Case Study

High contrast marking on metal with minimal debris

Most laser marking techniques involve either engraving the mark into metal or plastic components, or ablating a surface layer to reveal a contrasting material underneath. Both processes usually require high energy pulsed laser systems and of course involve process debris. Control Micro Systems, Inc. of Winter Park, FL, USA, instead uses a modulated CW fibre laser to generate high contrast marks on metal bearing housings with minimal debris, thereby preventing contamination of bearing surfaces.

Control Micro Systems specializes in the engineering and manufacture of customized turnkey industrial laser systems, principally for marking, engraving and etching, but also for welding and cutting metallic and non-metallic materials. CMS uses a selection of pulsed or CW/modulated solid-state Nd:YAG & Nd:YVO_4 lasers, as well as CO_2 lasers for these diverse tasks - each laser type and its associated wavelength has advantages for particular applications.

A laser engraving process is often used for marking metal surfaces as it is swift, non contact and extremely durable, but is however 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. CMS had until recently accomplished this using a Nd:YAG laser. However, by switching to the new fibre laser, a 100W CW/modulated fibre laser from SPI Lasers plc of Southampton, UK, they have generated the same high contrast mark on the bearing housing, but with less debris, at reduced raised recast, and at much greater convenience to the end-user - meaning almost no maintenance, increased lifetime and exceptional 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 housing

Advantages of fibre lasers

Many different laser designs have found their way into materials processing applications. Fibre lasers are however revolutionizing 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.

Advantages for industrial manufacturers

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

CMS has opted to introduce fibre lasers as an option for its marking systems as they help minimize the balance that must be ordinarily struck between production quality and production line speed by providing an extended performance envelope - the rapid ROI enjoyed by fibre lasers is a result of the high process yield, near 100% up-time and near-zero maintenance.

The deployment of manufacturing tools equipped with fibre lasers to enhance process control can bring important financial advantages for any manufacturer. Coupled with the small footprint, such tools can also open up processes that were previously out of reach for some manufacturers.

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