The CUTTING EDGE

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*"Industry Unity is the Surest Path to Individual Success"*

# Why Make the Die?

## Digital Converting as an Alternative Production Solution

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### Overview

Producing two-dimensional shapes from sheet or roll goods has long been the domain of flatbed or rotary dies. This conventional approach is now being challenged by the introduction of laser digital converting modules that can process two-dimensional shapes directly, without the need for tooling.

These modules are integrated with sheet-fed or roll-fed material handling systems to form complete digital converting systems to process materials or shapes for short to medium run production or for applications that may be otherwise problematic to produce using conventional tooling. This technology is enabled by the use of highly reliable diffusion-cooled lasers, galvanometers and process control software.

While standard x-y laser systems have long been used for producing prototype parts or for laser cutting dieboard, the converting industry can now produce their production parts directly using digital converting technology. The converter can now profit from the flexibility and processing advantages that a laser solution offers.

### Laser Processing Modules

Laser Processing Modules (LPM) are the core of a digital converting system. The module is designed for easy integration into sheet or web handling systems. The modules are sold to integrators or OEM's who incorporate the Laser Processing Modules into their products. The capabilities of this technology enable it to convert materials at production speeds required by industry. This is done with an added benefit. The quality and repeatability of the part is typically better due to the non-contact nature of laser processing.

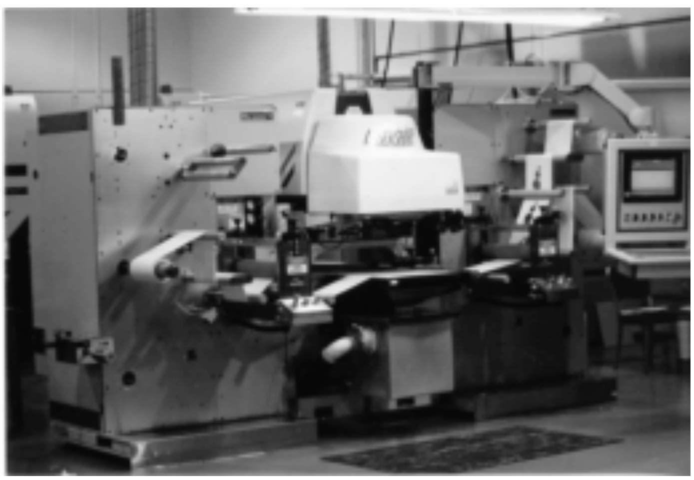
Digital converting allows companies to make instantaneous job order changes and die line modifications without the need for tooling. While this is an immediate advantage for any converter, it also opens a world of possibilities for product personalization. It is now possible to mass-produce a product that your customer defines how it will look. No other product in the converting industry offers this flexibility. Additionally, the laser itself is a highly flexible device. By simply changing laser parameters, the same part can be micro-perforated, cut, kiss-cut and scored all in the same station, a task that can be difficult to perform with hard tooling.

What does this all mean to a converter? A number of things. First and foremost, the converter can become more responsive to their customers' needs and requirements for on-time and highly accurate parts, especially with the industry trend toward lower quantity, but more frequent production runs. Secondly, because tooling is not required and tooling forces are not present, shapes can be produced that are just not possible otherwise.

In addition, materials that contain adhesives, abrasives, elastics, wovens and non-wovens can be cleanly cut. In short, this process revolutionizes the way in which a converter can respond to the demands of an ever changing market place and set themselves apart from their competition.

A laser beam is not useful until it can rapidly move in a predefined, focused pattern. A limitation in past attempts at laser digital converting has been shortcomings in the ability to manipulate the laser beam at speeds that allow economic production rates. Laser digital converting requires that the focused laser beam trace the complete die line. Therefore, the part cycle time is dependent on the speed at which the laser can process the material and also the lineal part length.

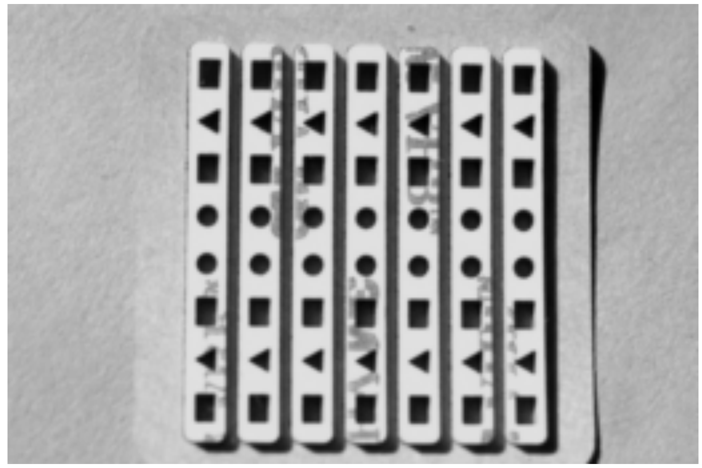
For web based production, process on the fly software allows the converter to keep the web in motion as the laser tracks the web to cut the required component features. The ability of the high-speed motion systems to manipulate the beam at over 200 inches/second for applications like kiss-cutting pressure sensitive material allow production speeds of 100 feet/minute. However, it must be remembered that the ultimate web speed is in direct proportion to the total die line length across the web. The shorter the die line, the faster the web speed. For applications that require the highest precision possible, digital converting systems will run in an intermittent or indexing mode. With the web or sheet stationary, highly accurate and repeatable components can be produced to accuracy's less than +/- .005".



The computer that controls the laser digital converting system has capabilities only dreamed of in the converting industry. Instead of spending money to purchase, store, set up, and maintain dies, the digital converting system accepts and processes .dxf files directly. This allows the converter to accept an email from their customer with an attached .dxf file.

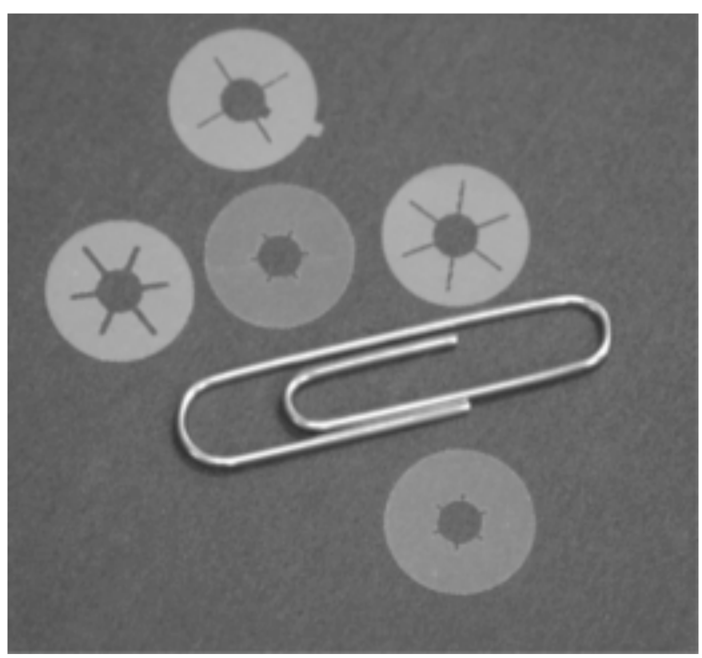
This file is then networked to the digital converting system. Once the correct laser parameters are added the converter immediately processes parts. Any part features that do not fall into tolerance or any part changes are made directly at the computer. It is now possible to complete a production run in the time that it now takes to produce a steel rule die!

The system control accepts inputs from the material handling system. Depending on the application, photo-eyes can detect eye marks that will register the laser to part print.



Optional features include devices like a two-camera vision system that is used to pick up the location of two eye-marks. This way the software shifts the program in x, y, and q for critical registration or re-registration requirements. Since it is typical for the controls to allow 4 camera input, additional cameras can be integrated downstream to verify critical part or feature location or to verify feature size. If needed, this information is fed back to the control for SPC and $cp_k$ analysis. It is this capability that can offer the high-end converter quality capabilities that are not possible with existing technology.

Laser digital converting can process any programmed shape. Associating this shape with different laser parameters, the converter can cut through the material, kiss-cut to a liner, score to a depth or perforate a given material. Material is through cut by adjusting the cutting speed to allow the beam to fully penetrate the material. Kiss cutting to a liner is then accomplished by increasing the cutting speed or reducing the laser power for a given material. If the material is a PSA with a silicone liner, it is possible

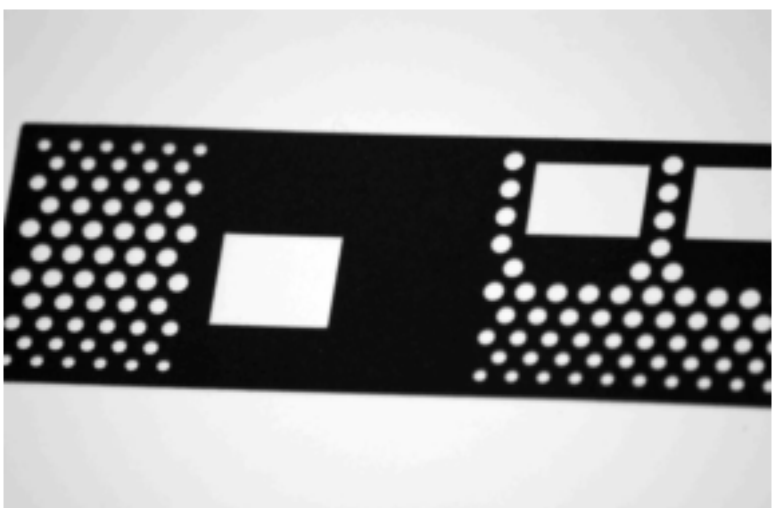



to score the PSA to the liner, but not break through. Additionally, it is possible in most materials to control the depth of penetration of the beam. Utilizing this technique, fold lines, package easy opening features and other material weakening characteristics can be accomplished.

Another attribute of laser technology is the ability to rapidly pulse the beam on and off. The ability to perform this operation makes a digital converting system an incredible micro-perforating tool. While the laser beam is being turned on and off, the motion system can manipulate the beam to preprogrammed locations. This allows a digital converting system to easily feature micro-perforate or zone micro-perforate web or sheet based material. By controlling the laser on and off time, the length of the perforation and the land between perforations can be varied. This allows the converter the ability to tailor the perforation for specific materials.

The non-contact nature of a laser produced perforation means that the perforation is highly consistent and is not subject to problems associated with die wear. In high performance applications the laser-perforated product will exhibit repeatable stable hole patterns with much lower standard deviations than possible with mechanical perforated products. This translates into higher customer satisfaction and product quality.

Laser digital converting will not completely replace flat bed or rotary dies. It offers unique process and production advantages that hard tooling cannot approach. Flexible, highly productive laser digital converting systems offering personalization and high part quality are now on the market.



Leading edge converters will recognize these differences and implement this technology in order to take their production and customers to the next level. One only has to look at the dramatic difference lasers have already made in the dieboard market.

Over 20 years ago leading dieboard companies began making investments in laser technology to produce laser cut board resulting in improved die quality, accuracy, and shorter lead times. Laser Digital Converting will extend this capability in our highly demanding manufacturing environment.

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