

Pipeline mapping from PII Pipeline Solutions

For years, pipeline operators worldwide have taken advantage of the industry's largest fleet of in-line inspection tools from PII Pipeline Solutions, a GE Oil & Gas and Al Shaheen joint venture. In the past decade, many of these tools have provided highly accurate mapping data in addition to their primary inspection functions.

This mapping capability has now been extended to a wider range of tool sizes using low-drift Inertial Measurement Unit (IMU) technology.



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Mapping & Strain capabilities

Add long-term value to any in-line inspection with simultaneous centerline mapping



Increase security, decrease costs



MagneScan HR/SHR – higher accuracy MFL inspection.

CalScan EP – enhanced for geometry, mapping and welds.

Why map a pipeline?

Increasingly, regulations demand that pipeline operators document the precise location of pipeline assets. In some cases, however, records are old and of unknown accuracy, or may not include details of centerline location.

Our pipeline mapping service can benefit operators by determining the precise location of each girth weld and pipe feature.

The mapping function can be added to corrosion or caliper inspection tools giving maximum benefit from a single inspection run.

Minimizing repair costs

When repairs are required for defects reported by an inspection, our IMU coordinates enable you to quickly and reliably locate them before excavation – by going directly to a precise GPS location – significantly reducing digging costs and in-field time.

By giving you the GPS coordinates of the defects to an accuracy of ± 1.5 m, our IMU mapping technology takes your repair crew directly to the job.

Planning mobilization

Accurate IMU data helps operators avoid unpleasant in-field surprises by taking into account local geography and third-party constraints that may impede site access.

- Clear indication of land ownership
- Minimize access needs
- Plan logistics for roads, rivers, forestry
- Arrange all necessary resources in advance

Improve return on investment

Knowing the precise location of all asset features is a key part of any integrity management system. PII Pipeline Solutions' mapping service improves the quality of information available, thereby enhancing the performance of all GIS, GPS and associated decision-making tools.

IMU mapping features

- Suitable for liquid and gas pipelines
- Accuracy is ± 1.5 m (4.921') with reference points up to 3 kilometres (2 miles) apart – more precise measurement can be provided upon request
- Datum standard WGS84
- Format: latitude, longitude and elevation
- Report can be converted to any National Geographic Standard
- IMU modules are fully suspended for better centerline route mapping
- 0.125% strain (= 400 D bend) for a single inspection
- 0.02% strain (= 2500 D bend) for an IMU run comparison

Mapping for every project and budget

Various capability levels are available for IMU mapping, ranging from basic, budget-priced units through to high-performance, low-drift navigation units. PII Pipeline Solutions uses the best available, low-drift IMUs to map the position of your pipeline.

By including the IMU mapping option with your next in-line inspection, you will reap the combined benefits of pipewall-integrity data and mapping data from a single run.

IMU mapping capabilities are available for pipelines from 6" to 56" in diameter, and can be added to the following inspection tools:

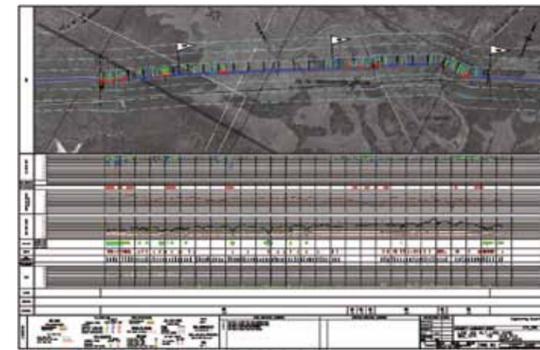
MagneScan™ – versatile, high-resolution metal-loss inspection for advanced length and width sizing of pitting and Narrow Axial External Corrosion (NAEC).

Caliper – location and measurement of dents and other geometric deviations.

IMU's impact on the inspection operation

Inclusion of the mapping function makes little change to the logistics of an inspection run. The main additional activity is the provision of surveyed reference points prior to inspection, approximately every 3 kilometres (2 miles) along the pipeline.

These points can be features such as block valves or temporary above-ground markers. PII Pipeline Solutions' procedure WO77 is available for more information on accurate survey techniques used to obtain these control references.



Create accurate maps and alignment sheets for review and analysis.



IMU provides GPS coordinates for location of identified defects to an accuracy of ± 1.5 m.

Strain measurement

Environmental loading can cause significant bending strain which threatens pipeline integrity. This can be caused by many factors, including:

- Unsupported pipe
- Landslips and earthquakes
- Sea-bed movement
- Anchor damage
- Frost heave
- Sand-dune movement
- Poor construction

To identify areas of bending strain, specialized algorithms are applied to the IMU data in order to calculate pipeline curvature. Comparison with a previous inspection greatly improves confidence in the identification of low-level deformations; therefore, we recommend that new lines be mapped to provide an accurate baseline.

If bending strain is found, remedial action can include exposing the pipe and replacing backfill or rock dumping. Failures can occur at previously innocuous pipeline defects e.g., at girth weld anomalies when an additional external load occurs. Also, in some cases, extended environmental loading can lead to the formation of buckles, circumferential cracks and ultimately to failure.

Our performance has been confirmed by blind testing in a client's pipeline. The client exposed a 60 m length of pipe and displaced the center by 20 cm. By running an IMU tool before and after the deformation, we successfully located and sized the deformation feature in 29 kilometres of 30" pipeline. Other run-to-run comparisons have confirmed the repeatability of our bending strain data, both onshore and offshore.

A range of strain reports can be offered as an addition to mapping runs. The short Strain Screening report will identify any potential strain events on the pipeline where the curvature exceeds certain criteria and report on the location and magnitude of the highest strain events, recommending, if appropriate, a full strain assessment to be performed. The full Strain Assessment study will assess the curvature throughout the pipeline and identify the areas of pipeline movement, assess the bending strain associated with the changes in curvature and align the curvature data with ILI anomaly data to identify coincident geometric features and other anomalies. A Strain Comparison study will compare bending strain features using two IMU data sets and identify where changes are occurring thus identifying where pipeline movement is taking place. Additional reporting including derived strain values along the full pipeline, identified bends, the slope angles and selected out of straightness values can be provided to help inform further geotechnical studies and determine where future monitoring of the pipeline should be focused.

Why choose PII?



Best solutions

Every technological innovation we offer is firmly grounded in the reality of your business. We don't sell static tools. We are continually evolving the science of pipeline integrity, and the benefit to you is the most comprehensive suite of solutions available.

Total service

A successful inspection is just the beginning. The real objective is to enhance the long-term integrity of your pipeline. The breadth of our expertise is always at your disposal – from Fitness-for-Purpose assessments and mapping surveys to remediation services and long-term integrity planning. Different tools with different specifications can be used depending on different situations.

Unmatched experience

Our teams have inspected more pipelines than any other company, and we maintain the industry's most extensive and detailed database of pipeline defects. We've inspected over 1 million kilometres of pipeline and documented every known type of pipewall anomaly. This experience, combined with a steadfast commitment to technological advancement, enables us to identify and predict changes in pipewall conditions with the utmost accuracy.

Global support

PII Pipeline Solutions has the global infrastructure and local presence to deliver advisory, technical and support services 24 hours a day. Whenever and wherever you need us, we'll be there – equipped with the highest level of experience and technology every time.

Continuous improvement

A triumph in one area can lead to remarkable enhancements in the next, so we leave no stone unturned. As we transform in-field discoveries into new software utilities, we use other programming innovations to increase our data resolution and inspection efficiency. Because so many environmental and operational factors are beyond your control – our job is to maximize control everywhere it is possible. And we've been doing just that for over 35 years.

Integrity services

Our pipeline services go far beyond data gathering. We have the experience and resources required to offer complete pipeline integrity solutions from a single source. All our inspection services are grounded in the most advanced technology and statistically significant procedures available. The information provides a solid, highly detailed foundation upon which future pipeline integrity can be monitored, maintained and improved.