

Sound Wave Inspection Systems

# **CURRENT APPLICATIONS**

## **HEAT EXCHANGERS & BOILERS**

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## 1. *Solution Overview*

The Sonic V system from Sound Wave Inspection Systems introduces an innovative, non-traversing technology for inner diameter tube inspection that aims to deliver ultra-fast and accurate results for today's challenging turnarounds in the oil & gas, chemical, power generation and other adjacent markets.

Featuring acoustic pulse reflectometry (APR), the system has been designed to achieve full coverage of all ID defects in all tube types, regardless of shape or material. The Sonic V is an advanced, yet easy-to-use tool that has much less operator requirements and minimal training for highly efficient inspection. Experienced experts take care of fast analysis and report generation.



## 2. *Advantages and Limitations*

As an industry standardized and proven NDT technology, the Sonic V system with APR technology currently has a range of proven capabilities that make it a viable and complementary “tool in the toolbox” today for use in turnarounds and emergencies.

Additional capabilities are now in development for introduction in the near term that will further expand the system’s performance scope into OD defect detection and crack detection as well.

**Advantages** in [speed and coverage](#):

- ✓ **Very fast**

- 10 seconds per tube [Enabling 100% coverage vs. sampling in the same available inspection time.](#)
- ✓ **Many tube types**
  - Range of shapes (including straight, u-bends, twisted, fin fan tubes, spiral wound tubes and others)
  - Any material (ferromagnetic, non-ferromagnetic, graphite, plastic)
  - Large diameter tubes such as boilers (up to 2")
- ✓ **High ID detectability**
  - ID damage mechanisms - holes, blockages, ID wall loss (erosion, corrosion, and pits), bulges
- ✓ **Easy to use**
  - Data acquisition by one operator with minimal training
  - Consistent, repeatable results
  - Automatic tube sheet mapping
  - Analyzing & report generation by the most experienced analysts in the world
- ✓ **Complex Geometries (twisted, "S" shaped)**
  - Inspections of all geometries possible

## Limitations

- ✓ **Tube Seizes**
  - We can inspect tubes from 6mm ID up to 52mm ID
- ✓ **Tube Length**
  - We can inspect tubes up to a length of 20m
  - If tubes are longer, we can inspect from both sides
- ✓ **No OD defects can be detected**
  - With APR we cannot detect OD defects and cracks
- ✓ **Cleaning requirement**
  - Tube cleanliness required
  - Typically, the level performed for eddy current is adequate, depending on application
  - If cleaning is problematic because of time and/or costs, at least the tubes should be strongly air-blown in order to be able to detect holes and blockages. Wall loss defects will not be reported from dirty tubes.



### 3. Applications

As a new inspection tool, the Sonic V system currently provides a strong value proposition for the following NDT applications:

#### 3.1. Leak detection

Fastest, most accurate leak detector in maximum 10 seconds per tube

SWIS' pulse reflectometry technology in the Sonic V provides rapid detection of leaks in tubes up to 2" in as little as maximum 10 seconds per tube. The inspection system quickly identifies the location and size of holes as small as 0.5 mm and even smaller depending on application, regardless of tube shape or material.

### **Business opportunity**

- ✓ Ideal for emergency situations when leaks need to be found and plugged immediately.
- ✓ A secondary check after RFT testing to confirm no presence of holes before unit goes back into service.

### **3.2. Rapid screening tool**

100% screening for rapid assessment of the entire heat exchanger unit prior to sampling.

With high speed inspection of just seconds per tube, SWIS' Sonic V inspection system offers an exceptional screening solution for testing 100% of a heat exchanger unit before sampling inspection with an existing, preferred method. By quickly identifying good tubes and those with suspected damage mechanisms, you can better target your inspections, saving valuable time and reducing risk of undetected critical defects going back into service.

### **Business opportunity**

- ✓ 100% coverage vs. sampling only – providing more information about overall unit condition than possible today in the same available inspection time.
- ✓ Prescreening – deliver a very quick report (maximum 2 hours after finishing data acquisition, depending on number of tubes) stating three items: NDD tubes, holes (with sizing) and restrictions (important for deciding if RFT/ET/IRIS probe will fit into the tube later...). This will help the inspector determine a new “playing field” for where to inspect or focus the primary inspection.
- ✓ A quick second opinion of RFT results to help deliver a better, more “bulletproof” report to the customer (an advantage in today’s competitive environment).
- ✓ Confirming a decision of whether or not the defect found is a through wall hole or a pit. The Sonic V can accurately determine if it is a through hole (limited capability for ET, RFT and IRIS).
- ✓ Sonic V inspection can be performed by same inspection operators of other methods during any down times while already on-site (for example, while waiting for the analyzer to catch up).

### **3.3. U-bend inspection**

Providing valuable information about tube condition within the “U” area

With its non-traversing technique (APR), the Sonic V can easily and quickly inspect the entire length of the tube from one side regardless of shape. This includes the difficult “u-bend” area, which is currently challenging with several existing techniques.

### **Business opportunity**

- ✓ Provide information on critical “U” areas of U-bend bundle not possible or practical today within the time and capability limitations of existing traversing methods (for example regular RFT).
- ✓ No need to inspect both sizes of the tube.

### **3.4. Fin-fan inspection**



### Fast, non-traversing ID inspection for challenging units

With defects in Fin Fans primarily being ID in nature, the Sonic V acoustic pulse reflectometry technology can inspect up to 2" in diameter quickly with detection of a range of defects for greater unit efficiency.

#### **Business opportunity**

- ✓ Alternative to NFT method for quickly detecting ID defects such as holes, blockages, internal corrosion, inlet erosion and ID pitting commonly found in these units.

### **3.5. Large diameter inspection**

#### Ultra-fast inspection up to 2" in seconds per tube

For larger-size heat exchangers and boiler tubes, SWIS' pulse reflectometry technology provides rapid detection up to 2" ID in as little as maximum 10 seconds per tube. Using non-invasive acoustic sound waves, the Sonic V inspection system quickly identifies the type, location and size of inner diameter defects regardless of tube shape or material.

#### **Business opportunity**

- ✓ A rapid assessment of ID defects in larger size tubes such as tubular air preheaters and boilers.
- ✓ Temporary over heat (relevant in some boiler cases, where a blockage created over heating that forced an emergency shut down). The fastest tool to find the blockages that created the problem and/or verify that it was cleared.

### **3.6. Cleaning assessment**

#### Fast, accurate measurement of tube cleanliness level

With its APR for ID inspection, SWIS' Sonic V can accurately determine the cleanliness level of each tube. The location and percentage of blockages/restrictions are found in as little as maximum 10 seconds per tube, making it a valuable check prior to inspecting with any method that has cleaning level requirements.

#### **Business opportunity**

- ✓ Performed by inspection service providers or asset owners prior to inspection to save in inspection time/cost if the tubes are not clean enough for the test to be conducted properly.
- ✓ Performed by cleaning companies to prove to customer that the tubes were cleaned to their requirement.



## 4. *Today's value proposition - Summary*

As a relatively new, complementary solution to existing NDT methods for heat exchangers and boilers, the Sonic V enables inspection service providers to deliver, and asset owners to receive, **a more comprehensive and confident assessment of overall unit condition within today's very tight turnaround timelines.**

The Sonic V system's acoustic pulse reflectometry technology provides an ultra-fast and cost-effective solution for **increased speed and coverage** in NDT:

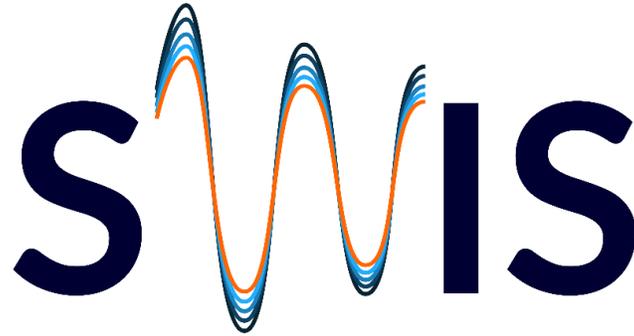
- ✓ **Fastest leak detection device** during for example emergency shut-downs
- ✓ **100% screening** vs. sampling only
- ✓ **Second "opinion" confirmation check** of inspection results by other methods (for example: through wall holes vs. pits)
- ✓ **Expanded inspection coverage** with more defect information on challenging tube geometries (for example: the "u" in u-bends) and larger sizes (for example: boilers and tubular air preheaters).



- ✓ **Efficient ID inspection of Fin-fans** and all other applications as alternative to current solutions

**Inspection service providers** can offer a better assessment of overall unit condition within the same turnaround window (inspect more tubes within the bundle and/or provide more/better on each tube that is inspected regardless of shape or material).

**Asset owners** can get more information and a better understanding of existing damage mechanisms and asset utilization, while lowering risk of unit failure within the same turnaround window.



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