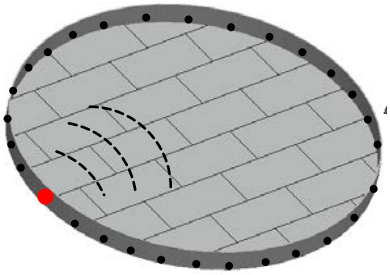
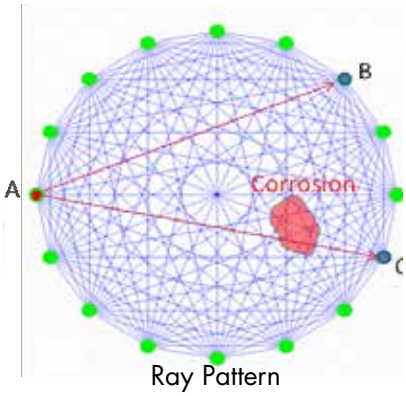


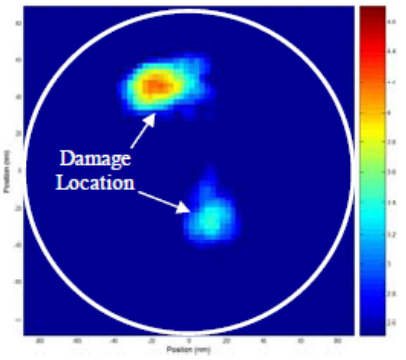
Tank Bottom w/Sensor Array

Figure 1. Conceptual drawing of a lap welded storage tank floor with an array of guided wave sensors installed on the outside perimeter of the tank on the annular ring.



Ray Pattern

Figure 2. Ray pattern showing all unique combinations of transmitter-receiver sensor pairs.



Tomogram of Tank Floor

Figure 3. Example CT image showing the location and relative size of damage which has occurred in the tank floor.

For more information, please contact:

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Structural Integrity Associates, Inc.®
Experts in the prevention and control of structural and mechanical failures

An Ultrasonic Guided Wave System for Storage Tank Floor Monitoring

Structural Integrity Associates, Inc. (SI) is currently developing and incorporating new structural health monitoring (SHM) technologies into our service offerings to complement our well established nondestructive testing and engineering assessment solutions.

One of SI's targeted applications is SHM of storage tank floors using an ultrasonic guided wave tomography approach. This approach consists of permanently installing a guided wave sensor array around the perimeter of the area of interest. For tank floors, sensors could be installed on the outside perimeter of the tank, on the tank's annular ring, to monitor the entire tank floor. Smaller sensor arrays could also be installed inside the tank or at other accessible locations to provide localized monitoring of critical areas. Once the sensors are installed, guided wave data is collected in a tomographic fashion by transmitting and receiving guided wave energy between every possible unique sensor combination in the array. A baseline data set is acquired at the time of installation and subsequent data sets are acquired at later times to monitor for degradation occurring from the baseline state. Computed tomography (CT) imaging algorithms are applied to the data to generate CT images showing the location and relative size of degradation as it occurs over time. A conceptual example of guided wave tomography for monitoring an entire tank floor is illustrated in Figure 1-3.

Guided wave tomography has shown the ability to detect corrosion and crack-like damage in a variety of metallic and non-metallic structures. Customizable sensor designs can be designed to optimize the system based on the tank material, size, and expected degradation mechanism. The primary benefit of the guided wave SHM approach for tank floors is that, once installed, it provides a means for monitoring the tank floor for degradation without requiring the tank to be drained for costly manual or robotic inspections. Tremendous costs savings can be realized by detecting degradation before failures occur and also by extending the interval between routine time-based inspections when no significant degradation has occurred.