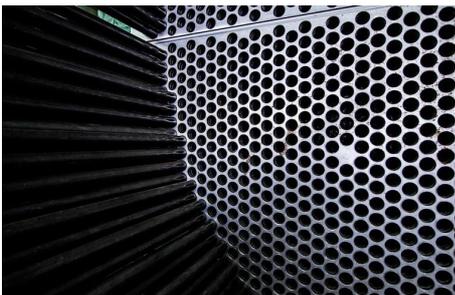


Near Field and Remote Field Testing

Remote field testing or RFT is one of several electromagnetic testing methods commonly employed in the field of non-destructive testing. Other electromagnetic inspection methods include magnetic flux leakage, conventional eddy current and alternating current field measurement testing. Remote field testing is associated with eddy current testing and the term 'remote field eddy current testing' is often used when describing remote field testing. However, there are several major differences between eddy current testing and remote field testing. RFT is primarily used to inspect ferromagnetic tubing since conventional eddy current techniques have difficulty inspecting the full thickness of the tube wall due to the strong skin effect in ferromagnetic materials. For example, using conventional eddy current bobbin probes to inspect a steel pipe 10 mm thick (such as what might be found in heat exchangers) would require frequencies around 30 Hz to achieve adequate I.D. to O.D. penetration through the tube wall. The use of such a low frequency results in a very low sensitivity of flaw detection. The degree of penetration can, in principle, be increased using partial-saturation eddy current probes, magnetically biased probes and pulsed saturation probes. However, because of the large volume of metal present as well as potential permeability variations within the product, these specialist eddy current probes are still limited in their inspection capabilities. The difficulties encountered in the testing of ferromagnetic tubes can be greatly alleviated with the use of the remote field testing method. The RFT method has the advantage of allowing nearly equal sensitivities of detection at both the inner and outer surfaces of a ferromagnetic tube. The method is highly sensitive to variations in wall thickness and tends to be less sensitive to fill-factor changes between the coil and tube. RFT can be used to inspect any conducting tubular product, but it is generally considered to be less sensitive than conventional eddy current techniques when inspecting non-ferromagnetic materials. Near Field Testing (NFT) technology is a rapid and cost-effective solution intended specifically for fin-fan carbon-steel tubing inspection. This new technology relies on a simple driver-pickup eddy current probe design providing very simple signal analysis. NFT is specifically suited to the detection of internal corrosion, erosion or pitting in carbon steel tubing. The NFT probes measure lift-off or 'fill factor' and convert it to amplitude-based signals (no phase analysis). Because eddy-current penetration is limited to the inner surface of the tube, NFT probes are not affected by the fin geometry on the outside of the tube.



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

NFT and RFT 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. Each of these techniques has its own merits and demerits.

Key customer benefits

RFT has several benefits over other electromagnetic testing techniques:

- Suitability for ferromagnetic materials
- Equal sensitivity at the inner and outer surfaces
- High sensitivity to wall-thickness variations
- Ability to be used with lower fill factors than ECT

NFT technology uses two coils — a transmitter and a receiver. Typically, the receiver coil is close to the transmitter coil, taking advantage of the transmitters near-field zone - that is, the zone where the magnetic field from the transmitter coil induces strong eddy currents, axially and radially, in the tube wall.

NFT probes operate within the same frequency range as RFT probes.

NFT is specifically suited to detecting corrosion, erosion and pitting inside carbon steel tubing. NFT is perfect for fin-fan tube heat exchangers because eddy currents do not pass through the wall of the tube. NFT is also much more sensitive to defects close to structures such as support plates and tube sheets.

Benefits of NFT:

- Fast
- No need for an external reference coil
- Easy to use
- Unaffected by structures such as support plates and tubesheets