HARNESSING LASER POWER:

The Crucial Role of Laser Power in Laser Cutting and Engraving Applications for Business

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Laser technology has emerged as a transformative force across industries, providing businesses with precise and efficient solutions for cutting and engraving applications. In these processes, laser power stands as a fundamental factor that significantly influences the outcome of cutting and engraving operations. This article delves into the intricate relationship between laser power and its impact on the efficacy and precision of laser cutting and engraving applications for businesses.

Understanding Laser Power:

Laser power denotes the energy delivered by a laser beam within a specific timeframe and is commonly quantified in watts (W) or kilowatts (kW). Laser cutting and engraving systems encompass a broad spectrum of power ranges, spanning from a few watts to multiple kilowatts. The power output dictates the intensity of the laser beam, thereby directly affecting the speed, depth, accuracy, and versatility of the cutting and engraving processes.

Cutting Applications:

Laser cutting has garnered widespread recognition across industries due to its ability to yield immaculate and precise cuts in an array of materials, including wood, plastics, fabrics, and more. In this context, laser power assumes a paramount role in achieving optimal results for various material thicknesses and compositions. Higher laser power facilitates faster cutting speeds, rendering it indispensable for large-scale industrial production.

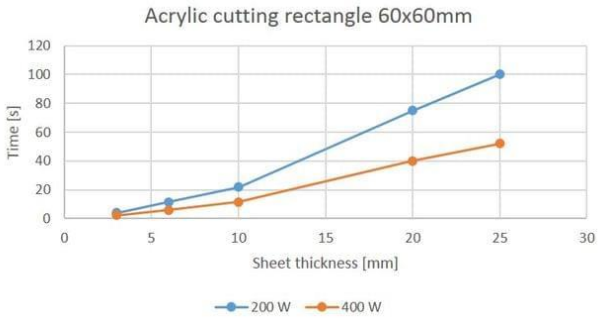

Figure 1 Higher laser power delivers time saving when cutting thicker acrylic sheets. The thicker the material, the greater the saving.

Thicker and denser materials necessitate higher laser power to effectively penetrate the surface. The power density of the laser beam interacts with the material, causing it to melt or vaporise, thereby enabling a clean and precise cut. Laser power also governs the cutting quality, as inadequate power settings may yield incomplete cuts or unsatisfactory surface finishes.

However, when dealing with finer materials such as paper, certain textiles and thin plastics, achieving optimal results requires striking a delicate balance between power and speed to prevent burning. Excessive power can char the material and reduce the level of engraving detail. Therefore, it becomes imperative to utilise high-quality laser equipment where the stability and control over laser power are finely tuned. This ensures that the laser power settings can be precisely adjusted to maintain the necessary parameters for achieving pristine cuts without compromising the integrity of the material.

While higher laser power can achieve greater speeds, this along with cutting quality, is also dependent on the motion system in use by the laser machine. For example, if you want to cut with high levels of detail at fast speeds, you should find out whether the motion system is capable of delivering these results without compromising on either speed or quality. A series of tests can be conducted during a laser demonstration to prove the speed vs quality results on various materials and designs.

Engraving Applications:

Laser engraving, conversely, revolves around the process of etching designs, patterns, or text onto surfaces. The depth and speed at which the laser removes material during engraving are influenced by laser power. Higher-power lasers can expedite material removal, thereby reducing engraving time. This is particularly advantageous for businesses engaged in high-volume production with stringent deadlines, and to improve production efficiency.

Laser power influences the level of intricacy and detail attainable in the engraving process. As with cutting delicate materials, fine lines and intricate designs often necessitate lower power settings to ensure precise etching without compromising the structural integrity of the material.

Figure 2 Anodised aluminium data plate (100 x 60mm) 49 pieces on a 726 x 432mm work area. An 80W laser will finish the engraving job approximately 2.5 times faster than the same laser system using a 30W source.

Laser Power	30 Watts	80 Watts
Progress	39% finished	100% finished
Time per unit	45 seconds	45 seconds

However, it is important to bear in mind that each laser tube has a window for optimal operation and therefore a point of diminishing returns is reached once you go beyond these ideal parameters. For example, if you want to engrave a delicate material which requires a low power setting of 10W, you will see far better results using a 30W laser source than you would with a 400W laser source.

Figure 3 Adjusting power settings will achieve different cutting and engraving results. This example shows a piece of card which has been cut and engraved with varying degrees of intensity and detail.

Starting with the right specification of laser source, the ability to control laser power enables businesses to create bespoke and intricate designs, positioning laser engraving as an ideal

choice for personalisation and branding purposes.

Material Considerations:

Different materials respond diversely to laser power. While certain materials require more power for effective cutting or engraving, others possess greater sensitivity and necessitate lower power to mitigate excessive heat damage. Calibrating laser power settings with meticulous precision is vital to achieve optimal results and prevent material degradation.

The Influence of Laser Source Technology:

The type of laser tube installed in a laser cutting and engraving system can significantly impact the control of laser power. Glass, ceramic, and metal laser tubes are common options with distinct characteristics. Ceramic laser tubes are widely regarded for their exceptional stability and precise control over power settings. They allow for finer adjustments of laser power, providing operators with greater flexibility to optimise cutting and engraving results.

On the other hand, glass laser tubes, often found in low- to mid-range laser systems, may offer adjustable power settings, but they generally provide less precise control compared to ceramic tubes.

An often overlooked factor for laser source effectiveness is beam quality. Ceramic and metal lasers have a far superior beam quality compared to glass-tube lasers. You can liken this to comparing a 30W halogen bulb with a 30W LED bulb. Although both lasers have the same peak-rated power, the outcome and processing time can vary greatly depending on the application.

The choice between ceramic, glass, or metal laser tubes should be based on the specific requirements of the application, taking into consideration factors such as power needs, control capabilities, stability, and overall system performance.

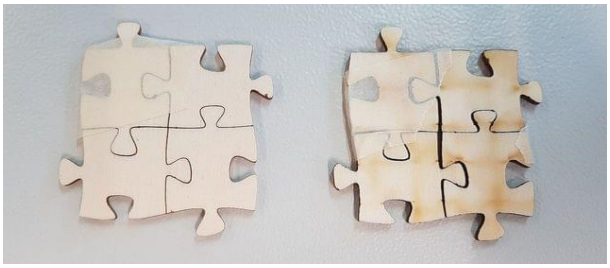

Figure 4 A high beam quality provides more desirable results with less kerf. On the left, a jigsaw has been cut with an RF laser (higher beam quality typical of ceramic and metal tubes), on the right a DC laser beam (typically a glass tube) has been used.

Laser power settings, along with other parameters are easily managed and controlled when using an advanced laser system with a software programme such as Trotec's Ruby®. Operators can quickly and easily adjust settings for the laser to achieve optimum results depending on the job and material being processed.

Figure 5 Some laser manufacturers have demo showrooms where it's possible to test different laser systems and technology to find the right business solution. Trotec has six showrooms across the UK and Ireland.

Striking the Balance

When purchasing a laser cutting and engraving system, businesses should find a laser supplier who can demonstrate the various results that can be achieved through the adjustment of settings across a range of laser technologies. As well as laser power and speed, other factors can also

influence the result. For example; the type of motor used to run the laser head (i.e. servo or stepper) can affect detail as well as speed, while good extraction will reduce flaming or charring and can also minimise cleaning of the material after processing. Some laser manufacturers have showrooms with a range of laser systems available for demonstration.

It can also be helpful for businesses to choose a laser supplier which has a direct presence in the same country. This makes it easy to access knowledge and advice and gives peace of mind that technical service and support are readily available directly from the manufacturer.

Found this interesting?

Click here to watch our video 'Why is the laser power crucial?'

https://www.troteclaser.com/en-gb/learn-support/faqs/optimal-laser-power

Conclusion:

Laser power assumes a pivotal role in laser cutting and engraving applications, exerting a direct influence on the quality, efficiency, and versatility of these processes. Prudent selection of the appropriate laser power for specific materials and applications is critical for businesses to achieve optimal outcomes.

Higher laser power facilitates faster cutting speeds and deeper engraving, making it indispensable for large-scale industrial production. Conversely, lower power settings enable the realisation of intricate designs and customisation as well as the processing of thin or fragile materials. By learning the relationship between laser power and different materials, businesses can unleash the full potential of laser technology, thereby striking the right balance of precision, quality and speed to meet their specific production goals.

For more technical advice, hints and tips, or to book a laser demonstration, visit www.troteclaser.com.