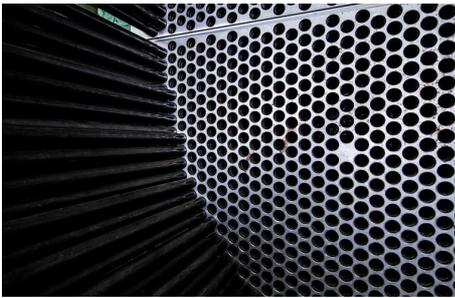


Magnetic Flux Leakage Tube Inspection

Magnetic flux leakage (MFL) is a tube-testing technique primarily designed for the rapid testing of ferromagnetic tubes with non-ferromagnetic fins wrapped around them, such as in air fin coolers. Two strong magnets generate a static magnetic field that saturates the tube wall (Fig. 1). When a flaw (pitting, wall loss, etc.) is located between the two magnets, the magnetic flux in the tube wall is disturbed and a small amount of flux will leak into the inner tube. This leakage of flux is detected by the coils placed between the magnets. The variation of the flux leakage induces current in the coils, thereby causing a signal output. This signal output can be used to provide information on any wall-thickness reduction in the tube. Magnetic flux leakage (MFL) is mainly applied in the inspection of air fin coolers, but it can also be used for inspecting bare tubes with diameters of one inch (2.5cm) and above.



The Applus+ solution

Comprehensive testing services

Applus+ offers five inspection methods for heat-exchanger tubing systems:

- ECT - Eddy Current Testing
- RFT - Remote Field Testing
- NFT - Near Field Testing (Fin Fan Testing)
- IRIS - Internal Rotary Inspection System.
- MFT - Magnetic Flux Leakage Testing

Choosing the appropriate inspection method for your equipment depends on your tube material and specific inspection needs. All our crews are trained to use all techniques, so they can perform complementary inspections, providing the most comprehensive service possible.

The best crews in the business

The key Applus+ differentiator is the high level of training received by our crews, who

work efficiently and report quickly.

They are unique in the industry in that they consist of:

- A two-person team to perform the inspection
- An additional technician to analyse results on-site
- As a result, we can typically provide:
 - An initial report on the day of inspection
 - A final report that is delivered in days, not weeks

Thorough reports, fully explained

Reports are only useful when the customer understands them fully.

Applus+ ensures our customers understand our reports by:

- Explaining the initial reports on the day of inspection
- Providing a timeline for final report delivery
- Conducting an exit interview to answer all questions

The Applus+ goal is to provide excellent service and exceed the industry standard.

Target customers

Magnetic flux leakage tube-inspection techniques are of particular interest to the petrochemical, power-generation and industrial manufacturing sectors.

Ferromagnetic tubes in heat exchangers, boilers and air fin coolers are most commonly found in the petrochemical industry. Carbon Steel, an inexpensive material, has good mechanical properties and heat-transfer capabilities. However, it is often employed in conditions where if corrosion sets in, it acts very fast. Over the years, with shrinking maintenance budgets and longer intervals between plant shutdowns, the need for reliable inspection of these units has increased. The advent of digital technology has led to several enhancements to the inspection equipment based on RFEC, magnetic flux leakage and ultrasonic IRIS.

Key customer benefits

Advantages of magnetic flux leakage include:

- It is not affected by the presence of aluminum fins
- It is a relatively high-speed inspection (up to 1 metre/sec)
- It has very good sensitivity to both pitting and circumferential grooves