



SMART SENSORS FOR INTERNAL CORROSION MONITORING

Maximizing Asset Integrity and Efficiency



SN Integrity

TABLE OF CONTENT

01

Internal corrosion as an industry challenge

A brief description about current industry challenges regarding corrosion

02

Current monitoring methods in the industry

Most methods applied today and their limitations

03

How our products resolve those issues

How our sensors work

04

Our main products

Ultrasonic sensor technology

05

So, who are we?

Our company and partners



TABLE OF CONTENT

06

07

08

09

Our experience and case studies

Some examples of our latest projects

Cost savings

How our solutions can save money for your company

services we offer

Corrosion management and corrosion inspection

Why choose us?

A summarize of how we can help your integrity assets





INTERNAL CORROSION AS AN INDUSTRY CHALLENGE

01



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INTERNAL CORROSION AS AN INDUSTRY CHALLENGE

- Internal corrosion is a major threat to asset performance and safety.
- Understanding corrosion is critical for effective asset management.
- High costs associated with corrosion: repair, replacement, and lost production.
- Health, Safety, and Environmental (HSE) risks due to corrosion.





CURRENT MONITORING METHODS IN THE INDUSTRY

02



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CURRENT MONITORING METHODS IN THE INDUSTRY

- Traditional UT inspections: time-consuming, expensive, and disruptive.
- Limitations of manual inspection programs: inconsistent data, safety concerns.
- Need for continuous, real-time monitoring to address these challenges.

Prone to human error



Thousands of locations



Difficulty of access



Non-digitized data





HOW OUR PRODUCTS RESOLVE THOSE ISSUES

03



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HOW OUR PRODUCTS RESOLVE THOSE ISSUES



SENSOR NETWORKS, INC.
Inspection, Testing & Asset-Integrity Solutions

microPIMS operation

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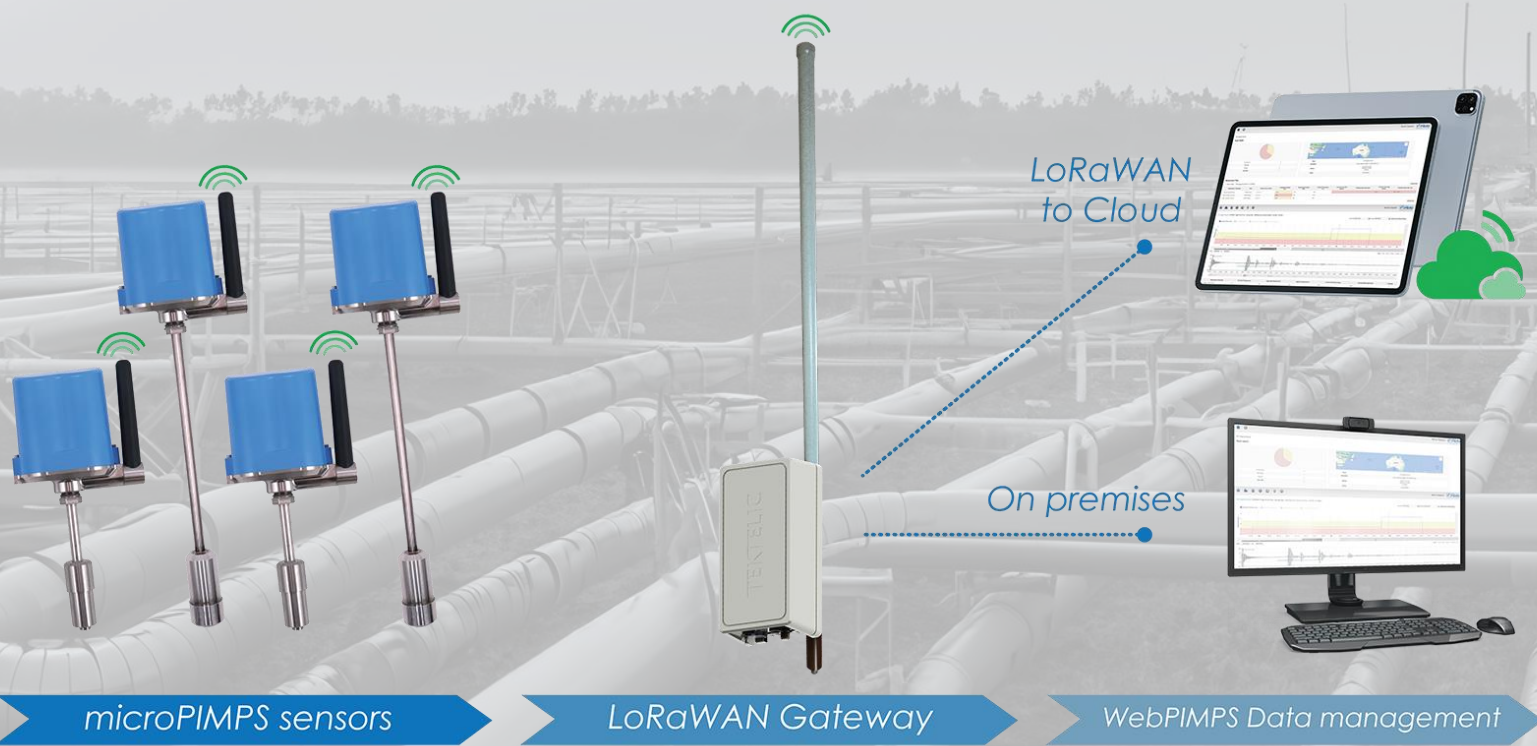


microPIMS operation video



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HOW OUR PRODUCTS RESOLVE THOSE ISSUES



microPIMPS sensors

LoRaWAN Gateway

WebPIMPS Data management



HOW OUR PRODUCTS RESOLVE THOSE ISSUES



inductosense

WAND system operation



WAND system operation video



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HOW OUR PRODUCTS RESOLVE THOSE ISSUES



HOW OUR PRODUCTS RESOLVE THOSE ISSUES



The video thumbnail features a background of an industrial refinery at night. In the center, the text "HotSense operation" is written in a large, white, 3D-style font with a blue outline. To the left of the title is the ionix logo (a red square with "ionix" in white) and the SN Integrity logo (a white circle with a blue and red swirl). To the right of the title is a white rectangular device labeled "hotsense" with "WIRELESS HART UT THICKNESS NODE CALPERAY 1 1016" printed on it. A white cable connects this device to a black cylindrical sensor with three metal probes. A white play button icon is overlaid on the device, and a white hand cursor icon is pointing at the sensor.



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HotSense sensors video

OUR PRODUCTS BENEFITS

- Our corrosion monitoring products can excel manual UT methods:

Feature	UT PIMS	Manual UT
Data Quality	Precise	Variable
Data Quantity	Many	Few
Corrosion Rate	Yes	No
IOW Analysis	Yes	No
Inspection Ability	No	Yes
Monitoring Ability	Yes	No
Human Error	Low	High
Cost Over Time	Low	High





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OUR MAIN PRODUCTS

04



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OUR MAIN PRODUCTS



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SmartPIMS

Non-intrusive ultrasonic corrosion/erosion monitoring system of critical assets. It offers a range of connectivity options including Mod-Bus, Datalogger, LoRaWAN, and Cellular, enabling the optimal utilization of thickness data via local PC, SCADA/DCS, or wireless transmission to IoT analysis systems.



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microPIMS

Intrinsically safe, wireless, non-intrusive network of ultrasonic sensors designed for corrosion/erosion monitoring. It features long-life batteries and operates using long-range sub-gigahertz LoRaWAN wireless connectivity. The sensors can be programmed to take thickness readings at user-defined intervals, and the data is automatically sent to the private webPIMS software for analysis and trending.

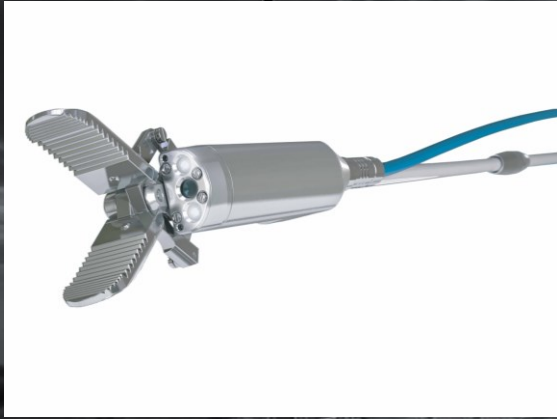



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matPIMS

It's a non-intrusive corrosion-monitoring sensor array that collects thickness data over a surface area and transmits it to a SCADA/DCS system via Modbus (RS-485). It is designed for large area monitoring post fix/repair, directly assessing trouble spots, sand and slurry erosion monitoring, and DOT monitoring requirements.

OUR MAIN PRODUCTS



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Jaws 2.0

JAWS 2.0TM is a rugged, motorized retrieval tool with integral HDTV camera and LED Lighting. It is easy to use, robust, submersible, and works in any industrial environment. JAWS 2.0 is available as a basic kit or as part of an ultimate loose-parts retrieval kit.

OUR MAIN PRODUCTS



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TMS Sensors

- Thin, compact, battery-free ultrasonic sensor, with RFID for location assignment.
- Can be permanently installed at thickness measurement locations
- Embeddable



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WAND data collector

- Easy-to-use, handheld device,
- Wirelessly activates the TMS sensor
- Instantaneous wall thickness measurement, with the simple press of a button by unskilled operator




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Remote Data Collector

It's an intrinsically safe, battery-powered device designed for use with up to 8 WAND TM sensors. The device collects and logs thickness measurements, which can be retrieved wirelessly by Bluetooth 5.0 at a range of up to 200m, making it ideal for difficult-access locations.

OUR MAIN PRODUCTS




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HotSense™ 380 High Temperature Ultrasonic Sensors

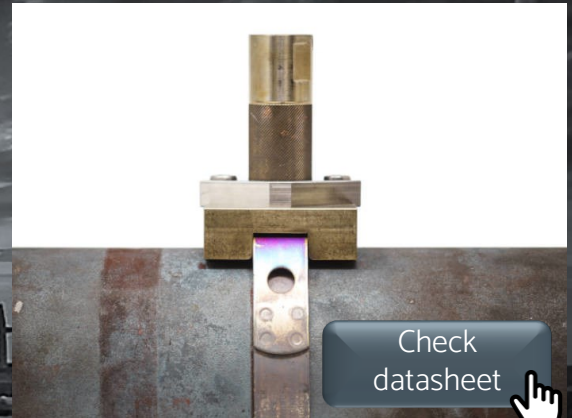
- Ultrasonic transducers for 0° measurements ideal for thickness, corrosion, and erosion monitoring.
- On-stream installation and calibration with integrated reference block.
- Intrinsically safe certified to Zone 0 for use in the most hazardous locations
- Operating temperature range of -200 to +550 °C




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HotSense™ Automated Wireless Ultrasound for On-Stream Corrosion monitoring

- Track wall loss rates, detect changes, and forecast into the future
- Predict maintenance intervals and avoid unplanned shutdowns
- Data collection on-premise or remote server, no internet or cloud required
- Complements traditional NDT inspections



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HotSense™ Ultrasonic High Temperature Sensors

- These transducers provide the highest sensitivity in class, making them ideal for thickness, corrosion, and erosion monitoring in hazardous environments.
- The transducers can be installed on live plants in minutes with a single tool and have various deployment options for different applications.


OUR MAIN PRODUCTS



ARTIO device

ARTIO™ is a wireless system for industrial corrosion monitoring and thickness testing. It includes an ultrasound unit and a smartphone app that processes, displays, and records ultrasonic data, with a database for data management and export. This device enhances and connects to user's UT probe.



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datasheet 



SN INTEGRITY & PARTNERS

05

OUR COMPANY

Corrosion is a major problem for industries such as oil and gas, power generation, and petrochemical, and can cause costly repairs, lost production, and even environmental disasters.

We offer smart corrosion monitoring technologies for Australian industry assets integrity based on IoT's and next level inspection.



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OUR PARTNERS



They design and manufacture ultrasonic sensing technology to monitor internal corrosion and erosion. Their core WAND technology is based around embeddable, wireless, battery-free sensors and they have a full range of digital data collection solutions.



Engineering and manufacturing company that specializes in non-destructive testing equipment for industrial applications. They offer various solutions including ultrasonic transducers and non-intrusive asset integrity monitoring.

The logo for ionix, featuring the word "ionix" in a white, lowercase, sans-serif font on a red rectangular background.

ionix

ADVANCED
TECHNOLOGIES

They offer a range of sensors, and transducer devices based on their novel high-temperature piezoelectric materials. Their extreme environment HotSense™ ultrasonic platform enables continuous online ultrasonic monitoring, through a temperature range of -55 to +550 °C



EXPERIENCE / CASE STUDY

SANTOS – MOOMBA PLANT CO2 ABSORBER



Challenges:

- Customer required high volume of monitoring locations
- Alternative methods of monitoring large-scale were too expensive

Solution:

- Cost-effective permanently installed sensors
- Measurements could be acquired quickly and as frequently as needed
- Customer able to maximize profitability of asset by life extension
- Savings \$350k by cutting manual UTMs



Santos



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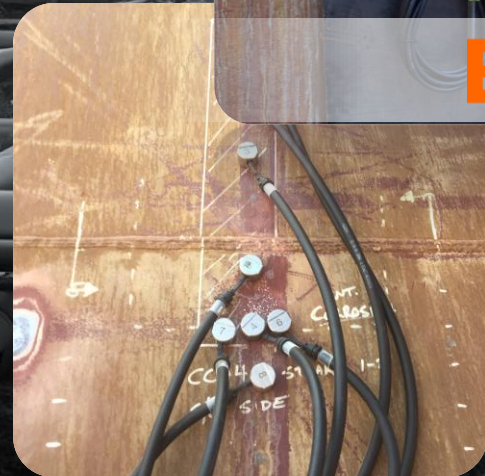
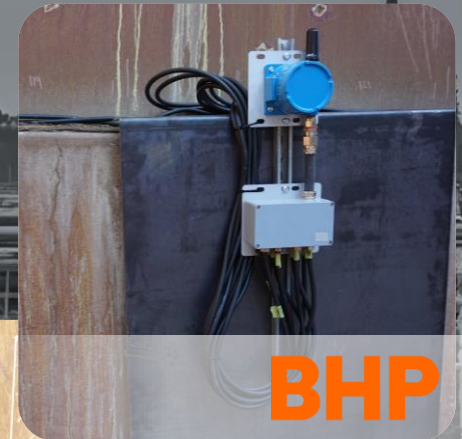
BHP – OLYMPIC DAM MINE SITE

Challenges:

- Tanks were inspected by Phased Array Ultrasonic Testing (PAUT) detect an area with nominal wall thickness (NWT) 12 mm as low as 3mm WT
- Tanks contain Sulfuric Acid and leaked in the past.
- Plant was on a shutdown. No support from other areas.
- May 2020 Full restrictions due to Covid-19

Solution:

- Within a week, we installed smartPIMS and programmed it to collecting data every 4 hours. Daily uploading to cloud-based software for analytics (i.e. metal loss, corrosion rates and end of life).
- Weekly report to Customer.
- Within a month with data collected the corrosion rate was determined to be 0.3 mm/year.



BEACH ENERGY BEHARRA SPRING GAS PLANT

Challenges:

- RBI plan using manual UT Crew costing \$100k per year
- Difficulties to monitor cladded equipment

Solution:

- Cost-effective permanently installed Inductosense sensors
- Measurements could be acquired quickly and as frequently as needed.
- No need of NDT tech as reading will be done by BE's staff (Saving \$40k per year)
- Data readily available at the cloud (i.e. easy to manage it remotely by BE's integrity team)



SANTOS – DARWIN LNG PLANT

Challenges:

- New absorber (follow standard 37AA)
- Pitting corrosion (1 – 3mm)
- 110 mm NWT thickness vessel
- Non corrosive process
- They wanted to confirm if pitting were from construction or process generated after 1 year service

Solution:

- 2 smartPIMS with 8 sensors were installed
- Readings: every 4 hours and daily data transfer to cloud-based webPIMS software
- Being in service since 2018, no metal loss has been detected.



Santos



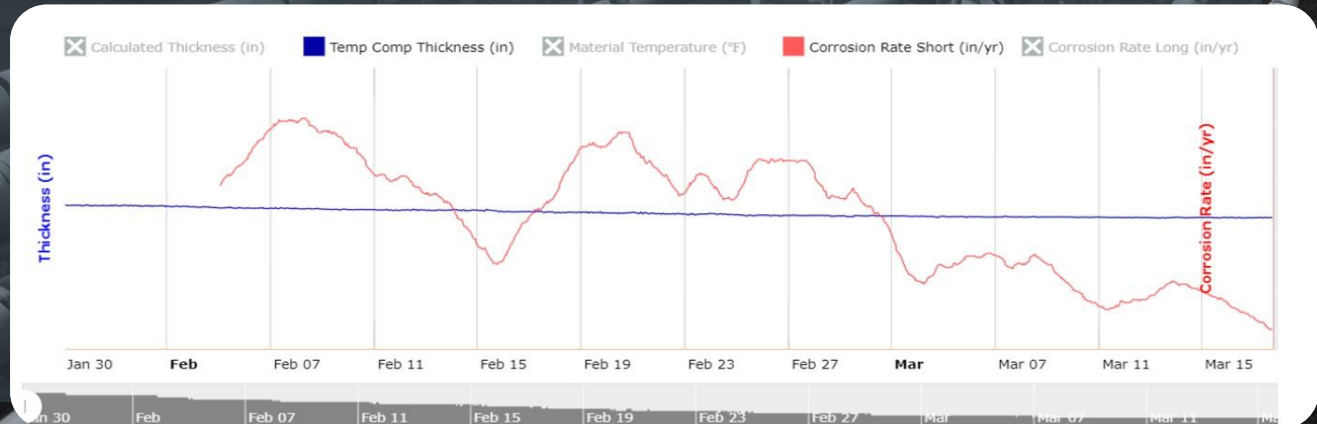
CASE STUDY – CS SYSTEM WITH H2SO4

Installed multiple microPIMS sensors for real-time monitoring of a critical CS system with a H₂SO₄ containing process fluid

- Supplemental inspection method to existing UT inspections
- Locations of sensors chosen based on historic thickness monitoring data known to have higher corrosion rates

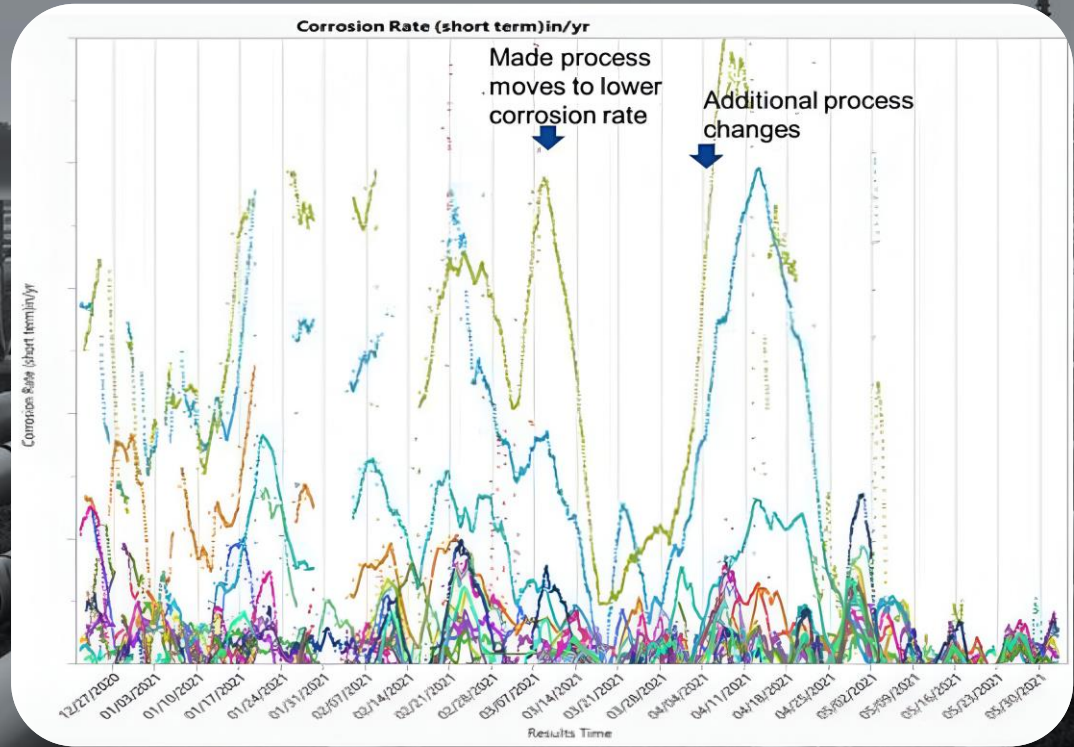
Goals:

- Understand impacts of different process variables and their effect on corrosion
- Provide early indication when corrosion increased beyond historical values
- Troubleshoot key operating parameters to understand correlation to changes in corrosion rates



CASE STUDY – CS SYSTEM WITH H2SO4

- This figure shows calculated Corrosion Rates (CR's) from the wireless sensors throughout the system overlaid on the same graph vs. time
- Highlights operational changes overall effects on CR's throughout the system while troubleshooting was performed
- Provides holistic view of the CR's to be seen throughout the system





COST SAVINGS



COST SAVINGS

By implementing our solutions, your company can save money from:

Category	Potential cost savings
Reduced NDT Inspections	While complete elimination is unlikely, a potential 20% reduction in NDT inspections could save money after our solutions are implemented.
Reduced Maintenance & Repair Costs	Proactive maintenance based on real-time data can potentially reduce unplanned maintenance and repair costs. (Quantifying these savings requires data on historical maintenance costs and potential reduction due to early detection.)
Extended Asset Life	Early detection and prevention of corrosion could potentially extend the lifespan of your company assets beyond their designed lifespan, delaying replacement cost.





SERVICES WE OFFER



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OUR SERVICES

- We deliver smarter solutions for asset integrity.
- We provide experience in corrosion monitoring with expertise in the highly specialized field of smart Ultrasonic Permanent Installed Monitoring sensor (PIMS) based on IoT's.
- We are linked with the very best global partners to deliver solutions through a single point of responsibility approach to critical asset management applications.



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OUR SERVICES



SN Integrity

CORROSION MANAGEMENT

- Development, selection and implementation of corrosion monitoring systems to ensure asset integrity.
- Preparation of corrosion management plan (CMP), including corrosion loops, inspection strategy, mitigation, and actions to implement.
- Failure mode effects and criticality analysis (FMECA) adding lessons learned into CMP.
- Pipeline Corrosion Monitoring and surveys Assessment

NDT AND INSPECTION

- Selection of suitable technology and methodology to address a particular application.
- Deliver cost-effective selection of new technologies to manage your asset integrity.
- Preparation of Inspection and test plans (RBI and Prescriptive)
- Inspection and Maintenance Repair (IMR) Budgeting, Planning, Execution, Data management

ULTRASONIC SENSOR TECHNOLOGY

- With global industry leading technology providers as partners, we deliver unparalleled corrosion, and erosion monitoring technology hardware, software, analytics, including support directly to the Asset Manager, allowing complete access to real time data, either through existing client network, or as a furnished network included within the system.



WHY CHOOSE US?



WHY CHOOSE US?



Smart solutions

To ensure Assets Integrity risks are ALARP (as low as reasonably practicable).



Non intrusive methods

Our sensors use ultrasonic technology, a NDT technology



IoT based technologies

Auto data collection at any user-defined time interval & transfer to cloud for analytics (e.g. metal loss, corrosion rate, end of life, etc.)



Competitive prices

Cost-effective reliable and accurate UT wall thickness measurements for continuous corrosion monitoring



THEY TRUSTED US THEIR PROJECTS



Any questions?



GET IN TOUCH FOR MORE INFORMATION



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<https://www.linkedin.com/company/sn-integrity/>



Thanks