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Types of laser cutting machine pdf

Laser cutting is a technology to cut material with a computer managed process that generates a beam and interface integration is regulated and cut along directions and everything that comes in the route is either again evaporated, burned or melted and further produce high quality surface finish material. Laser Cutting Systems in India has gained momentum over the conventional means as they help reduce production costs and produce efficient and good quality material. There are mainly 5 types of Laser Cutting Machines: Rotating Laser Cutting: Rotating laser cutting is mainly used for laser cutting of steel pipes and pipes. Sawing, drilling or milling were the main conventional ways used to process pipes or pipes, but rotating laser cutting is more up to date and significantly reduced production cost benefits. Rotating laser cutting helps to process around pipes, ellipses, rectangular tubes, D-type pipe materials. Laser cutting system manufacturers expand rotary laser cutting machines to process with high speed, accuracy and precision Robotic Laser Cutting: Robotic Laser Cutting is the latest 3D laser cutting innovation that extends outstanding flexibility and good power control. The process can be monitored and accessed from anywhere. The cutting is done with high precision with specialized laser cutting head that has advanced autofocus sensors. Laser Cutting System Manufacturers provide Robotic Laser cutting machines that provide efficient and efficient output with multi-axis mechanical arm. Small format Laser Cutting: It is mainly necessary for metals and nonmetals and has adjustable Z-axis to cut thick materials with high accuracy. The height can be adjusted to maintain the focus length and produce high-quality material. They require virtually no maintenance compared to conventional means for laser cutting and produce perfectly finished outputs 5 Axis Laser Cutting: Laser Cutting System Manufacturers provide 5 Axis Laser Cutting machines that have the ability to do three-dimensional profile cutting and also cutting off two-dimensional metal plates. Axis laser cutting provides very cost-effective outputs compared to the conventional ways. Laser Cutting Systems India has rolled out 5 Axis laser cutting machine that is extremely versatile and provides time-saving solutions and helps to reach areas like others would be very difficult to reach Large Format Laser Cutting: Laser Cutting Systems India provides large format Laser Cutting machines that offer 2D large-format profile laser cutter. They are mainly used for the high efficiency level required for aviation, automotive, metal fabrication, shipbuilding, signage and many more materials. They provide highly accurate and cost-effective results Laser Cutting Systems in India has taken a fantastic growth over the conventional means of cutting. Laser cutting systems are smoother and faster, resulting in higher efficiency. There are many laser cutting system manufacturers available in but you should choose a reputable manufacturer to ensure cost efficiency, quality, warranty, customer service and satisfaction. A CNC laser cutting machine cutting design into a metal plate. Photo credit: Andrey Armyagov/Shutterstock.com Laser cutting is a fabrication process that utilizes a focused, powerful laser beam to cut material into custom shapes and designs. This process is suitable for a wide range of materials including metal, plastic, wood, gemstone, glass and paper, and can produce precise, intricate and complex parts without the need for specially designed tools. There are several different types of laser cutting available, including fusion cutting, oxidation cutting, and scribble. Each laser cutting process can produce high-quality precision, accuracy and edge finishes, and generally less material pollution, physical damage and waste than with other conventional cutting processes, such as mechanical cutting and water jet cutting. However, while laser cutting demonstrates certain benefits over more conventional cutting processes, some manufacturing programs can be problematic, such as cutting reflective material or material that requires secondary machining and finishing work. The requirements and specifications required by a particular cutting application, such as materials and their properties, energy and power consumption limits, secondary finishing, etc., help determine the type of cutting process that is best for use. While each cutting process has its advantages and disadvantages, this article focuses on laser cutting, which describes the basics of the laser cutting process and the necessary components and mechanics of the laser cutting machine. In addition, the article explores various laser cutting methods and applications, the benefits and limitations of the process, and comparisons between laser cutting and other types of cutting processes. Laser cutting machine and process laser cutting is a non-contact, thermal-based fabrication process suitable for metal and non-metal materials. In order for the laser cutting process to run smoothly and with optimum capacity, several factors should be taken into account, such as the laser cutting machine's configuration and settings, the material being cut and its properties, and the type of laser and auxiliary gas employed. Overview of laser machine components and mechanics Unlike mechanical cutting, which utilizes cutting tools and power-driven equipment, and water jet cutting, which uses pressurized water and abrasive material, laser cutting uses a laser cutting machine to produce cuts, engravings and markings. While laser cutting machines vary from model to model and application to application, the typical setup includes a laser resonator unit, mirror and a laser cutting head containing a laser-focusing lens, a pressurized gas unit and a nozzle. The basic laser cutting process includes the following stages: beam production beam Localized heating and melting material ejection beam movement Each step is integrated into the laser cutting process and, when performed correctly, produces a precise cut. Beam generation The term laser comes from the abbreviation LASER or Light Amplification of stimulated radiation emissions. Essentially, this acronym summarizes the basic principles of laser generation – stimulation and reinforcement. Together with these principles, the laser resonator uses the processes of spontaneous discharges and stimulated emissions to produce a high-intensity light beam that is both spatial and spectrally coherent (that is, a laser beam). Spontaneous discharge: The laser resonator contains an active laser medium (e.g. CO_2, Nd:YAG, etc.), if electrons are stimulated by an external energy source, such as a flash lamp or electric arc. As the medium receives and absorbs energy, its atoms experience a process known as spontaneous emissions. During this process, energy absorbed by an atom's electrons causes the atom to jump briefly to a higher energy level and then return to its ground state. When the electrons return to their ground state, the atom emits a photon of light. Stimulated discharge: The photons produced by spontaneous discharges travel within the medium, which are found in a cavity of the laser resonator between two mirrors. One mirror reflects to keep photons traveling within the medium, so that they continue to propagate stimulated discharges, and the other mirror is partially transmissive to allow some photons to escape. Stimulated emissions is the process by which a photon (that is, event photon) stimulates an atom that is already at a higher energy level. This interaction forces the stimulated atom to fall to its ground state by emitting a second photon of the same fixed wavelength or coherent with the photon event. The process of one photon propagating the release of another photon enhances the strength and intensity of the light beam. Thus, stimulated emission of light photons (it would a type of electromagnetic radiation) causes amplification of light; in other words, light reinforcement by stimulated emission of radiation. Improperly adjusted photons in the resonator pass through the partially transmissive mirror without being reflected into the medium, generating the first laser beam. Once generated, the beam enters the laser cutting head and is guided by mirrors into the focus lens. Beam focusing The focus lens focuses the laser beam through the center of the nozzle at the end of the laser cutting head event to the surface of the workpiece. By focusing the beam, the lens concentrates the beam's energy to a smaller place, which increases the intensity of the beam (I). The following equation illustrates the underlying principle behind this occurrence: Where P represents the power of the first laser beam, and πr^2 represents the cross-sectional area of the beam. When the lens focuses the laser beam, (r) of the beam decreases; This reduction in radius reduces the cross-sectional area of the beam, which in turn increases the intensity since the force is now distributed over a smaller area. Localized heating and melting, and material ejection When the beam hits the material's surface, the material absorbs the radiation, increases the internal energy and generates heat. The high intensity of the laser beam allows to heat, melt and partially or completely evaporate a localized area of the surface of the workpiece. The weakening and removal of the affected area of the material forms the desired cuts. Siphoned into the laser cutting head and flows coaxially to the focused beam, the auxiliary gas- also referred to as the cutting gas - is used to protect and cool the focus lens, and can be used to expel molten material out of the sidewalk - the width of the material removed and cut the manufactured and supporting cutting process. Laser cutting utilizes several different types of material cutting and removal mechanisms, including fusion cutting, chemical degradation cutting, evaporation cutting, scribble and oxidation cutting. Fusion Cutting: Also referred to as inert gas melt cutting or inert gas cutting, fusion cutting is employed by CO_2 and Nd: YAG laser cutting machines. The laser beam produced by the cutting machine melts the workpiece, and molten material is expelled through the bottom of the kerf by a beam of the auxiliary gas employed. The ongoing gas and ongoing gas pressure depend on the type of material being cut, but the inerte gas is always selected based on a lack of chemical reactivity with respect to the material. This mechanism is suitable for laser cutting most metals and thermoplastics. Chemical degradation: Chemical degradation is used by CO_2 laser cutting machines and is suitable for laser cutting of thermos polymers and organic matter, such as wood. Since thermos kits and organic materials do not melt when the heat is applied, the laser beam burns the material instead, reducing it to carbon and smoke. Evaporation cutting: Evaporation cutting is employed by CO_2 laser cutting machines and is suitable for materials such as laser cutting acrylic and polyacetal due to the proximity of their melting and boiling points. Since the laser evaporates the material evaporates along the cut, the edge produced is generally glossy and polished. Scribble: Scribble is employed by CO_2 and Nd:YAG laser cutting machines to produce partial or completely penetrating grooves or perforations, usually on ceramics or silicon chips. These grooves and perforations allow mechanical rupture along the weakened structural lines. Oxidation cutting: Also referred to as flame oxygen cutting, oxidation cutting is employed by CO_2 and Nd: YAG laser cutting machines and is suitable for laser cutting of mild and carbon steel. Oxidation cutting is an example of the reactive gas melt cutting mechanism, which specifically uses chemically reactive auxiliary gases. That inertness, the reactivity of an auxiliary gas is relative to the material being cut. Oxidation cutting, as the name implies, uses oxygen as auxiliary gas, which exothermally reacts with the material. The heat generated accelerates the cutting process and produces an oxidized molten edge that can be easily removed by a gas beam to allow a cleaner, laser-cut edge. Beam movement When the localized heating, melting or evaporation has started, the machine moves the material removal area over the workpiece to produce the entire cut. The machine achieves movement either by adjusting the reflective mirrors, controlling the laser cutting head or manipulating the workpiece. There are three different configurations for laser cutting machines, defined by the way the laser beam moves or is moved over the material: moving material, flying optics and hybrid laser cutting systems. Movable material: Movable material laser cutting machines have a stationary laser beam and a movable cutting surface with which the material is attached. The workpiece is moved mechanically around the stationary beam to produce the necessary cuts. This configuration allows for a smooth and consistent standoff distance and requires fewer optical components. Flying optics: Flying optics laser cutting machines have a moving laser cutter head and a stationary workpiece. The shaving head moves the beam over the stationary workpiece in the X and Y axes to produce the necessary cuts. The flexibility of flying optics machines is suitable for cutting materials with variable thickness and sizes, as well as for faster processing times. However, since the beam moves continuously, the changing beam length must be taken into account throughout the process. The shifting beam length can be controlled by collimation (adjustment of optics), using a constant beam length axis, or using an adaptive optic or capacitive height control system that is able to make the necessary adjustments in real time. Hybrid: Hybrid laser cutting machines offer a combination of attributes found on moving material and flying optics machines. These machines have a material handling table that moves on one axis (usually the X-axis) and a laser head that moves on another (usually the Y-axis). Hybrid systems provide more consistent beam delivery, and reduced power outages and greater capacity per watt compared to flying optics systems. Lasers are produced as either pulsating beams or continuous wave beams. The suitability of each depends on the characteristics of the material being cut and the requirements of the laser cutting applications. Pulsating beams are produced as short bursts of output power, while continuous wave beams are produced as continuous, high power. The former is usually employed for scribblening or evaporation cutting applications and is suitable for cutting delicate design or piercing through thick materials, while the latter is suitable for and high-speed cutting applications. Types of Assist Gases Laser cutting utilize a variety of auxiliary gases to help cut the process. The cutting process used and the material being cut determines which type of auxiliary gas – either inert or active – is most suitable for use. Inert gas cutting (that will vile, fusion cutting or inert gas melting), as indicated by the name, uses chemically inert auxiliary gases. The special auxiliary gas used depends on the reactive properties of the material. For example, since molten thermoplastics do not react with nitrogen and oxygen, compressed air can be used as auxiliary gas when laser cutting of such materials. On the other hand, since molten titanium reacts with nitrogen and oxygen, argon or another corresponding chemically inert gas – must be used as assist gas in laser cutting applications involving this material. When laser cutting stainless steel via inert gas cutting process, nitrogen is usually used as assist gas; This is because molten stainless steel chemically reacts with oxygen. When laser cutting material via the reactive melting cutting process, an active (e.g. chemical reactive) gas – usually oxygen – helps to accelerate the cutting process. While in inert gas cutting material heats up, melted, and evaporated exclusively by the power of the laser, in reactive gas cutting the reaction between auxiliary gas and the material creates additional heat that aids the cutting process. Due to this exotic reaction, reactive gas cutting usually requires lower laser power levels to cut through a material compared to the power level required when cutting the same material via the inerte gas cutting process. The cutting pressure of the required assistive gas is also determined by the applied cutting process and the properties and thickness of the material being cut. For example, polymers typically require gas jet pressure of 2-6 bar during the inert gas cutting process, while stainless steel requires gas jet pressure of 8-14 bar. In general, thinner materials also generally require lower pressure, and thicker materials generally require greater pressure. In oxidation cutting, the opposite is true: the thicker the material, the lower the pressure required and the thinner the material, the higher the pressure required. Types of laser cutting machines There are several types of laser cutting machines available that are categorized into gas, liquid and solid state lasers. The types are differentiated based on the condition of the active laser medium, that is, whether the medium is a gas, liquid or solid material, and what the active laser medium consists of (e.g. CO_2, Nd:YAG, etc.). The two main types of lasers employed are CO_2 and SOLID-state lasers. One of the most commonly used gas state lasers, a CO_2 laser utilizes a carbon dioxide mixture as the active laser medium. CO_2 lasers are usually used to cut non-metal materials since early models were not powerful enough to cut Metals. Laser technology has since evolved to enable CO_2 lasers to cut through metals, but CO_2 lasers are still better suited for cutting through non-metals and organic materials (such as rubber, leather or wood) and only engraving metals or other hard materials. Pure nitrogen lasers are another commonly used gas state laser. These lasers are used for applications that require the material not oxidize as it is cut. There are several variants of solid-state lasers available, including crystal and fiber lasers. Crystal lasers use a variety of crystal media, such as neodymium-drugged yttrium aluminum garnet (Nd: YAG) or neodymium-drugged yttrium orthovanadate (Nd: YVO_4) -which allows powerful metal and non-metal laser cutting. Although versatile compared to their material cutting capabilities, crystal lasers are usually more expensive and have shorter lifespans than other types of lasers. Fiber lasers offer a cheaper and long-lasting alternative to crystal lasers. This type of laser first generates a beam through a series of laser diodes which are then transmitted through optical fibers, reinforced and focused on the workpiece to perform the necessary cuts. Laser cutting machine considerations As described in the previous section, the type of laser suitable for a laser cutting application is largely determined by the material being cut. However, other considerations can be taken into account when choosing and setting up a laser cutting machine for a specific application, such as machine configuration, laser power, wavelength, temporal mode, spatial mode, and burn location size. Machine Configuration: See Beam Movement, Over Laser Power: Laser Power, or Wattage, may increase or decrease the total processing time of a cutting program. This occurrence is due to the increasing intensity of the beam as the laser's effect increases (power density (intensity) = $P/\pi r^2$). The price of a laser cutting machine usually depends on the power of the laser; the more powerful the laser, the more expensive the equipment. Therefore, manufacturers and job stores must find a balance between processing costs and equipment costs when choosing a laser machine based on laser power. Wavelength: The wavelength of the laser beam is the spatial length of a complete vibration cycle for a photon in the beam. The special wavelength of the laser beam partially determines the material's radiation absorption rate, which is what allows the material to be heated, melted and evaporated to produce the necessary cuts. Beam mode: The mode refers to how the intensity of the laser beam is distributed over the cross-sectional area of the beam. The mode affects the size of the beam's focal point and the intensity of the beam, which in turn affects the quality of the cut. Typically, the optimal mode has a Gaussian intensity distribution (TEM_{00}). Focal Spot: The beam is directed through a lens or a specialized mirror and focused to a small place with high The point where the diameter of the beam is the smallest is called the focal point, or focus. The optimal position of focus of a laser cutting application depends on several factors, including the characteristics and thickness of the material, beam shape and mode, type of auxiliary gas and the condition of the pho shell. Material Considerations Metal laser cutting Image credit: Metal Works of High Point, Inc. Laser cutting is suitable for a variety of metal and non-metal materials including plastic, wood, gemstone, glass and paper. As mentioned in the previous sections, the type of material that is cut and its properties largely determine the optimal cutting mechanism, cutting gas and cutting gas pressure, and laser machine to use for laser cutting application. Table 1, below, illustrates the suitability of each laser cutting mechanism previously described for cutting a material. Table 1 – Suitability of laser cutting mechanisms for cutting various materials Note: X indicates that the mechanism is suitable for cutting the special material Material Fusion Cutting Chemical degradation Evaporation Cutting Scribing Oxidation Cutting Ferrous Alloy X X X X Non-ferrous alloy X X X Thermoplastic X X Thermoset X X X Ceramic X Glass X X Elastomer X Composite X X X Wood X Table 2, below illustrates the suitability of each regular employee helping gas to cut a material. Table 2 – Suitability of auxiliary gases for cutting various materials Note: X indicates that the auxiliary gas is suitable for cutting the relevant material Meroplast X (inert) X (inert) Titanium X (inert) Titanium X (int) Stainless steel X (inert) X (re Active) Carbon Steel X (inert) X (reactive) alloy steel X (inert) X (reactive) Aluminium X (inert) X (reactive) Nickel X (inert) X (reactive) Copper X (inert) X (reactive) Table 3, below, illustrates the suitability of each type of laser previously described to cut a material. Table 3 - Suitability of Laser Machine Types for cutting various materials Note: X indicates the laser type is suitable for cutting the special material Material (molten) CO_2 Nitrogen Nd: YAG / Crystal Fiber Metals X (steel and aluminum) X X X Plastic X (low contrast) X (high contrast) Glass X Wood X Stone X In addition to the reactive or non-reactive properties of the material being cut, another significant consideration that manufacturers and job shops can take into account when deciding on the suitability of laser cutting for their cutting application is reflectivity. The greater the reflection of a material, the greater the percentage of radiation reflected rather than absorbed by it. This lower absorption rate slows the cutting process and prolongs the turnaround, as well as increases the laser flow requirements for cutting the material. Highly reflective materials, such as copper and aluminium, can also cause damage to the laser machine beam can bounce back towards the components of a laser cutter. Advantages of Laser Cutting Compared to other types of cutting, laser cutting provides several advantages. These include: Greater cutting precision and accuracy Higher quality edges Narrower kerf widths Smaller HAZ and smaller material distortion Less material pollution and waste Lower maintenance and repair costs Greater operator safety Laser cutting machines are able to cut a wide range of designs with a greater degree of precision and accuracy than more conventional cutting machines. Since laser cutting machines can be fully CNC controlled, they can repeatedly and consistently produce complex and intricate parts to high tolerances. Laser cutting also produces high-quality cuts and edges that typically do not require further cleaning, treatment or finishing, reducing the need for additional finishing processes. The focused beam provides narrower kerf widths, and the localized heating provides minimal thermal input to most of the material being cut. The smaller kerf minimizes the amount of material removed, and the low thermal input minimizes the hot affected zones (HAZs) which in turn reduces the extent of thermal distortion. The non-contact nature laser cutting process also reduces the risk of mechanical distortion, especially for flexible or thin materials, as well as reduces the risk of material contamination. Due to tighter tolerances, narrower kerf widths, less heat affected zones, and smaller degrees of material distortion, laser cut part design can be arranged more closely together on the material. This proximity to design reduces the amount of material waste, which leads to lower material costs over time. While the initial investment in laser cutting equipment is usually higher than with other cutting processes, running and maintenance costs are relatively low. Laser cutting machines are able to perform multiple operations and applications without the need to buy or change out separate, specially designed tools; this laser cutting capability reduces both the total equipment costs and the lead time between different processes and applications. In addition, as laser cutting is a non-contact process, the laser components experience less fatigue – and thus last longer–than components in contact cutting processes such as mechanical cutting or rotating die cutting. Along with the relative reasonableness of replacement laser components, the durability of laser components further reduces the total equipment costs over time. Other benefits of laser cutting include reduced risk of operator damage and quieter operations. The laser cutting process uses little or no mechanical components and occurs in a chassis, therefore there is less risk of operator damage. Since there is less noise produced during the laser cutting process, the overall working environment is also improved. Laser cutting restrictions laser cutting shows advantages over other forms of cutting, there are also limitations in the process, including: The range of suitable materials Inconsistent production speed Metal curing Higher energy and power consumption Higher equipment costs As indicated in previous sections, laser cutting is suitable for a wide range of metals and non-metals. But the material cut and its properties often limit the suitability of some cutting mechanisms, assisting gases and laser types. In addition, material thickness plays a significant factor in determining optimal laser power, auxiliing gas pressure and burning position for a laser cutting application. Varying materials or varying thicknesses within a single material also require adjustments to the cutting speed and depth throughout the cutting process. These adjustments create discrepancies in production time and increase processing time, especially in large production runs. One advantage of laser cutting is the production of high quality cuts that usually do not require extensive secondary cleaning, treatment, or finishing. While in some respects this is an advantage, resulting work hardening laser cut edges can be problematic for some applications. For example, parts that require further processing, such as powder coating or paint, will first need surface treatment after the laser cutting process before receiving the necessary coating or paint. The addition of this step increases both the processing time and total treatment costs. While laser cutting may have lower maintenance and material costs over time, for some production applications, it may be more cost-effective to use other cutting processes. For example, while both metal and non-metal materials can be laser-cut, laser cutting plastic causes the release of potentially harmful and toxic gases. These emissions require air pollution control equipment, which increases the necessary equipment costs. For manufacturers and job stores starting up, although replacement and maintenance parts are relatively inexpensive, the initial investment in laser cutting equipment also tends to be much higher compared to more conventional cutting processes. In addition, laser cutting equipment typically uses more power and energy than other cutting processes, leading to further increases in operating costs. Altogether, the high initial equipment and operating costs can make laser cutting unsuitable for low-budget operations. Alternative cutting processes Although laser cutting can produce high tolerance, complex and precision parts, it may not be appropriate for all production applications, and other cutting processes may be more suitable and cost-effective. Illustrated below are some comparisons between laser cutting and other cutting processes. Table 4 – Comparisons between laser cutting and mechanical cutting processes Note: X indicates which cutting process has the advantage Laser cutting Mechanical cutting precision/tolerances X Intricate design capabilities X No mechanical distortion X material costs (less waste) X Equipment costs X Operating costs X Operating costs X Maintenance costs X Mechanical cutting is a fabrication process that uses power-driven equipment, such as omtentøy, mills and presses – to cut, form and cut material in custom shapes and designs. As illustrated in Table 4 above, laser cutting has several advantages over mechanical cutting; It provides greater precision and higher tolerances, as well as offers lower material (e.g. less waste) and maintenance costs. However, laser cutting also usually requires much higher initial investments and operating costs than mechanical cutting due to expensive laser cutting equipment and high power and energy consumption of the equipment. Table 5 - Comparisons between Laser Cutting and Die Cutting Processes Note: X indicates which cutting process has the advantage Laser Cutting Die Cutting Precision / Tolerances X Intricate Design Capabilities X Quick Prototyping / Design Adjustments X Multiple Operations (in line) X Faster Production Turnaround X Constant Cutting Speed / Pressure X Large / Long Production Runs X Die cut part production is a production program that laser cutting can serve as an alternative solution to mechanical cutting processes, such as flatbed die cutting or die cutting cutting. As illustrated in Table 5 above, laser cutting offers opportunities for higher precision and faster prototyping. While die cutting is able to produce precision parts to some extent, laser cutting offers even tighter tolerances for more intricate designs and patterns. In addition, laser cutting is more cost effective for prototyping and design adjustments, as the process does not require the creation of separate die components to test out new designs. But drowsy cutting – especially rotating cutting – provides certain benefits of laser cutting. For example, rotating die cutting allows several in line operations, as well as constant and continuous cutting pressure. Altogether these considerations allow rotary die cutting to provide faster turnaround than laser cutting, especially for large or long production runs. Table 6 – Comparisons between laser cutting and water jet cutting processes Note: X indicates which cutting process has the advantage Laser Cutting Waterjet Cutting Precision / Tolerances X Intricate Design Capabilities X Composite / Multi-layer Material X Thick Materials X No Mechanical Distortion X No Thermal Distortion X Operational Costs X Quiet Operation X Waterjet cutting is a fabrication process that uses pressure water – as well as abrasives, such as grenade or aluminum oxide – to cut and form material in custom shapes and design. As shown in Table 6 above, laser cutting can produce parts with greater precision and intricacy than water jet cutting, while water jet cutting can produce parts thicker and multilayer materials that can be problematic for the laser cutting process. While there is less risk of mechanical distortion with laser cutting, waterjet cutting provides a lower risk of thermal distortion. Compared to laser cutting, water jet cutting also generates more noise and more waste - that is, used water and abrasive mixtures - that require cleanup and disposal, which increases operating costs. Table 7 - Comparisons between laser cutting and plasma cutting processes G.E. Mathis Company Benefits Laser Cutting Plasma Cutting Precision / Tolerances X Intricate Design Capabilities X Thick Materials X Selection of Suitable Materials X Turnaround X Equipment Costs X Operating Costs X Plasma Cutting, also referred to as plasma arc cutting, is a fabrication process that utilizes a cone of overheated ionized gas to cut and form electrically conductive material in custom forms and design. As illustrated by Table 7 above, compared to laser cutting capable of cutting metal and non-metal materials, plasma cutting has a more limited range of suitable materials, as only electrically conductive materials can be cut via the plasma cutting process. In addition, plasma cut parts are produced with significantly less precision and lower tolerances due to the wider kerf produced during the process. Despite these limitations, plasma cutting offers lower equipment and operating costs (due to generally lower power and energy consumption) and faster turnaround compared to laser cutting, as well as capabilities to cut thicker and multilayered materials. Summary Outlined above are the basics of laser cutting machine, laser cutting process, laser cutting working principle, various laser cutting capabilities and applications, and some of the considerations that can be taken into account by manufacturers and machine stores when deciding whether laser cutting is the most optimal solution for their special cutting application. For more information on domestic commercial and industrial suppliers, head over to the Thomas Supplier Discovery Platform, where you will find over 500,000 commercial and industrial suppliers, including over 2,500 laser cutting service providers. Sources Other cutting articles articles