Remote Asset-Integrity Monitoring

Measuring Metal Loss with Installed Ultrasonic Sensors & IoT

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Metal loss due to corrosion & erosion is a major issue and cost for:

- Refineries: overhead crude lines and naphthenic acid corrosion
- Chemical plants: hydrofluoric acid corrosion
- Oil production facilities: sand erosion
- Mid-stream assets: general ID corrosion and individual pit monitoring
- Electric power generators: FAC and MIC
- Any PSM-regulated sites: compliance and loss prevention

ULTRASONIC NONDESTRUCTIVE TESTING (NDT) is a 70-year-old, proven, established and refined technology. Recent advances with microelectronics, software, wireless communications and the “Internet of Things” have made “installed ultrasound” an extremely attractive and cost-effective solution for corrosion & erosion monitoring.

For long-term installations, including underground or harsh environments, the transducer is encapsulated for extended protection. Installed sensors are ideally suited for monitoring areas of active metal loss due to corrosion/erosion.

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- Safe. Non-invasive to the asset’s pressure boundary.
- Absolute in its ability to directly measure remaining wall thickness. (Not a proxy for wall loss.)
- Extremely accurate to 0.001" (0.025 mm), with ability to measure down to 0.040" (1 mm) in carbon steel, especially for fixed-location probes.
- Rugged, reliable and portable. Low recurring maintenance costs.
- Versatile and cost-effective.

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Flexible matPIMS linear or area arrays, with 16 ultrasonic elements can be wrapped around pipes and elbow extrados, with up to 1,000' (305 m) of cable.
### Wired solutions

**Best suited for:**
- Buried installations
- Integration with plant control systems via Modbus/RS485
- Lowest hardware cost per TML/CML
- Manual, automated and integrated data collection options
- High data-collection frequency (>2X/day) incl. control room
- Data-logging model can take & store 3,000 readings. (batteries req’d)
- Resistance to RF interference

**Modbus control room systems** are ideal for offshore platforms when wired directly into the asset’s plant control system or DCS. The installed sensors provide automatic closed-loop monitoring of the production process.

**Upstream**

**Midstream**

**Downstream**

**SNI’s Pit-track™ hardware/software solution** can monitor the growth of many individual pits with a high degree of thickness resolution.

### Wireless solutions

**Best suited for:**
- Situations where wiring is cost prohibitive or impractical
- Fully-automated and integrated data collection
- Measurement intervals less than twice daily
- Periodic repositioning

**Cellular systems** are battery powered, environmentally sealed, self-contained, C1, O2 safety rated and 100% autonomous. Programmed to turn-on at any desired periodic time interval and powering up to 8 dual-element or 16 single-element probes, the smartPIMS device transmits all data and measurements to the cloud/web portal. These units transmit the data using secure HTTPS-SSL encryption protocols.

**Transducer model XD-201** is an ultra-high temp probe which can operate in 960°F (516°C) continuous-duty service. These probes and their temperature-measuring RTDs are mechanically clamped onto the plant asset.

**MatPIMS™ 3×5 transducer array** is a 16-element device that can wrap radially or axially on a pipe as small as 4” diameter. It plugs directly into a Modbus tablet with up to 1,000’ (305 m) of cable for signal/data capture.
Data Flow & Management with webPIMS™ and dataPIMS™

AWS-hosted cloud-based data management system for ultrasonic thickness measurements from installed UT sensors.

webPIMS can automatically or manually receive data from ultrasonic sensors for web-based display, storage, trending and analysis. Users can access this data from anywhere with an internet-enabled device such as a PC, tablet or smartphone.

An intuitive user’s interface allows easy access to stored images or pdf drawings of the actual installed set-up. Temperature sensors at the TMLs record the asset’s temperature while software automatically compensates for thermal changes.

dataPIMS™ software is used for system setup, commissioning, calibration, data-logging, data-uploading and CSV file export.

The smartPIMS & webPIMS products store the digitized RF waveform from every thickness reading. Changes in wall thickness, due to corrosion and/or erosion, can be accurately trended while metal-loss rates are precisely calculated using statistical noise-reduction algorithms. Per-TML alarms can be set for either minimum thickness or a maximum metal-loss rate.

Executive Summary view shows the GPS location of your assets, the in-or-out-of-spec status and an exportable tabular summary with time / date stamp and temperature status. Ultrasonic test data can be automatically uploaded to this cloud app via SNI’s cellular smartPIMS device, at any periodic time interval or manually via the tablet-based Modbus system.

webPIMS data can be easily accessed from any mobile device or smartphone.

Data Flow & Management with webPIMS™ and dataPIMS™

6 tiers of user-defined hierarchy are possible:
- Company
- Site
- Plant
- Asset
- Collection Point (Instrument)
- Probe/TML

Digital images and/or piping schematic drawings can be archived at each tier.

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webPIMS data can be easily accessed from any mobile device or smartphone.

All thickness data is archived for easy future access and analysis. These files can be downloaded from the web for further analysis or imported into other RBI software platforms. Auto reporting via e-mail is easily set up.
transmitter

model no. .......................... smartPIMS Modbus and Modbus DL

Modbus DL with batteries can collect and store 3,000 thickness readings.

protocol .......................... Modbus

communication .................... RS-485, 2-wire, max. 1000’ (305m)

power ................................ 10-20 VDC

ultrasonic system and enclosure .......................... [same as cellular model]


datalogger

performance

processor ..................... Intel i5-4200U 1.6GHz w/ 3MB L3 cache (dual-core)

memory .......................... 8 GB RAM

storage ......................... M2-SATA SSD, 64 GB

operating system ............. Windows 10

connections ................... network power, data via RS-485-to-USB adapter

physical

drop/shock resistance ........ MIL-STD-810G

environmental ..................... IP65, 14-131°F (-10 to +55 °C)

dimensions/weight ................. 11.4” x 7.48” x 0.78” / 2.73 lbs.

transducers

tablet

processor ..................... Intel i5-4200U 1.6GHz w/ 3MB L3 cache (dual-core)

memory .......................... 8 GB RAM

storage ......................... M2-SATA SSD, 64 GB

operating system ............. Windows 10

connections ................... network power, data via RS-485-to-USB adapter

physical

drop/shock resistance ........ MIL-STD-810G

environmental ..................... IP65, 14-131°F (-10 to +55 °C)

dimensions/weight ................. 11.4” x 7.48” x 0.78” / 2.73 lbs.

transducer cable

controller

processor ..................... Intel i5-4200U 1.6GHz w/ 3MB L3 cache (dual-core)

memory .......................... 8 GB RAM

storage ......................... M2-SATA SSD, 64 GB

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