CHOOSING THE RIGHT TECHNOLOGY
FOR A VARIETY OF MARKING AND CODING APPLICATIONS

By Scott Benigni, product manager, Videojet Technologies Inc.

Marking and coding may not be high on your list of priorities… until you get a project that uses new packaging materials or has new customer requirements – the customer needs permanent codes; the packaging has changed from a paper box to a plastic bag; the marks need to be highly readable. Then it becomes crucial to know all your options before choosing the right technology.

Careful analysis can make the difference between a successful, efficient operation and one that experiences needless downtime, resulting in unhappy customers. Key factors to consider include:

- Types of materials or substrates you'll be marking

- Desired speed of application or throughput

- Print quality- permanence and readability

- Up front investment your company is willing to make

- Total cost of operation, which includes cost for service and consumables, such as inks and ribbons

- Whether variable data, graphics and bar codes are needed

Once you know these factors, it will be easier to choose which marking and coding technology is best for your application. Continuous ink jet (CIJ), laser coding, thermal transfer overprinting (TTO) and binary array ink jet printing are all options that have benefits for different applications. Here is how each technology fits into the increasingly diverse industry of package marking and coding.

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Continuous ink jet (CIJ)

Perhaps the best known method of non-contact marking and coding is continuous ink jet (CIJ). CIJ has become one of the most versatile and durable options for manufacturers. Small character CIJ printers create lot codes, expiration dates, bar codes and graphics on a wide variety of primary packaging, while large character CIJ printers do the same for secondary packaging such as cartons and corrugated boxes.
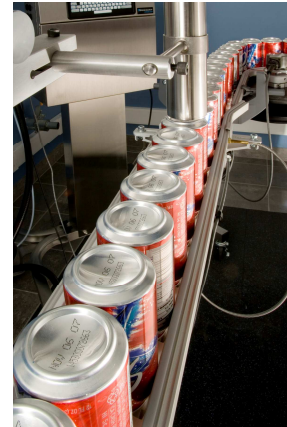
Product packaging requires readable, high-quality codes to ensure accuracy in the tracking and tracing of those products. Small character CIJ delivers this by applying a stream of ink drops via a printhead to the package. This allows codes to be applied in a variety of fonts, lines and direction and at a range of throughput speeds – up to 1,000 feet/min. and with code heights ranging from 1/32-inch to more than ½-inch.

Plus, the development of related technologies – such as software that monitors and controls ink viscosity and automatic flush systems that eliminate daily printhead cleaning – have helped reduce downtime. Also key is that many small-character CIJ printers are portable and can be moved from line to line as needs arise.

Laser coding

Industrial laser marking started in the early 1970s and since then has developed to a well-established technology. Today, laser marking and coding is used in thousands of production lines throughout the world. It can be used for marking numerical codes, 2D-matrix and bar codes, logos and symbols onto labels, sleeves, glass and plastic bottles, cans, kegs, tubes, blisters, cardboards, tubular films and caps.

Lasers do not require inks, stamps or ribbons to generate a code. In modern sealed-off CO_2 laser coders, such as Videojet's 3120, 3320 and 3430 models, the infrared laser light is generated via radio frequency discharge in a carbon dioxide gas mixture. The CO_2 laser systems code thermally by changing the surface color (e.g. PVC packages), melting, foaming (e.g. PET bottles), or removing the material surface (e.g. printed labels, cardboards, cans, tubes).

The advantages of laser coding are numerous – speed, versatility, code permanence, non-contact operation, clean and dry process, maintenance-free operation over thousands of hours, extremely low operating costs, and adaptability to a fully automated line. Lasers also offer unsurpassed reliability in "no code/ no run" operations. This means that if it's mandatory to code the product prior to distribution, then production will stop if a product is coded incorrectly. Halting production is a very expensive process, and most companies will do everything to avoid downtime. The unequaled uptime of a laser coder and its extreme productivity result in cost savings for a variety of applications.

Thermal transfer overprinting

Thermal transfer overprinting (TTO) features a thermal transfer printhead and ribbon that makes contact with a flexible substrate, such as synthetic films and plastic labels. Miniature print elements under a glass coating heat small areas of the ribbon and transfer ink to the target substrate. Print elements are program-controlled to create real-time images, including clean, high-resolution bar codes, text and graphics. TTO systems can address applications in both continuous (moving) and intermittent (stop-print-start) environments.

Maximizing production uptime and ribbon utilization are the keys to success with TTO, and some methods of doing so are more effective than others. For example, the Videojet DataFlexPlus™ features a solid-state, clutchless ribbon drive system that uses bi-directional stepper motors. The system continuously monitors ribbon tension to avoid ribbon-related faults, such as real or "false" ribbon breaks, which can interfere with production. This system also more precisely controls the ribbon, leaving only a millimeter of space between prints for better ribbon utilization. TTO systems that use clutch-based ribbon drives cannot as effectively accommodate fluctuations in ribbon tension on control spacing between prints. As a result, clutch-based systems use more ribbon and experience more ribbon-related faults, which translates to increased downtime and higher operating costs.

Typical applications for TTO are within the snack, bakery, meats and frozen food industries, where flexible packaging is common. Such packaging also plays a big part in the retail hardware sector, where items like screws, nails and fittings for do-it-yourself projects are sold pre-packed. Many automotive-related companies also pre-pack small components for retail outlets in the same way. There are also special applications, such as in the coffee and confectionery industries, where generic packaging is used across a wide product range and all product branding and specifications have been added using TTO. This saves companies substantial cost through reduced waste and inventory.

Binary array ink jet

Binary array technology is a form of non-contact continuous ink jet printing that uses up to 256 orifices in the nozzle to generate more than 15 million droplets of ink per second, creating a "curtain" of ink. The printed image is controlled electronically by on/off

(or binary) charge of pressurized droplets of ink. Charged droplets are returned to the system, while uncharged droplets are used for printing.

Binary array ink jet printers, such as the BX6500/6600 from Videojet, print high-resolution bar codes, text and graphics up to two inches high. This technology is also cost effective when printing variable information in high volume, reducing inventory of pre-printed package variation, and generating images that look better than those from other ink jet or laser technologies. Binary array has low running cost compared to contact technologies, can print graphics and variable information, prints on a wide variety of substrates and works with web or sheet-fed applications.

Applications for binary array ink jet printing include printing variable information on pre-printed chipboard folding containers and labels; personalization of promotional mail packaging; security forms and serializing, lottery and gaming; plastic bottles; and compact disc jackets with artist name and serial number.

Thermal ink jet
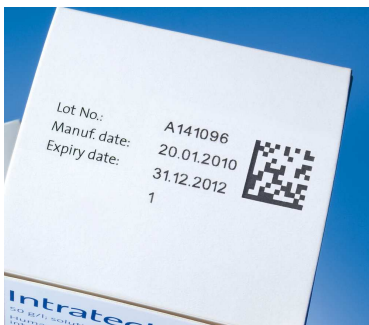
Thermal Ink Jet (TIJ) printers use print cartridges with a series of small electrically heated chambers controlled by a flex-circuit. This is not unlike the technology used in desktop ink jet printers. To produce an image, the printer runs a pulse of current through the heating elements, causing a steam "explosion" in the chamber to form a vapor bubble. This bubble propels a droplet of ink out of the nozzle and places it precisely on a surface to form text, bar codes or graphics onto the substrate. This technology is well-known for its ability to generate high-quality graphics and high-grade two-dimensional symbologies such as DataMatrix codes.

TIJ technology is ideal for coding requirements often found in the pharmaceutical, tobacco, health and beauty, and other industrial markets. These printers enable high-speed coding of serialized data and many types of bar codes, including GS1 DataMatrix, to be compatible with track-and-trace applications.

Making the choice

Careful consideration of the application – materials to be marked, requirements for permanence and readability, anticipated line speeds and operating costs – is the first and most important step toward determining the right marking and coding technology for your company's needs. From there, supplier representatives can assist in taking the next step in examining the features and costs of specific laser coders, thermal transfer overprinters, binary array printers, and even standard ink jet printers. Once all these issues are factored in, actually choosing a marking and coding system becomes the easiest step of all.

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