The Materials Testing and Analysis Unit is a commercial group within the Residual Stress & Damage Characterisation Unit in the School of Materials. It has a dedicated team of Project Officers, acting as a quick-response unit, which is able to take on both commercial and research projects at short notice.

Our main work is measuring residual stresses in engineering components, using x-ray diffraction. We are the only testing laboratory in the UK that is accredited to ISO 17025\(^1\) for this work. We help engineers:

- validate new or existing manufacturing processes
- extend lifetimes of critical engineering components
- investigate causes of stress-related component failures

by providing them with stress data that can be used to modify their component designs to combat service stresses

\(^1\) ISO 17025 accreditation only applicable to xrd stress measurements performed in our laboratory
Portable x-ray Stress Measurement

We have a 'state-of-the-art' Proto iXRD system, which:

- is fully portable for use in the field
- has an automated stress mapping facility
- can perform measurements in awkward locations, by using a four degrees-of-freedom sample stage with movement in three planes and rotation about a vertical axis
- can be used to measure metal samples of varied shape and weight, by positioning the Proto in its floor-standing mode
- collects many x-ray events simultaneously, resulting in very fast data collection
- has high throughput, allowing us to make multiple measurements in a relatively short time

Some of the varied components in which we have measured residual stresses are:

- fuel tubes
- shot-peened gears
- laser-peened fan blades
- food cans
- sintered tungsten plates

We can also facilitate access to a wide range of materials-related analysis techniques for our customers, including:

- atomic force microscopy
- C-scan analysis
- 3D coordinate measuring
- Electronic speckle pattern interferometry
- image correlation
- x-ray diffraction
- nanoindentation
- neutron strain measurement
- Raman spectroscopy
- scanning acoustic and electron microscopy
- stress measurements using slitting, contour and magnetic methods
- x-ray tomography.

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Stress profile for shot-peened titanium alloy

<table>
<thead>
<tr>
<th>Stress (MPa)</th>
<th>Depth (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>-200</td>
<td>750</td>
</tr>
<tr>
<td>-600</td>
<td>1000</td>
</tr>
</tbody>
</table>

Stress profile for shot-peened titanium alloy

Staff

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