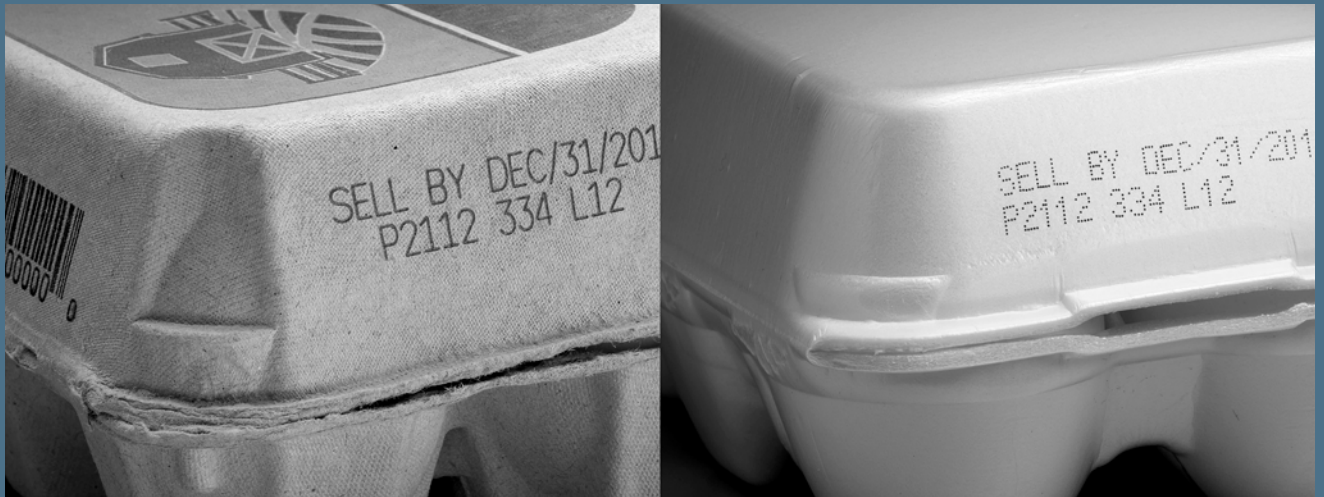**VIDEOJET**

Increase production efficiency and eliminate errors with advanced egg carton coding solutions

Egg carton coding is the most common way that eggs are tracked for traceability. It's also the most common way consumers determine the quality of the eggs they are about to buy, and most importantly, it is how they determine the quality of their eggs once they have them at home.

However, the sell by or best by information on the egg carton is often poorly printed, even on higher-priced specialty eggs. Since this information is the key traceability link, it is vital that this is printed clearly. Newer continuous inkjet (CIJ) and laser marking technology not only offers better print quality, but is also easier to setup and changeover, and requires less maintenance than current printing solutions.

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Why code on egg cartons?

Carton level identification is mandated in the United States by the USDA (7 CFR 56), in Canada by the CFIA (C.R.C. 284), in Europe by EC Regulation 557/2007 and comparable organizations in other countries.

It provides traceability information that links the eggs within the carton back to the farm and date of packing. With this information, government authorities can alert the public and manage a recall of questionable eggs. This identification is currently the first location the consumer finds the date and lot coding information for eggs.

If reliably getting the right traceability code on the right carton isn't hard enough, the increasing variety of egg carton styles, sizes and materials adds to the challenge. There has been an increase in the use of clear plastic cartons which allow consumers to see the egg's condition without having to open the egg carton. This has the added benefit of limiting egg handling, thereby decreasing the likelihood of damaged eggs.

The use of molded paper/pulp cartons is very popular in Europe and is increasing in the US. These cartons are becoming more popular in the specialty egg sector where paper is believed to be more eco-friendly. As warehouse shopping becomes more popular, the use of larger cartons – whether 30 egg trays or 24 egg cartons – is increasing. These new packaging solutions push the limits of an egg carton definition and offer new challenges to coding.

Meanwhile, another segment of consumers is choosing an 'eat fresh', less wasteful lifestyle and is demanding smaller egg cartons, typically four- and six-count options. All of this combines to complicate something as simple as printing or coding on an egg carton.

Food traceability through the distribution chain

Traceability is the ability to identify the origin of food components, through all the stages of production, processing and distribution. Traceability typically relies on the 'one up – one down' approach where companies have a system in place to identify what they receive from whom, how they process the product, and what product they supplied to whom.

To be successful, traceability solutions need to be simple to implement and to use. Considering most highly publicized food recalls, it's fair to say that once the threat is understood, much of the affected product has already moved through the distribution chain and is in the hands of retailers and consumers. Having legible traceability codes printed on the egg carton increases the effectiveness of a recall.

The basics of printing traceability codes on egg cartons

There are several important aspects to keep in mind when selecting a printing solution: the location of the code on the carton, creating and changing the codes, physical and data integration with the grading system, the best inks to use and system maintenance for reliable printing.

The egg carton material and color will impact the information printed on the carton. For ink-based printing solutions, different carton materials will have different absorbing properties that will affect the ink dry time and adherence. Most paper cartons are porous and very absorbent, so the ink will dry quickly and adhere well to the carton. Foam cartons are typically non-porous and will require a different type of ink to adhere to the carton, and the ink will take longer to dry. Clear plastic cartons have similar characteristic to foam cartons, but with the added challenge of being 'see through' which effects legibility.

The key advantages CIJ printing offers over older printing solutions are non-contact printing which is faster and cleaner, and rapid changeover to print different traceability codes. Newer CIJ printers have enhanced environmental robustness to allow them to print well in temperature and humidity swings, and they are designed to require far less service and maintenance which increases uptime and productivity.

Laser marking systems will image the most common types of carton materials without any problems. Laser marking solutions eliminate the need for supplies by etching directly on the egg carton, which gives operators one less thing to worry about, and reduces maintenance. Since there are no supplies (inks) required for laser coders, the image is permanent the instant it's applied to the carton. However, the egg carton material does impact the laser code's legibility. Laser printed codes are very easy to read on paper cartons but more difficult to read on foam or clear plastic, as the user has to adjust the carton in the ambient light to better read the code. Some types of plastic carton materials cannot be marked by laser marking systems. Talk with laser marking suppliers to determine how well laser will work on all your cartons.

Benefits of coding on egg cartons

For the consumer, egg carton coding is a simple way to feel confident in their purchasing decision by providing a way to determine the freshness of the eggs, and how long the eggs will remain fresh if properly stored. The code also is the primary identification if a recall is issued.

Retailers rely on the egg carton codes to maintain optimal stock rotation by helping to ensure an efficient FIFO ('first in/ first out') inventory system which provides their customers with the freshest eggs and lowers their spoilage. The codes simplify processes if a recall is issued by providing a simple way to pull affected product off the shelf.

Government authorities at both the state and federal level utilize egg carton coding as part of retailer inspection for product freshness. Carton codes are the primary identifier for suspect items as part of a food recall.

Packers and graders benefit by maintaining compliance with retailer requirements and with food safety and egg laws.

Coding location on the carton

Your customer's requirements and the carton's design will influence where the traceability information is printed on the carton. To get the best print quality, the coding surface should be as flat as possible so that the distance from the printhead to carton's surface is constant.

Newer CIJ and laser marking systems offer the benefit of coding on the ends or top of the carton. These newer printers' non-contact nature makes them faster and more reliable than contact printers. This increases your capability to meet the requirements of more customers and to adapt to new requirements, while improving your efficiencies with higher reliability and better grader integration.

Coding on the ends of the carton

In North America, traceability information is typically placed on the ends of the carton. If it's a split carton, both ends are coded. This is a very affordable location to code because printers can be located in one fixed location, along the side guide of the conveyor that transports the carton towards the packing area. Coding on the end of the carton can occur either before or after the carton is filled. Coding can occur on an open carton or a closed carton.

Printing on a moving carton is the best way to implement a CIJ solution. For laser, the coding happens so quickly that movement is irrelevant – you can code on a moving or stationary carton. Coding on the end of the carton can get challenging when the carton is uniquely shaped, like the green carton shown. In this case, it would be best to consider coding on the top of the carton.

If coding will occur after the carton is closed, it's important to ensure that printing only takes place if the carton is closed. A sensor can be installed to detect an open cover to prevent printing directly onto the eggs.

Coding on the top of the carton

This type of coding is very common in Europe. The top of a carton is a great location to code because it's ideal for the consumer to check the best by date. Coding on the top of the carton is exclusively done after the carton is filled with eggs and the cover is closed.

Laser technology works well in this application because the laser can be configured and mounted in such a way that one laser can print anywhere on the top of the carton, including multiple places for split cartons. CIJ printing requires the printhead to move across the length of the carton. This is typically accomplished with a traversing mechanism that moves the head back and forth in a similar manner to how a desktop inkjet printer works.

Another top of the carton printing option is to use thermal inkjet (TIJ)printers. These printers are installed in the packing lane and the printheads are installed just above the closed cartons as they move down the packing lane. These printers perform very well on paper cartons, but are less popular on foam and plastic because of the ink dry time.

Creating and selecting what to print

While the information coded on egg cartons is similar, a quick walk through a couple of grocery stores will highlight that different retailers and brands present the information differently, and they provide different amounts of information. Creating, editing, and selecting the right information to print on the right carton is critical for both proper food traceability and operational efficiency.

New printing solutions can be integrated to create and manage these traceability codes that shorten the changeover time, allow newer codes to be created and distributed across the operation quickly, and can integrate directly to the grader control system, reducing errors. This is much better than older systems that require operator intervention whenever something needs to be changed. This takes time, slows down production and can lead to problems if someone forgets to perform the change.

The various codes that are printed on the cartons are stored in the printer. They are usually designed on the printer or with additional software on a computer and downloaded to the printer. Each code is assigned a name in the printer so that the operator can select the appropriate code. There can be multiple codes for the same customer depending on the number of different egg cartons the customer wants packed, how they want to present the information and what information they want to print.

Selecting which code to print can be accomplished via the printer's user interface or via an external signal to the printer. If you only have two customers with a single code for each, selecting the right code is as simple as walking up to the printer and picking the one needed. However, if you have many customers with multiple codes each, there's a greater chance that an operator could select the wrong code. Having an external signal from a device that knows exactly what to print is a far better solution.

Physical integration

When selecting a new printing solution it's important to properly install and physically integrate the equipment into the grader's packing lanes.

Printers can be installed before or after the cartons are filled. CIJ printheads are typically mounted to the packing lane hardware and the printers are installed nearby. Laser printers are mounted to the packing lane hardware.

Make sure that the cartons are properly aligned and registered to one side of the conveyor as they move in front of the coding equipment so that each code is as legible as possible. Whether printing will occur on an open or closed carton, the same care should be taken to help ensure the best print registration.

Data integration

When integrating the printer into the egg grader's control system there are a couple of options, depending on the grading equipment and the production complexity.

Simple integration

Printers operate in a standalone mode where they get no information from the grader. Considering the example of a typical egg carton, all the information is set up in the printer when it's installed, and with the printer's real-time clock, there's nothing required from the grader or the operator to print on the cartons. Date and time rollover happens automatically and doesn't require any operator intervention like contact printing solutions. In a simple integration, each printer is programmed when it's installed, to have every possible coding method for all customers. Then, when customers change, the operator or supervisor will need to select the correct code for the printers that need to change.

Better integration

The printers can get direction from the grader controller through another computer system. This computer system receives information from the grader or from the operator when there is a change in the packing requirements, like a different retailer, for example. It forwards the information to the printers so they know what to print. An example might be changing between a simple carton of a dozen eggs, to a dozen eggs in a split carton. The split carton should have the date codes printed on both cartons, whereas the single carton only needs one code. In this scenario, when the grader manager changes the carton type, the intermediate computer updates the appropriate printers to account for the change.

	Contact Coders	Labelers	CIJ	Laser	TIJ	TTO
Printing type	Contact	Contact	Non-contact	Non-contact	Non-contact	Contact
Paper cartons	Good	Good	Great	Great	Good	–
Foam cartons	Good	Good	Great	Ok	–	–
Clear plastic	OK	Good	Good	Ok	–	–
Label	Good	Great	Great	Great	Good	–
Shrink wrap	OK	Good	Good	–	–	Great
Date & time rollover	Manual	Auto	Auto	Auto	Auto	Auto
Supplies	Ink, stamps	Labels	Ink	–	Ink	Ribbon
Code creation	Manual	PC	Manual, PC	Manual, PC	Manual, PC	Manual, PC
Code change	Manual	Auto	Auto	Auto	Auto	Auto
Code location	End or top	Top	End or top	End or top	End or top	Top
Print quality consistency	Varies over time	Varies over time	Consistent over time	Consistent over time	Consistent over time	Consistent over time
Data integration	None	Better	Better	Better	Simple	Simple
Ink low detect	No	–	Yes	–	–	Yes
Incorrect ink	No	–	Yes	–	No	–

Best inks to use for a CIJ solution

CIJ printing solutions need to consider the type of ink that's required to print on the egg cartons. Most carton coding inks are non-food grade, because the carton isn't considered a food product.

Choose an ink that provides the best adherence to the surface of cartons while achieving the fastest drying time so that the ink doesn't smear when cartons are packed into cases. If you are printing on a variety of different carton materials, then select an ink that's optimal for all of them so that there is no need to change inks.

Newer CIJ printers have features that simplify the loading of inks with a cartridge ink system that is the quickest and cleanest way to load ink. These systems also alert the operators when they are running low on ink so that production is never stopped because of lack of ink. Print quality is identical carton after carton and it doesn't degrade as the ink runs low or the stamp wears out.

Most carton coding occurs after the eggs are filled. In this case, consider how to prevent coding on an open carton and how to process the eggs if they are accidentally coded. We've already discussed how to prevent printing on an open carton. It is best to assume that eggs might get printed on, so develop a process to handle these eggs. This can be as simple as quarantining the eggs and allocating them as breakers, or discarding the damaged eggs.

Coding on flats or trays

30-egg flats or trays are popular with large grocery chains, discount grocers, and food service providers. These trays offer a unique challenge because the vast majority are made from paper and they are typically shrink-wrapped to contain the eggs instead of having a cover over the eggs.

Shrink wrap solutions require expensive equipment and the consumer can't reseal the container. There are new packaging solutions that are made from clear plastic that offer packaging simplicity and are re-sealable for improved egg protection and customer satisfaction.

In either case, these packages can be coded with either the CIJ or laser technology discussed in this white paper, or with Thermal Transfer Overprinters (TTO). Like conventional egg cartons, CIJ can print directly on the plastic, whether shrink wrap or a plastic carton. Laser can code directly on a plastic carton or on a label applied to either the shrink wrap or the carton.

TTO printers print with ribbon directly onto the shrink-wrap material. The TTO equipment is installed with the shrink-wrapping equipment and the wrap material passes through the TTO printer prior to being wrapped around the egg flat. The information printed by the TTO printers is controlled on the printers by the operator who will change what needs to be printed as production requirements vary.

Equipment maintenance and cleaning

Egg carton coding equipment is typically installed in a location that's fairly clean and free from the mess that can be created when grading eggs. The latest CIJ technologies offer trouble-free operation by incorporating features that prevent debris from building up on the printhead. This extends printer uptime and provides low maintenance operation while lowering the costs associated with production stoppages and maintenance activities.

It's especially important when cleaning the packing conveyor area to protect the printing equipment from inadvertent damage or contamination from the cleaning process. You may need to cover the CIJ or laser heads to protect them from cleaning liquids and high velocity debris if you are using compressed air to clean.

Benefits of other technologies

CIJ and laser offer some significant benefits over other egg carton coding technologies. Contact marking solutions, like roller wheels or contact pads are messy and inconsistent in their print quality. This leads to ink leaks and spills and general untidiness that becomes difficult to clean. These coding solutions can also produce inconsistent and unprofessional print quality. Keep in mind that the purpose for carton coding is to create an optimal solution for the consumer to judge egg freshness and to be the first line of response in a food recall scenario.

It isn't always easy to change the information being coded on the carton with a contact marking system. These printers can also be difficult to reconfigure if a new layout is required. Moreover, they don't indicate when they are running low on ink, or when they might have a printing problem. If employees don't check, consumers will become the quality control point.

Labeling is popular in Europe and many other areas of the world. Labels are printed and applied after the carton is closed. Label printers print a stream of labels prior to being applied to the carton. When there is a changeover, these labels have to be removed and discarded. This requires time and manpower, which decreases production efficiency. If the printer runs out of labels, the pack lane has to be stopped and an employee has to find labels and load the printer. In addition, the printer doesn't warn in advance that it's going to run out, further decreasing efficiency.

Labeling systems are also susceptible to poor print quality, which usually manifests itself as thin lines in the print, making the print hard to read. These lines can be caused by debris that is lodged between the printhead and the media or they can be caused by the printhead actually failing in different locations. If it's debris, this can be solved by cleaning the head, which takes time and stops packing or is part of the maintenance operation. If it's a failing printhead, then the head has to be changed.

Getting the labels to stick and to be applied in the same location on the carton is also troublesome. The labels are not applied with a great deal of pressure, so they can fall off, especially if they are applied in the wrong location. Then the employees have to manually apply the label, which takes time, effort and a hand labeler. CIJ and laser solutions eliminate all the hassle associated with labels, don't cause the packing lane to shutdown, produce very legible codes with minimal effort and mark directly on the material so the code can't fall off. What's the use of a traceability code label that's fallen off when there's a food recall?

Improve efficiency and quality with the latest solutions

There will be increased demand for expanded variety of eggs as consumers segment themselves based on their different needs. This will increase the number of different packaging requirements. Retailers and brands will continue to advance egg carton packaging solutions to differentiate their products.

Food safety concerns continue to gain media attention. Consumer demand for safe, healthy food continues to remain an important priority. Expect more pressure to improve operating procedures and increased emphasis on better traceability methods. The increase in globalization and global trade will lead to an increase in sharing of best practices, which will further drive enhancements in traceability requirements.

As complexity increases, having an integrated solution will eliminate the wasted effort managing and adjusting older coding solutions. Having all the printing controlled directly from the grader eliminates errors by taking human intervention out of the process. Additionally, utilizing technology that is designed for long runs and nearly maintenance-free operation further allows you to focus on improving efficiency and better managing your operation.

Stay ahead of the change. The best way to meet evolving requirements and increased business pressure is to invest in the latest printing solutions that are designed to be easy to configure and adapt to changing needs and requirements.
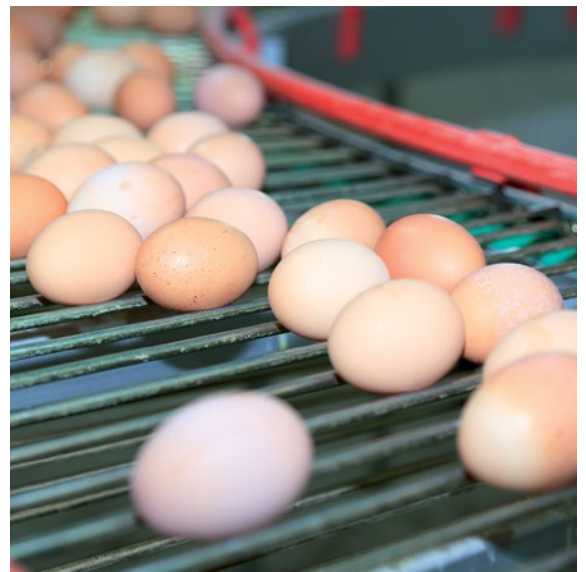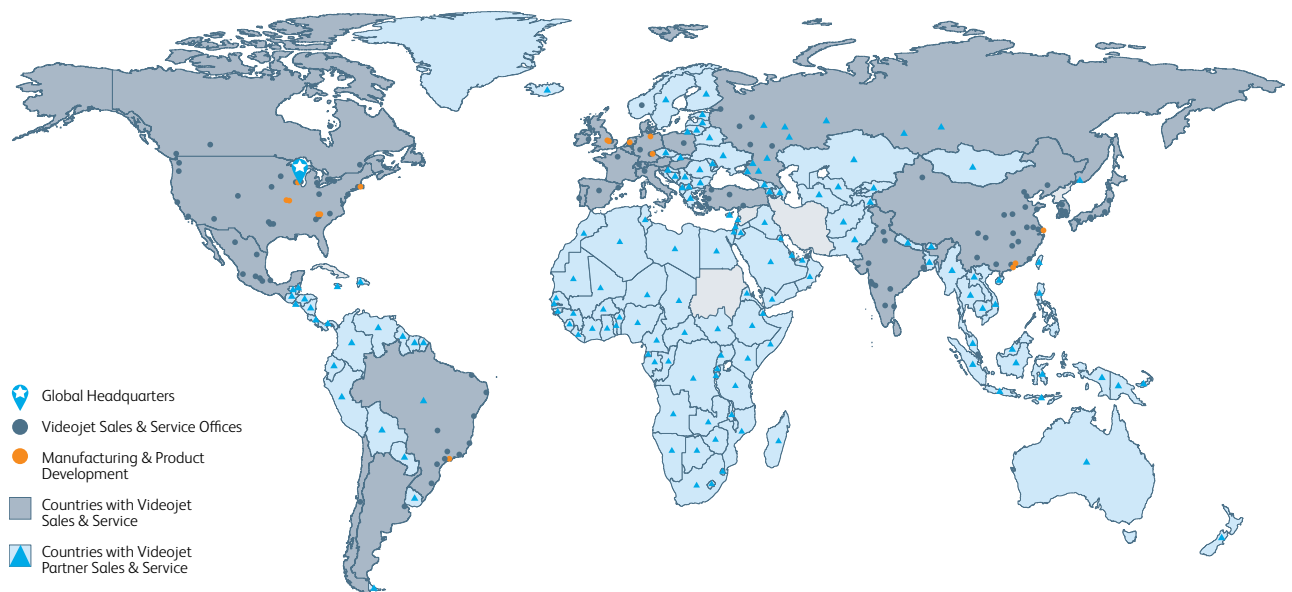
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Our goal is to partner with our customers in the consumer packaged goods, pharmaceutical, and industrial goods industries to improve their productivity, to protect and grow their brands, and to stay ahead of industry trends and regulations. With our customer application experts and technology leadership in Continuous Inkjet (CIJ), Thermal Inkjet (TIJ), Laser Marking, Thermal Transfer Overprinting (TTO), case coding and labeling, and wide array printing, Videojet has more than 325,000 printers installed worldwide.

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Call **800-843-3610**
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or visit **www.videojet.com**

Videojet Technologies Inc.
1500 Mittel Blvd. Wood Dale IL 60191 / USA