The Eagle Array
Pipeline Integrity: Remote Condition Monitoring

Tradition
We specialize in the fabrication of innovative ultrasonic sensors and multi-parameter sensor networks for monitoring the mechanical integrity of piping, tanks, pressure vessels, and pipelines. We bring innovative technologies to the market that provide a positive environmental benefit, protect personnel, and enhance current and future energy resources. 35 years of worldwide commercial NDT services, installations, and applications.

Overview
Eagle Array™ systems are configured in single or multi-sensor, low-profile packages that operate above or below ground, submerged and in harsh environments. In addition to condition monitoring, the Eagle Sentry™ system provides the user with a host of environmental monitoring variables. Unprecedented performance flexibility allows the Eagle arrays to accommodate a wide range of user communication requirements and data management demands.

Our rugged and reliable ultrasound sensors monitor unusual events, remotely, on pipelines and piping components, pressure vessels, heat exchangers and tanks. We allow the user to focus on analysis and prediction: material integrity, environmental variables and process operations. The Eagle Array™ represents cutting edge technology, easily accessible with features that significantly reduce cost, improve facility safety and ease the burden on the operator. Benefits that are compounded daily.

Power
Our clients have the opportunity to choose between the following power options:
• 110/240 VAC
• Instrumentation DC power
• Solar power/battery
• Power over Ethernet (POE)

Connection
Two ways to connect:
• Plug-n-play
• Wireless:
  - Wi-Fi
  - Cellular Network
  - Local Mesh Network

Location
Our sensors can be configured in the following types of areas:
• Above/below ground
• Challenging data connection and transfer locations
• High elevations
• Hazardous locations
• Off-shore/On-shore

Implementation
No pipe size limitations; elbows, transitions, valves, reducers can all be monitored

Sensor Tasks
• Monitor material thickness
• Monitor pit growth
• Track flaws and cracks
• Identify and track corrosion rates
• Measurement accuracy of +/- 0.0004 inches
• Store measurement history of A- and B-scans, always accessible to the user
• Capture readings on demand or on an established reporting schedule
**Temperature**

- **Measurement:**
  - -40°C - 232°C
  - -40°F - 450°F
- **Storage:**
  - -40°C - 125°C
  - -40°F - 257°F
- **Operating Enclosure:**
  - -10°C - 60°C
  - 14°F - 140°F
- **Humidity:** 5% - 90%
- **Altitude:** 12,000 feet (3657.6 m)

**Electrical**

- **Solar powered/battery backup (Model 1000):**
  - Two 6V, 13 AH batteries.
- **120 VAC powered (Model 3000):**
  - 15 Amp Lithium battery options available
- **Normal Operating Current:**
  - 240 milliamp @ 12 volts DC
- **UT Current:** <20 milliamp per UT pulse
- **Temp/Humidity Current:** 180 µA
- **Vibration Sensor Current:** 1000 µA - 46mA
- **Wi-Fi Communications current:** 250 mA

**Dimensions**

- **Transducer Mount:**
  - Length: 2.0 in. | 50.8 mm
  - Width: .75 in. | 19.05 mm
  - Height: 1.0 in. | 25.4 mm
- **Transducer Diameter:**
  - .375-0.5 in | 9.525-12.7 mm
- **Array Shroud:**
  - Length: 2-18 in | 50.8-457.2 mm
  - Diameter: dependent on pipe diameter
  - Weight: 1-3 lbs. | 453.6-1,360.8 grams
- **Enclosure:**
  - Length: 15.75 in. | 400.05 mm
  - Width: 15.75 in. | 400.5 mm
  - Diameter: 7.87 in | 199.898 mm
  - Mounting Post (Di.): 4 in. | 101.6 mm
- **Solar Panel:**
  - Length: 21.02 in. | 533.908 mm
  - Width: 26.57 in | 674.878 mm
  - Height: 1.18 in | 29.972 mm
  - Weight: 10.25 lbs. | 4.649 kg

**Vibration Monitoring**

- **Measurement Range:** -70 - +70g
- **Sensitivity:** 19.073 microg/LSB (Least Significant Bit)
- **22 kHz Resonance Frequency**
- **100.2 Thousand Samples per Second Sample Rate**
- **2-Axes Data Transmission**

**Thickness Measurement**

- **Material Thickness Measurement Modality:** Ultrasound
- **Ultrasound Center Frequency:** 500kHz - 5 mHz
- **Pulse:** Broadband or narrow band pulse echo
- **Transducer Type:** Piezocomposite, Lead Zirconate Titanate, or Lead Metaniobate
- **Thickness Resolution:** Approx. +/- 0.001 in. (frequency dependent)
- **Ultrasonic Imaging Area:** .250 - .625 in. per transducer (size dependent)
- **Sensor Population:** 8 typical - 100+
- **Transducer to Metallic Surface Coupling:** Elastic
  - Non-conductive silicon
- **Sampling Rate:** 35 - 140 MHz
- **A-Scan Samples:** 2,500

**Connectivity**

- **Wired Internet Protocol:** TCP/IP
- **Wireless RF Mesh Protocol:** DigiMesh (2.4 gHz/900 mHz)
- **Max Data Rate:** 54 Mbps
- **Wi-Fi Protocol:** 802.11 a/n or 802.15.4
- **Wi-Fi Range:** <=400 feet w/ repeaters
- **900 mHz Range:** 40 miles (line of sight)

**Safety Certification**

- **Model 1000 (Battery/Solar) is suitable for use in:**
  - Class 1, Division 2, Group D or unclassified locations
- **Model 3000 (120 VAC) is suitable for use in:**
  - Class 1, Division 2, Group A, B, C, D & unclassified areas
- **UL 60950-1**
- **CSA 22.2 No. 60950–1**
- **EN 60950**

**Encryption**

All networks can be equipped with the following security protocols:

- Wireless Equivalent Privacy (WEP)
- Wi-Fi Protected Area (WPA)
- Wi-Fi Protected Area II (WPA2)
- Wi-Fi Protected Area Enterprise (WPA E)