

Graphitization in Radiant Coils of Fired Heater and Its Prevention

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Graphitization is a microstructural change that sometimes can occur in carbon and low alloy steels used in pressure vessels and piping when exposed in 425 °C to 595 °C ranges for extended time. At these temperatures, the carbide phases in these steels are unstable and decompose into free iron (ferrite) and graphite nodules. Graphitization is typically found after operating 40,000 hours above these temperatures. When the formation of graphite nodules takes place, the nodules may have a random distribution or form a planar array within the microstructure.

This talk will discuss the problem of graphitization that can occur in carbon steel used for radiant coils of fired heaters exposed to high temperature for extended time. The case study experienced in GC will be described dealing with actual material degradation which is visible and can be observed by non and/or destructive testing during plant shutdown. The metallurgical examination and testing were conducted to verify the effects caused by graphitization and investigate the cause of degradation. The recommendation will be provided to the audiences for preventing the occurrence of graphitization and improving your plant integrity.