

Lasers Improve Sign & Display Fabrication

Lasers offer attractive advantages for cutting acrylic and other plastics used in signage and point-of-purchase displays. Recent advances in technology have rendered laser systems more cost-effective than ever, making them increasingly accessible to even small fabricators. This article reviews the current generation of laser systems and the applications that they service.

Laser Cutting Basics

Most acrylic cutting in the sign industry today is still performed with the mechanical router. Probably the most significant disadvantage of this method is the fact that router cutting produces a rough edge, which must then be subsequently flame polished in order to give it a smooth, transparent appearance. For some applications, additional limitations of the router are its inability to produce sharp corners and render intricate detail.

The laser is a non-contact tool that cuts by essentially melting and vaporizing away material. Typically, plastics cutting is performed using the carbon dioxide (CO₂) laser because its infrared output is strongly absorbed by most organic materials, even those which appear transparent in the visible spectrum.



Laser cutting offers several advantages over the router. First, laser processing can deliver a variety of cut edge finishes, including a smooth, transparent edge which entirely eliminates the time and cost of flame polishing. Next, the focused laser beam produces a very narrow cut width (as small as 0.005 inches), thus enabling the production of very sharp edges and angles, as well as the ability to render very fine features. The laser is also a flexible tool which can perform anything from kiss cutting to through cutting, with very accurate control of cut depth and high repeatability and consistency, without the need to change tools.



Laser cut edges can have a smooth appearance eliminating the need for flame polishing.

Furthermore, laser cutting can be employed on materials over a wide range of thicknesses, from mylar sheets to 1.25 inch acrylic.

Practical Laser Systems

The typical laser system has a cutting bed, ranging in size from 2' x 2' to 6' x 10', onto which the material is placed. The laser beam then travels over its surface, under automated control, to perform the cutting.

Utilizing a laser cutter is usually quite straightforward. For example, all the systems supplied by Kern Electronics & Lasers connect to a computer via a USB cable, and appear as just another printer application. Kern has configured their printer driver to enable simple drawings, produced in applications such as CorelDraw or Adobe Illustrator, to easily yield both simple cuts and complex results. For instance, hairlines in the drawing tell the system to cut; but, nine different cut depths are supported through color coding of the

lines. Engraving of graphics, letters and logos is supported by simple grayscale fills inside shapes. A white fill produces the shallowest result, while black delivers the deepest engraving. Gradient fills enable accurate reproduction of sophisticated and complex graphics.

Recent advances in CO₂ laser technology have been key in reducing the cost and improving the capabilities of these systems. In particular, the development of sealed, slab discharge CO₂ lasers, such as the Diamond series from Coherent, offer better performance and practical characteristics than older laser designs. Specifically, these slab discharge lasers are now much more compact (for a given output power) and more reliable than their predecessors. Furthermore, the high stability and favorable output beam characteristics (piercing power) of slab discharge lasers enable them to cut thicker materials and deliver superior edge quality. All this allows a 400W slab discharge laser to deliver the cutting speed and capability of a much more powerful and therefore more costly laser, thus lowering purchase price and long-term cost of ownership.

Typical Applications

One common signage application is cutting out letters or other shapes from acrylic sheets, typically varying from 1/8 to 1 1/4 inches in thickness. These are then affixed using adhesive to a signboard. The individual cut pieces can vary in size from a fraction of an inch to several feet in dimension.

The appearance of the laser cut edge varies depending upon the cut speed. At lower speeds (typically in the 30 inches/minute range) the laser beam produces an edge that has the same appearance as a flame polished part, while at higher speeds the cut surface looks frosted or milky. Typically, acrylic lettering is produced with a smooth surface. Also, a new trend in this area is to light the sign with LEDs, which requires good control over edge quality for proper results.

Another popular sign making technique benefits from the laser's ability to remove thin layers of material with high precision. Here, the laser is used to cut a shape from a piece of acrylic that is already painted on one side. Then the laser etches only the paint from the rear surface in the areas in which characters and graphics are to appear. Next the back surface is painted with a contrasting color to make the etched areas highly visible.



Laser processing makes engraving of complex patterns simple.

The laser also excels at engraving complex, 3D patterns. Again, these are supplied as a grayscale coded graphic to the system. In this case, the laser raster scans across the part to produce the engraved pattern, and then cuts the outside shape of the piece using vector scanning. Typically, the engraving is done at a speed that produces a lightly frosted appearance.

The same laser system that cuts 1-inch thick acrylic sheets can also be used to cut very thin mylar for stencils. These are then used for sign painting.

In conclusion, laser systems enable even relatively small sign making operations to access a range of sophisticated processing capabilities. They can reduce product turnaround time, deliver greater added value to customers, and hence increase profitability for sign manufacturers.

Written by Derek Kern, VP of Sales & Marketing, Kern Electronics & Lasers, and Andrew Held, Ph.D., Product Marketing Manager, CO2 Lasers, Coherent. Kern Lasers has been a leading manufacturer of state-of-the-art laser cutting and engraving systems since 1982. All Kern laser systems are designed to handle a demanding production schedule.