NON-DESTRUCTIVE TESTING (NDT) SERVICES

PYROMETALLURGICAL VESSELS AND FURNACES

ACOUSTO ULTRASONIC-ECHO (AU-E)

With time, refractory linings in metallurgical furnaces undergo deterioration and wearing. The deterioration is caused mainly by thermal stresses and chemical attacks, resulting in loss of heat-transfer and load-bearing capability. Failure of the lining is dangerous and could affect the structural integrity of the furnace. The degree and mechanism of deterioration depends on many different factors.

Non-destructive testing (NDT) and monitoring of the refractory lining leads to better safety, longer service life of the vessels, controlled maintenance, and increased production. Accurate thickness measurements and monitoring of the refractory lining in operating furnaces is now possible using Hatch's acousto ultrasonic-echo technique (AU-E).

Sidewall acousto ultrasonic-echo technique inspection

TAPHOLE ACOUSTIC MONITORING (TAM) SYSTEM

The refractory lining within a tapping channel experiences extreme mechanical and thermal abuse. This wear-and-tear could result in exposure of the copper block to the molten metal, which could cause a catastrophic tapblock failure.

A new taphole monitoring system was developed by Hatch's NDT Group based on acoustic signal characterization pattern recognition and neural-network principles.

The Taphole Acoustic Monitoring (TAM) system provides real-time, continuous coverage of the tapblock performance in operating metallurgical furnaces. The TAM system automatically provides warnings and alarms as the tapping and lancing causes deterioration of the inner refractory lining. The TAM system could also be used for training the operators for better drilling and lancing practices.

Taphole acousto ultrasonic-echo technique inspection

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NON-DESTRUCTIVE TESTING (NDT) SERVICES CONTINUED

Acousto ultrasonic-echo field system

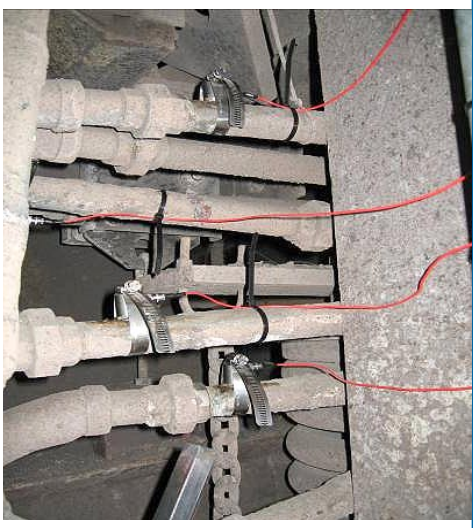
ULTRASONIC INSPECTION OF COOLING BLOCKS

Hatch's NDT Group has developed a methodology for the accurate (average ±2 mm) determination of cooling-block thicknesses in operating furnaces. Part of the development was selection of the UT pulsar/receiver, in combination with the right transducers. Another aspect of the development was a temperature-wave speed calculator that determines the UT wave speed in the material, such as copper coolers, when the hot face is at 200oC and the cold face is at 40oC.

Ultrasonic inspection of the cooling blocks provides the following advantages:

FLASH FURNACE

- Detection of metal infiltration between multiple layers of refractories
- Hearth refractory and build-up thickness assessment
- Detection of discontinuities, flaws, and defects within refractories
- Detection of delaminations between layers of refractory lining
- Wall refractory thickness measurements with and without copper coolers
- Reaction shaft roof refractory thickness measurement
- Taphole thickness assessment



Acousto ultrasonic-echo taphole inspection

ELECTRICAL FURNACES

- Refractory thickness measurement through the walls and hearth, with and without cooling elements and metallic shell
- Taphole block thickness measurement
- Thickness measurement of the build-up at the hearth
- Detection of metal infiltration between layers of refractories
- Detection of discontinuities within the refractories
- Detection of delaminations along refractory layers due to hydration

CONVERTERS AND REACTORS

- Determination of refractory thickness

Reliable refractory-condition monitoring allows operators to plan for maintenance more efficiently. These robust measurement techniques can result in a longer campaign life. Protection of the damaged areas could prevent run-offs and create a safer working environment around the furnaces.