

Advances in Metal-Marking Technology

By Kristian Steven Wieber

For much of the history of the personalization industry, the permanent marking of metal was a process set aside for rotary engraving. However, technological advances in equipment and materials have made the process easier and more accessible than before, opening the market to shops that may not have rotary engravers but do own laser engravers and sandcarving systems. Let's take a look at these technologies and the upgrades they have undergone.

WHY MARK METAL?

The first question that any business considering the incorporation of metal marking should ask is: Why? For Bob Henry, Epilog Laser, the answer is simple: "To increase revenue. Traditional award shops can reach new markets by offering metal-marking services."

There is also an aesthetic aspect to consider. Peter Norman, IKONICS Corporation, points out that metal marking in combination with other substrates adds a unique look to the finished piece. "That will add value and help improve the overall gross profit margin for the end product."

He is not the only one who sees aesthetic value in metal marking. Karly Baldi, Horizons ISG, notes, "More engraving shops are using markable metals for high-end applications such as corporate awards, diploma and newspaper reproductions, industrial labels, and wayfinding signage. If a customer's product needs to last, it creates a higher perceived value. Higher perceived value equals higher profit."

As Josh Stephens, Trotec Laser, points out, there is also value in performing as many services as possible for each client. "This process has opened new doors to the awards and engraving



IMAGE COURTESY EPILOG LASER

Thanks to advances in technology, metal-marking systems have become more affordable and accessible.



industry, allowing shops to offer a wider variety of end products to their customers. By having the equipment and knowledge to process multiple materials, shop owners will not have to turn a potential customer away," he says.

That's an opinion Dennis Gilmore of Ferro Corporation agrees with. "The ability for an awards and recognition business to use its CO₂ laser systems beyond the traditional cutting and marking of organic materials is essential to business growth."

HOW IT WORKS

There are several ways to mark metal. In addition to the aforementioned process of rotary engraving, two of the most popular methods are laser engraving and sandcarving.

Norman states, "Each method gives a unique look to the finished product. Sandcarving on metal has become much easier over the years, and modern sandcarving equipment is much cleaner now compared to 10 years ago." Sandcarving is a great option for shops looking to personalize metal for aesthetic purposes and low-volume industrial applications.

For those shops considering high-volume industrial applications, laser engravers offer a less labor-intensive alternative. With a laser engraver, the table can be filled with the items that need to be marked, and once the job is sent from the computer to the laser, the operator can walk away and work on other tasks while the laser goes to work.

In the case of a YAG or fiber laser, the metal does not need to be prepped in any way. However, CO₂ lasers require a metal manufactured specifically for laser marking or a metal-marking agent that must be applied to the substrate before it's lasered.

From Stephens' point of view, fiber lasers are the ideal solution for marking metals, because metals will absorb



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Marking on metal adds an aesthetic value to a product that many customers look for.

the heat from the laser as opposed to reflecting the heat like other lasers, such as CO₂. This thermal process means that users are able to achieve a variety of different marking results including annealing, polishing and etching.

"Annealing is a slow lasering process that heats the surface of metal," says Stephens. "If the metal, such as steel, contains carbon, then a process called carbon migration brings the carbon to the surface of the metal and creates a permanent black mark without material removal."

Etching is a faster process, he adds, as results are engraved into metal, but oxygen in the air will oxidize the mark. The resulting etch will be a brownish color in metals such as steel.

"Laser polishing is achieved with a low power and fast mark, as the laser is just hitting the metal surface to clean or resurface the finish," finishes Stephens.

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a CO₂ laser system, Henry explains that it must first be treated with a metal-marking agent. Operators apply the marking agent to the metal, let it dry, engrave the graphic, text or logo, and then wipe away the excess with a damp cloth. The heat from the laser bonds the marking agent to the metal and the user is left with a permanent mark.

MARKABLE MATERIALS

Now that the process has been explained, it might help to know what materials are needed for the process. Baldi explains, "Horizons Imaging Systems Group (ISG) manufactures two laser-markable metals, AlumaMark and DuraBlack. AlumaMark is specialized aluminum that can be marked with any CO₂ laser."

AlumaMark is not etched or engraved, but it is actually imaged by the heat of the CO₂ laser. The results are photographic-quality images, including halftones, on real aluminum that offer awards shops the opportunity to differentiate themselves from their competition.

"DuraBlack," Baldi continues, "is CO₂ laser-markable aluminum for durable, on-demand marking for harsh operating environments."

Of course, those aren't the only materials for laser marking. "Through the CerMark/Thermark technology, metal marking can achieve high-contrast durable marks on most metal substrates such as stainless steel, brass, copper, aluminum, pewter and titanium," says Gilmore. "These laser marking materials are supplied as liquids, pastes or tape for application by spraying, screening, air-brush or hand painting. The CerMark/Thermark products work by simply applying the product to the metal surface in a thin even coat and marking with a laser system."

EQUIPMENT ADVANCES

As metal-marking technology has advanced, it has done so with improvements on both the equipment and materials side. The ingenuity of shop operators has expanded the tasks performed in metal marking, as well.

"Customers are getting creative with metal marking, combining it with other substrates to create artistic contrast, which adds value to the piece. Speaking from the sandcarving side, the process is faster and easier, especially with the development of

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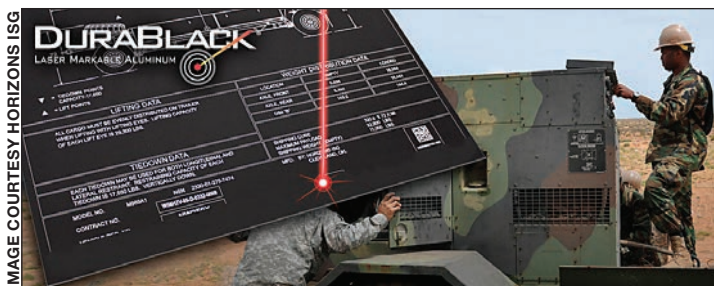
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ADVANCES IN METAL-MARKING TECHNOLOGY



Various products such as DuraBlack give shops the opportunity to differentiate themselves from their competition.

dry process photoresist, which eliminates the water processing and drying step," says Norman.

On the laser side, Henry says, "One of the biggest advancements in metal-marking technology was the advent of fiber laser marking systems. Prior to those systems being used, the most common tool for metal marking was a YAG laser, which can be costly to purchase and maintain. With the addition of smaller, more user-friendly fiber laser metal-marking equipment, metal-marking systems have become more affordable and accessible."

Providing a brief history of laser metal marking, Stephens says, "Since the introduction of YAG lasers in 1970, laser metal marking has evolved tremendously over the past 44 years. The technology to generate the beam has significantly improved, laser lifetimes have improved, and pricing has drastically decreased."

"Metal marking has become easier for a variety of reasons," says Henry. "One of them being that equipment has become more user friendly. Additionally, the process has become faster as fiber laser engraving beds can hold higher quantities of materials, which eliminates an operator having to hand-feed piece after piece."

MATERIAL ADVANCES

Advances in materials have made it much easier for shops to mark metal, as well. In fact, some see the majority of advancements as having come from this side of the process.

Gilmore suggests breaking down the advancements into what each awards business owner can afford. "The development of the CerMark/Thermark technology made it possible for CO₂ laser systems to create marks on metals in an affordable way. Since the conception of metal-marking technology, CerMark/Thermark has continuously improved the performance of the products to better suit the user's applications."



The development of different products has made metal marking more profitable than in the past.

Baldi also sees more advancement on the markable metals side. "There are a variety of laser-markable metals out there that are imaged differently with a laser and used for assorted profitable applications," she points out.

According to Gilmore, the material side of the technology is continuously improving the performance of the products and is a major focus of the formulator. He adds, "A few years ago, CerMark introduced two new colors for metal. The pearl and copper colors are finding a niche in the firearm and knife industries that use the products on black Parkerized metal surfaces. Tool manufacturers who use the black oxide process also use the pearl and copper to acquire a high contrast mark as well as to accent their part markings. Both the pearl and copper can be used on stainless steel, as well."

METAL-MARKING PROFITS

In a variety of ways, metal marking is a profitable process for awards shops, and it should certainly be considered as a means of diversifying services and generating additional profit. It can add aesthetic value to awards, and with its industrial applications, it can keep a laser busy when it might otherwise be sitting.

IMAGE COURTESY FERRO CORPORATION

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