

CASE STUDY

EMERGENCY FTIS™ INSPECTION IMPROVES VACUUM FURNACE LIFE OF HIGH-RISK ASSET

OVERVIEW:

Effective and accurate preparation and inspection of fired heater coils is imperative in the development of a comprehensive reliability management plan. Section 573.9.6 of the API code recognizes the use of “intelligent pigs/in-line inspection devices that utilize immersion based ultrasonics to accurately measure inside tube diameter and wall thicknesses.” Based on service providers and tool specifications, several thousand to several million unique diameter and wall thickness readings can be obtained for an inspection and used in a reliability management plan.

In the fall of 2015, Quest Integrity performed an emergency inspection of a vacuum furnace, which had begun to prematurely leak. This unit had been previously inspected in 2012 by another global intelligent pigging inspection company. The data collected during the 2012 inspection was then used as a basis for determining a remaining life estimate, which concluded that a future inspection to assess the tube condition was not required until 2018. In July of 2015, a pipe in the convection section of the furnace unexpectedly leaked in several locations. Quest Integrity was requested to perform an inspection and assessment on the furnace to measure the condition of the remaining tubes, accurately estimate the remaining life and determine the contributing factors associated with the sudden increase in corrosion.



Figure 1. Intelligent Pig Navigating Piping

RESULTS

Extremely low wall readings were found throughout the piping in the convection section in the form of general and localized internal and external wall thinning. Significant areas of wall loss as high as 85% were identified, which were well below the client’s minimum acceptable wall thickness threshold (Figures 2a-b). General and localized internal and external wall thinning were also identified in the radiant section of the piping. Several types of pipe deformations were

detected, including areas of bulging, swelling and ovality, many of which found to exceed the client's minimum acceptable threshold.

The client confirmed that no changes in operating conditions had occurred during the three years between the 2012 inspection and Quest Integrity's inspection in 2015. It was determined that due to the limitations of the previous inspection provider's tool, the 2012 inspection was only capable of identifying areas of general wall loss. Had the inspection been able to identify localized areas of wall loss, the client would have effectively prevented the asset failure from occurring.

Multiple pipes, including the pipe with the lowest wall reading, were removed from the furnace and manually tested with UT (ultrasonics) to verify wall loss. The results from the manual UT examination subsequently confirmed the extreme wall loss. A remaining life assessment was also conducted by Quest Integrity, which revealed that the piping in question would not have maintained operational integrity until the future inspection date in 2018, as previously indicated by the 2012 inspection.

BENEFITS

Quest Integrity implemented its comprehensive Furnace Tube Inspection System (FTIS™) and expert advanced engineering assessment capabilities to provide accurate inspection results for optimal asset operation. The long-term benefit of this inspection and engineering service allows operators to accurately detect damage mechanisms prior to tube failure, and effectively plan and manage scheduled maintenance while ultimately avoiding costly and catastrophic operational outages.



Figure 2a. Hole in Tube Causing Premature Leakage in Piping



Figure 2b. Two Additional Areas of Internal Localized Wall Loss