High-contrast marking using lasers

Fibre lasers now being used to generate high-contrast marks on a wide range of metal housings with minimal debris. Tim Miller* and John Tinson* reports.

TRADITIONALLY, laser marking involves either engraving a physical mark onto a surface to generate a simple colour, or etching of a surface layer of material to reveal another, highly contrasting layer underneath.

Either technique can be used on a broad spectrum of materials, and in addition to generating identifying marks can also form part of an industrial process.

The advantages of laser marking include speed, flexibility, a non-contact marking process, meaning that components parts are not stressed by the marking process. The non-contact nature of the process also contributes to low maintenance schedules as tools do not need to be replaced. Laser marking is also highly repeatable and easily readable.

While the laser engraving process is fast, non-contact and produces durable results, it is also responsible for the production of debris, fine metallic particles removed from the surface as part of the engraving process.

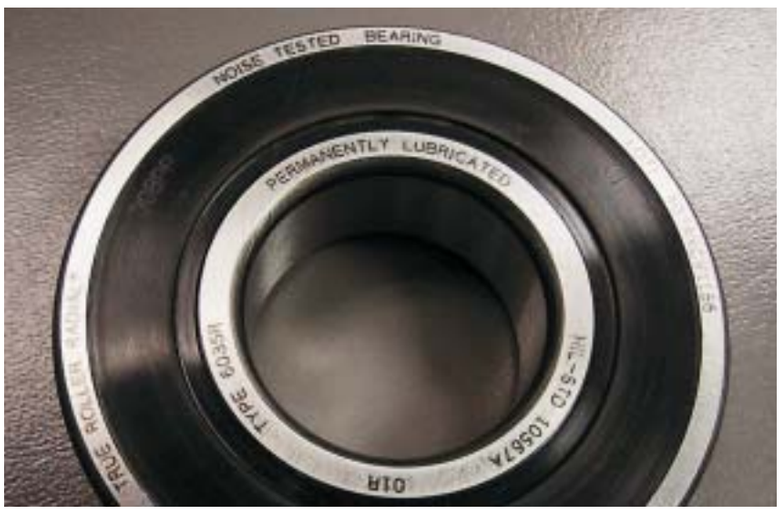
Naturally for bearing manufacture there are stringent requirements for process debris. The marking of bearing housings using a laser has thus traditionally combined a "minimal" engraving process with an induced change in surface colour.

Control Micro Systems, a US-based manufacturer of industrial laser systems, used to accomplish this using Nd:YAG lasers, but its customers were looking for a way around the cost, maintenance, lifetime and reliability issues associated with the Nd:YAG design.

For this application CMS engineers have pioneered the use of a fibre laser from SPI Lasers (UK) - more specifically a 100W cw/modulated fibre laser usually used for welding and cutting tasks.

Switching to the new fibre laser means generating the same thermally induced high contrast mark on the bearing The new CNC press brake has increased ourhousing, but doing so with less production of debris, at reduced raised recast, and at much greater convenience to the end-user - meaning almost no maintenance, increased lifetime and reliability.

The 100W fibre laser used in this application typifies the flexibility of fibre lasers as a tool for a wide variety of applications - marking applications are traditionally an application for high energy pulsed lasers, but the performance envelope provided by fibre laser technology allows systems integrators like CMS to redefine these domains.



High contrast marking on bearing housings.

Advantages of fibre lasers

Many different laser designs have found their way into materials processing applications. Fibre lasers are however revolutionising many of these applications through a combination of improved optical performance, better system flexibility, high component yield, long up-time and exceptional reliability.

Critical to many marking applications, they do not exhibit the shortcomings in spot size performance found in other laser designs - at all power levels, across all pulse sequences and during the entire lifetime of the laser, the spot size remains small, predictable and consistent.

The small spot size and high beam quality also mean high irradiance at the focus, so manufacturing tools equipped with fibre lasers can produce better results faster and at lower power levels. The focused beam consistently treats only a very small area of material, with the benefit that very little heat is generated in the surrounding area. High quality precision marking, welding and cutting can be performed close (0.1mm) to the most intricate component parts.

Fibre laser technology is now frequently chosen as an upgrade over conventional flash-lamp pumped solid state, or even DPSS laser technology in many other laser-assisted industrial manufacture segments.

The consistent and improved marking performance means reduced maintenance costs, longer up-times and improved production quality with less scrap. Fibre lasers are also physically robust and thus suitable for the most challenging of industrial environments.

All of these factors equate to a plug-&-play, maintenance-free architecture for systems integrators looking to cut development, production and servicing costs, with the added benefit of being able to provide the end user with a better, more flexible product.

Advantages for manufacturers

In general, the choice of tooling for any application comes down to determining the required performance followed by a trade-off between initial outlay, component yield, uptime and maintenance.

Not only are component assemblies

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Laser cutting/piercing machine

MAZAK's new HyperGear laser cutting machine is said to offer an easy to use, two-dimensional CO2 cutting laser.

With automatically changeable lens, torch, nozzle and beam mode functions, the lack of manual changeovers means the set-up times across different jobs are now almost non-existent.

The PREview 640 controller and Hyperline Guides provide high-speed performance with greater cutting control and accuracy. With a free traverse speed of 120m/min, and acceleration at 3G, the HyperGear uses a predictive feedback system to ensure accuracy.

The automatic quick changing piercing gun means the operator can switch between piercing and cutting operations, again without the need for manual changeover.

A self-maintenance system allows the machine to identify and correct any cutting problems. Sensors provide notification of maintenance needed on the machine, both present and in advance, along with part numbers and specific maintenance instructions.

Set-up times across different jobs are said to be almost non-existent.

The machine can automatically cut a variety of worksheet materials in a variety of thicknesses, all without the need for a skilled operator.
John Hart 03 9542 6262.

Laser cutting machine

ADVANCED Cutting Technology has released laser cutting technology that uses computerised laser cutting equipment to produce accurate finishes, even for intricate designs.

The company can cut a diverse range of materials, including mild steel, high carbon steel, aluminium, acrylics, polypropylene and titanium.

It can also cut stainless steel with nitrogen to give a clean, bright cut with an oxide-free edge, ready for welding. Its new 3D laser cutting machine can cut formed components and shapes, including six-axis rotary cutting of tube, pipe, RHS and bevelling of mild steel and stainless steel plates.

The benefits of laser cutting technology include accuracy and the ability to make small production runs of blanks without the procurement time or cost of press tools. Large blanks can be duplicated without the risk of marking up errors.
Advanced Cutting Technology 03 9768 3553.

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becoming increasingly more complex but, at the same time, more and more demands are being placed on their quality and functionality.

The deployment of manufacturing tools equipped with fibre lasers to enhance process control can thus bring important financial advantages for any manufacturer.

**Tim Miller is CEO of Control Micro Systems, email sales@cmslaser.com or visit www.cmslaser.com. John Tinson is VP sales with SPI Lasers email john.tinson@spilasers.com or visit www.spilasers.com.*