

WHAT ARE THE ADVANTAGES OF FIBER LASER CUTTING MACHINE COMPARED TO CO2 LASER CUTTING MACHINE

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Fiber laser cutting technology has only appeared in the past 3 to 5 years. While many companies are just beginning to understand the technology, they are also beginning to appreciate the differences between fiber laser cutting and more common [CO2 laser cutting](#). With the continuous improvement of cutting technology, fiber laser cutting has become one of the most advanced technologies in this industry.

Thermal cutting methods mainly include flame, plasma and laser cutting technologies, among which laser cutting can achieve the best cutting quality, especially for fine features and hole cutting with diameter and thickness ratio less than 1:1. As a result, laser cutting technology is the most suitable method in the industry for demanding and precise cutting.

In the category of laser cutting, fiber laser cutting has gained a lot of attention because it not only provides the speed and cutting quality that carbon dioxide laser cutting can achieve, but also significantly reduces maintenance and operation costs. So this makes fiber laser cutting promising, and many experts believe it will soon replace other laser cutting systems.

Key Advantages of Fiber Cleaving

In carbon dioxide laser cutting technology, carbon dioxide gas is the medium for generating laser beams. However, fiber lasers work via diodes and fiber optic cables. Fiber laser systems use multiple diode pumps to generate a laser beam, which is then delivered to the laser cutting head via a flexible fiber optic cable, rather than mirrors to deliver the beam. This has many advantages, starting with the cutting table size. Unlike gas laser technology, where mirrors must be set within a certain distance, fiber laser technology has no range limitation. And it is even possible to install the fiber laser next to the plasma cutting head of the plasma cutting table, which is not an option for CO2 laser cutting technology. Also, the ability to bend the fiber makes the system more compact when compared to an equivalent power gas cutting system.

Perhaps the most important and meaningful advantage of fiber cleaving technology is its energy efficiency. With the complete solid-state digital module and single design of fiber laser, the fiber laser cutting system has a higher electro-optical conversion efficiency than carbon dioxide laser cutting. For each power unit of a CO2 cutting system, the actual typical utilization is about 8% to 10%. For fiber laser cutting systems, users can expect higher power efficiency, on the order of 25% to 30%.

In other words, the overall energy consumption of the optical fiber cutting system is about 3 to 5 times less than that of the carbon dioxide cutting system, so that the energy efficiency is increased

to more than 86%.

The fiber laser has a short wavelength, which increases the absorption of the cutting material to the beam and enables the cutting of materials such as brass and copper as well as non-conductive materials. A more focused beam produces a smaller focal spot and a deeper depth of focus, so fiber lasers can cut thinner materials quickly and cut medium-thick materials more efficiently. When cutting materials up to 6mm thick, the cutting speed of a 1.5kW fiber laser cutting system is equivalent to that of a 3kW carbon dioxide laser cutting system. Because the operating costs of fiber cleaving are lower than the cost of common CO₂ cleaving systems, this translates into increased output and lower business costs.

There is also the problem of maintenance. CO₂ gas laser systems require regular maintenance; mirrors require maintenance and alignment, and resonators require regular maintenance. Fiber laser cutting solutions, on the other hand, require hardly any maintenance. The carbon dioxide laser cutting system needs carbon dioxide as the laser gas. Due to the purity of the carbon dioxide gas, the resonant cavity will be polluted and needs to be cleaned regularly. For a multi-kilowatt CO₂ system, this cost at least \$20,000 per year. Additionally, many CO₂ cuts require high-speed axial turbines to deliver the laser gas, and the turbines require maintenance and refurbishment. Finally, fiber cleaving solutions are more compact and have a lower earth impact than CO₂ cleaving systems, so less cooling is required and energy consumption is significantly lower.

The combination of less maintenance and higher energy efficiency makes fiber laser cutting emit less carbon dioxide and is more environmentally friendly than carbon dioxide laser cutting systems.

Precautions for Fiber Laser Cutting

Some important things to consider when using fiber laser cutting. The first is eye protection. The wavelengths of light emitted by fiber laser systems are harmful to the eyes, so eye protection must be taken. Since the technology has been around for less than 5 years, comprehensive training on proper system operation and safety is highly recommended. Many operators do not have cutting experience with fiber laser cutting, so this lack of experience should be made up for with good initial training in operating a fiber cutting system.

Another item to be aware of is the material to be cut. While fiber laser cutting is good at cutting most materials, it cannot be used to cut acrylic or polycarbonate materials, and it can only cut wood or

fiber materials in limited applications. Also, the thickness of the material to be cut is an important factor in determining when to use fiber laser cutting. Thicker materials require more power to cut, and laser cutting may not be an option in these cases. This is a good time to take advantage of the ability to mount a fiber laser next to the plasma cutting head. Operators can use fiber laser to cut thinner materials requiring tight tolerances before switching quickly and easily to plasma cutting. It is even possible to cut the same part using 2 different cutting methods. For example, an operator may choose to use plasma to cut the exterior of a part, then use fiber laser to cut the interior shape.

Finally, it is best to factor in the components needed to evaluate a comprehensive laser cutting setup and how each part will be sourced. A system equipped with a laser power supply, gas console, laser cutting head as well as a height controller, numerical control (CNC) and cutting control program will realize the valuable benefits of an all-in-one solution. With comprehensive solutions, the process of purchasing and integrating a fiber laser system becomes less complicated. Consider screening out cutting parameters that have been determined in advance, optimizing the system for cutting so that cutting begins as soon as the power is turned on.

Conclusion

In short, compared with ordinary carbon dioxide laser cutting systems, fiber laser cutting systems have many unique advantages, such as high energy efficiency, low maintenance costs, and more convenient solutions—but they are not suitable for all cutting forms. Before choosing a comprehensive laser cutting solution, it is important to consider safety issues as well as training issues, the type and thickness of common cutting materials, and the required cut quality.