



**Materials
Processing
Institute**

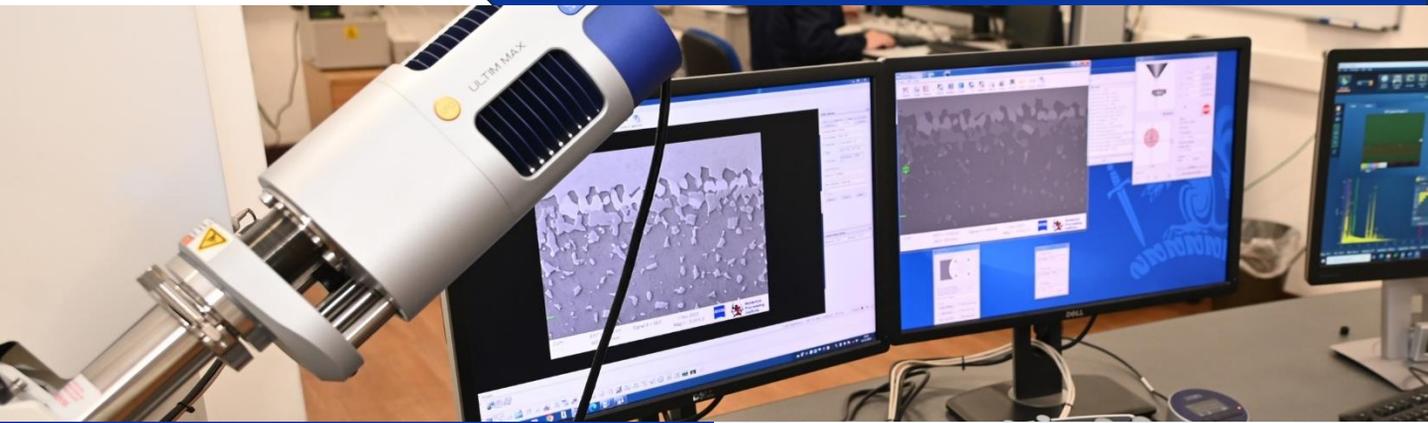
Services Portfolio

Characterisation and Analysis



Characterisation and Analysis Services Portfolio

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Characterisation and Analysis

Failure analysis

Investigate a failed or cracked component to determine the root cause and advise on improvements.

OES spark spectrometry of steels/alloys

OES spark spectrometry of steels/alloys.

XRF bulk chemistry for metals / oxides / slag

Rapid, non-destructive chemistry of metals and by-products to support process control.

Elemental segregation mapping (micro / macro)

Identify segregation bands or centreline enrichment that drive property scatter.

Phase identification by XRD

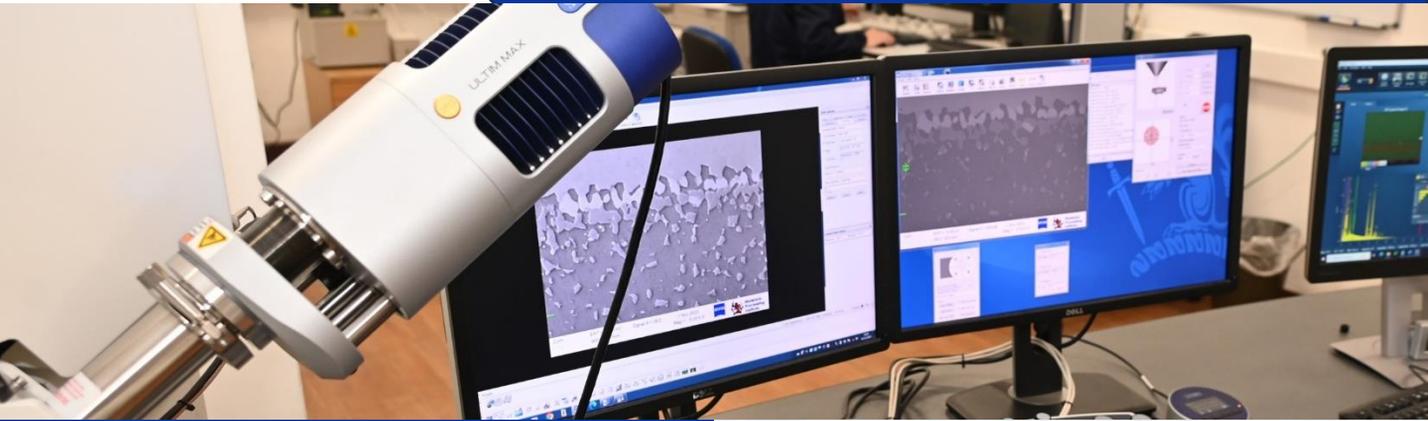
Confirm crystalline, mineralogical phases (i.e. different oxides of Fe) to ensure heat-treatment success.

Retained austenite quantification

Quantify RA in AHSS/bearing steels to meet dimensional stability and fatigue targets.

Carbide / nitride identification in tool steels

Correlate secondary hardening and wear with carbide type/distribution.



Characterisation and Analysis

Oxide / scale phase analysis after exposure

Understand oxidation mechanisms; optimise alloy or coating for high-T service.

Grain size measurement

Control toughness/strength via grain refinement; qualify process routes.

Microstructure quantification (phase fractions)

Measure ferrite, pearlite, bainite, martensite fractions to hit property windows.

Inclusion rating

Benchmark cleanliness for bearing / critical steels; drive process improvements.

Decarburisation depth measurement

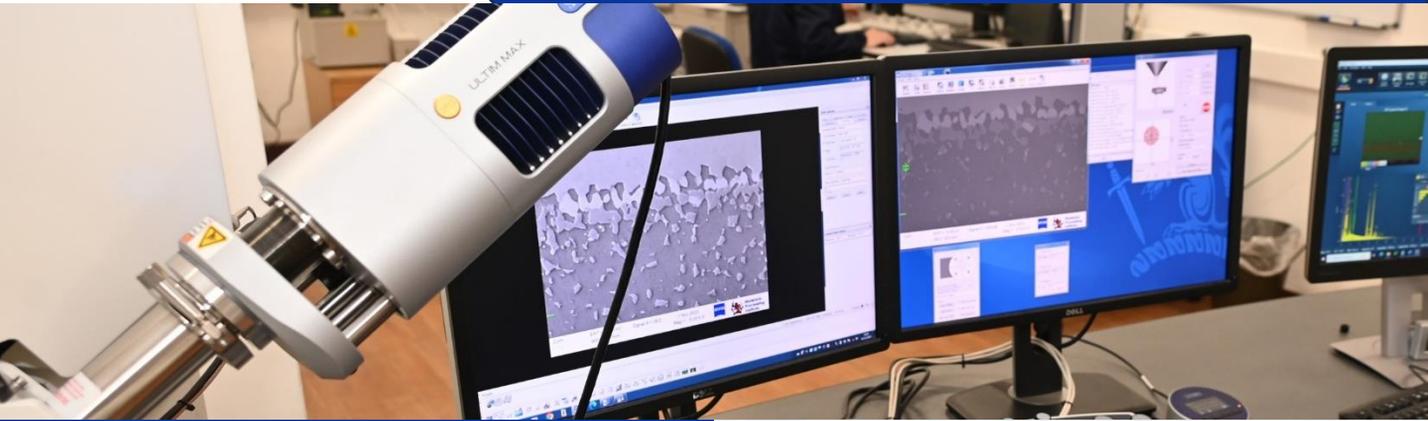
Ensure case/core carbon levels meet fatigue and wear requirements.

Case depth verification (carburised / nitrided parts)

Guarantee surface engineering meets drawing specification and performance.

Graphite morphology in cast irons

Ensure nodularity / flake type & size distribution for mechanical properties.



Characterisation and Analysis

Delta-ferrite content in stainless welds

Avoid hot cracking and ensure corrosion resistance.

Banding and texture assessment (macro-etch)

Assess flow lines and segregations affecting anisotropy and toughness.

Surface decarburisation / denitriding check

Prevent surface softening and dimensional drift after heat treatment.

Fractography of failed components

Identify fracture mode (fatigue, brittle, overload) to prevent recurrence.

Potential crack origin identification

Locate initiation sites and drivers (inclusions, defects, stress raisers).

Stress corrosion cracking (SCC) investigation

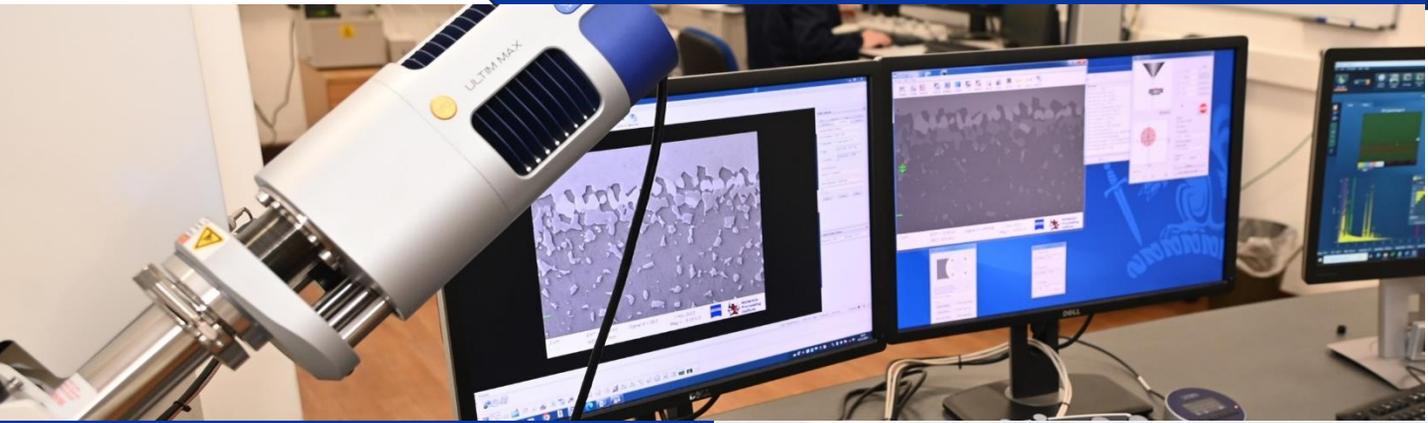
Identify the failure mechanism.

Wear mechanism identification

Distinguish adhesive / abrasive / oxidative wear to guide material / coating changes.

Weld failure root-cause analysis

Verify HAZ softening / hardening, inclusions, lack of fusion and residual stress.



Characterisation and Analysis

Coating thickness & uniformity (cross-section)

Ensure protective/performance coatings meet spec and coverage

Coating-substrate interface evaluation

Check adhesion, dilution, intermetallic formation and defects

Surface contamination / cleanliness check - Assessment of non-metallic particles in metals

Inclusions in melts

Stability of retained phases on aging

Predict dimensional stability and performance drift

Additive manufacturing part porosity / defect mapping

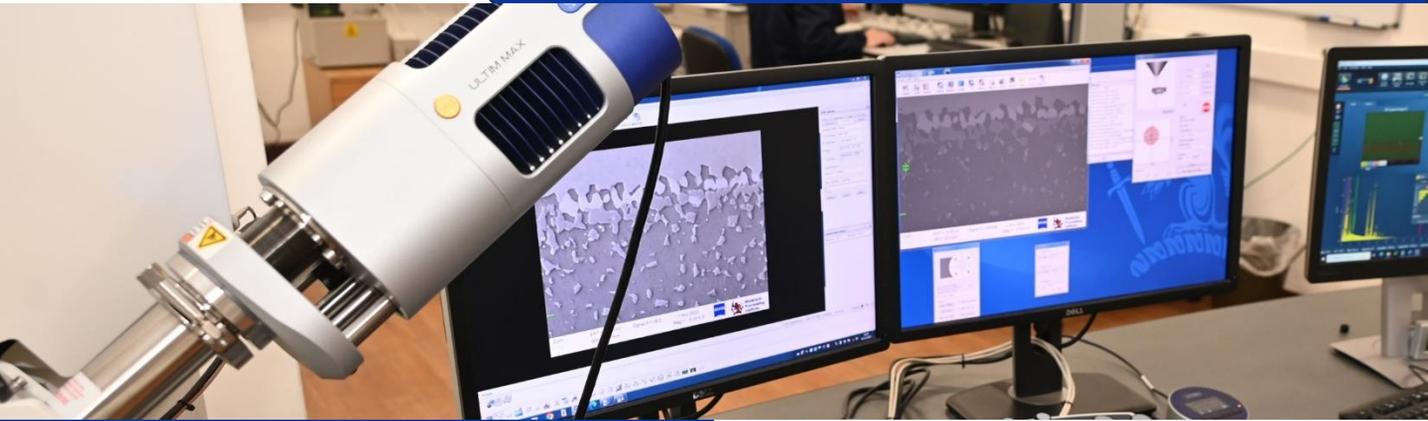
Microstructure and properties

Oxidation / weight change kinetics

Glass transition, crystallization and phase transitions investigations. Evolved gas analysis

Weld macro/micro examination

Verify penetration, fusion, HAZ width and defects per WPS



Characterisation and Analysis

Tramp element screening for recyclability

Protect melt quality and prevent defect-inducing elements.

Material identity & grade verification (PMI)

Prevent mix-ups and ensure correct alloy deployment.

Heat-affected zone softening / hardening maps

Control HAZ properties to avoid failure in service.

Inclusion chemistry & morphology mapping

Tie inclusion populations to fatigue performance and steel cleanliness.

Scale / decap characterisation pre-pickling

Optimise pickling and surface preparation, reduce over-pickling.

Root-cause characterisation package (full)

End-to-end failure investigation with actionable recommendations.

Industrial symbiosis material exchange

Facilitate usage of one industry's waste as another's raw material by characterising waste and testing it in the second industry's process.

Full Services Portfolio

Advanced Metals & Green Steelmaking

- Green Steel
- Product Development
- Process Improvement
- Extra

Advanced Materials Development

- Custom Alloy Development
- New Steel
- Supporting R&D
- Additive Manufacturing & Powder Metallurgy
- Additional Services

Characterisation and Analysis

- Characterisation and Analysis

Critical Raw Materials

- By-product Valorisation
- End of Life Process Development
- Mine Tailing Valorisation
- Piloting /Testbed Hosting
- Process Scale-up
- Process Optimisation

Sustainable Cement and Concrete

- Product Development
- Process Improvement

Powder Analysis and Additive Manufacturing

- Powder Analysis
- Additive Manufacturing
- Powder Processing

Energy and Process Decarbonisation

- Feasibility Studies
- Energy and Emission Optimisation
- Process Optimisation
- Leveraging Facilities

Facilities and Equipment

Full Services Portfolio

Training

Processes

- Ironmaking
- Desulphurisation of Iron
- Steel Plant Raw Material
- Primary Steelmaking
- Secondary Steelmaking
- Ladles
- Practical Steelmaking
- Stainless Steelmaking
- Electric Arc Furnace (EAF) Steelmaking
- Continuous Casting
- General

Supplementary

- Engineering
- Metallurgy
- Environmental Protection
- Management
- Research

Applications

- Circular Economy
- Digital Technology
- Analytical Techniques

Products

- Finished Goods

Materials Processing Institute
Eston Road
Middlesbrough
United Kingdom
TS6 6US

+44 (0)1642 382000
info@mpiuk.com
www.mpiuk.com



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Processing
Institute**

www.linkedin.com/company/materials-processing-institute/

