Top marks for lasers

A workpiece marking service is increasingly demanded by customers of sub-contract machine shops and OEMs, as Steed Webzell reports

Identifying and tracing components back to their origins is a growing requirement across a host of engineering-based industries. Laser marking has become the method of choice in recent years because a computer-controlled laser is extremely fast and accurate.

"The use of laser marking technology continues to grow in the UK market," confirms Peter Elliott, director at laser manufacturer HK Laser Systems, a division of HK Technologies. "We are seeing replacement of early generation lamp and diode pumped lasers by users who are committed to laser marking but wish to take advantage of the benefits that the latest technology brings. This, along with sales of equipment to existing users who need to increase their marking capacity, is extremely important."

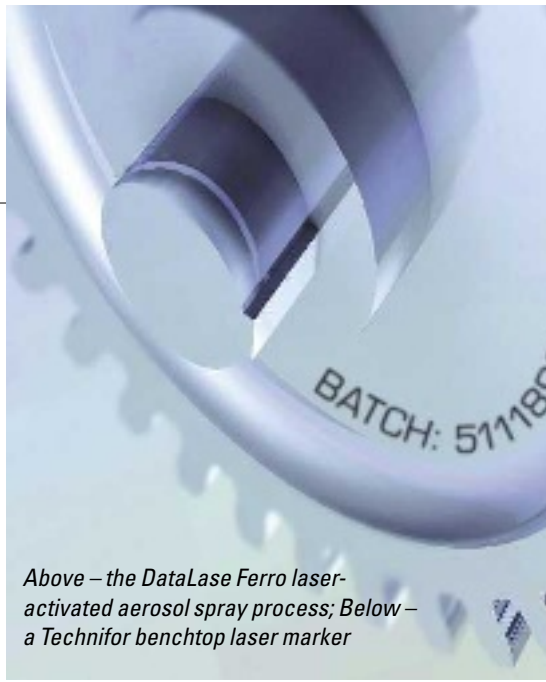
HK insists that the emergence of the latest fibre laser sources has resulted in more compact and affordable systems coming on to the market. This means that the price difference between alternative processes such as pin stamping, inkjet and pad printing is reduced, making the laser, with its cleaner and lower operational costs, a more attractive proposition.

"Fibre technology has had a major impact on laser marking, taking significant market share from conventional lamp and diode lasers," says Mr Elliott. "Our supply now is almost exclusively fibre-based systems in OEM variants, standard or customised systems, or with turnkey automated solutions. It is also interesting to note that the migration of manufacturing from the UK still results in opportunities. Products manufactured in the Far East are being imported, unmarked and then identified and branded prior to sale in the UK."

HALLMARK OF SUCCESS

One HK user which highlights laser marking technology progression in recent years is the London Assay Office, part of The Goldsmiths' Company, based in London. The LAO is responsible for hallmarking precious metals, originally using pump-based laser marking technology from HK. In more recent years the company has replaced this technology with two types of diode laser and two fibre laser machines.

Specialist machine builders often have to build laser marking capability into their systems, as can be confirmed by TEC Manufacturing, a 30-employee, £4 million turnover company based in Melton Mowbray.

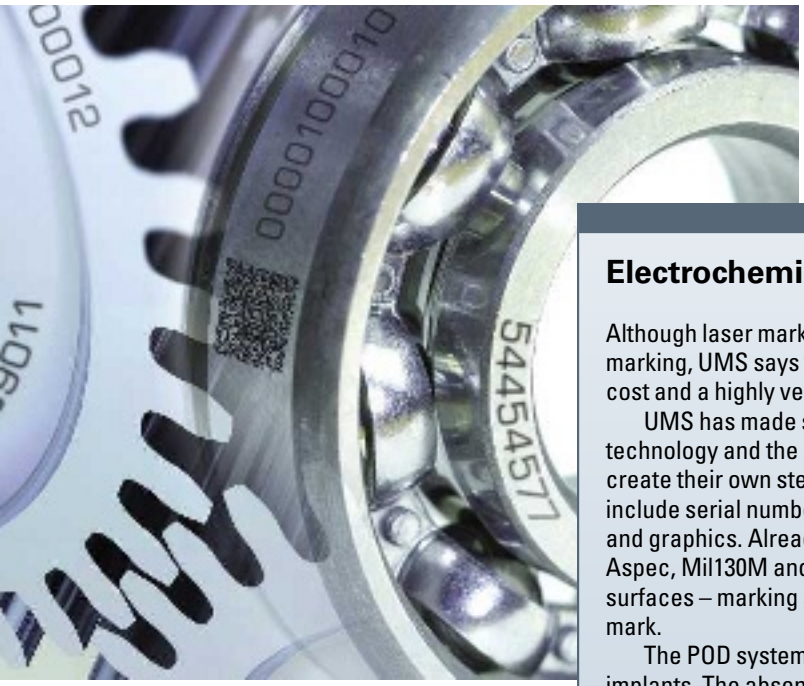


Above – the DataLase Ferro laser-activated aerosol spray process; Below – a Technifor benchtop laser marker

Managing director Tony Jones, explains: "In 25 years, we've built almost everything – from machines that assemble automotive parts through to ones that cut up dog chews. Increasingly, many of the machines and systems we build require the incorporation of component identification techniques, typically through the addition of barcodes or 2D data matrix marks."

When traceability is the brief, TEC recommends and installs Technifor laser markers. The company's relationship with the marking and traceability specialist originated around three years ago when TEC won a contract to build a system to assemble and test hydraulic valves that are used in JCBs. Previously, TEC had been using equipment manufactured by a Technifor competitor but reliability issues forced company engineers to look elsewhere. A call was placed to Technifor UK and within two days the part marking system was installed, commissioned and fully functional.

Since then, TEC has been a regular customer and a keen advocate of Technifor's marking solutions, and one piece of equipment in particular, the TD410 Nd:YAG laser marker which features short pulses for high peak power and beam quality. The Technifor TD410 is air-cooled with a low



Electrochemical print on demand

Although laser marking is emerging as an effective method for direct part marking, UMS says that its Print-on-Demand (POD) system offers a much lower cost and a highly versatile alternative without sacrificing quality.

UMS has made significant improvements to electrochemical marking technology and the digital-based system uses POD stencils that allow users to create their own stencils when they need them – instantly. Marks produced include serial numbers, date/batch codes, part numbers, data matrix codes, logos and graphics. Already deployed in the aerospace industry, it meets ISO16022, AT Aspec, Mil130M and UID standards. It can mark equally well on flat or curved surfaces – marking speeds are 0.25 to 4 seconds, regardless of the size of the mark.

The POD system can also be used for marking surgical instruments and implants. The absence of cytotoxicity in the electrolyte solution means it is safe for marking surgical steel in accordance with ISO10993. UMS believes it is the only company to have independent cytotoxicity tests carried out for surgical instruments.

maintenance fibre-coupled diode that has a guaranteed lifetime of 5,000 hours, although many users can expect greater than 10,000 hours. This represents a 10-fold increase over lamps in conventional laser marking units.

One end user to benefit from the TEC/Technifor partnership is Burton-upon-Trent-based Kongsberg Automotive, which now has a number of systems that verify, test and mark solenoid actuated pneumatic valves, eliminating the need to source and apply adhesive labels manually, along with the possibility of mis-labelling and/or the label going astray.

A CLEAR MESSAGE

Howard Moore, director and general manager at laser manufacturer Electrox, also believes that laser marking has become an industry essential. "Once the preserve of high volume manufacturers, laser marking systems have become a necessary and accessible tool of the general manufacturer and sub-contractor," he says. "Year-on-year increase during the past five years is estimated at around 20 per cent. By far the most significant increase is being seen in the take-up of laser-based systems in preference to and as replacement for more conventional technologies such as inkjet printing and acid etching."

Mr Moore says that the market is driven almost entirely by necessity – it is increasingly important to convey more information on a component or finished product, and to convey that data in both human-readable (component size, usage instructions) and/or machine-readable (security data or unalterable lifetime product identity) formats. Whereas previously a simple alpha-numerical code might have been sufficient, now common practice is to use linear bar codes and, increasingly, 2D matrix codes. This is because of the requirement to meet traceability prerequisites, the increasing need to convey product data to the end user, the recognition of the power of branding and for anti-counterfeiting in the face of an increased intrusion into the market of look-alike products.

Alongside the increased need for a marking system, two principal factors have caused laser to be preferred over any other marking technology. One is the advance of laser technology itself, making laser-based marking systems cheaper and more accessible for a wider number of companies while also giving the user greatly enhanced features. The other is the pressing requirement throughout the manufacturing industries to achieve higher levels of efficiency. The ease of use, speed of set-up, versatility, low cycle times, ease of installation and minimal running costs associated with laser marking systems are therefore significant factors in the choice of technology. The greater awareness of health and safety issues has also played a significant if not deciding role in the choice of marking system. With a laser-based system, the manufacturer has dealt with any health and safety issues, relieving the end-user from the problems, for instance, with the use of inks, acids or solvents.

TECHNOLOGY OFFERS CHOICE

"Even five years ago, the choice of laser system was limited," says Mr Moore. "Systems were cumbersome and required frequent maintenance, and the range of materials that could be marked was restrictive. Since the days of the water-cooled, lamp-pumped lasers, the variety of systems available has

expanded almost beyond recognition. Improved beam quality has resulted in a greatly enhanced mark, while power requirements have fallen by up to 75 per cent and marking speeds have doubled. Two of the most significant developments have been fibre laser marking and the creation of the EF Technology platform.

Electrox's EF Technology platform perhaps typifies the rapid development of laser-based marking systems over the past few years. Developed by the company's design and applications engineers in direct response to the changing needs of customers, laser marking systems based on the EF Technology laser platform are efficient, versatile, easy to install, and cost effective. They also benefit from a four-year warranty on the laser source.

One notable user of Electrox laser marking technology is Slough-based Retriever Sports, a manufacturer of darts, including the nickel tungsten, nickel silver or brass steel barrels.

"We have already found substantial cost savings by moving to laser marking," says Ian Bennett, who runs the business, "including a huge reduction in lead-times. The bottleneck caused by engraving has been eliminated, as has the cost of consumables, such as ink and solvents. More importantly we have eliminated all of the associated health and safety issues."

A different, but very significant portion of the UK market involving the use of lasers for producing marks on metal products is represented by the canning industry. Traditionally the method of choice for marking beverage cans has been ink jet, but this appears to be changing, as Trevor Wilson, vice president for business development at DataLase, suggests: "Today inkjet is the most widely used technology for applying variable information to beverage cans. However, inkjet has many known problems that laser can solve with high efficiency imaging systems that require little user intervention.

"The packaging industry has adopted laser very widely in the past few years, initially for laser ablation but increasingly for laser imaging with DataLase products," he adds. "High speed laser scanning systems ensure that the fastest production lines can be imaged by lasers with DataLase products. We are currently discussing trials with several beverage manufacturers on high speed canning lines. It is now possible to carry out non-stop imaging of products (no stopping when the inkjet fails) so higher production output can be achieved."

The London Assay Office is a keen user of laser markig technology, from HK Technologies

LASER MARKABLE AEROSOL

In collaboration with Ferro Corporation, a North American supplier of technology-based performance materials, DataLase has developed a special laser markable aerosol containing DataLase pigment, for applying variable information on to metal or painted metal parts.

Once exposed to a portable low power CO_2 laser, the new spray containing the DataLase pigment undergoes a chemical reaction turning it from white to black. The solution is aimed at markets such as automotive, aerospace and appliances, for tracking, tracing and barcoding of high value parts. This is a totally new application for the DataLase process which, to date, has been used on primary and secondary packaging.

Naturally not all engineering marking applications are metal-based. Take EPDM (Ethylene Propylene Diene Monomer), for example. For decades, commonly used as a low-slope industrial roofing material, EPDM is also making substantial inroads in the automotive industry because its high heat resistance out-performs natural rubber in engine bay and chassis applications requiring durable boots and seals.

A recent application trial by Laser Lines involved marking an easily readable identification code (with the potential to outlast the lifetime of the part) on an EPDM roofing gasket. The marking set-up included a Synrad sealed CO_2 laser, an FH Series marking head equipped with a 200 mm focusing lens, and a copy of the Synrad WinMark Pro laser marking software. In WinMark Pro, a seven-character, 7.6 mm high identification string was created. At 10 W power and a velocity of 381 mm/sec, the mark was produced in a cycle time of 0.36 seconds.

The applications for laser marking are truly endless. Major OEMs and sub-contractors across a broad range of industry sectors are moving to direct part marking and many more are set to follow suit.□

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