

# fuel combustion

## optimising with optical diagnostics

Improved fuel combustion is fundamental to low-carbon technologies across domestic, industrial and transport sectors. The University of Warwick is home to pioneering combustion diagnostic research facilities and expertise which are fundamental to achieving more energy efficient and clean combustion of fuels.

The new Birmingham Science City cutting edge diagnostics capabilities will place the West Midlands region at the forefront of research into the optimisation of combustion processes and system designs for existing and new fuels. The capability is focused on evaluating the combustion properties of different fuels, including bio-fuels, and optimising combustion processes for these fuels.

### The scope for applications is broad and includes:

- Household burners
- Large scale local heating
- Power stations
- Steel furnaces
- Internal combustion engines
- Gas turbine engines

### The state-of-the-art facilities include:

- A borescopic engine investigation system that allows the investigation of an internal combustion engine using an endoscope approach
- Various measurement techniques such as:
  - Laser fluoresce and direct light emission
  - A phase sensitive holographic camera which can create a remotely measured three dimensional temperature map in different thermal and combustion environments
- A passive optical emission tomographic system with 30/40 photomultipliers which can take optical measurements of combustion processes inside engines

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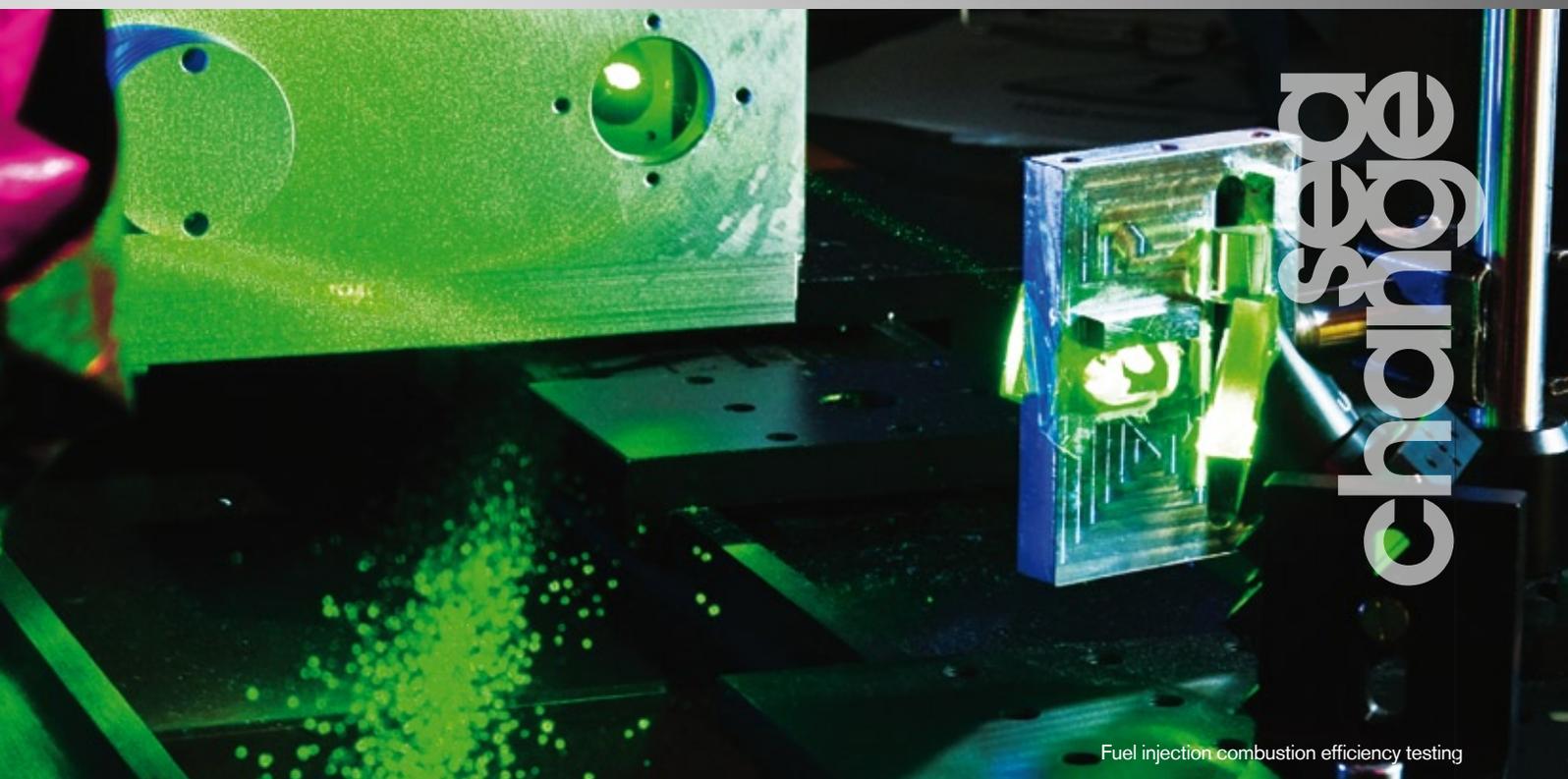
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These optical diagnostic facilities and combustion research work at the University of Warwick complement the work of other Birmingham Science City facilities at the University of Birmingham. Complementary areas are in the fields of materials for high temperature diagnostic probes and burner construction and on the efficient combustion of alternative fuels in engines.

This research facility is led by Professor Peter Bryanston-Cross, Head of the Optical Engineering Laboratory at the University of Warwick. His expertise is wide-ranging including:

- Image processing for diffraction image recognition
- Imaging of sub-micron particles
- Holographic storage of sub-micron three dimensional particle distributions
- Measurement of surface flatness and deflection to a precision of 10nm
- Automatic analysis of photoelastic data
- Image processing X-ray diffraction images
- Sub millimetre hole inspection using monomode fibre optics
- Use of embedded electronic systems for laser control

Already working with companies such as QinetiQ and Rolls Royce, the research group is keen to develop new partnerships, particularly with local businesses from the West Midlands region.

The set up of this new facility is part of the £10.5m Energy Efficiency & Demand project, funded by AWM and ERDF under the Birmingham Science City initiative. It is a key part of a larger investment in the research infrastructure of the West Midlands region, which unites the Universities of Warwick and Birmingham in a newly-formed Science City Research Alliance (SCRA).

The Energy Efficiency and Demand project, led by the University of Warwick, sits alongside the Hydrogen project, led by the University of Birmingham, under the umbrella of the Energy Futures theme. The investment aims to develop and promote a regional hub for academic and industrial expertise in energy efficiency and demand reduction as part of the Government's mission to achieve a strong knowledge-based economy.

**For further information and business enquires, including proposals for collaboration or access to the facilities:**

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Prof. Peter Bryanston-Cross – Head of Optical Engineering Laboratory



Flame analysis for internal combustion engines

[www.birminghamsciencecity.co.uk](http://www.birminghamsciencecity.co.uk)

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