MsS Guided Wave Testing System

**Magnetostriuctive Sensor (MsS) System**
- Composed of MsS equipment, probe, and software
- Electromagnetically generates and receives ultrasonic waves for long-range guided wave testing

**MsSR3030R Equipment**
- Wide frequency range operation: 5 to 250 kHz
- System band pass filter at 16, 32, 45, 64, 90, 128, 180, and 250 kHz
- Two operation modes: pulse-echo and pitch-catch
- Time-corrected gain (TCG) function
- Battery operation for 2 days in normal conditions
- Lightweight

**MsS Probe**
- Operating center frequencies at 8 to 16 kHz, 20-, 32-, 45-, 64-, 90-, 128-, 180-, and 250-kHz
- Dry coupling, shear couplant, and epoxy bonding
- Installation on any pipe diameter
- Minimum install clearance of 25-mm
- Pipeline inspection up to 500°C surface temperature
- No near field length
- Dead zone length of only 4-11 inches

**MsS Software**
- Step-by-step procedure for data analysis
- User-friendly DAC and TCG curve drawing
- Automatic indication finding with threshold level
- Reduction of false calls by indicating mirror and multiple reflection signals
- Multi-frequency analysis for finding different size of defects
- Calculation of remaining wall loss from percent reflection by assumption of defect location and shape
Guided Wave Testing using Multiple Center Frequencies

MsS guided wave system allows inspectors to use multiple center-frequency probes at every test location. The mostly used center-frequencies are 32, 45, 64, 90, 128, 180, and 250 kHz for guided wave testing because their wavelengths match with detectable defect size. This is the same as using a flaw detector with 1, 2.25, 5, and 10 MHz probe for the ordinary ultrasonic testing. The graph below shows guided wave testing data acquired at 128- and 32-kHz center-frequency. The 128-kHz data shows the 1/8-inch-deep generalized corrosion defects at -6.5 ft to -4 ft, but 32-kHz data does not show any indication at those locations. This proves that the guided wave testing with multiple center frequencies is necessary for finding different sizes of defects as shown in the schematic drawing below.
Magnetostrictive Sensor (MsS) guided wave testing is effective in maintaining the mechanical integrity of pipelines with insulation and jacketing. MsS probes are only 2 inches wide and insulation only needs to be removed at the probe’s installation location. The dead zone length of the MsS probe is about 4 inches from the center of the probe along each direction with no near field length with a 360° continuous probe. The MsS guided wave testing uses high-frequency ultrasonic waves of 64-, 90-, 128-, 180-, and 250-kHz center-frequency to reduce the interaction between traveling guided wave and geometric features such as simple pipe supports, welded pipe supports, and clamps, thus increasing inspection range. Using high frequency increases sensitivity of defect detection and spatial resolution. Due to these merits, MsS guided wave system is used for PMI inspection in order to find weld locations and also used for CUI and internal wall corrosion inspection to detect defects over a long distance.

The illustration below shows guided wave testing data acquired at 32-, 64-, and 128-kHz center frequencies. The 32-kHz data shows strong reflection and trailing signals from the welded pipe supports at about 10 and 30 ft, but the 128-kHz data shows an elbow signal around 50 ft due to much less interaction with the pipe supports. High-frequency guided waves provide both a longer inspection range and higher defect detection sensitivity if piping is attached or welded with many geometric features.
Sectional Focusing Inspection (SFI) Using MsS Guided Wave System

Sectional Focusing Inspection (SFI) allows inspectors to focus ultrasonic guided waves on a section of pipe circumference to locate the defects along the pipe’s circumference. SPI is highly sensitive to defects due to the sector probe only focusing ultrasonic guided waves on a targeted section of pipe circumference. The sector probe can inspect any pipe size including plate structure of vessel and tank wall. Compared with an encircling probe and piezoelectric ring or belt, SFI has merits of inspecting the following applications:

- Cased road crossing
- Corrosion under insulation (CUI)
- Dike and concrete wall penetration
- Soil-air interface, clamp area
- Pipe support
- Offshore piping having complex geometry
- Elbow section inspection
- Accurate inspection of large diameter piping
- Pressure vessel
- Tank wall, spherical tank, and other plate-like structures,
- Thick-wall plate
High Temperature Pipeline Inspection

High temperature pipelines are an important component for processing plant operation; the pipelines’ structural integrity is essential for safe operation of the plant. Due to insulation and a high-temperature environment, on-line inspection of the high-temperature lines is difficult. Guided wave testing using the magnetostrictive sensor (MsS) system is a cost-effective method of inspecting and monitoring the high-temperature pipeline. The MsS probe consists of electric ribbon cable and Fe-Co strip for generating and receiving ultrasonic guided waves. The high Curie temperature of the FeCo strip (938°C) allows MsS system to inspect a pipe with a surface temperature of over 500°C.
Guided Wave Analysis (GWA) LLC sells and rents Magnetostrictive sensor (MsS) Systems for guided wave testing. Through our highly skilled personnel GWA provides training and support to many industrial facilities and service companies around the world.

Our Services

- MsS System Sales and Rental
- Guided Wave Testing Training
- Special Inspection Support and Consulting
- Software Development

Our System

- MsSR3030R – Battery operated guided wave testing system for long-range ultrasonic testing
- MsS Probe – Light ultrasonic guided wave transducer coupled to pipe through dry coupling, shear coupling, or epoxy bonding. Multiple center-frequency operation
- MsS Sector Probe – Ultrasonic transducer for sectional focusing inspection (SFI) of pipe, plate, vessel, and tank wall.

MsSR3030R

CAPABILITIES

- Detecting corrosions and cracks in aboveground, buried, and insulated pipe
- Inspection of any material and diameter pipe including plate, vessel, and tank wall
- Volumetric inspection along pipe
- Probes can be attached for long term monitoring
- MsS dry coupling tool allows for high temperature inspection without removing heat tracer lines: up to 500°C surface temp

APPLICATIONS

- Piping systems in oil, gas, chemical and petrochemical facilities
- Offshore piping systems and risers
- Power generation piping systems
- Road crossings and levee penetrations
- CUI and PMI inspection

CODE COMPLIANT

- MsS Guided Wave Technology is covered by ASTM and other international standards.

For further information on guided wave testing technology and inspection applications, visit us at gwanalysis.com or contact us:

Sang Y. Kim, Ph.D.
Ultrasonic Guided Wave Testing Level III
ASNT NDT Level III in ET and UT
Phone: (210) 842-7635
Email: skim@gwanalysis.com

Find us at:
facebook.com/guidedwavetesting
youtube.com/guidedwavetesting