

# IN-SITU METALLOGRAPHY (Replica testing)



Early warnings: an effective tool for condition \life assessment of  
process plant components.

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# Early warnings through in-situ metallography

## For safety and reliability of plants

In situ metallography is a knowledge based NDT technique which can provide the early warnings of onset of many damages to the process and engineering industries.

Damage mechanism like creep, fatigue, stress relaxation cracking, high temperature corrosion including hydrogen attack, intergranular corrosion, stress corrosion cracking, hydrogen induced cracking, graphitization are possible to detect in the early stages and possible to monitor them with time and provide the judgment to replace or repair the component.

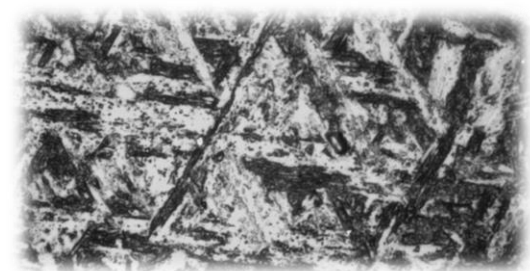
Microstructure examination done with experienced person and judgment is given by an experienced metallurgist preferably involved experienced with failure investigation and remaining life assessment.

Based on the creep cavities and classification of extent of damage the next inspection intervals are decided based on the Number and charts. Many life assessment calculations are proposed based on the cavitation models of microstructure examination.

TCR's metallurgists have backup of vast database of more than 30,000 in-situ microstructure interpretations on various components and materials. These databases contain extensive information from various plants that have been captured by providing this service. The databases also include rare collections of varying microstructure damage levels for various industries such as power, oil and gas, petrochemical, fertilizers, and other process industries.

The In-Situ Metallography team is highly skilled in the art of replica preparation. TCR has custom developed special purpose in-situ polishing devices to produce high quality replication even on warm components and unapproachable locations.

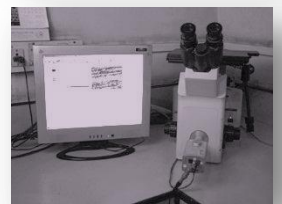
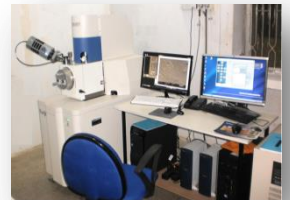
Our replication team of is capable of delivering throughput of about 20 metallography structures per shift



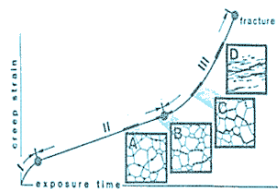
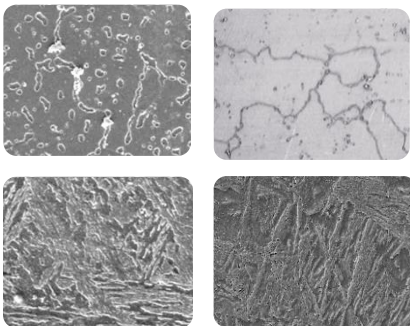


## Use of In-situ Metallography

- ✚ Remaining life assessment.
- ✚ Health assessment of critical components operating at high Temperature And High Pressure in process plants
- ✚ Damage assessment of fire affected equipment.
- ✚ Quality check for metallurgical processes such as heat treatments.
- ✚ Generate the data on imported components for indigenisation.
- ✚ adapt to Middle-East (localization)
- ✚ Failure Investigations.
- ✚ Useful For Repair Welding Decisions.



## Damages identified by Microstructures

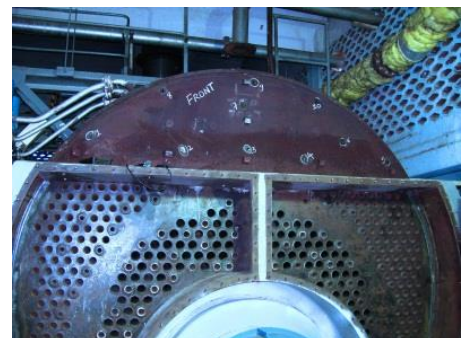


- ✚ Graphitization
- ✚ Degradation Of Pearlite
- ✚ Creep
- ✚ Thermal Fatigue
- ✚ Oxidation
- ✚ Grain Growth
- ✚ Hydrogen Attack
- ✚ Stress Corrosion Cracking
- ✚ Sigma phase



## Benefits of In-Situ Metallography in industries

- ✚ Monitor The Damages to the Plant Components.
- ✚ Preventive Maintenance and Inventory Control.
- ✚ Safe and Reliable Operation.
- ✚ To Ensure the Use of Correct Metallurgical Status of Components.
- ✚ Useful for Indigenization.
- ✚ Localization of Imported Components
- ✚ Heat treatment certification.
- ✚ Useful for Repairing Decisions for used Components.



## TCR Engineering Services

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