variety of pipeline characteristics.

INTERACTING THREATS

Threat detection and identification are key to managing pipeline safety. Prevention, detection and mitigation of specific threats are considered by operator integrity programs. Coincidental and interacting threats in a pipe segment can result in an increased chance of pipeline failure. Although an individual threat may not be of major concern, the condition might be critical if multiple threats are present and interacting at the same location.

NDT Global has developed inspection tools and technologies that allow assessment of isolated, as well as interacting pipeline defects. Two or more inspection technologies can be customized in a combined tool configuration for a single inspection run, saving operational costs and enabling evaluation of interacting threats at the same time.

Multiple data sets are gathered by a combined high-resolution inspection capturing, for example, both the geometry of the pipe and metal loss defects.
INSPECTING deepwater pipelines is extremely challenging and brings many unique problems commonly associated with working in these remote environments, such as accessibility and high-pressure.

To overcome these challenges, NDT Global has developed a range of inspection tools and strategies with the aim of simplifying the process. For example, the production of the first high-pressure tool for small diameter deepwater pipelines. The expertise shown in designing such bespoke ILI tools highlights NDT Global’s knowledge of what’s required for offshore inspections. Its experienced team understands that tackling offshore ILI issues early on significantly reduces risks, and any potential impact they may have on project schedules and costs.

CRA materials can prevent corrosion under certain conditions. Their effectiveness depends on the selection of the proper alloy for the expected operational conditions of the pipeline.

Clad and lined pipes typically consist of a low-cost carbon-steel backing substrate and an inner CRA material metallurgically (clad pipe) or mechanically bonded (lined pipe) to it. These type of pipes usually show a good balance of material costs, mechanical properties and corrosion resistance.

NDT Global’s Evo Series 1.0 ultrasonic tools can detect and size metal loss, cracks and crack-like anomalies in CRA pipes.

The use of corrosion resistant alloys (CRAs) for pipelines is steadily increasing. When compared to carbon steel, CRA materials can prevent corrosion under certain conditions. Their effectiveness depends on the selection of the proper alloy for the expected operational conditions of the pipeline.

Clad and lined pipes typically consist of a low-cost carbon-steel backing substrate and an inner CRA material metallurgically (clad pipe) or mechanically bonded (lined pipe) to it. These type of pipes usually show a good balance of material costs, mechanical properties and corrosion resistance.

NDT Global’s Evo Series 1.0 ultrasonic tools can detect and size metal loss, cracks and crack-like anomalies in CRA pipes.
WAX RICH LINE INSPECTION

Wax in crude oil pipelines is a common phenomenon, causing serious problems for the ability to perform ILI. As offshore crude oil lines often operate at lower temperatures, they may have a high presence of wax which deposits on the pipe wall or is transported within the pipeline medium.

The presence of this wax can seriously affect the performance of a chosen ILI tool and can lead to a strong deterioration of the quality of the inspection data, thus endangering the success of the inspection.

NDT Global offers an intelligent survey using an ultrasonic inspection tool, specifically developed for pipelines with high wax content. By allowing bypass of the pipeline medium, the liquid can be used to flush the ultrasonic sensors to keep them clear from the build-up of wax deposits. This solution includes: Nano coated sensor holders, cleaning cups on each module and optimized odometer wheels.

MULTI-DIAMETER PIPELINES

Pipelines traversing the world have a multitude of lengths and diameters. Some even have multiple diameters in a single segment. These multi-diameter lines pose unique challenges for operators when trying to achieve a successful ILI.

Such lines can have a single step diameter change, or a multi-step diameter change. For example, a single step change would be a pipe variant of 22" to 24" while a multi-diameter change would be a pipe variant of 24" to 28". To date, to gain a complete assessment of these lines, operators have been performing multiple inspections – an ILI for each diameter.

To address these multi-diameter lines, NDT Global has developed purpose-built tools with these unique and challenging pipelines in mind. These tools have the ability to not only navigate, but also fully inspect multiple diameters in a single inspection, saving operators considerable costs in performing multiple inspections.
Please note: Tool and performance specifications depend on inspection and pipeline conditions. Please contact your local NDT Global representative for further information.

NDT Global reserves the right to introduce modifications and changes without prior notice.