TCR Advanced Engineering P. Ltd

Experts in Metallography, Failure Investigation and RLA

Metallurgy for Industries

Power | Petrochemical |Fertilizer| Chemical | Refinery| Engineering| Automobile

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In-situ metallography (Digital imaging)

A technique to get same-day results for quick decisions on critical plant equipment.

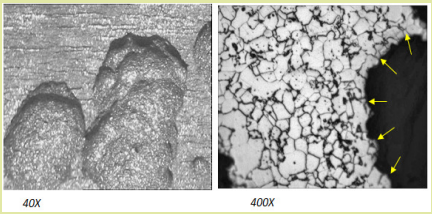
In-situ metallography (IMG) is the only technique which provides an early warning for various mechanisms resulting in damage to plant and equipment in the process industries. Generally various engineering components are designed on the basis of their allowable stress or based on their creep rupture properties. However, they fail during service or deterioration in their performance is noticed on account of one or the other damage mechanism. The onset of different degradation/damage mechanisms such as decarburization, graphitization, degradation of pearlite/bainite/martensite, creep cavitation, hydrogen attack, hydrogen induced cracking (HIC) & stress corrosion cracking (SCC) can be identified by our team of experienced metallographers and metallurgists using In-situ metallography technique.

Potential of this technique is underutilized due to the fact that there are very few experts who can correctly interpret the replica microstructures or microstructures developed onsite. TCR advanced has the exhaustive database of more than 50,000 replicas in its data-bank of microstructures. It covers different components/materials exposed to various operating conditions. At TCR Advanced a unique software search database is made available to the team of metallurgists which constantly supports the plant under 24X7 service utilizing modern internet based technology.

High power portable microscopes along with image grabbing facilities are deployed on site and the microstructure images are captured by well-trained metallographers & sent to the TCR laboratory through internet. A team of experienced metallurgists analyse the images, keeping in mind the background information of the component & based on the interpretation of the microstructures studied, an immediate guidance is provided to the technicians/engineers working on site.

Such services have immensely helped the industries to take very timely decisions in respect of "run, repair or replacement" of a

Microstructure of the Month



Magnification: *40X and 400X*

MOC: SA 210 Gr. A1

Component: Re-boiler tubes

Observation: Stereo microscope image indicates groove formation on ID surface. Erosion marks are seen on ID surface as well as on the surface of the grooves.
Optical microscope image shows corrosion damage by way of groove formation from ID side.

Cause: Premature tube failure in re-boiler tube heat exchanger is on account of cavitation erosion corrosion damage where the tubes are facing shell inlet steam directly.

Useful hints: A suitable impingement plate may have to be provided to prevent direct impact of steam on the tube skin at the shell inlet (N3) in consultation with the design expert. A process design expert may be consulted to avoid the direct transfer of the heat of the steam at the inlet. A design modification may be done to avoid bubble formation due to heating at entry level.

component or equipment.

The following photographs shows 'on-site metallography equipment and the kit' used for in-situ metallography by TCR Advanced.

Last year TCR Advanced offered almost 90 days of such services to different industries helping them in condition monitoring, damage assessment and RLA of plant & equipment.

The ability of taking microstructure images at site helps in taking critical decisions pertaining to repair, onset of irreversible damage immediately. The stage wise replication also helps in deciding about running the component with defects. The microstructure images can be compared with huge microstructure database available at TCR advanced. The team of metallurgists need not to visit site. Many times replicas are interpreted by sending it to lab and results arrive after 3-4 days after replication. This delays the decision making process. By utilizing TCR's modern technology, process plants can take timely decisions to increase productivity and safety.

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