The 'Big Three' in Metal Marking – *Applications for Etching, Polishing and Annealing*

By Mike Dean, vice-president of sales and marketing, Epilog Laser

Today nearly every industry has a need for permanent metal marking. Whether it's marking tools with serial numbers, medical devices with logos or even producing architectural signage that calls for a sleek look on metal surfaces, businesses are in need of metal marking solutions.

The FiberMark system, the latest in Epilog Laser's product line, not only meets that need, but exceeds it by producing a versatile machine that is extremely user-friendly and convenient to operate.

The FiberMark goes beyond the boundaries of traditional metal marking lasers, as it incorporates a large 24-inch by 12-inch marking area, state-of-the art fiber laser technology with flying optics beam delivery to create a system that is economical, easy to use, and advantageous over traditional Nd: YAG galvo based beam delivery systems. The FiberMark is also unique in that it is the only system of its kind to operate directly from almost any Windows-based software such as Word, CorelDRAW, AutoCAD, etc.

The fiber laser is a relatively new class of laser used for marking applications. Essentially it is a fiber optic cable that has been doped with Ytterbium. By pumping the fiber optic cable with light to excite the Ytterbium, the optic cable is able to act both as the laser source and as the delivery system for the laser beam. A fiber laser emits a wavelength between 1055 to 1070 nanometers in the infrared range similar to YAG lasers. Until recently, the fiber laser was only available in a continuous wave mode, not pulsed. This significantly hindered the machine's applications. The high per-pulse energy of the FiberMark and the much smaller wavelength is what makes marking on metal feasible.

"Fiber lasers were first developed in the late 1980s for communication and military applications," explains Mike Dean, director of sales and marketing for Epilog Laser. "Epilog is harnessing that laser technology for commercial and

industrial applications - something the marketplace has been in need of for some time now."

While used for a myriad of purposes, Epilog has found most metal marking is done in three capacities: etching, polishing and annealing. The difference between these styles can be found in the speed, power, frequency and focus settings of the FiberMark.

Etching is often used for industrial purposes – marking tools or parts with serial numbers, logos and bar codes. The etching process of the FiberMark actually removes small amounts of material from the sample. Material is removed to create whatever mark the user desires. Essentially it is a very shallow engraving that produces a high contrast mark in the metal.

Polished metal, or 'mirrored' as it sometimes called, is a laser effect where the laser beam heats the surface of a material and as it cools, the material takes on a different finish than the surround material. Most common on matte-finish metal, this technique creates marks that can look almost holographic. Unlike etching, no material is actually removed from the metal being marked – it is the heat that alters the finish of the metal. Since the polished look emits a sense of sophistication and distinction, it is often used in architectural signage or other applications where a unique or aesthetically pleasing mark is necessary. The mirrored finish produces a tone-on-tone look where the metal has been marked.

The annealing process is similar to the polishing process. The laser is used to heat metal to near melting points, which induces a color change to the top layer of material. Annealing often gives a dark iridescent look, with a faint rainbow of greens, blues and pinks that can sometimes be seen in the text or graphic. Since no material is removed from the metal, this technique is often used for medical devices used within the human body. Annealing leaves no cuts or shallow engravings like those found in marking and etching and typically produces the darkest mark of these three methods.

For nearly 20 years Epilog Laser has been designing and manufacturing CO2 laser systems that can engrave and cut wood, acrylic, plastic, fabric, rubber and many other non-metallic materials. Because of the CO2 laser's wavelength, it is difficult to mark directly on untreated metal. When using a CO2 laser for metal marking, the metal must first be coated with special metal marking material and then lasered. And though permanent marks can be produced using a CO2 laser, many users prefer the ease of direct marking that the FiberMark provides.

"That's where the need for the FiberMark comes in," said Dean. "It allows the laser to mark metals with no additional coatings and therefore increases the potential for product throughput."

Launching in late 2006, Epilog felt it was in an ideal position to combine the proven mechanics of their CO2 laser systems with the fiber laser technology.

"We have always combined advanced linear encoder technology in our CO2 lasers," Dean said. "We realized that we could take the proven technology that we've been using in our product line and add the fiber laser technology to have a perfect blend between the two. Regardless of industry, and now regardless of material, we truly have engraving and marking systems that can benefit most any business in some capacity or another."