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The science behind eddy current and remote field testing: for condenser and heat exchanger tubing

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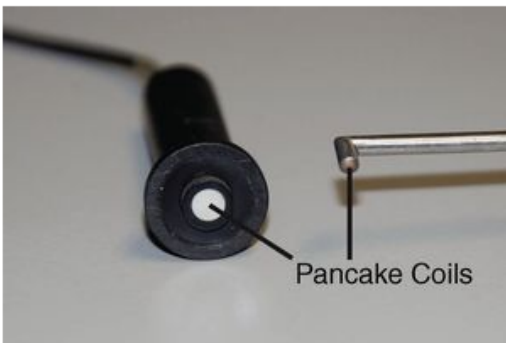


Figure 1

Probe coils in an absolute arrangement used for surface scanning. (Photo Courtesy of Conco Services Corp.)



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ABSTRACT

With the increasing demand on the world's power grids, now more than ever it is important to keep power plant condensers, feedwater heaters and balance of plant heat exchangers running at peak efficiency. While it is well known that keeping these units clean is important for maximizing power output, so too is monitoring each unit's tube integrity and taking corrective action to prevent tube failure. The best way to monitor a unit's tube integrity, detect patterns of tube wear and damage, and determine the specific wear and damage to a particular tube is through Non-Destructive Testing. Depending on the tube material, the best Non-Destructive Testing method to employ would be either Eddy Current Testing, Remote Field Testing or other variations of these electromagnetic techniques.

This paper will discuss the science behind Eddy Current and Remote Field Testing, how they differ and which one to select depending on the situation. It will look at the construction of the probes and how they work. It will explain the difference between use of a single frequency or multiple frequencies and the advantages of multi-frequency testing. The paper will also identify the necessary procedure for a successful Non-Destructive Test, including the types of tubes that can be tested and tube preparation.

INTRODUCTION

The modern Eddy Current Testing industry owes its existence in a very real sense to Michael Faraday, (1791 to 1867). This brilliant scientist's discovery of and experiments into electromagnetic induction laid the foundation for the many Electromagnetic Testing techniques in use today. Though there has been much advancement in test instrument technology, computer software and test coil design, the basis of the electromagnetic techniques still rely heavily on the experiments performed by Faraday in the mid 1800's.