TALCYON

APRIS | *CASE STUDY*

Petrochemical Plant (Sao Paulo)

Furnace Tube Inspection

OVERVIEW

Furnaces play a vital role in the process and reliability of any refinery or petrochemical plant. Periodic maintenance in terms of inspection shall be a part of asset integrity management to ensure safety and economics of processing plants.

Operating conditions, type of process or service, material of construction, and several other factors are part of degradation mechanism that impacts a furnace tube's integrity and life. In most of the cases, creep is the major concern due to heavy coking.

In addition to that mechanisms such as carburization, sulfidation, oxidation, hydrogenation, sigma phase transformation, low toughness, pitting and erosion are causes of furnace tube failures.

The Paulinia Refinery in Sao Paulo were concerend about their furnace tubes having bulges, erosion at the bend area, and scattered pits across the inner diameter of the tubes. For ease and convenience, they wanted a non-invasive inspection method.

DETECTING THE FAULTS

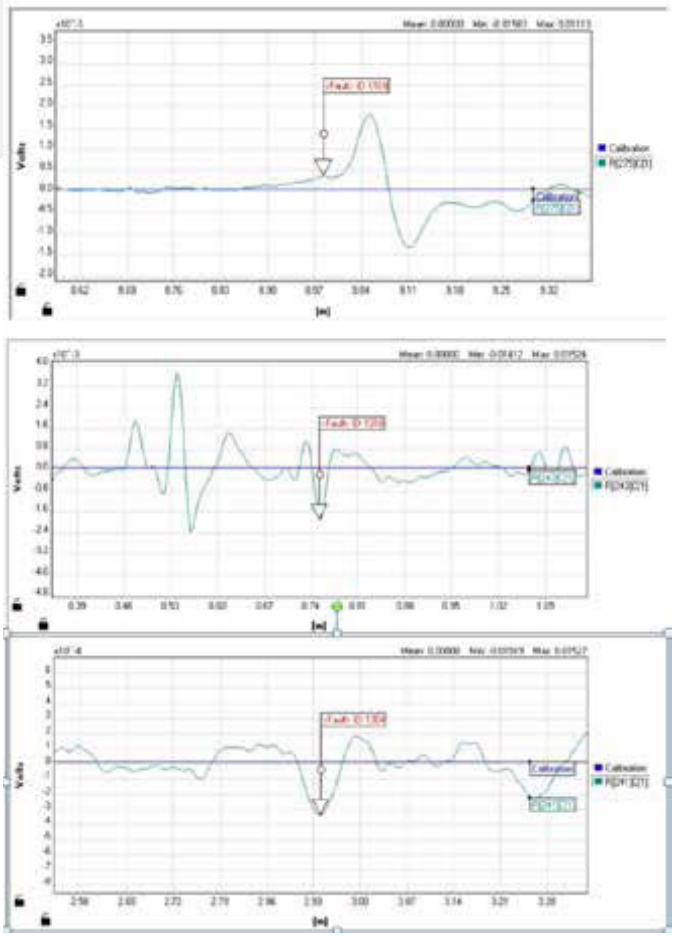
The plant invited a team of engineers who were competent in performing Acoustic Pulse Reflectometry inspection on tubes from 7mm to 100mm using APRIS.

Their primary reason for selecting APRIS is due to the advantage of the technology being non-invasive. APRIS uses sound waves to propagate in any tube material and configuration.

Furthermore, it only takes 10 seconds to inspect a tube with a maximum length of 25m.

A total number of 326 tubes were inspected.

ø: 60mm T: 5.5mm L: 21.5m



Sample of Signals with Fault Signatures

OUTCOME RESULTS

It took only 1.5 hours to complete the inspection. 28% of the tubes had pitting with wall loss between 20 - 45%. About 18% of tube bends had wall loss between 20 - 30%, which were confirmed to be erosion.

A few tubes had blockage with cross section reduction of 15%, which were found to be bulges.

1. **Using APRIS, it was possible to have 100% of the tubes inspected for a precise understanding of their inner diameter condition, even at their bend sections.**

2. **Tubes with bugles were plugged to prevent development of creep.**

Tubes with wall loss greater than 30% were scheduled for inspection every 18 months.