Steam Traction Engine Boiler Inspection Challenge

In looking for wall thinning under insulation, ultrasonic testing (UT) is often perceived as providing the most accurate results. Except that it requires inspecting from inside pipes or vessels, or stripping the insulation and weather jacket. Time, security, and economic constraints often make this, however, impractical.

The Challenge

To illustrate the power of pulsed eddy current as a screening tool in this situation, it was put to the test.

A steam traction engine over 100 years old with a 10 mm (0.4 in) thick insulated carbon steel boiler and covered with a 0.5 mm (0.02 in) painted carbon steel jacket was used as the test component.

In the past, the weather jacket and insulation were painstakingly removed, which allowed using UT to ascertain the general wall thinning of the steam traction engine's boiler base, along the riveted seam. Using this method, the remaining wall thickness (RWT) was established as 20 % (2 mm / 0.08 in).

For obvious reasons, the tractor's boiler cannot be stripped of its insulation and weather jacket repetitively to perform this operation without incurring important repair costs.

Similarly, assessing the boiler's remaining wall thickness is impossible from inside.

The Solution

Pulsed eddy currents (PEC) are perfectly suited to tackle this challenge. PEC is an advanced electromagnetic inspection technology used in detecting defects and corrosion in ferrous materials such as carbon steel.

The Lyft® PEC solution offers an excellent way to inspect for wall loss under insulation because of the unique way eddy currents penetrate the target component wall.

The Lyft instrument's magnesium alloy casing is tough and dust resistant, which is perfect for the application's dusty environment. It also cools without any external air exchange.

The SmartPULSE™ technology built-in to Lyft enables a high degree of automation and the extensive use of advanced algorithms, removing many operator-specific dependencies. SmartPULSE automatically optimizes the pulser and receiver parameters (gain, duration, time gates, filters, etc.).

The Lyft software also features a wall thickness compensation tool, which helps assess the remaining wall thickness more accurately in the presence of defect undersizing.

The Challenge

Accurately ascertaining the minimum remaining wall thickness (RWT) of a vintage steam traction engine boiler without stripping the weather jacket or insulation.

The Solution

A powerful pulsed eddy current (PEC) solution able to assess the RWT with equal accuracy to UT without stripping the weather jack or insulation.
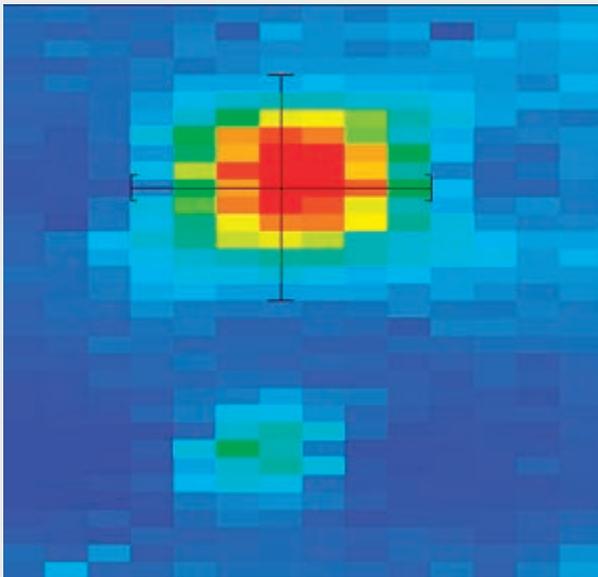
The Benefits

Easy-to-deploy, easy-to-use solution with wall thickness compensation of small flaws and intuitive C-scan imaging.
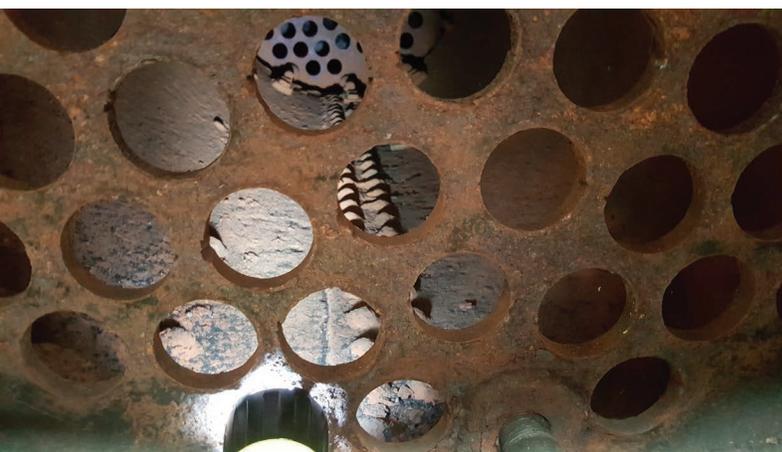
The solution was deployed in instants and soon found thinning concentrated at the bottom of the boiler, along the riveted seam of the steam boiler. Lyft was able to ascertain thinning down to 1.8 mm (0.07 in) or 18% remaining wall thickness, which is thinner than what had been ascertained with UT (20% RWT), which is equivalent to UT.

Examples of Compensated Wall Thickness

The Benefits

The Lyft solution offers a number of benefits over UT:

- *No surface preparation*—Unlike other inspection techniques, PEC does not require any preparation of the surface under test, making it faster and more cost effective.

- *Wall thickness measurement tool for smaller flaws*— The compensated wall thickness tool (unique to Lyft) mitigates defect undersizing by quantifying the minimum wall thickness of a specific region in a C-scan. The tool's specialized algorithms isolate a defect's contribution to the A-scan signal to more precisely compute its minimum wall thickness.

- *In-service inspection*—PEC technology is designed to be used with air, soil, water, concrete, asphalt, and corrosion product between the sensor and the surface under test, enabling it to perform in-service inspections.

- *Intuitive, quantitative data*—A-scan and C-scan imaging, as well as other tools included in the Lyft software enable quantifying wall loss.

- *Lesser operator dependence*—Lyft automatically optimizes parameters and measurements, ensuring repeatability and performance.

- *Easy deployment*—The entire solution is portable, light, compact, and quick to deploy for improved productivity.

This is only a fraction of what we can do. Challenge us with your project specifications.

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