

MAKING A BETTER MARK WITH INK JET

As substrates, industry regulations and customer demands change, fluids are also evolving

By Dan Laird, technical support chemist, Videojet Technologies Inc.

On the surface, it seems clear-cut. You've got a new product running on your line, so you calibrate and adjust all the equipment and add your trusty continuous ink jet (CIJ) printer for coding on the packages. All that's left is to get the line started, right?

Before you begin printing codes on the new packages, there are other factors to consider that may require a change in ink:

- Package substrate
- Environment in which you're printing
- Ink drying time requirements
- Code durability requirements
- Industry standards, along with related regulatory or safety restrictions



Once you've evaluated this information, you'll be able to determine which ink is best suited for the application.

What's the substrate?

All inks are not created equal. There is no truly "one size fits all" ink to work in every CIJ printer and application. So before choosing an ink, you should first consider the substrate to be marked. Paperstock can typically handle most inks, but new plastics are being developed every year that provide a challenge to making inks adhere.

The condition of the substrate when it's being marked can quickly narrow the list of appropriate inks. Many metals have a microscopically thin layer of lubricant that is present from other processes prior to printing. Depending on the thickness of the lubricant, marking and coding

may be affected. For coatings like oil and water, inks have been developed that can penetrate such materials. But that's not just a chemistry problem as one might infer – it's also a physics problem. The drops of ink aren't being shot hard enough by the printer to penetrate the lubricant.

Where are you printing?

Another concern is the physical environment of the plant and the conditions at the time of printing, especially the air around the printhead. Not all inks adhere equally well in every condition; factors like moisture, temperature, humidity and dust can all have a negative effect. These conditions will rule out some inks, but there are others tailor-made to such situations. The key is to choose the right ink for the situation.

Additionally, technology is available that can help a printer work more optimally in plants that may have a significant amount of dust in the air. A manufacturer that supplies both printers and inks can help you make the right decisions when it comes to choosing a combination of the correct ink and printer technology for your situation. Keep in mind, too, that if conditions change, that could necessitate a change in ink.

How fast does it have to dry?

Drying times are also crucial. It's not enough to say that it has to be fast; the speed needs to be quantified. The most important data to have is the amount of time between when the code is printed and when it first touches something. It could be a person's hand, another product or a roller, but that needs to be calculated.

The typical time lapse is 2 to 5 seconds from printing of the code to the first touch, so inks must dry that quickly. That may sound lightning fast, but there are some high-speed operations where the drying time is measured in *tenths* of a second. New ink could be required if your drying time changes.



How durable does it need to be?

A mark or code also has to be durable. It may have to survive chemical soakings, abrasions or environmental extremes like water and sunlight. The cradle-to-grave marking and coding trend continues to grow in many industries, which requires extremely durable inks that can stand up to the toughest chemicals and abrasions in order to survive for the life of the product. These inks are usually used in conjunction with a specific type of printer for maximum effectiveness. Perhaps your goal is to create a chemical-resistant code that's going to be subjected to solvents, oils and alcohols. In that situation, the best choice may be an ink formulated to cure via heat or ultraviolet radiation.

If you're exporting your products, there is a possibility you'll have to mark or code them with ink that can be removed later, but also adheres well and doesn't rub off. The returnable bottle market is one example. When bottles are returned to the manufacturer or copacker, the mark or code is removed in order to reuse them. A caustic bath will do the job, but a relatively recent development is an ink that can be removed with water, a less intensive process.

What are your industry standards?

Also important to consider are standards specific to your industry, along with regulatory or safety restrictions concerning flammability or volatile organic compounds (VOCs), like solvents that evaporate into the air after printing. That means the chemistry that goes into developing an ink must be altered to remove or reduce chemicals that would violate these regulations. For example, in the printing and brewing industries, companies emit VOCs like ethanol in multiple areas in their operations, so code printing is one spot where they will try to reduce emissions to remain at or below acceptable levels. Companies that are certified for the ISO 14001 standard must continuously analyze their operations to see how they can reduce waste, and targeting a CIJ printer to reduce VOC emissions is a method that should be considered.

When in doubt about meeting the requirements of regulations, standards or safety restrictions, employ the help of an experienced ink and printer manufacturer, because they will be familiar with the regulatory needs of many industries. Some manufacturers can do VOC emission estimates and provide regulatory information.

Have special needs?

Every industry has special needs that require special solutions. Perhaps you want to create a “covert code,” where you want to track a product but your copacker doesn’t want your code visible on the product because it’s going to apply its own code. There, the best choice is an invisible code created with fluorescent ink that is visible with an ultraviolet light (UV or black light). Without UV light, the package looks clean.

That’s just the beginning, however. Inks are available that change color when exposed to steam heat, which is especially common in the food industry for quality control measures. A product is cooked in its can via high-pressure steam, which changes the code from black to another color, like blue or red, to indicate it is completely cooked. Opaque inks are the same color independent of the background. These inks are ideal for printing white and yellow codes on dark substrates. Some opaque inks require a unique printer because they are based on heavy pigments and not dye, although Videojet offers a patented opaque ink without the use of pigments, so it doesn’t require a special printer.



Food grade inks may be required on a package that comes in contact with food. Typically, such inks are used for marking and coding on the inside of a package, where it’s touching, or potentially could touch, the food. In order to create food grade inks, marking and coding manufacturers must choose from raw materials on the U.S. Food and Drug Administration’s

Generally Recognized as Safe (GRAS) list and manufacture them in a special facility separate from its other non-food grade ink production sites, which is subject to FDA inspection. Some inks can even be kosher-certified.

Maybe you think you need food-grade ink. A specialist can provide data – based on industry experience – that supports or disproves that claim to help you make the best possible choice.

A holistic process

Marking and coding should be viewed as a holistic process, meaning it's dangerous to separate a manufacturer's printers from its inks. Ink is a component of the entire printing system. At companies that manufacture inks and printers, chemists and printer design engineers work together to create the best possible system, to maintain the end user's uptime and reduce maintenance and parts costs. This involves developing ink property specifications and designing a printer to those specifications. Remove one part of that equation and the system doesn't run as efficiently. Designing when you know the solids, viscosity and solvent blends that make up inks is a much more efficient manufacturing process. Some solvent blends can actually attack parts of a printer's equipment, which adds up to increased parts and maintenance costs over time. But the manufacturer is aware of material compatibility issues and can properly choose the correct solvent blend suitable for both the ink and printer.

Thus, a manufacturer's inks are best-suited for its own printers. Some third-party ink suppliers may offer products that save a few dollars in purchase cost, but end up costing 10 times as much in the long run on parts, maintenance and downtime. Remember, if a printer goes down because of substandard inks, you're paying your employees to stand around while you're missing customer deadlines. Plus, if you've saved \$1,000 per year on third-party inks but spent \$1,500 on new nozzles, then you didn't save anything at all.

Keep in mind, too, that leading ink and printer suppliers invest a lot in research to develop new inks for new coding applications as they arise. Third-party ink providers merely create similar formulas for existing inks, so they can't afford to stay on top of industry innovations.

Long-term relationship

Developing a relationship with a trusted service provider is key to efficient operation. An experienced ink and printer specialist can help you choose an ink that dries faster or adheres better, or troubleshoot if the system isn't working at optimum. In many cases, a change in the operation, particularly the substrate that's being marked, can create the problem. The specialist can diagnose the problem and recommend an ink that will work better with the new substrate or change in conditions. An ink specialist can also assure that you'll receive the exact same ink blend for your next batch because of tight quality control and batch testing. It's also possible for a manufacturer to make custom ink for a customer. Videojet, for example, has its Special Application Ink program for developing custom inks.

A quality ink and printer manufacturer also won't use a customer site as a quality control laboratory. Approved trials are performed at customer sites, certainly, but first there needs to be extensive internal testing in environmental chambers that simulate conditions by varying temperature settings in order to gauge the effects on both printers and inks. Also, ink makers should have programs in place to monitor ink batches after manufacturing, such as accelerated aging tests. If there is a batch problem, complete lot traceability means the ink manufacturer can find all customers that have a suspect batch within minutes. Ask your ink provider about such testing and batch traceability standards before you consider signing a contract.



Purchasing peace of mind

CIJ printing has been a fixture in industrial coding since the 1970s and has evolved with the times. With new applications come new ink solutions, but the suppliers most qualified to guide your business through the complex choices of substrates, conditions, regulations and other needs are those that manufacture both printers *and* inks. What your company is purchasing, then, is more than just a printing system – it's peace of mind knowing there is one less thing to worry about today.

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