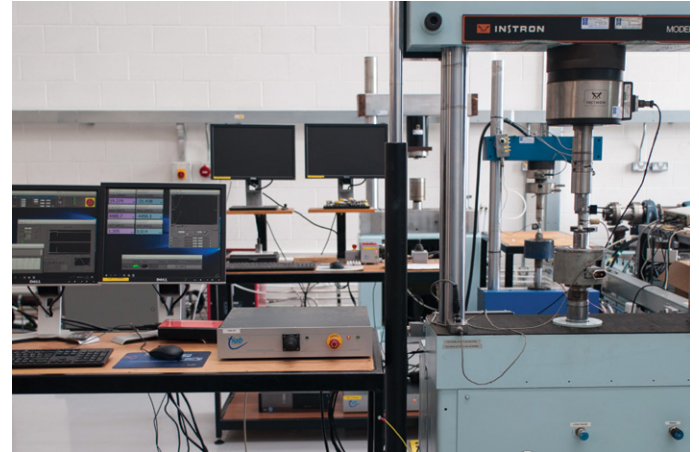


Material assurance & material characterization

HBM Prenscia provides material testing services for material assurance, material characterization and specialized testing projects. Fully characterized design curves are derived from test data analyzed and interpreted in-house using customer-specified Certainty of Survival and Confidence Interval for direct use in fatigue analysis software.

All material testing services are performed at the ISO 9001 certified Advanced Materials Characterization & Testing Facility (AMCT Facility) operated by HBM Prenscia. All test equipment is calibrated to United Kingdom Accreditation Services (UKAS) standard by accredited bodies.



Benefits

Achieve real cost reduction

- Compare fatigue performance of materials from different suppliers to identify most cost-effective resource
- Reduce costs of over-design
- Reduce raw material costs
- Select materials and manufacturing processes to meet end-user performance requirements

Better performance and design

- Develop more durable products
- Meet fatigue performance targets
- Increase confidence in your product durability

Meet environmental targets

- Reduce final product weight
- Optimize manufacturing process



**Cost savings and
design Improvements**

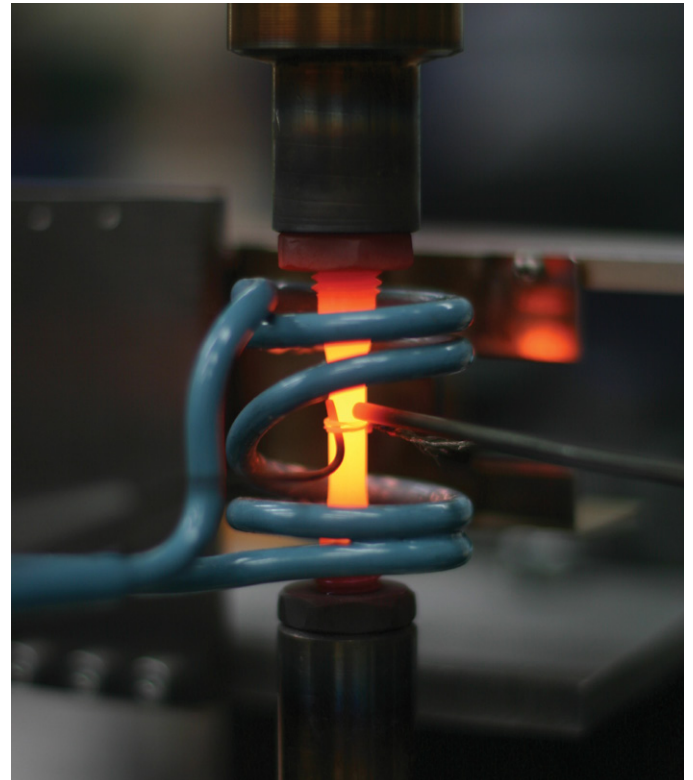
Material characterization

The fundamental process of material science is the characterization of the materials. This process includes material testing and analyses to derive design curves used in component fatigue analysis. Our expertise enables us to perform a range of fully customizable services that deliver all the material properties necessary for obtaining accurate results from mechanical FEA and fatigue analysis.

Fatigue life is represented in terms of Strain-Life (EN) or Stress-Life (SN). In most cases strain controlled tests are utilized in order to obtain the highest quality curves.

Range of services:

- Tensile and compression tests with full evaluation of basic mechanical properties
- Strain-controlled fatigue tests for Basquin, Coffin-Manson, Smith-Watson-Topper and Ramberg-Osgood curves. Full evaluation of regression and design curves
- Load-controlled fatigue tests for Basquin curves. Full evaluation of regression and design curves
- High temperature tensile, creep and fatigue tests in strain or load control between -40 to 1100°C
- Analysis of Iso-thermal SN and EN curves or analysis of advanced Chaboche thermo-mechanical fatigue properties
- Testing to recognized standards, in-house customer standard or development of bespoke tests for advanced materials and components
- In-house design and manufacture of test specimens and required test equipment
- Full specimen preparation from stock materials or customer-supplied materials
- Extraction of specimens from real components
- Fatigue testing of jointed materials
- Tensile and fatigue testing of advanced engineering polymers
- Testing of civil engineering elastomeric materials
- Fatigue tests for axial, torsion, rotating bend, 4 point bend or custom tests



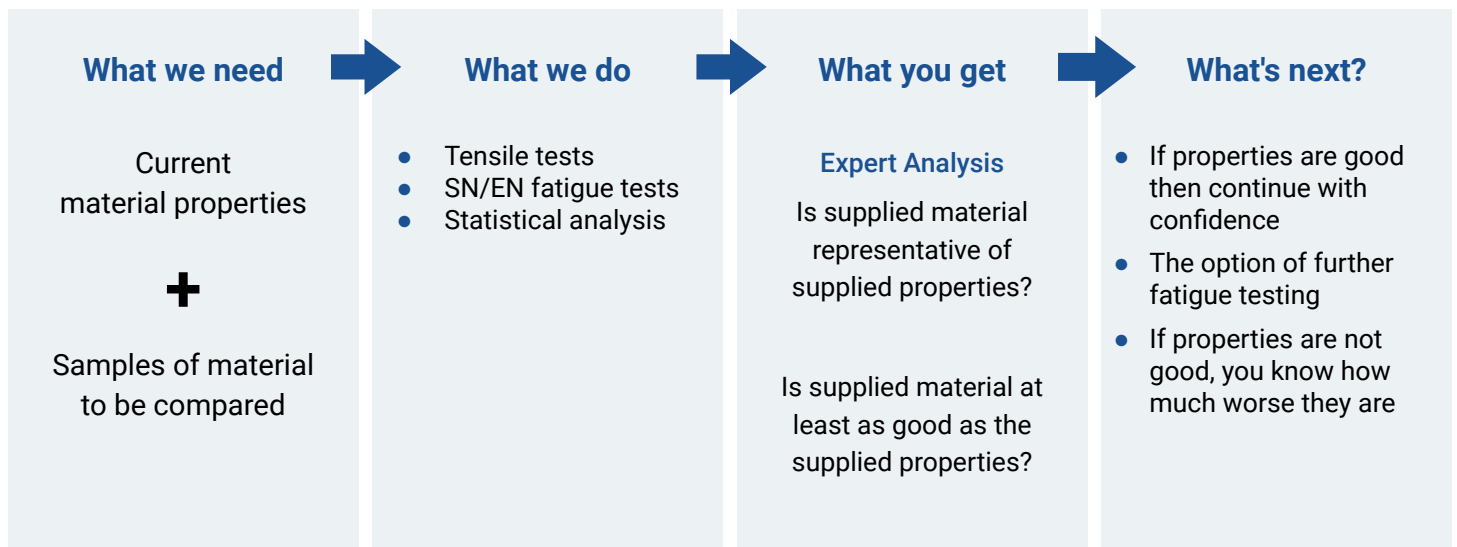
Project specialization:

- Strain-Life (EN) characterization of automotive body materials
- Life testing of cast iron engine materials from components
- Determination of elevated temperature fatigue performance of welded thin sheets
- Qualification of candidate surface coatings for replacement of hexavalent chrome on aircraft parts
- Quality Assurance testing of casting suppliers
- Thin sheet fully reversed testing of radiator core materials
- Fatigue characterization of short-fibre composite materials for automotive application
- Fatigue life testing of human implants and medical devices

Material assurance

The Material Assurance service offers certainty that a material is performing to an acceptable level. Based on a minimum feasible number of test specimens, a hypothesis test is performed to determine whether the supplied specimens correlate with the supplied design curve.

The service is used to compare real material performance with a customer's existing design curve. Service is also offered for comparing the fatigue performance of different materials.



Benefits:

- Improved confidence in your design parameters
- Minimal cost and fast turn-around
- Fewer test samples required than for full fatigue analysis
- Prioritize materials that require further testing
- Compare impact of changing material quality on your product's fatigue performance

Ideal for:

- A CAE engineer who wishes to check that the fatigue dataset is representative of the material being used
- Providing design data for FEA fatigue analysis, where none currently exists
- Checking the quantitative benefit of a proposed surface finish or material treatment against a base curve
- Ensuring that a new supplier is providing material of a consistent quality to that from a previous source
- Regular quality control, especially when a part is fatigue critical



About HBM Prencsia

HBM Prencsia is a global leader in providing technology and engineering software products and services for reliability, durability, and performance. We offer a broad range of engineering solutions that deliver compelling value to our customers for the design and development of reliable, robust systems, and reduce life cycle costs for mechanical and electronic hardware and software (mechatronics). By offering a range of industry leading software (nCode and ReliaSoft), training, and services (Prencsia Solutions and Omnicon), we enable companies to enhance returns on investment and operational success through design and certification, optimized processes, data management and processing, and CAE simulation. For more information, please visit www.hbmprencsia.com

© 2018 HBM United Kingdom Limited (an affiliate of HBM Prencsia Inc.), at Technology Centre, Advanced Manufacturing Park, Brunel Way, Catcliffe, Rotherham S60 5WG, UK. All Rights Reserved. All other product names, logos, trademarks, and service marks are the property of their respective owners.