

The Speed and Precision of Laser Etching Vs. Mechanical Engraving



INTRODUCTION

There are many factors to consider when choosing a method of marking, etching, or engraving. Chief among these are the material to be engraved, the required precision of the marking, production speed, and the shape of the object part and the mark upon it. In general, laser is faster, more precise, and lets you create a wider variety of indelible marks and automated codes than any other method.

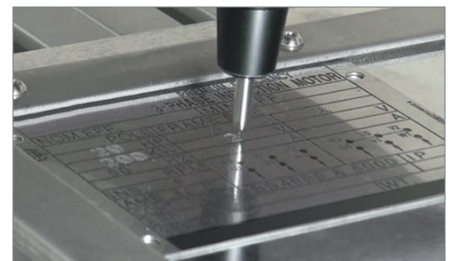
How Each Method Works

Laser Marking

In laser engraving a laser beam is focused to a point usually just below the surface of the metal to be engraved or etched, vaporizing the metal and causing a mark. Depending on how much of the surface is to be marked, the spindle may then rotate so that more of the object's surface is exposed to the laser beam. The depth of the mark is highly controllable and varies with the power of the laser. The width and the position of the mark can also be finely tuned, based on the direction and focus of the laser beam.

Mechanical Etching

Alternatives to laser rotary engraving that involve mechanical contact include diamond drag cutting, stamping, and dot peening. Diamond drag and stamping are, respectively, the cutting of a mark with a diamond-edged tool or the stamping of a mark with a die. Dot peening is like tattooing, where a hand-held oscillating stylus repeatedly strikes the object's surface so that a mark is etched in whatever pattern the operator's hand designs.



Methods

From the top: Laser Marking, Mechanical Engraving

Comparing Laser Etching to Mechanical Engraving

Key criteria for comparing these two methods include:

Type of material to be engraved. While you can find a mechanical engraving method that can engrave almost anything, lasers are somewhat more limited as to types of materials. Not all plastics are “laserable” — some plastics are better suited for YAG or CO₂ wavelengths. Some types of granite, for example, are also less suited for YAG laser engraving and more dependent on specific laser wavelengths as there is probability for irregular densities. On the other hand, because lasers are more controllable — for example, in their power output — it also makes them more suitable for delicate material that would be destroyed if it were stamped or cut too deeply or too aggressively.

Type of marking. Lasers produce marks with consistently clean vertical edges, while diamond drag engraving can produce both vertical-edged marks like the laser and also the V-shaped grooves that many people desire in decorative engraving. An advantage of lasers, however, is that the depth of marks can be more varied and more controlled. That means that thinner metals can be engraved so there’s no unwanted embossed look (raised surface) on the reverse side of the engraving — which can happen with stamping.

Precision. Since lasers cut with light — which can be aimed with extreme accuracy at a target — they can be much more precise than mechanical cutting, stamping or dot peening. Laser engraving would be excellent, for example, for etching the markings on a medical tube, the tuning dial of a laboratory instrument, or a barcode.

Automation. Lasers are extremely programmable, which means that set up is fast, operation is virtually hands-free (for faster throughput) and results are highly repeatable compared to mechanical methods. And because lasers are highly programmable they are also the method of choice when it comes to engraving marks, such as sequential serial numbers and bar codes.

LASER ETCHING ADVANTAGES
- More precise, tighter tolerances
- More delicate materials can be engraved
- More control over marking depth
- Easier to automate
- Much greater variety of markings (e.g., decorative fonts)
- More repeatable results
- More flexible—less set-up time and cost

MECHANICAL CONTACT ADVANTAGES
- Wider range of materials can be engraved
- Nice V-shaped cut (diamond drag)

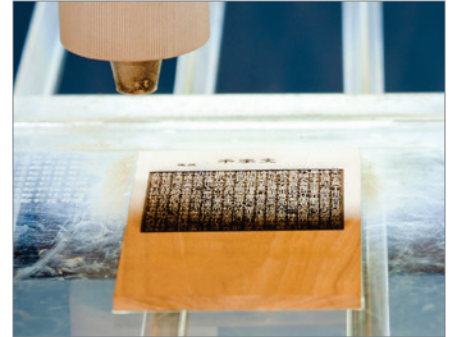
Complex markings. Decorative fonts, serif fonts, photographs, logos, and artwork are just some of the categories a laser can engrave, which would be much more difficult, more expensive, or just outright impossible with diamond drag cutting, stamping, or dot peening. Lasers are also better suited to markings that change, such as when different customers' logos are to be etched onto a part during a production run — as there may be no additional set-up to do if the only element that is changing is the pattern.

Round Tubes and Objects. When the object you wish to engrave has a rounded surface, the method of choice is laser rotary etching, especially if you wish to mark the object on more than one side. It is far easier to rotate the object on a spindle on a laser device than it is to rotate the engraving equipment around the object when machine engraving.

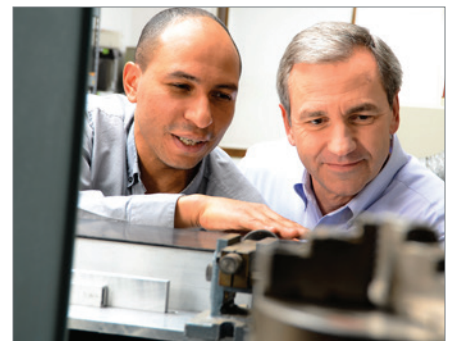
Cost. Laser engraving is typically less expensive for industrial applications — again, largely due to its flexibility and programmability. That is particularly true in the case of stamping, where changing engraving patterns requires making a whole new die, which is expensive and takes time.

CONCLUSION

The best way to compare laser rotary engraving to more traditional types of engraving is on the basis of your own product and production requirements. Are you looking for high precision and fast production throughput? Does your application require that markings update with each unit engraved or that engraving patterns change frequently? Are you looking to etch in a photograph or a decorative piece of art? What about special fonts? If you have needs like these then you should probably consider laser rotary engraving. The best way to know for sure is by discussing your application with a laser rotary engraving expert first, before you commit to a process.



Complex Markings



Next Steps:

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