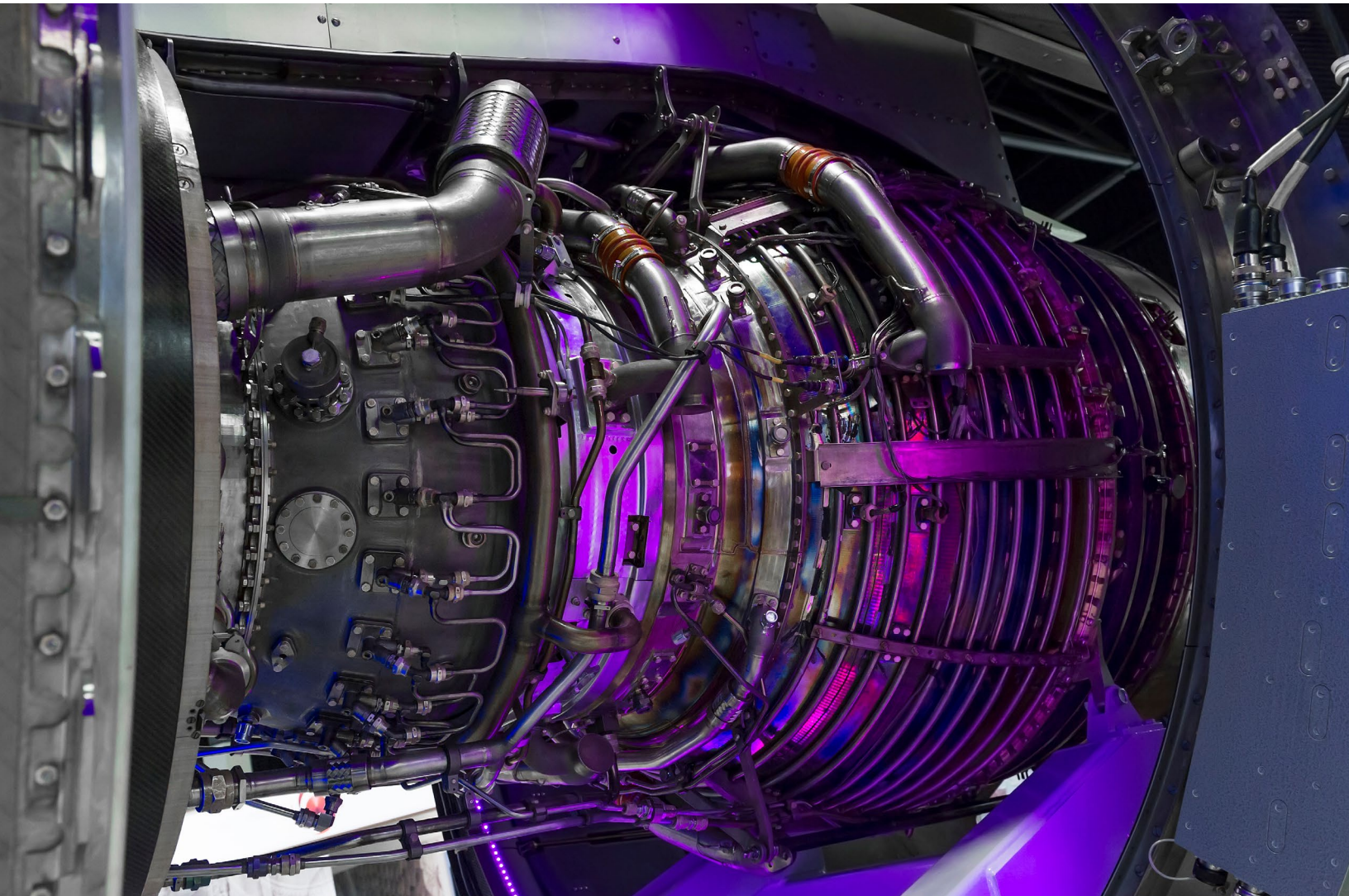
Laser Marking/Engraving for Aerospace Applications:

Benefits, Challenges, & Solutions

HAI TECH LASERS, INC.

Laser marking is a versatile and efficient technique that uses a high-powered beam of light to add information or graphics to a component's surface quickly and cost-effectively. Laser marking machinery can handle multiple marking procedures, such as laser engraving, etching, or annealing. Unlike temporary marking methods, lasers create heat- and abrasion-resistant markings that can withstand harsh working conditions. This advantage has made laser marking a popular choice for aerospace components.

The aerospace sector utilizes the technique to label parts with information such as bar codes, part and lot numbers, and serial codes, ensuring components are traceable throughout their working lives for easy identification. With over 30 years of experience in laser marking services and machinery solutions, Hai Tech Lasers, Inc. can pass on the benefits of laser marking to our aerospace customers to provide precise, clear markings on a wide array of materials and critical components.



Benefits of Laser Marking

Aerospace manufacturers must comply with strict traceability requirements. In such a high-stakes industry, clear, lasting markings are not only convenient but essential for safety. If a batch of components is defective, users must immediately remove them from service to protect against catastrophic equipment failure. Laser-marked serial numbers facilitate this process by ensuring components are fully traceable throughout the supply chain. These marks have excellent resolution, high contrast, and reliable repeatability and permanence, so both machines and humans can easily read them now and in the future.

Key benefits of laser marking include:

Versatility

Unlike other marking methods, laser marking can handle components in a wide range of sizes, shapes, and compositions, including hard or coated metals, and radial or conical shapes. Additionally, laser marking can achieve customizable marks ranging from high-resolution logos and branding information to clear product numbers and machine-readable codes.

High-Quality Results

Laser marking is less prone to error than chemical etching and can achieve higher resolution than dot peen marking. Lasers create high-contrast marks with no spreading, blurring, or surface damage.

Cost-effectiveness

In the long term, laser marking offers cost savings compared to processes like chemical etching, which require the use of expensive consumable resources.

Environmental Friendliness

Unlike chemical etching, laser marking does not require potentially hazardous chemicals, so there is no harmful waste to dispose of after marking. All that laser marking requires is a modest input of energy.

Durable Markings

Laser marking creates permanent markings that are less susceptible to damage than chemical etching. These markings remain clear even when exposed to extreme temperatures, frequent wear, and corrosive chemicals.

Efficiency

Computer-guided lasers can create marks at a rate of several characters per second, so laser marking can process even high-volume runs quickly. The software itself is robust, yet still dependable and simple for operators to interact with and learn its applications.

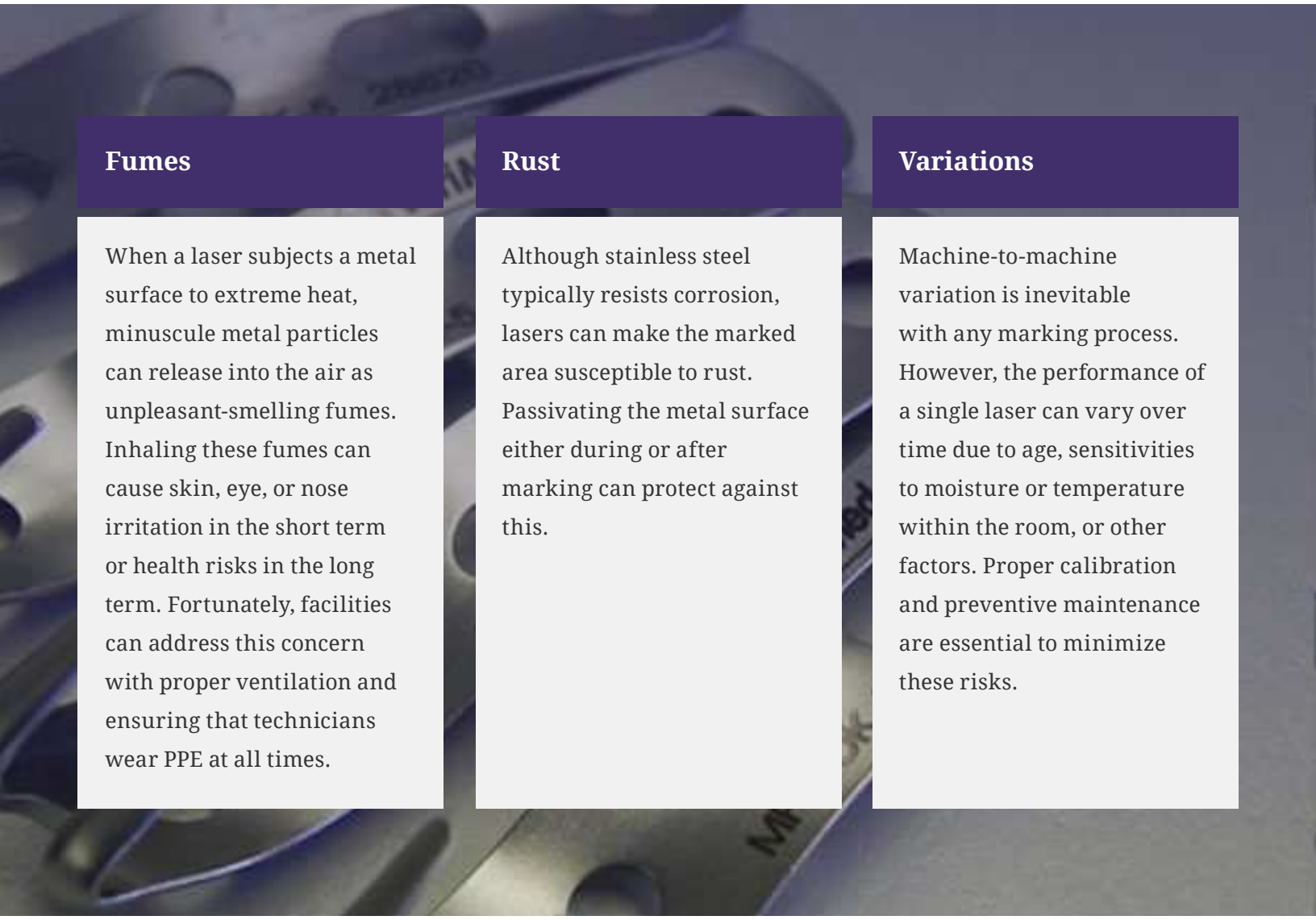
Repeatability

Computer guidance ensures that laser marks are highly repeatable with negligible error rates. This ensures that laser-marked components exhibit excellent uniformity, offering more control than other forms of marking.

Whatever the specific application, laser marking can create the crisp, reliable marks that the aerospace industry demands.

Challenges of Laser Marking

Laser marking is not without its challenges. Manufacturers performing the process must account for certain factors:



Fumes

When a laser subjects a metal surface to extreme heat, minuscule metal particles can release into the air as unpleasant-smelling fumes. Inhaling these fumes can cause skin, eye, or nose irritation in the short term or health risks in the long term. Fortunately, facilities can address this concern with proper ventilation and ensuring that technicians wear PPE at all times.

Rust

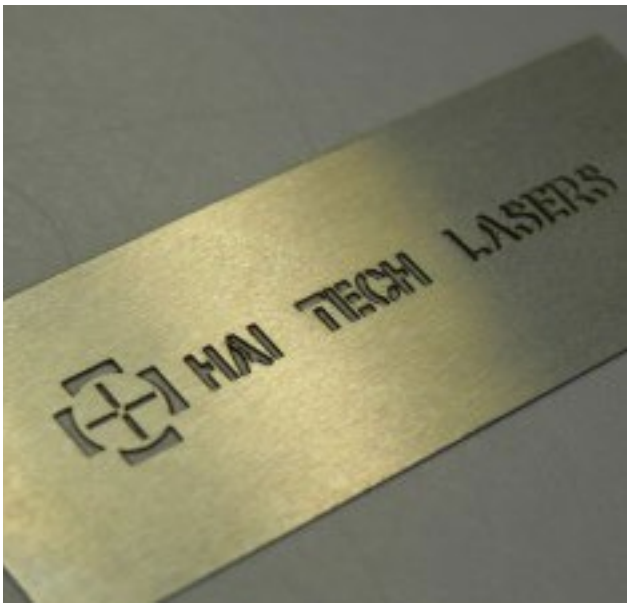
Although stainless steel typically resists corrosion, lasers can make the marked area susceptible to rust. Passivating the metal surface either during or after marking can protect against this.

Variations

Machine-to-machine variation is inevitable with any marking process. However, the performance of a single laser can vary over time due to age, sensitivities to moisture or temperature within the room, or other factors. Proper calibration and preventive maintenance are essential to minimize these risks.

Clients seeking high-quality laser marks will get the best results by working with a reputable provider. However, there are some considerations that clients should keep in mind to prevent common missteps. The most important consideration is the material. While laser marking can accommodate most materials, not all marking processes are ideal for all metals. Rough surfaces may be particularly challenging to mark since they lack a uniform surface. Some surface coatings can also introduce variability into the marking process. Consult with your provider early in the design phase to ensure that you choose the right process for your material. This also helps in avoiding later buffing in an attempt to alter or replace previous markings, which can cause irreparable harm to the metal's surface.

Applications of Aerospace Laser Marking

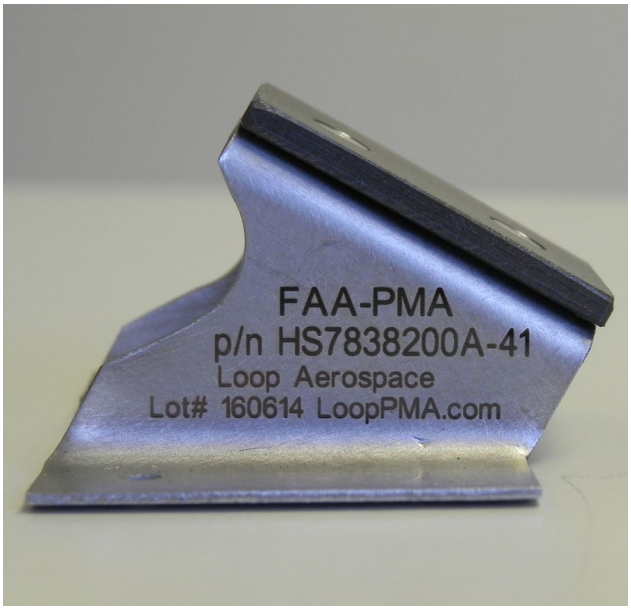


Laser marking is the ideal solution for a large portion of aerospace marking tasks. Lasers can apply:

- Serial numbers, lot numbers, and other identifying information
- Service marks
- Branding logos and graphics
- Safety ratings, warnings, and symbols
- Surface profiling and conditioning
- Labels and details for panels, switches, and controls
- Barcodes and QR codes

Due to strict industry requirements, the aerospace sector must apply these markings to a full range of aerospace components, including:

- Turbine blades, rings, and discs
- Bolts, screws, nuts, washers, and other fasteners
- Thermal and energy components (including pumps, actuators, combustors, generators, jet engines, igniters, spark plugs, and thermal exchange systems)
- Brake discs, thrust reversers, and landing gear components
- Nozzles, vanes, and turbine shafts
- Transmission gear and gear assemblies
- Control panel switches or lit buttons
- Glass parts like solar panels



Flat, round, or curved in shape, laser markers can apply crisp markings to all of these components and more. Additionally, lasers can cleanly mark almost any material with no surface damage, ranging from hard, treated metals to ceramic, plastic, or glass.

How Hai Tech Lasers Serves Aerospace Clients

Aerospace clients face some of the most rigorous industry regulations to ensure that every component is identifiable long after its production. While many marking processes are available to comply with these standards, laser marking offers unparalleled quality, versatility, and durability. Hai Tech Lasers leverages this technique to provide full-service laser marking and engraving for clients with stringent specifications.

When you work with Hai Tech for your labeling project, you can expect markings of superior resolution and longevity on components of varying shapes, sizes, and material compositions. Our flexible, automated processing ensures high-speed production with repeatable results, even for the most complex of designs. Also, Hai Tech's procedures are safe, meaning that our marking processes will not damage your component. We are committed to offering these services at a low cost and with minimal lead times so that our clients can benefit from clean, high-contrast markings on components for critical applications.

We draw on a variety of cutting-edge laser marking services to ensure our capabilities are tailored to each client's unique specifications. For more information on how our laser marking services benefit aerospace clients, contact us today or request a quote to begin your project.

About Hai Tech Lasers

For over 30 years, Hai Tech Lasers, Inc. has specialized in precision industrial laser marking and laser engraving. We have supplied laser marking and engraving systems to many companies, including Honeywell, Parker Hannifan, and Dow Corning, among others. We have also used our expertise to establish our own laser marking and engraving job shop. Hai Tech Lasers, Inc. has worldwide distribution. We service the Aerospace, Medical and Automotive industries, having customers in North America, South America and Europe.

Our headquarters are located in Santa Clarita, California, bordering northwest Los Angeles. Call us so that we may help with your laser marking and engraving system needs.

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