



Laser Cutting Technique

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ABSTRACT

LASER (Light Amplification by Stimulated Emission of Radiation) cutting is a cutting, drilling, micro machining, welding, sintering, and heat treatment technology that has been created. It is an innovative thermal energy-based technology for cutting complex profile materials with a high degree of precision and accuracy. Cutting settings have a substantial impact on work quality. The goal of this research is to determine the relationship between CO2 laser cutting parameters like laser power and cutting power. The laser beam has a diameter of 0.2mm and a power of 1-10 kW. Different gases are utilised in conjunction with cutting depending on the application. The kerf breadth and roughness of the cut surface are reduced as the frequency and cutting speed are increased.

KEYWORDS: Surface roughness, process parameter, kerf width, CO2, Heat impacted zone, laser cutting

1. INTRODUCTION

Laser is shortened as "Light Amplification by Stimulated Emission of Radiation." The laser is light emanation clear radiation. This suggests it originates from a source (called a Resonator) that produces (communicates) radiation (light or even in the indistinct scope) of in-sync surges of undefined repeat, stage, and polarization [1]. Laser light is overall a tight frequency light, there are lasers that produce a sweeping scope of light, or communicate assorted frequencies of light meanwhile. Laser cutting advancement has been comprehensively used as a piece of metal and non-metal material preparing, which unbelievably diminishes the dealing with time and cost and demonstrates the idea of work piece. Present day laser transforms into the amazing sword that would cut clean through iron as though it were mud [2]. Laser cutting is a development that utilizes a laser medium to cut materials and is usually used for

current collecting and age applications. Laser cutting works by planning the yield of a strong laser most routinely through optics. The laser optics and CNC writing computer programs is used to organize the material or the laser support point made. A generally average business laser for cut-chime materials would incorporate a development control structure to take after a CNC or G-code of the guide to be cut into the material. The drew in laser support point composed at the material, which by then either condenses, consumes, disintegrates away, leaving an edge with a phenomenal surface wrap up [3-5]. Mechanical laser slicing machines are used to cut level sheet material and furthermore essential and directing materials considering the application. Laser cutting is master by the utilization of high power thickness essentialness made from the connected with laser. Heavily influenced by the PC, laser discharges through heartbeat and a yield of high-repeat

thump laser approaches a light emanation explicit repeat and heartbeat width [6]. After conduction and reflection through the optical way and focused by centring point of convergence assembling, the beat laser shaft transforms into an unnoticeable and high-essentialness thickness flare, arranged near the surface zone to be ready and subsequently it dissolves or consumes the material in a moment. Every high-imperativeness laser heart-beat can falter a fine opening in a second. Heavily influenced by the PC, laser head will move modestly and be arranged by the outline thusly to get the sought after shape [7]. Differentiated and the con-ventional cutting taking care of strategies, laser cutting has high cut-chime quality, speed, versatility and broad assortment of utiliza-tion.

Laser Cutting

Fashion designers have frequently adopted laser cutting in garment manufacturing since they were first introduced in the 19th century (Petraak and Rogale 2001). Synthetic textiles are because the laser melts and fuses the edge, it provides well-finished edges.

Avoids the fraying problem caused by traditional knife cutters. Additionally, utilize due to the precision of cut components, laser cutting is becoming more popular in the leather industry.

Laser cutting can be utilised to create new and unique fashion accessories such as jewellery.

Innovative concepts to create a combination of clothing and jewellery design

A laser is used to cut the fabric into the desired pattern shapes in laser cutting. A extremely

A fine laser is focused on the fabric surface, increasing its strength. When compared to traditional cutting methods, laser cutting is less expensive.

Furthermore, because laser cutting does not use mechanical action, high accuracy cut components can be achieved at high cutting speeds.

Laser cutters are safer and easier to maintain, and they may be used for extended periods of time. Laser cutters can be used in conjunction with computer technologies.

It is capable of producing items while designing them on the computer. Laser cutting machines are more efficient and easier to use. Textile fabrics, composites, and other materials can all be cut with laser cutting machines.

They can work with a variety of fabrics, which is impossible with die cutters. As a result, laser cutting equipment are progressively becoming adopted in the clothing industry. Laser characteristics

- No mechanical wear, thus good quality
- No mechanical wear, thus good quality
- No material fixation is required due to force-free processing
- No fabric fraying in synthetic fibres due to formation of fused edges
- It is clean and lint-free
- Simple process due to integrated computer design
- High quality raw materials and significant cost savings
- Extremely high precision in cutting contours
- High working speed

Laser engraving

In laser engraving laser is used to mark or engrave an item.

The procedure is very complicated, and regularly computerised systems are used to pressure the laser head.

In spite of the complexity, very specific and smooth engravings can be obtained with excessive price of production. The method does not contain physical contact with the engraving surface, consequently, no wear and tear. The marks produced by means of laser engraving are clean, crisp and everlasting. In addition, lasers are faster than different conventional strategies used for product imprinting, which affords greater versatility in cloth selection.

One gadget may be used to reduce via thin materials in addition to

Make engravings on them. Laser engraving is used to engrave the printing monitors, for hollowing, for growing pattern buttons, to engrave leather-based, denim etc. Pictures, lower styles and even personalised signatures may be engraved on leather footwear, leather-based bag, pockets, leather-based belt, leather couch and leather-based garments, significantly increasing the introduced value of merchandise. In addition laser engraving is used to create embroidered

pattern inside the material by means of colour fading and burning the fabric. The low cost sealed CO2 lasers are desired for laser engraving.

Denim engraving is some other speedy-growing application of laser using sealed CO2 lasers. The laser is used to create minute designs and styles on denim material as well as finished denims. This technic can be utilized in location of the traditional techniques including sandblasting and acid washing. The accuracy and layout flexibility is very huge, that could't be accomplished through the conventional methods. Lasers can produce three-D results by way of strategies consisting of embroidering, embossing, or even apparent cuts, tears and mends. Any photo this is created in a pc aided layout (CAD), can be transferred to denim by using appropriate laser manner. While the use of lasers, capabilities which includes good mode satisfactory, excessive strength balance, actual-time control of laser strength and speedy pulseupward thrust-time are the crucial parameters that could cause coloration trade with out charring or different harm to the cloth. Such damage ought to lessen the product existence and cosmetically unacceptable. The benefits of laser engraving over conventional strategies consist of:

- High running pace without mechanical contact
- No put on and tear of components
- Reduced waste
- Complete exhaust and filtering
- Exact contours feasible

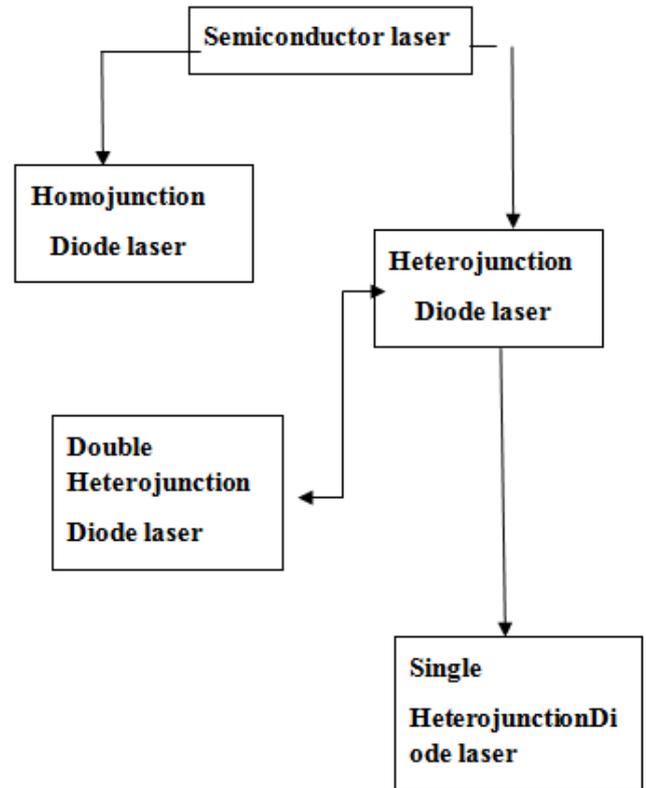
LASER-TYPES:-

- Semi-conductor-laser
- Solid-laser
- Gas-laser
- Ruby (Al-Oxide doped with Cr)-laser
- Ions (Ar+Kr+only one gas charge) - laser
- Molecular (Co2+N2+He)-laser

METHODOLOGY:

Classification of Semiconductor

Laser



2. RELATED WORK

CNC laser cutters are classified according to the condition of the active laser medium (solid, liquid, or gas) and the active laser medium component (for example, CO2, Nitrogen, etc.). The following are three of the most prevalent laser kinds. CNC laser cutters are typically categorized based on the state of the active laser medium (solid, liquid, or gas) and the component of the active laser medium (for example, CO2, Nitrogen, etc.). Here are three of the most commonly used types of lasers

1. CO2 laser cutter CNC
2. Crystal laser cutter CNC
3. Fiber laser cutter CNC

1. CO2 laser cutter CNC

Carbon dioxide is used as the active laser medium in the CO2 laser cutter. Because of their great power output capability and efficiency, they are the most prevalent type of laser cutter.

CO2 laser cutters have a power output of up to 15 kW and a 30 percent efficiency (the highest of all the gas laser cutters). They're great for cutting small details and acute angles, especially in sheet metal or metals that are less than 10 mm thick. On thicker metal surfaces, higher-powered CO2 laser cutters can also produce good cut quality.

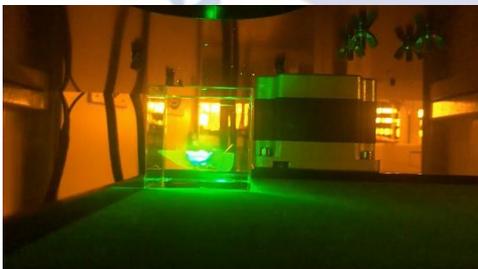


2. Crystal laser cutter CNC

Fiber laser cutters are a more current laser technology that creates a beam by combining a bank of diodes and focusing it through a fiber-optic wire. Fiber laser cutters can cut materials with a thickness of less than 5 mm faster and cleaner than CO2 laser cutters.

Although fibre lasers may work with a wide spectrum of materials, silver requires specific consideration.

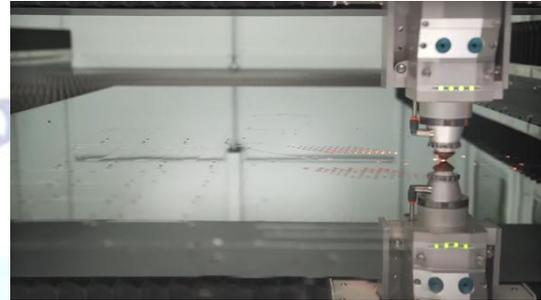
Silver absorbs the laser's heat and begins to deform during cutting, making it difficult to create the desired machined component. As a result, during fibre laser cutting operations, top-tier machine shops often use a bracket as a heat sink to transmit heat away from the silver workpiece.



3. Fiber laser cutter CNC

Beams manufactured from crystals such as neodymium-doped yttrium aluminum garnet (Nd: YAG) and neodymium-doped yttrium ortho-vanadate are used in CNC crystal laser cutters (Nd: YVO).

Because crystal laser cutters have a higher intensity (or laser power) than CO2 laser cutters, they can cut through thicker metals. These cutters are also compatible with a wide range of materials, including metals, glass, wood, and plastics.



3. MATERIALS:-

Cardboard, Wood board Bamboo board, rubber plate, leather, fabric, acrylic, plastic, etc. are in required size in Interface in the software that in presented in it. Format of images in must in this software are jpeg, jpg, Png, bmp, svg. Windows operating system is must requires to operate This software and the micro SD card is use to save the programming in it. For once one programming is perform on this machine.



Cardboard



Leather

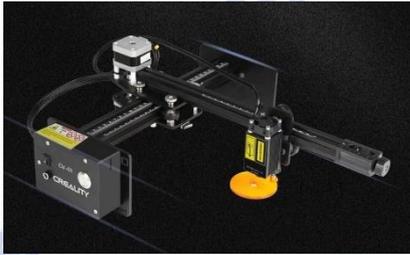


Acrylic



Plastic sheet

4. EXPERIMENT TEST



We use Creality cv-01 3D Engraving Machine for making the logo of a college

This specification of the are:-

Model number: - CV-01

Product dimensions: 416x363x138mm

Product weight : 1.84kg

Power requirements: 100-240V 50/60Hz

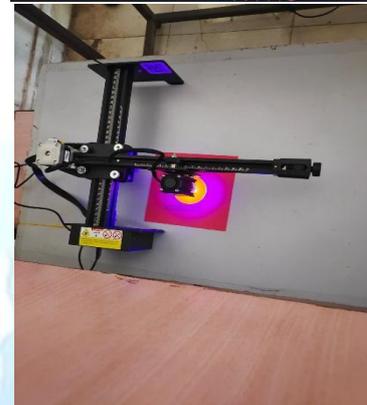
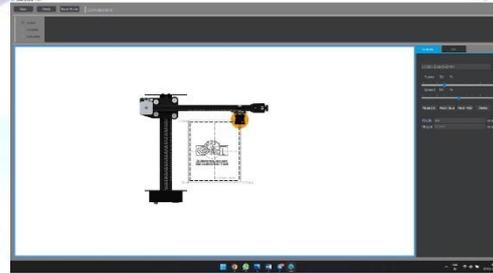
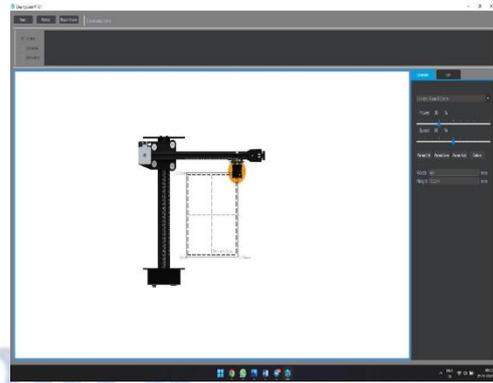
Working temperature range : 0°C-35°C

Working humidity range: 20%-90%

Engraving area : 170mm 200mm

Output power : 1.6W

Laser source : Semiconductor lasers



After uploading the images or letting on the software convert the image to gcode means "Geometric code" Software takes sometime to generate the gcode. After the gcode programming this software the how much time take to cutting the material shows on the software it self. We need to wait for that time.



5. CONCLUSION

The input operands were truncated with two distinct lengths, x and y , and then rounded to the nearest odd values to minimise the error caused by the truncation procedure, as proposed in this study. In terms of speed, area, and energy, the proposed multiplier surpassed prior approximation multipliers. When compared to exact multiplication, the latency and power consumption of the multiplication were improved by 4 percent–41 percent and 89 percent–97 percent, respectively. When compared to the precise multiplier, the proposed multiplier improved in speed, area, and energy as the multiplier width rose. This was owing to the proposed multiplier's simple and scalable calculating core.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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