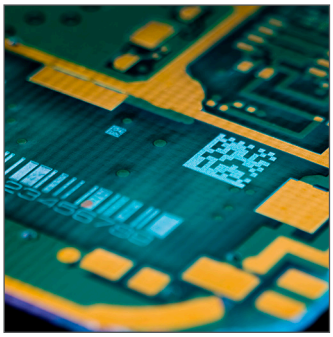
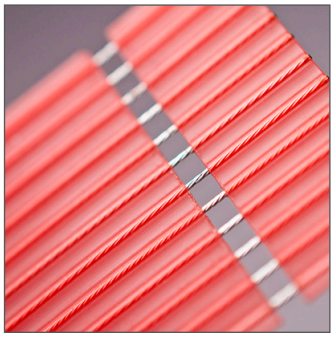
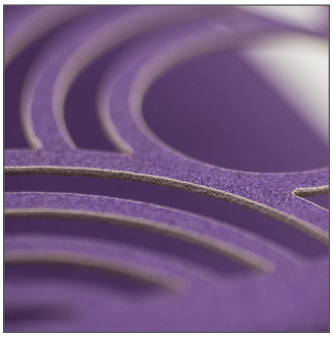
Why Use Lasers For Manufacturing?

Lasers are a unique manufacturing tool, offering advantages that other processes simply cannot match. Industrial CO_2 lasers have been used in a huge variety of applications for the past 30 years, but the mystery remains: what benefits does this equipment offer? What limitations will I be faced with? And most importantly: how do I know if laser processing is the right choice for my needs?

What benefit does laser equipment offer?

Over the last decade, laser marking and coding has expanded into all industries looking to make similar features not only because of their performance, but also for its added benefit. Key advantages include:

- **Unique Processes:** because of the physics governing laser/material interactions, lasers can offer unique effects and applications. This includes innovative new part designs that integrate fine features other equipment cannot provide or entirely new processes like additive manufacturing. Because laser processing is non-contact, lasers can also work with extremely delicate materials or materials that need to remain sterile.
- **Multiple Processes:** a single laser is capable of performing multiple application processes on a material, including: cutting, marking, drilling, engraving, scoring, perforating, and more through a combination of laser settings and beam delivery. The option to have a single piece of equipment perform multiple steps in a manufacturing process provides cost-savings and saves valuable floor space in manufacturing environments.
- **Digital Processing:** lasers and their beam delivery equipment are software-controlled, allowing designs to be created or updated on-the-fly. This makes changeovers quick and painless, and even allows each manufactured part to be entirely unique if desired.
- **Highly Reliable:** CO_2 lasers are designed to be rugged industrial pieces of equipment, many run 5+ years without requiring service. This reliability and the lack of consumables or replacement mechanical parts means downtimes will kept to a minimum.
- **Late-Stage Alterations:** lasers can be combined with other equipment to provide customization late in the manufacturing process, providing greater efficiency and cost-savings. For example, many automotive manufacturers produce bumpers that fit on multiple car models. Lasers are used to cut holes for mounting sensors in the mass-produced bumpers, allowing them to be unique to each car model.

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- **Fast Learning Curve:** the digital nature of laser processing allows a fast learning curve: laser settings and design files can be saved as a baseline for future projects or materials. Application Engineers are also available to test new materials and provide process settings. For initial installation of laser equipment, laser systems (combined laser and scan head assemblies) can be used to minimize integration design work and allow users to be operating within minutes.
- **Reduced Operating Costs:** the above benefits combine to provide cost-savings over the laser's lifetime. Especially key are the digital nature of the process, the ability to accomplish multiple processes with a single piece of equipment, and minimized downtime associated with change-overs and repairs. This allows cost-effective manufacturing, including: prototyping, short runs, and even unique individual parts.
- **Added Flexibility and Improved Efficiency:** CO_2 lasers are proven performers for a wide variety of industrial applications, replacing legacy technology with digital precision and control. Users of CO_2 laser processing systems stay ahead of their competition by offering their customers more flexibility with greater efficiency to keep pace with ever-changing market trends.

What tradeoffs are there?

- **Safety:** like any piece of industrial manufacturing equipment, proper care is required for safe operation. This can include: emergency stop circuitry, electrical interlocks, safety enclosure around the processing area, fume extraction, and proper signage. With the proper training and safety measures, lasers are no more of a safety risk than traditional mechanical equipment.
- **Laser Wavelength:** materials absorb different laser wavelengths to varying degrees. By pairing the target material with a laser wavelength that it absorbs efficiently, the process result will have higher quality and better throughput. Work with an Applications Engineer to determine the correct wavelength for your processing needs.
- **Laser Power:** the average power and peak power of a laser can impact process speed, the thickness of material that can be processed, and resulting edge quality. Typically lasers with higher average power can process materials more quickly. Again it is best to work with an Applications Engineer to ensure your process requirements are met.
- **Beam Delivery:** there are a variety of ways to deliver the laser beam to the target material, including galvanometer scan heads, XY-gantries, and fixed-focus setups. The choice of beam delivery can impact processing speed, size of the processing area, and the achievable level of detail or quality.
- **Auxiliary Equipment:** all lasers require a few pieces of additional equipment for proper operation, including: power supplies, fume extraction, beam delivery, and cooling (this could be either water cooling, which would require a chiller, or air cooling, requiring fans). Processes may also benefit from added options like gas-assist.
- **Environment:** care must be taken to protect optics on the laser and beam delivery system. This means that hot, high-humidity environments (which may cause condensation to form on optics) or dusty environments (causing contamination on the optics) can lead to optics failure. Enclosing optic trains from dust ingress and preventing condensation formation will ensure long lifetimes for optics and lasers alike.

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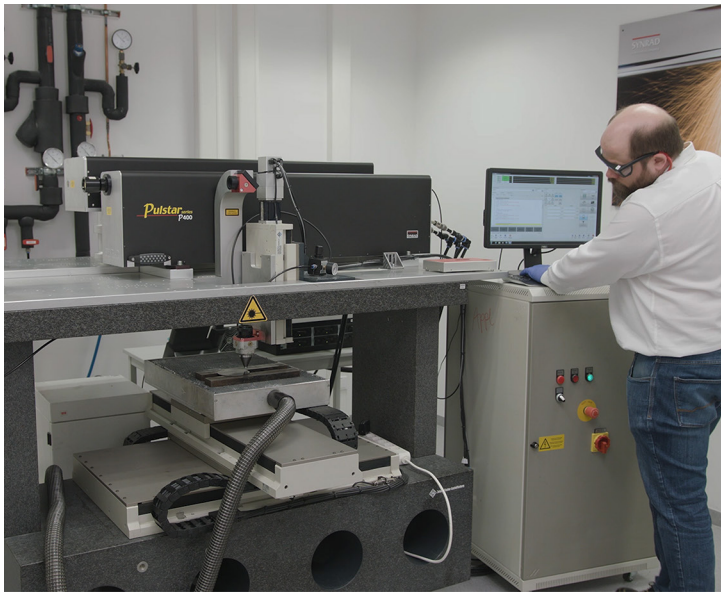
What tradeoffs are there?

Lasers offer many benefits that other manufacturing methods cannot match. Laser processing should be considered if:



- Your process either cannot be achieved by other manufacturing methods or those solutions are not as cost-effective as laser processing. This could include late-stage alterations to standard parts, prototyping, short runs, and more.
- You require a high level of flexibility in your manufacturing, which could include multiple application processes (cutting, marking, scoring, etc.) for job-to-job flexibility or even producing unique individual parts.
- You require fast time from design to market.
- You are interested in migrating to a digital process or including Industry 4.0 in your manufacturing.
- Your customers are demanding higher levels of customization, no minimum order quantity, or faster turnaround times on their jobs.

Still have questions? Our Application Engineers have answers. They are available for consultation on new projects or materials and can also provide free applications testing on your specific materials.

Interested in speaking to one of our knowledgable representatives?

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