



By J. Stephen Spence

A LOOK AT TROTEC'S FineMarkerHybrid Laser

Trotec's Hybrid Laser combines YAG and CO₂ laser technology into one machine. Photo courtesy of Trotec Laser, Inc. Ypsilanti, MI.

For information on FineMarkerHybrid or any Trotec Laser, Inc. product, please call 866-226-8505 or visit www.troteclaser.com.

Every time I work with one of Trotec's lasers I'm impressed with the quality of manufacture. From the outside, it looks pretty much like any other laser, but the inside is nothing short of a work of art. I attribute this to its European origin and the great pride the Austrians take in what they do. The quarter inch aluminum plate used to frame this machine and the finely machined parts make me want to leave the sides off just so I can appreciate its craftsmanship.

But lasers aren't just about finely machined parts, they're about power and accuracy and flexibility and ease of use. That's where we'll focus our attention as I share my impressions after working with the Trotec FineMarkerHybrid laser.

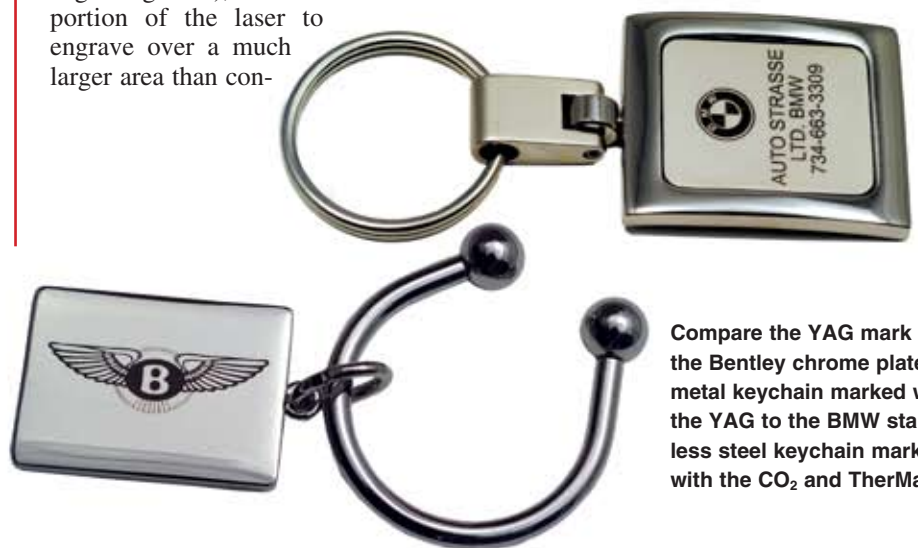
If you're not familiar with this new laser, and few people are, the exciting element is that the Hybrid combines both an extremely capable CO₂ laser and an Nd:YVO₄ laser in the same cabinet, using the same lenses and the same electronics and mechanics. In case you're not familiar with an Nd:YVO₄ laser (also called a "Vanadate" laser), it is a close cousin to the industrial "YAG" lasers used for marking metal, among other things. The reason

Trotec combined a CO₂ and Vanadate laser in one machine is two-fold: One, it greatly reduces cost since much of the cost of building a laser is involved in the mechanics, cabinet and electronics needed to drive the system and two, it reduces the footprint of the machine since only one cabinet is required rather than two separate lasers in two separate cabinets.

There are other advantages as well. Since this system uses "flying optics" (meaning the final mirror and lens assembly actually moves across the engraving area), it allows the YAG portion of the laser to engrave over a much larger area than con-

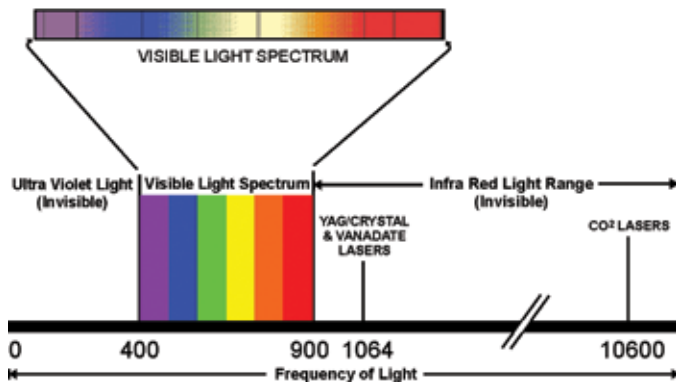
ventional YAG designs using galvo optics (we'll discuss this in more detail later).

Trotec's Hybrid allows both lasers to be controlled from the same software (usually CorelDRAW). This reduces the learning curve and allows the same item to be engraved with both CO₂ and YAG lasers sequentially insuring perfect registration every time. As a point of reference, since most other lasers use galvo optics and since most galvo drivers use propri-



Compare the YAG mark on the Bentley chrome plated metal keychain marked with the YAG to the BMW stainless steel keychain marked with the CO₂ and TherMark.

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Light varies across the light spectrum from Ultra-Violet to High Infra-Red (both invisible to the human eye). See where the YAG and CO₂ lasers are in relationship to each other and the visible light spectrum.

etary software, a lot of first time users of other brands of YAGs have found disappointment when working with their YAG's proprietary software.

In my opinion, Trotec's Hybrid represents a great way for a shop to justify having a YAG without shelling out \$50,000 for a stand-alone YAG, in the hopes it might one day pay for itself. Since the Hybrid is much less expensive than two separate lasers, it allows even small shops to install a YAG and then build a customer base before investing in a more specialized stand-alone machine. This also makes it much easier to justify the investment for a bank loan officer or for a lease-purchase program because the CO₂ capabilities alone make the Hybrid a first-rate machine.

However, the Hybrid's two-in-one concept also necessitates making some tradeoffs. For one, although the

CO₂ portion of the Hybrid is incredibly fast, and although the YAG is capable of running at the same speeds, the YAG portion generally needs to be run at slower speeds than a CO₂. And any flying optics machine is inherently much slower than one using a galvo lens system. The hitch, of course, is in the fact that a galvo system can only engrave an area that is typically 4" square while the Hybrid can engrave over an area the size of its 17" x 29" table.

Another tradeoff with having two lasers within the same cabinet is that you can only use one at a time. This means that when the CO₂ is being used, you can't use the YAG and when the YAG is being used, jobs requiring a CO₂ must wait in line.

Of course the other potential concern is that in the event of some electromechanical malfunction chances are

both lasers will be out of commission while waiting for service or parts. This really would not be an issue if you had a stand alone CO₂ and a YAG.

Having brushed over the basics, let's take a more detailed look at what I discovered.

The Lasers

As stated earlier, what makes Trotec's machine a "hybrid" is having two distinct lasers within the same cabinet. One is a very capable 45-watt CO₂. The other is a Diode End-Pumped YAG. The particular type of YAG used in the Hybrid is more accurately termed a "Vanadate" (Nd:YVO₄) laser, which, according to Trotec, offers more peak power than a comparable YAG (Nd:YAG). The Vanadate offers higher peak power and faster repetition rates and is easier to pump than a YAG because of a better temperature variant. A Vanadate laser is a crystal based light source that has several advantages over a conventional YAG, including its ability to emit a polarized linear light beam that's easier to "pump" (apply energy so as to induce laser energy) because of its ability to better absorb some frequencies. This is said to make it more stable than the typical YAG (Nd:YAG).

For the purposes of readability and because of our familiarity with the term "YAG," I will take the liberty and use the terms "Vanadate" (Nd:YVO₄) and YAG (Nd:YAG) interchangeably throughout this article, in spite of the distinct differences between the two.

The Vanadate laser used in the Hybrid is capable of producing an



A peek inside the left side of the Hybrid uncovers the electronics for moving the optics from side to side and left to right.



The right side of the machine showcases the motor (lower right) that handles the auto focus and table height adjustments and the motor (lower left) is for the air assist pump.



The back of the system is clean and uncluttered and includes the cooling fans, exhaust and electronic connections.

extremely small spot size. In this case, down to 20 microns (.001"). The CO₂ laser also has a very fine spot (.003"), but due to the physics involved in a CO₂ laser, it can't normally generate the spot size obtainable with a YAG laser. In fact, the smallest spot size a typical CO₂ can produce is about four to five times larger than what a YAG can produce. Some CO₂ lasers perform better than this due to special light amplification devices (special lenses), but the typical CO₂ laser does well to create a spot around the .004"-.005" mark. Why this ultra tiny spot size is important will become clear shortly.

We have become accustomed to rating lasers by power. CO₂ lasers come in a variety of power ranging from 5 watts to 250 watts or more. Vanadate lasers are not rated by their wattage output in the same way as CO₂ lasers. These lasers are rated in accordance to their "Peak Power" which, in the case of the Hybrid, is 45,000 watts at ~20 ns (nanoseconds) with a wavelength of 1064nm (nanometers). If you have trouble understanding this new lingo, don't feel bad. Understanding the physics isn't nearly as important as having a clear understanding of what it will and will not do. The Hybrid is equipped so it can be upgraded to an even more powerful Vanadate laser if desired. The laser units can be user installed.

Many lasers, especially YAGs, require a chiller (a refrigeration system to keep the laser tube from overheating and burning itself out prematurely). The Hybrid's laser tubes are both air-cooled, so chillers aren't required, making the maintenance much easier and less costly.

Both laser tubes share the same optics. This is surprising since the focal length of a YAG and a CO₂ laser are different by about .15". The Trotec software automatically compensates for the focal length difference when setting up a job. So far as the operator is concerned, the laser can be focused manually or automatically with no thought given as to which type of laser is being used. In jobs that use both lasers, the software will automatically change the focus after running the CO₂ portion of the job (or vice versa).



Keeping a clean lens is far more important with a YAG than a CO₂, so be forewarned; you will have to clean your lens often.

Speed

How fast a laser can travel has become a popular sales pitch in the laser market. To understand speed, one must understand the relationship between speed and power and pulses per inch. Running a laser at full speed on some materials will produce incredible results while on other materials, the laser must be slowed greatly as a way of obtaining enough power to cut the material. This being said, the speed of the Hybrid is 79" per second, which in West Virginia tech talk translates into "it's a wizz banger."

Because of the overbuilt frame and unique self-lubricating linear bearing system, the movement is not only extremely fast, it is also very smooth and quiet. The fact that the bearings are enclosed, as part of the harsh environment package that is standard, helps to keep them clean. This keeps the resulting engraved image accurate—an especially important point when attempting to engrave one point text (one point is what the manufacturer claims the laser can do, but I've engraved text many times smaller than one point. So small, in fact, it required magnification to even see it).

Lenses

The standard focal length of the Hybrid's lens is considered to be 3.2". This is an approximation since there is a built in difference in focal lengths between the YAG and CO₂ lasers. The laser comes with AutoFocus as well as a manual focusing tool.

One thing users must get used to is the fact that focus is critically important for the YAG to work at its



To focus the Hybrid just hang the focus tool in the ledge of the lens assembly and raise the engraving table until the tool falls off.

maximum potential. Even a tiny error in focus can make a notable difference. Of course, once you focus the laser, it will automatically adjust itself for the proper CO₂ or YAG focal distance, but care should be taken to be as precise as possible. To highlight this even more, Trotec, when building these machines, actually calibrates it for any variation within the optics.

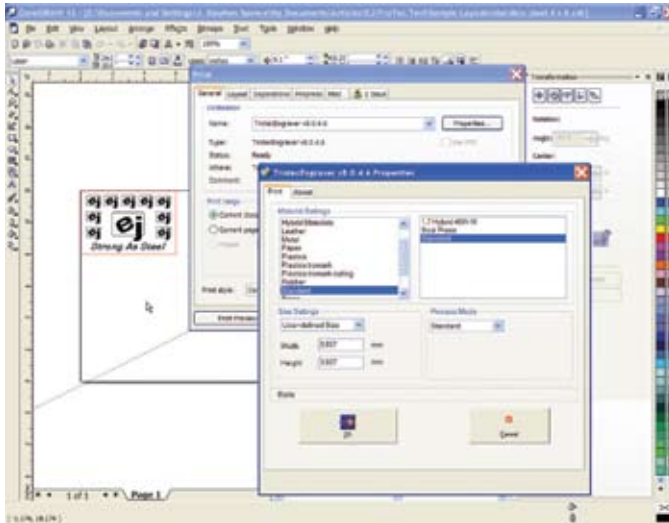
Likewise, it's extremely important that mirrors and the lens be kept clean.

Software

Like most lasers, a variety of graphics programs can be used, including CorelDRAW. Whatever program is used, the job information must be sent to the Hybrid's print driver. The driver for the Hybrid is multi-layered. It can accommodate the user who has only enough skill to place the product on the engraving table and push a few keys on the computer to a level suitable to accommodate the most elaborate of engraving jobs, involving multiple heights within the same product, deep insets such as the inside of a bowl or serving tray to jobs that require both the YAG and the CO₂ within the same job, even with extremely tight tolerances.

Multicolor selection within CorelDRAW or similar programs makes programming easy for both the professional and the novice alike. Allow for a few hours of supervised training if you're familiar with lasers and a bit more if you're new to lasering. After that, it's time to "burn some stuff up."

Take a day or two and try engraving everything you can think of using



The Hybrid software appears more complex than it is. Simply create your graphic and press "Print." From there a variety of options are available in the "Properties" menu and the Job Control management system.

both types of lasers at a variety of settings. This is simply a means of learning the machine and knowing its real-world capability. After a couple of hours, you should begin to feel comfortable with the software and if you have to turn to the manual from time to time, Trotec has done an excellent job producing a full color instruction guide for the software—something missing from many lasers currently on the market.

The Hybrid can be driven with either a serial (RS232) cable or the faster USB cable. On-board memory

makes downloading jobs quick and easy, freeing up the computer for the next task. Jobs are stored on your computer's hard drive and can be easily recalled at will.

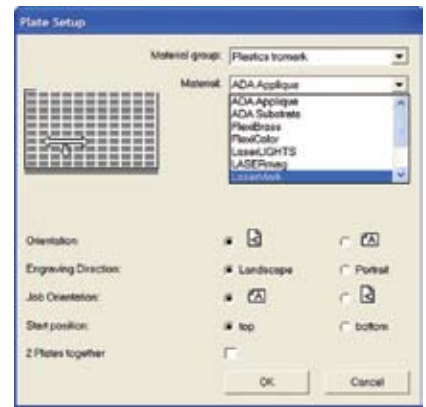
The Cabinet, Mechanics & Options

Most lasers offer a variety of options that can be purchased along with the laser. The same is true with the Hybrid: Standard features include auto focus, a red spot pointer, air assist and a "harsh environment package." Options include a vector cutting grid, rotary attachment and an internally mounted air compressor to drive

the air assist system.

One feature I really like about this design is the in-cabinet lighting system which consists of two small but powerful halogen lamps recessed in the front wall of the cabinet. This insures the engraving area is always well lit. Unlike their earliest machines, these lights are protected with a grill to prevent the operator from coming in contact with the hot bulbs.

Another feature I liked was the magnetic table. While most lasers use an aluminum table, the Hybrid uses a special three-ply steel/plastic/steel laminated table. This is wonderful for building jigs and holding materials such as Rowmark Mates that have a tendency not to lay flat while being engraved. Just a few magnets from



This screen shows a large number of the preset materials available for the YAG and CO₂.

Radio Shack or the backs of some magnetic name badges and you can hold just about anything in place. For bigger projects, just use bigger magnets. This is an idea that is long overdue.

Using magnets is not the only reason for using a three-ply table however. Keeping a table perfectly level at all times is essential to a laser working properly, especially a YAG, with its critical focusing requirements. According to Trotec this approach, along with a three point screw system to raise and lower the table, insures the table will always be perfect for engraving or cutting.

As for size, the engraving area is 17" x 29" x 6.8" deep when using the



This screen offers you the option of setting power, speed and ppi manually.

CO₂ and 6.95" deep when using the YAG. The overall size of the cabinet is 44.5" x 36.4" x 23.6". Fortunately, the legs can be removed to allow it to pass through a standard doorway.

Safety

In a time when most laser companies are offering "pass through" engraving capability, the Hybrid stresses laser safety and for good reason.

Both YAG and CO₂ wavelength can damage the eye. The YAG goes through the cornea to the back of the eye (retina) and can cause permanent damage. The CO₂ can scratch the front of the eye (cornea) and this can be repaired by an ophthalmologist. The YAG is just as safe when used in Class A, Class 1 or Class 2 environments. A different pigmented safety glass must be used with YAGs.

While servicing a CO₂ laser or adjusting mirrors (with safety glasses of course), about the worst thing that might happen is a nasty burn and most old-time laser operators have a few scars to show and wild stories to tell about how they got their scars. (I'll save my story for another time.)

This machine, with its Vanadate light source, is a very different story. These tubes put out invisible light beams that are so dangerous they can blind a passer-by in a split second. Conventional safety glasses won't help, nor will Plexiglas or glass itself—as in the case of the CO₂ laser beam. YAG laser light will pass right through glass and acrylic like sun light through a window. Understand: YAG lasers are extremely dangerous when not used properly!

Special goggles are available to protect one's eyes but typical users like you and me should not need them because we should *never* attempt to defeat the safety features of these machines—period! For those who want the added protection of safety glasses, prepare for the sticker shock—they cost about \$500 per pair, (but they can be found for as little as \$100 in the states) and they aren't even made by a famous designer. The government however deems this machine perfectly safe and gives it a Class 2 rating—so long as the safety features are fully operational.

As a part of the safety system of

the Hybrid and to allow the operator to watch the work as it is being done, a special "window" is mounted in the top of the cabinet. Other than its yellow color, it doesn't look any different than a traditional CO₂ laser, but the orange film is capable of blocking the YAG light beam from leaving the cabinet. Even here, not all the power of the light beam can be absorbed—instead it's reduced to a level that's deemed safe by the Federal Government. For the techies, it is reduced by 1mW or 1,000,000 times.

A good exhaust system is imperative for any laser machine! You can use your own external exhaust system or a standalone carbon system made specifically for this machine



Special safety glasses are required when servicing YAG lasers.

but obtaining total exhaust of fumes is paramount. No dippy little blower exhausts for this baby. A suitable standalone carbon exhaust starts at \$3,900 and uses 33 pounds of activated charcoal. The advantages of a carbon exhaust is that it turns off and on as needed, is controlled completely by the laser's software and the fact that it helps to control odors generated by the laser in either the YAG or CO₂ mode. Anyone who has ever made a rubber stamp can appreciate this feature. However, the carbon filtration system is not required as many users obtain more than acceptable results from one of the more traditional exhaust systems such as those from Penn or W.W. Grainger that have been used for years.

What Does It Do?

Writing this EJ article was my first real hands-on experience with a YAG laser. Like most engravers, I

had built up in my mind what a YAG could do that a CO₂ couldn't. My expectations were unrealistic so the first thing I had to do was clear my head and learn what the real capabilities were and, even more important, what was practical in a real world application and what was not. For instance, here's a short quiz. See how many you get right:

1. A YAG laser will engrave anything a CO₂ won't. True or False?
2. A YAG laser is much faster than a CO₂. True or False?
3. A YAG laser is better at engraving glass than a CO₂. True or False?
4. A YAG will engrave just about any material a CO₂ will. True or False?
5. A YAG laser is best for metal since it will make a black mark without using chemicals. True or False?
6. A YAG laser is best for engraving stone, bricks and other hard materials. True or False?
7. All and all, a YAG laser is more versatile than a CO₂. True or False?
8. If they weren't so expensive, all award shops would have a YAG laser? True or False?
9. Vanadate and YAG lasers are the same thing. True or False? Well, how do you think you did?

Here are the answers:

1. False. Although the light wave frequency allows a YAG to engrave some things a CO₂ cannot, there are many products that are more laser friendly to a CO₂ than a YAG.
2. False. The laser type isn't where the speed comes from. The speed comes from the mechanics that surround the laser. Most YAG lasers are extremely fast because they use a galvo mirror system rather than flying optics like those used in most CO₂ lasers. Unfortunately, a galvo mirror system greatly restricts the size of the object that can be engraved making it impractical for marking anything much over 4" square.



Gold plated products like this star (4" w x 3 1/2" H x 3/4" d) engraved especially well with the YAG leaving a dark engraving mark on the surface (shown close-up at right).

3. False. A YAG's light beam easily passes through clear glass leaving no mark at all.
4. False. Actually a YAG does its best work with certain types of plastics and metal. There are other materials it can engrave but ABS plastic, polycarbonate plastics and lots of metals will be the money makers for most engravers.
5. False. YAG lasers will create a black mark on metals that contain a high amount of carbon by forcing carbon molecules trapped in the metal to rise to the surface. Metals without carbon content will still mark, but the mark won't change color.
6. False. Actually, I found better results engraving stone, ceramic tile and similar materials with the CO₂ portion of the Hybrid than with the

Vanadate.

7. False. A YAG is like a screwdriver. When you have a screw to take out, nothing else will do the job as well as a screwdriver. To mark metal and some other materials, nothing will do as well as a YAG. By the same token, many materials require a CO₂. The question isn't that one type is better than the other, they are each different tools for different jobs. The YAG might be likened to a screwdriver while the CO₂ is more like a hammer. Each has its own task to do. In the engraving shops of the future, seeing both types of lasers will be commonplace.
8. False. Although the shop of the future will likely have both types, the question as to which type is best lies in what needs to be marked. If metals need to be marked, a YAG is probably best. If wood is the target, a CO₂ is best. The shop of the future will see value in both markets and thus will require



Coated products such as these sublimatable tin boxes marked beautifully with the YAG.



Italian charms are extremely popular, profitable and mark with great detail, in a matter of seconds, with the YAG.

both types of lasers.

9. False. Although a Vanadate laser is within the YAG family and operates at the same wavelength, that's where the similarity ends. According to the manufacturer, the Vanadate is crystal-based (Nd:YVO₄). A Vanadate is affected by temperature, but is more robust and can take temperature fluctuations better. A Vanadate has higher peak power than a YAG as well as faster repetition, therefore a Vanadate can be q-switched faster for faster marking on certain materials.

So, how did you do? Well, I hope you did well, but if you didn't, don't feel bad. Most of us have unrealistic ideas about lasers and what they can and can't do. The important thing is that before actually buying one, you learn what's real and what's not.

Having said all that, let's look at some of the results I found while testing a wide variety of materials with both the YAG and the CO₂ laser.

Gold & Gold Plate: Our test piece was a gold plated brass star paperweight. These are terrible to engrave with a rotary engraver and a CO₂ laser won't touch them, but the YAG did a beautiful job of not only marking the gold, but it even caused it to mark black (probably because of the base metal underneath). This illustrates how nicely it can engrave jewelry such as key chains, charms and lockets, not to mention plated items such as letter openers, paperweights, desk easels and the like.

Electrical Metal: Conduit, electrical cover plates and other bare metal like that used in commercial and industrial power systems engraved very well, but didn't turn black. Electrical metallic tubing (EMT) is actually galvanized (zinc plated) steel. Since the YAG didn't make a black mark, one might assume it either didn't cut through the zinc coating or the steel has little or no carbon. Still, I can see multiple applications for the permanent mark it does make.

ABS Plastic: ABS (the base material of traditional engraving stocks) is very difficult to laser with a CO₂ since the plastic melts at too low a temperature. Interestingly though, I

was able to engrave ABS using the YAG laser with minimal melting or distortion. However, don't take this to mean you can laser materials like Gravograph's traditional "Gravoply." Engraver's plastics with a thick cap, even though they are ABS, are still the domain of the rotary engraver.

Steel, Stainless Steel & Chrome:

This is what YAGs are made for. Each metal engraved handsomely at high speed with a dark imprint. I wouldn't call the mark black, but it was a very dark brown. The mark is highly legible and permanent.

Copper, Tin, Aluminum, & Brass:

These metals all did well, but there was no color change, making each appear to be two shades of the same color. This had a very elegant look and would be suitable for many things including jewelry or ID marking for traceability.

Trophy Brass: This was interesting as I found if I engraved trophy brass at high speed, it removed the protective coating so as to create two shades of brass. This was both elegant and easy to read. If I slowed down the laser, it actually cut into the brass. Another discovery was that engraver's brass did best when engraved with the plastic coating left on the metal! The YAG left a darker mark and we're not actually sure why. Always allow the material to cool completely before removing the plastic film.

Anodized Aluminum: This is a favorite metal with CO₂ laser owners since it's the only metal that engraves with a CO₂. I found equal quality between the two laser types but the YAG allowed for much finer detail and a faster engraving time.

Polycarbonate, doped polyethylene (plastics): These are the materials that change color when engraved with a YAG. The reason this occurs is because the laser affects the carbon and reacts with the laser energy and turns it black. This is a favorite material of the medical and chemical industries. polycarbonate (brand name "Lexan") typically comes in three colors: black, white or clear. The black material engraves white and the white material engraves black. Some white poly materials engrave red. Another piece which I think was white doped polyethylene engraved gray (almost



This 1" x 2³/₄" polypropylene block was engraved with a YAG. Notice the engraving turned the plastic black.

silver). Since polyethylene alone does not change color when engraved, it must be assumed that an additive (referred to as doped) is what causes the change. Doping is a term referred to when Polyethylene is modified to increase its electrical insulating capabilities, etc.

Italian Charms: Stainless Steel Italian charms engraved beautifully with the YAG, although the mark left by the laser was more of a gold than a black—it really looked sharp. Charms can also be engraved with a CO₂ laser when used along with a chemical such as CerMark, but the resolution won't be nearly as good. With the YAG, I could actually engrave readable text below one point in size.

Trophy Aluminum: Gold aluminum engraved exceptionally well leaving a white mark on the gold background. It was highly readable and would be great for trophy plates or any number of other things. Very classy.

Fiberglass Reinforced Plastic: The YAG left a gray (almost silver) imprint, but the CO₂ cut deeper and faster leaving engraving that was easy to paint fill.

Acrylic: Be it in clear award form or as an engraver's plastic, cast acrylic did best using a CO₂ when being raster engraved. Extruded acrylic, which lasers very poorly with a CO₂, did better with the YAG. Both types of acrylic do fine when being vector cut.

Trophy Marble: Italian trophy marble engraved with the YAG, but it was very slow. A high power CO₂ does best.

Jet Black Marble: Jet Black marble engraves white when hit with a laser. Both types did well.

Coated Metal, Black Brass, etc.: Coated metals, such as Victory's LaserBright, which typically do so

well with a CO₂ laser, including black brass plated steel, polished black brass and the various colors of each can be engraved with the YAG, but the CO₂ is faster. Most colored metals leave a residue over the engraved area that must be cleaned off with lacquer thinner.

There are some materials that should never be engraved with either type of laser! PVC (vinyl) is the most commonly recognized. It not only expels some dangerous gases, it's highly corrosive to the mechanics within the laser cabinet.

Another material I ran across is magnesium. In preparing for my tests on the Hybrid, I collected about every type of metal I could lay my hands on from copper to titanium. One metal was an alloy of tin and magnesium. Fortunately, one of the Trotec people was listening and reminded me how flammable magnesium is. It had never crossed my mind. Striking that metal with the power of a laser could have had the same result as striking an



Stainless steel is one of the easiest materials to work with using a YAG.



This ³/₁₆" diameter tungsten carbide cutter was YAG engraved.

entire box of matches at the same time. Safety goes beyond not defeating the safety features of the laser; it also includes common sense and a little knowledge of the materials being marked.

Potential Markets Beyond The Usual

Aeronautical: Every part of an aircraft must be marked and be traceable. This is sometimes done using barcodes, but more often it is done using human readable text. Many metal products can be marked with a YAG without changing the properties of the material.

Automotive: More and more parts are being laser marked by auto manufacturers. Most parts now carry a serial number or Data Matrix linking them to date of manufacture. This is important for both warranty purposes and for product recalls.

Electronics: Many electronic components are marked with lasers, including microchips and circuit boards.

Federal Government & NASA: New regulations now require a great many products sold to the Department of Defense and NASA to be marked with a 2D Data Matrix code. YAG lasers are ideal for this type of marking since they have an extremely small engraving capability—20 microns—(a micron is one millionth of a meter or 39 millionths of an inch) and at high speed. It's expected that a great many products will be marked with labels of all types. Some will best be marked using a CO₂ laser while others will require a YAG, making the Hybrid an exciting tool and an excellent investment.

Medical: Marking medical instruments and various products is a highly profitable market for those who have gone after it. With a YAG, you can mark the hardest medical grade stainless steel, chrome and other materials. The medical field also uses a great deal

of polycarbonate. This is a material that not only engraves with a YAG, but actually changes color as well making even the tiniest mark easily legible. With product liability lawsuits running rampant, we can only expect to see more and more medical products, fixtures and appliances marked for traceability and identification.

Industrial: Every time a valve used in a chemical, gas or propane transmission line is serviced, it must be labeled with a stainless steel tag showing who serviced it, etc. Labels used in highly corrosive environments, explosion proof containers or used in connection with chemicals, atomic energy or in the presence of flammables must be clearly marked using non-flammable materials (usually stainless steel). Industrial plants are full of electronic sensors, regulators, switches and conduits. All must be clearly marked to government safety standards.

These are only a few of the many potential markets that might be approached. CO₂ engravers can go after some using chemicals and special materials developed for use with carbon dioxide lasers, but the potential expands greatly when the capability of marking metal is added.


In Conclusion

This is not the first flying optics YAG engraver ever built. Flying optic systems have been around in big industry for a long time. Nor does its CO₂ laser offer anything other Trotec lasers don't offer. What it does is bring the two laser types together in a form that offers a very fine CO₂ laser plus a highly versatile YAG in a way that's easy to use; it accommodates very large items (17" x 29") and does it at a price far below what it would cost to own both a CO₂ of equal quality and power plus a YAG laser engraver.



With the YAG you can actually engrave readable text below one point in size like on this PEEK (PolyEtherEther-Ketone) industrial part.

At about \$75,000, this combination cuts the cost of owning both types of lasers by many thousands of dollars. It also affords operators the benefits of both types of lasers so they can develop a market for YAG engraved products much as they did for their CO₂ engraved products.

Over time, as the demand for YAG lasered products increases, shop owners may begin to look more and more at faster and faster standalone galvo type YAGs, provided the size of the products is small enough. One might consider this a transition stage opening the door of the future when every shop owner will have multiple lasers. Even if you never go beyond this one design, with the difference in price, it would be difficult not to justify the extra money since there are so few YAG engravers in our industry. Add to that the exceptional profit margins connected with YAG engraved products—especially for industrial, medical, aeronautical and government UID (Unique Identification) markets, this clearly becomes a look into the future of our industry. 

J. Stephen Spence

J. Stephen Spence is president and founder of Recognition Concepts in Huntington, WV. He has been in the R & I industry for over 15 years. Steve is a recognition authority and a certified recognition specialist, as well as a well known lecturer and author of a number of books about engraving and sublimation. His areas of expertise include sublimation, laser and rotary engraving and sales and marketing. Steve is also a recognized authority on Data Matrix and the government's UID Program.



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