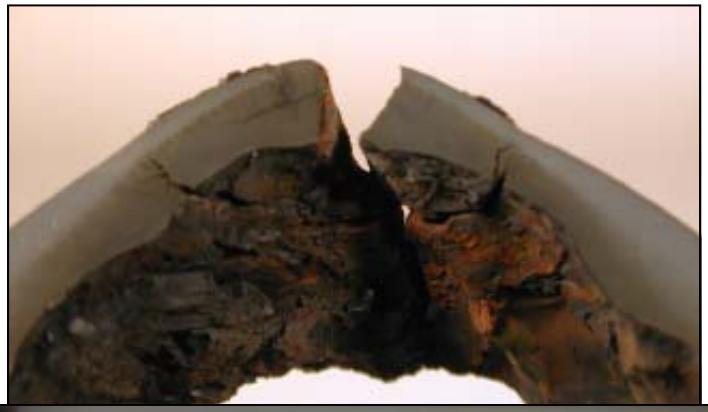
METALLURGICAL CONDITION ASSESSMENT



- ***Make Informed Repair or Replacement Decisions***
- ***Understand Current Conditions of Equipment***
- ***Predict Remaining Useful Life of Components***

Determining the metallurgical condition of a damaged component can provide information on whether it needs repair or replacement, or if it is suitable for continued service in its current condition.

A thorough metallurgical assessment of components, combined with an understanding of the failure mechanisms of concern, can establish how much longer the component can provide reliable service. This information allows you to plan refurbishment or replacement prior to unexpected catastrophic failure or other damage.

Metallurgical condition assessment performed on components that sustain in-service degradation mechanisms can provide a benchmark as to the current condition and allow the calculation of remaining useful life.

Typical mechanisms of degradation are creep, oxidation, corrosion, transformation, or embrittlement. Any of these conditions can progress to cause catastrophic failure. A simple test can define the condition of the component and allow a planned approach to repair or replacement to avoid forced outages.

Our metallurgical assessment services can help prevent the loss of critical components by directing maintenance efforts.

In order to assess the metallurgical condition of equipment components, M&M Engineering offers a complete suite of tests.

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Microstructural Analysis

Examining a component's microstructure can reveal deterioration from corrosion, cracking, thermal aging, or mechanical deformation. Accurate assessment provides important data for determining equipment condition and remaining life. Samples are analyzed for metallurgical and manufacturing defects and internal and external surface discontinuities.

We evaluate the microstructure using optical or electron microscopes and compare the results to technical literature as well as our internal glossary of microstructures.

Hardness and dimensional measurements add to our assessment of the component's condition.

Scale and Deposit Analysis

Scaling and deposit buildup can reduce efficiency by acting as barriers to heat transfer, promote corrosion by acting as concentration sites for corrosive species, or can result from corrosive attack. We employ energy dispersive x-ray spectroscopy and powder x-ray diffraction to identify constituents in a sample. Scale and deposit analysis can determine the nature, sources, and effects of deposits. We then suggest steps you can take to mitigate their formation.

Chemical Analysis

Equipment operates best when all of the parts are made of the correct material. We quantitatively analyze alloying and trace elements in the component and compare the test results with the appropriate alloy specification. We then bring any discrepancies to your attention.

In-Place Metallography

When examining large components that cannot be easily moved, in-place metallography is used for microstructural and crack evaluation. In-place metallography, combined with replication, allows us to examine a component's microstructure without removing a sample from the component. The same techniques can be used on small specimens when standard preparation methods are difficult or impossible.

In-place metallography allows for a quick onsite component evaluation. It can reveal whether a component has suffered from overheating or other microstructural damage that nondestructive evaluation techniques cannot detect. We have three portable metallography laboratories that can be dispatched within hours of a request.

Portable Hardness Testing

M&M Engineering can measure the hardness of components in the field using a Microdur™ or an Equotip™. Hardness data is used to estimate the tensile strength of steels or to determine if a component has experienced thermal softening.

Portable hardness testing is often used in conjunction with in-place metallography/replication to provide a thorough assessment of the metallurgical condition of components in the field.

Remaining Life Estimation

Metallurgical assessment provides data that allows us to calculate remaining life deterministically or probabilistically using a variety of industry codes as guidelines. M&M Engineering can predict future reliability, taking into consideration operating conditions, microstructural features and dimensions.

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