Words: Penny Lees

Super Lasers To Speed Up Nuclear Decommissioning

The University of Manchester recently installed one of the most powerful, commercially available fibre lasers in the UK- with the aim of speeding up nuclear decommissioning.

Lasers save time, increase productivity and introduce new technology, with resultant major impact on company bottom line and long term market position. However, it is Fibre lasers that are leading the revolution in laser applications, as costs fall but versatility and capability rises.

The potential for many aspects of decommissioning work includes the power capability of super lasers to make 'light work' of thick gauge steel and concrete cutting operations. It is not just in metal cutting that these new 'Light Tools' are making their mark. High Brightness Fibre Lasers as well as Ultra-short Pulsed Lasers offer advanced surface texturing and molecular restructuring, alongside capabilities around metal oxide removal, concrete decontamination and even underwater operations. These enable the development of rapid manufacturing systems and the creation of new products and materials.

Historically, lasers have been used in industry as 'fixed' machines with limiting mirror or prismatic deployment systems. Fibre Lasers along with Fibre Optic Technology, allow the main laser system (or rack mounted laser and electronics coupled to a mobile or static robotic system) to be remote from the cutting or process head within a hot cell environment. The fibre optic cable can be several hundred metres long, giving the ability to work flexibly within a confined or hazardous area.

Safety is of prime importance to the industry with strict guidelines already in place. Secondary cut safety issues within hot cells can be managed using, for example, graphite absorption matting and hi-tech lens focussing techniques. The Nuclear Decommissioning Authority recently commissioned a Feasibility and Research Study into the utilisation of high power fibre lasers, which showed promising results.

The University of Manchester Laser Processing Research Centre (LPRC) is a leading UK institution of manufacturing laser technology. A world leader in laser research, numerous papers published by Professor Lin Li, Director of the LPRC and his colleagues, highlight work in laser based nuclear decommissioning technology. There are strong links to the university's Dalton Nuclear Institute, which recently opened its Cumbria Facility for future research into all aspects of nuclear engineering.

The LPRC portfolio of lasers range from traditional to long pulse; a range of fibre lasers including new high powered industrial systems below:

- Three robotic systems attached to a 16 KW fibre laser - currently amongst the highest powered laser available. The increased power and enhanced control support improvements to automated systems for cutting welding and deposition.
- A 400W pico-second laser micro-machining system with a 7 axis motion system. Allows rapid machining of metals, ceramics and composites with minimum heat affected zones.
- A 300W micro second pulsed TEA CO2 laser.

The powerful 16 KW fibre laser newly operational at the LPRC and Dalton Nuclear Institute has been supplied by IPG Photonics, the leading world-wide developer and manufacturer of high-performance fibre lasers and applications. Stan Wilford, IPG's UK based Sales Engineer, explains how fibre lasers outshine traditional laser capability, using words like compact, reliable, efficient, versatile, cost effective and maintenance free. Key features around power capability, dexterity and accuracy will enable fibre laser systems to greatly benefit industry in the years to come. For further information contact swilford@ipgphotonics.com

LPRC works with large British manufacturers researching the use of lasers in specific systems in their manufacturing processes. The facilities include mock up nuclear cells for research into leading edge applications for the industry, using the latest breed of super lasers. Key capabilities for speeding up decommissioning projects include: welding of pump components and pipes; under-water cutting and welding for plant maintenance; cutting thick section concrete; scabling of concrete for decommissioning; remote cutting of pipes; decontaminated surface removal and paint stripping.

The LPRC is currently engaged on a programme to demonstrate laser technology. The Knowledge Exchange in Laser Engineering (KE-LAS) project aims to enable companies to benefit from the potential advantages that laser technology offers across a broad range of sectors including Energy. The ERDF £1.2m funded programme supports North West SME's in projects to introduce laser technology into their business or make better use of the lasers already in-house. At one of a series of recent industry briefings Roger Hardacre, KE-LAS Business Development Manager said that limited places are still available through KE-LAS until April 2012.

Highlighting the benefits to companies he said: “SME's wondering if new laser technologies would benefit their business can use the programme for a free feasibility study, including pilot tests. Then, to further implement new laser capacity, we can steer them towards a bespoke project that could be part funded from the national Knowledge Transfer Partnership programme. It's a low risk way towards new competitive technology that will enhance a company's manufacturing process.”

KE-LAS offers:

1. An information service and free business consultation.
2. Fully funded feasibility studies to assess how new laser technology could improve competitiveness.
3. Individual support programme to devise, test, install and integrate a laser system. This project may form a Knowledge Transfer Partnership supported by the EPSRC up to 65% project cost for the SME's.
4. Long term relationship to update companies with new technologies and applications in laser engineering.

For information about KE-LAS contact roger.hardacre@manchester.ac.uk

The nuclear supply chain, already interested in the capability of super lasers for the future, can learn more. Technical consultancy RJ Barr Associates Ltd is working closely with the University of Manchester and the LPRC to publicise the potential use of fibre laser technology for nuclear applications. MD Bob Barr explained the intention to establish a nuclear laser special interest group, which would enable discussion around technology innovation through group meetings and online updates. Interested individuals should contact KE-LAS Business Development Manager, heather.daluzvieira@manchester.ac.uk. Early in 2012 a nuclear open day at LPRC will provide an opportunity to observe the new laser in use, with the potential to bring along materials to test its capability and discuss in-depth research. The university has extensive experience of working closely with large engineering companies to develop innovative projects.