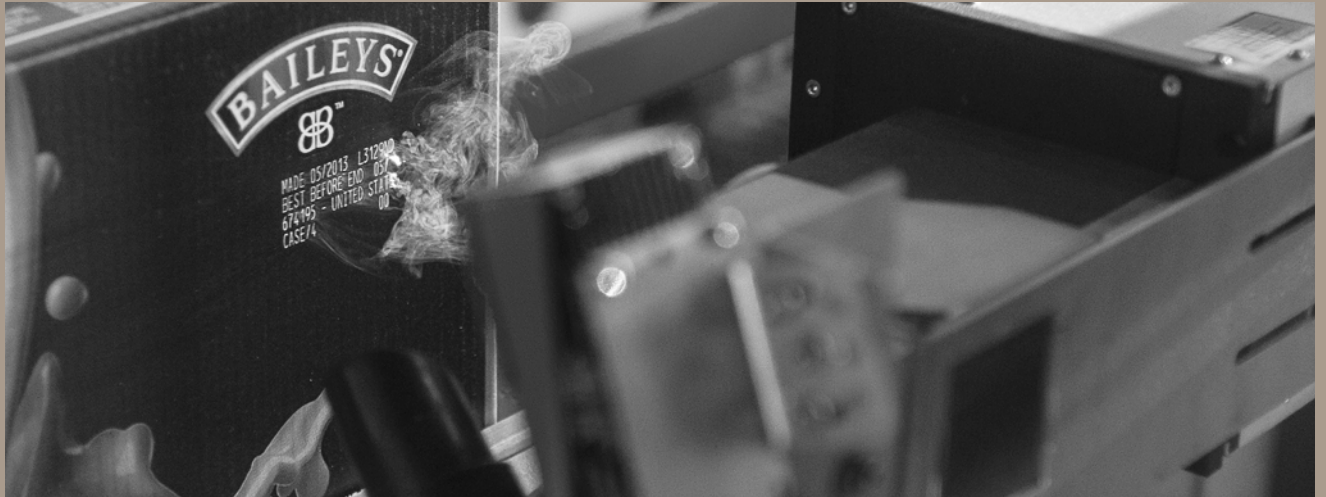




Removing the costs of coding errors

Consumers, business partners and the regulatory authorities demand ever more accurate on-pack coding and information. Are processes and today's Laser Marking Systems up to meeting that challenge?



Executive summary

- Improved legibility, more variable data, better chosen print locations, faster production lines and more diverse packaging formats are all putting coding under the microscope.
- Coding errors affect product quality and drive unacceptable costs throughout the business due to scrap, rework, regulatory fines, damage to the brand reputation and more.
- The majority of miscoded products are caused by operator error; but not all operator errors originate on the production line.
- Code Assurance is an approach to proactively preventing errors by designing message creation and job selection processes to be as foolproof as possible.
- Videojet is pioneering the concept and implementation of Code Assurance through an interface, a PC-based message design and rule creation software, and a network control package. This solution is a critical, and often ignored link in the chain of error prevention in coding and labeling technologies.

This paper examines the key factors in the total coding process and how to improve them to benefit from a corresponding improvement in productivity, waste reduction, lower costs and risk management.



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The actual cost of coding errors

Correct product coding is important to manufacturers of fast-moving consumer goods (FMCG), helping improve supply chain efficiency and visibility while providing customers with important information about the products they buy.

Coding errors are costly, not only to plant operations but to the entire business. There is the cost of rework – assuming that the product can actually be reworked and the plant has the capacity to do so. In a 24/7 production environment, rework may not be possible. Or, once the product has been coded, it may be impossible to recode or repackage. The need to scrap miscoded product can be even more costly than rework but it may be the only option.

And that's nothing compared to the trouble and cost of miscoded products that end up on the retail shelf or in the homes of consumers. Beyond the risk of regulatory penalties and fines, the brand's reputation itself can suffer costly damage. The product may be unavailable while restocking takes place, forcing customers to switch to competing brands, possibly never to return.

Worse still, in high-profile cases, media reports can lead to depressed sales even when the product is back on store shelves.

The real costs may be all but invisible

Most organizations struggle to quantify the actual cost of lost product and lost production capacity as a result of coding errors – let alone lost reputation.

Most evidence is anecdotal. In many cases, management is simply unaware of the scope of coding problems.

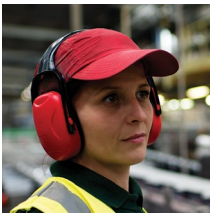
Another factor that complicates accurate cost accounting is that many companies tend not to highlight coding errors within their plant efficiency reporting. Often, there's an assumption that coding errors are detected by regular inspection and then rectified.

The specific costs associated with rework remain entangled with general measurements of line inefficiency, so that there is often no knowledge of the cumulative effect of these mistakes.

Today, getting codes right isn't just important – it's crucial.

The true frequency of coding errors

Of course, much can be done to build a form of Code Assurance into your organization organically.



For example, you can start with initiatives as simple as retraining operators, improving ergonomics at data-entry points and performing cross-checks before committing to a print job. These and other operator-centered methods can measurably reduce errors. However, assuming most FMCG companies undertake these simple steps already, the room for further improvement is still staggering.

The truth is that coding errors happen so often they are commonplace.

Videojet recently surveyed a variety of FMCG manufacturers and found that all had experienced coding errors – many of them on a frequent basis.

In fact, nearly half the companies surveyed were having trouble with coding errors at least once a week, with one-quarter reporting coding errors at least once a day.

For your business to truly benefit from Code Assurance, it is mission critical to move beyond behavioral methods and adopt solutions that deliver maximum automated accuracy while minimizing the risk of human error.

Why correct coding matters

Manufacturers are looking for ways to:

- remove operator error from message setup and job selection processes
- minimize the cost of scrap due to coding errors
- reduce resupply costs for replacing recalled or withdrawn products
- reduce potential for lost business from incorrect products being shipped
- minimize brand damage by narrowing the scope of any recalls
- meet the requirements of retail partners and regulatory overseers for product quality and traceability.

With reliably correct coding, all these issues are addressed up front, before they can become problems.

It's better to prevent errors than to calculate the damage



More than half of coding errors are caused by operator error – our surveys suggest a range of 50 to 70 percent. The most common mistakes are incorrect data entry and incorrect job selection. In our survey, we found that those two mistakes accounted for 45 percent of all coding errors.

Up to 70 percent of coding errors are caused by operator error, with almost half caused by mistakes in code entry and job selection.

Even where the problem is recognized, many companies respond by simply introducing more checks during the packaging operation. However, this does not address root causes such as the wrong codes being entered in the first place, nor does it tackle the problems and costs associated with product rework or the resulting decrease in plant efficiency.

It's in the manufacturer's own self-interest to understand the scope and cost of coding mistakes and take counter measures to eliminate them. Moreover, many retail partners are now requiring compliance with coding standards that include implementation and documentation of methods to eliminate such errors.

Preventing errors by design: mistake-proofing coding processes

Manufacturers need proactive solutions to address all these issues – from unaccounted costs, to ineffective countermeasures, to partner mandates – instead of reacting to coding problems after they occur and their costs accrue.

There are two ways to deal with coding problems at the source, actually on the production line:

- proactively reduce the likelihood of errors
- try to catch errors when they happen to minimize waste, correct the error and get back to production as soon as possible.

It's not a question of either/or. Even if you're effectively preventing coding errors, you still need the ability to quickly respond if something goes wrong in order to limit the damage. But clearly, resources invested in prevention can pay back many times over when compared to the expense of putting errors right.

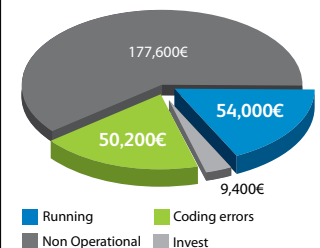
Reducing coding errors cut running costs by almost 50%

During a cost analysis exercise, a global manufacturer of pet food discovered that coding errors were almost equivalent to their total annual equipment running costs.

The total annual coding costs for nine lines were calculated to be 291,200€ broken down as follows:

Annual cost element

Capital investment costs	9,400€	3%
Equipment running costs	54,000€	19%
Scheduled non-operational time. Maintenance and line set-up	177,600€	61%
Coding errors	50,200€	17%
Total	291,200€	



Cost of coding errors at this particular site turned out to be a huge 17% of total running costs.

By identifying the errors and putting process in place to remove these coding errors before they happen, the customer was able to cut their annual equipment running costs by 50%.

Traditionally, running costs have held the center of attention for competitive justification and cost saving projects. In reality, there are far greater rewards to be had from eliminating coding errors through Code Assurance measures. Error prevention opportunities are realized through continuous improvement in usability, data handling and equipment capability.

Poka-yoke

and its role in Code Assurance



In recent decades, manufacturers have increasingly turned from quality assurance based on statistical sampling of products bound for market to a more proactive philosophy of prevention.

Code Assurance is Videojet's comprehensive approach to preventing or eliminating errors in the coding and marking process

Often referred to as 'poka-yoke', this approach focuses on up-front process design. Lean manufacturing processes are created with fail-safe features that allow operators to immediately detect a mistake and correct it. Better still, to prevent mistakes from occurring at all despite the operator's actions.

Code Assurance: a comprehensive approach to coding quality

Code Assurance is Videojet's comprehensive approach to preventing or eliminating errors in the coding and marking process. However, there are a number of factors that interact and impact on achieving Code Assurance:

Packaging design

What is the size and style of the packaging being coded? What materials are used? What space have you for coding and whereabouts on the pack is it?

Code design

How do you design, create, manage and implement your codes for usability, clarity, robustness and longevity?

Data design

From accurate data input to accurate overprinting of your code, how do you design-in and control data integrity for built-in productivity?

Coder design

What are the best technologies to utilize to ensure that accurate data input and accurate overprinting are fast, easy and convenient to achieve, so that line uptime is maximized while downtime is minimized? As a result of the multifaceted nature of achieving Code Assurance, our comprehensive approach has led to our creation of **The Four Pillars** of efficient, effective coding and overprinting, of which Code Assurance is just a part.

These Four Pillars are:

Code assurance –

the subject of this white paper, our solutions don't just help prevent coding errors. They empower you to get the right code in the right place, on the right product; time after time via designing, creating, managing and implementing the whole coding process effectively.

Uptime advantage –

our product range is designed to minimize both planned and unplanned production line hold ups.

Built-in productivity –

simply by being more available, more of the time, our solutions enable you to maximize your line efficiency and minimize your cost of ownership.

Simple usability –

the quality, accuracy and use of data is vital, so all our products are designed and engineered to be fast and simple to use at every stage, ensuring information integrity from input to pack.

Key to Code Assurance are the human-machine interfaces – including both hardware and software components – which can and should be designed to simplify data entry and help prevent operator errors, both at code entry and job selection.

We also believe the structural flow of coding processes can be redesigned to minimize operator interactions to reduce the risk of errors, even to the point of distributing correct codes to the correct printers for the correct jobs automatically.

Poka-Yoke:
mistake-proof by design.

The term 'poka-yoke'
pronounced PO-kah YO-kay,
might be translated literally
as 'prevent-mistake'.

Our complete Code Assurance methodology relies on four basic principles

1

Simplify message selection, so the operator selects the right message for the right job.

2

Restrict operator input to the absolutely essential points of contact only.

3

Automate messages as much as possible, with pre-defined rules that help prevent incorrect entries.

4

Use authoritative data sources – such as MES, SCADA, ERP or other enterprise IT systems – so that the appropriate information is pulled to the printer automatically when the operator selects a job.

Videojet incorporates poka-yoke concepts into its execution of these principles to help reduce operator mistakes and coding errors.

By utilizing this, error prevention becomes part of the process, so that mistakes are difficult (ideally, impossible) to make, and easy to identify and correct should they occur.

The concept of poka-yoke began in 1961 with a simple change in the way workers were assembling switches. Instead of grabbing parts from the parts bin as they worked, employees were taught to place the necessary parts in a tray before beginning assembly.

This simple change in process design completely eliminated the common problem of missing parts in many of the switches that had been shipped to customers.

If a part remained in the tray, the worker knew he had to go back and install it before moving on to the next switch.

The poka-yoke principle has since been applied to countless, more sophisticated processes, but the essential principles of the first poka-yoke solution still apply more than 50 years later:

The solution should...

- 1. be cost-effective**
- 2. be easy to implement**
- 3. ensure correct operation without depending on constant attention or infallible input from the operator**
- 4. ideally, work without depending on the operator at all.**

Code Assurance – from the ground up



1

**Simplify message
selection**

New Code Assurance solutions have poka-yoke design features built into the operator interface. Customers can build on this foundation by adding powerful poka-yoke capabilities through PC and network-based message creation and management:

2

**Restrict operator
input**

Using an operator interface with built-in Code Assurance tools implements poka-yoke principles 1-3

It's an integral part of new-generation laser marking technology, as well as ink jet coders, thermal transfer overprinters, large character marking, labeling and thermal ink jet product lines.

Network controls eliminate the need for poka-yoke principle 1, further strengthens principles 2 and 3, and fully implements principle 4

A network setup and control solution pulls from authoritative data sources to distribute the right codes to the right lasers for the right jobs. Network controls can distribute coding messages to multiple coding and labeling equipment technologies across the plant – and even across multiple plants – to simplify management and practically eliminate coding errors due to incorrect operator input.

3

**Automate
messages**

Windows-based software provides additional support for poka-yoke principles 2 and 3

A Windows-based software isolates code design from the production floor and eliminates the need to load individual messages onto each printer interface.

4

**Use authoritative
data sources**

Now let's take a closer look at what Code Assurance means, and how Videojet solutions help manufacturers achieve it.

From individual operator interactions to facility-wide automation

A central goal of Code Assurance is to simplify the process of message selection and constrain incorrect entries, so that operators reliably enter the right coding message and apply the message to the right job.

Predefined coding rules automate as much of the message creation process as possible, minimizing day-to-day operator input while ensuring that any necessary input complies with policies and logic that pertain to the specific job.

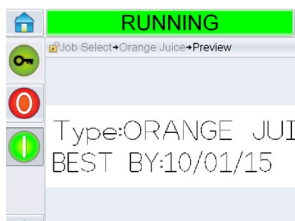
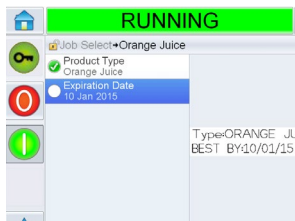
Although it's impossible to eliminate operator input completely, the intelligent interface can restrict input to the few key points where the process requires it. Even then it can restrict the input to policy-defined formats and content choices to substantially reduce the opportunity for operator error.

Software plays a key role in error prevention and code assurance. PC and network-based technologies remove the need to create codes at individual printers, provide a centralized source for the right code, and connect printers with authoritative data sources, quality control solutions and product tracking systems across your enterprise.

The deeper the organization goes into Code Assurance, the less risk for operator error and costly coding mistakes there are. Code Assurance isn't a single technique, but a progression of possibilities stretching from the individual operator to the entire operation. Code Assurance allows any organization to find the optimum balance of costs and benefits.

Implementing an intelligent user interface

When evaluating and implementing Code Assurance solutions, many companies begin with the user interface. The goal here is to manage and enforce acceptable parameters for the coded message and to eliminate operator error from the job selection process.



The printer's user interface can be designed with several features to help advance these goals, including:

- Requiring separate user authorizations for code creation and job selection.
- Restricting the types of coding parameters the operator can enter, or allowing job selection only from a list of valid jobs that have been created and stored in advance.
- Providing stored jobs with a meaningful name that describes the actual product being coded.
- Using calendar selection for dates to eliminate errors arising from date formats that vary from region to region or product to product.
- Assigning date offsets so that, for example, a Use By date can only be selected from the range of valid dates allowed for the product.
- Linking Use By dates to Sell By dates, so that once the Sell By date is selected the correct Use By date is generated automatically.
- Setting calendar rules that prevent operators from selecting specified dates, such as weekends or holidays, while also preventing the system from using these dates in automatic date calculations.
- Restricting selection of data to a drop-down list to eliminate the possibility of wrong key-presses.
- Prompting for required fields and confirmation of correct entries before allowing the operator to begin the print job.
- Confirming data prior to every job change to ensure the correct job has been selected.

These goals must be achieved while still making it simple and efficient for the operator to perform their role. In designing the interface, for example, Videojet specified a large 264mm (8.4") touchscreen and designed the display for easy operation – with fonts that are easy to read, colors that are easy to interpret and buttons that are easy to press.

Along with the calendar selection, drop-down menus, field prompts and other Code Assurance features listed above, the physical design of the interface makes it almost impossible for a reasonably careful operator to get code creation and job selection wrong.

Removing message creation and management from the production floor

With an intelligent user interface, separate authorizations are required for code creation and job selection. This separation of duties ensures that a shift foreman, for example, can't make coding changes that should only be made at a product management level. At the next level of Code Assurance, these processes are separated even further by completely removing message creation and management from the production floor.

By moving these processes to a central location, coding messages can be built by a dedicated individual with proper training and authorization, in an environment free from the distractions and pressures of the production line. Videojet provides a Windows-based solution for isolating and protecting code creation and management processes by moving them away from the printer interface and onto a locally networked PC.

Designed to be printer-independent, the software provides a single, simple solution for creating, editing and visually verifying messages and then distributing them to any enabled coding or labeling equipment in the facility.

In addition to helping ensure code accuracy, centralized message management saves labor by simplifying printer set-ups and streamlining the changeover process.

Code Assurance benefits include:

- Reduced overhead, with no need to create different code designs for different printer types, and no need to learn and work with different printer-specific software.
- Increased control and efficiency, since a single message can be created away from the production line and run on any printer.
- Better coding quality with reduced errors, thanks to features such as wizard-based creation of complex or merged fields, seamless connectivity to a wide range of databases, print preview for confirmation of the finished design and many other advanced features.

Implementing network-based, database-connected message control

For customers who want to move to the highest level Code Assurance system, it's essential to provide networking capability for full line coding control across the plant or even across multiple plants.

Such control software can be thought of as a Supervisory Control And Data package that ensures traceability and provides support for continuous efficiency Acquisition (SCADA) solution for coding and labeling improvements.

These packages need to work with existing serial, Ethernet or wireless network, and be used as a self-contained coding network control system. Alternatively, it should be integrated with SCADA, factory networks, MES and ERP systems to form part of a broader enterprise quality assurance solution.

Open Database Connectivity (ODBC) allows messages created to be stored in SQL, Access, Excel and generic databases for connectivity to enterprise IT systems.

Upon job selection, this connectivity enables the job information to be pulled from any enabled coding or labeling system, and the correct message for that job to be pushed back to the printer or labeler. Jobs should be selected using the interface or they may be scanned in from a worksheet using wired or wireless bar code scanners to provide even greater assurance against operator error.

Industry-standard Open Process Control (OPC)

OPC functionality offers an alternative mechanism for downloading and starting jobs, as well as viewing real-time status information. A well designed poka-yoke package eliminates the effort of programming multiple printers separately, reducing set up and changeover time. And with a dynamic, centralized message database, it's easy to rapidly adjust the messages being printed by coding equipment. Each message change is made once and automatically made available to all printers, supporting automation goals for a more productive operation.

More importantly, this create-once/use-anywhere message process can help eliminate errors. And for even greater Code Assurance, scanners can be placed throughout the packaging and line to check codes for accuracy in real time.

If an error is detected, the alarm beacon can be activated and the line can be stopped or the product rejected automatically. And with all data stored in a secure, data management system, the solution also helps assure reliable product traceability.

With flexible configuration to suit each plant's physical setup and information, architecture and coding needs, poka-yoke approach provides powerful Code Assurance – and labor savings – through centralized message creation and automatic code distribution to printers and labelers across your enterprise.

Getting started with Code Assurance



Benefits include:

- Accurate and consistent on-pack coding from line to line and plant to plant, with centralized message creation and automatic distribution to printers, labelers and scanners across the network.
- Minimized operator input to increase production efficiency and prevent errors from being introduced on the production floor.
- Reduced costs, with centralized control to protect against waste, rework and recalls.
- Optional wired or wireless SCANPOINT integration, providing bar code driven set up to eliminate operator input and ensure the correct product and packaging are used.
- Optional integrated fixed-position bar code validation to confirm correct packaging.
- Optional intranet view of live, enterprise-wide performance information.
- Dashboard performance feedback and production counts in audit logs.

As we've already mentioned, you can build Code Assurance into your organization starting with initiatives as simple as retraining operators, improving ergonomics at data-entry points, and performing cross-checks before committing to a print job.

These can reduce errors but they're not foolproof.

It's the only user interface on the market designed to implement Videojet's Code Assurance model through poka-yoke principles.

And we're rolling it out across an extensive range of Videojet coding equipment, including:

- CO₂ and fiber range of laser marking systems
- the DataFlex® line of Thermal Transfer Overprinters
- the 2300 series of high-resolution case printers
- the 8510 Thermal Ink Jet printer
- the 1550 and 1650 continuous ink jet printers

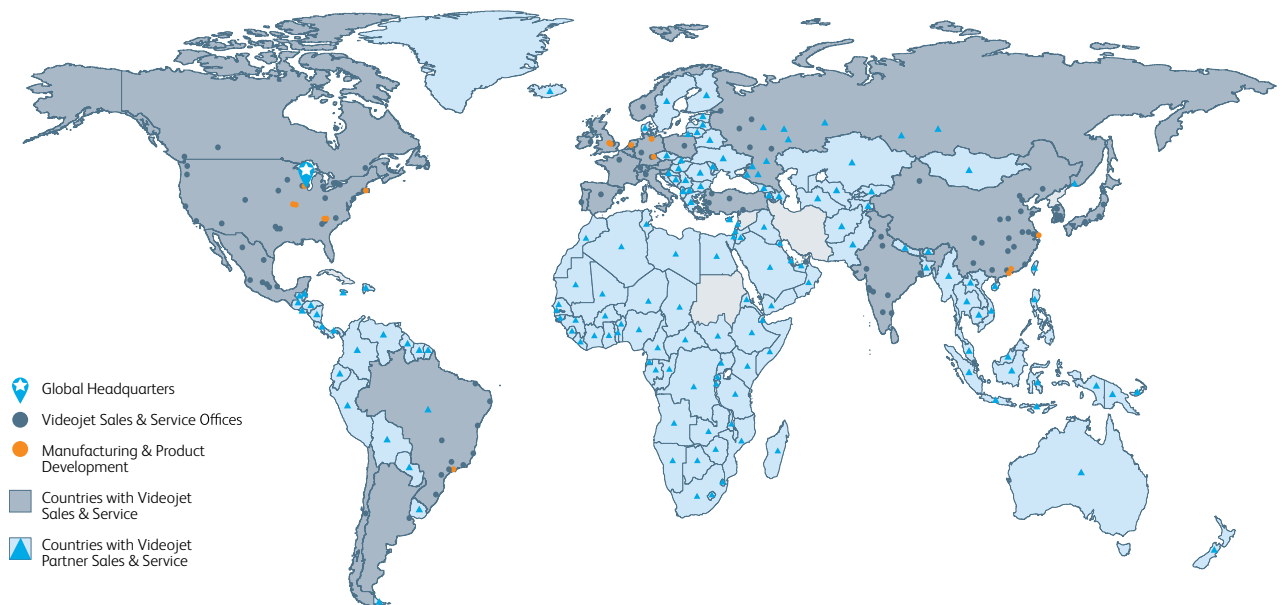
As you add layers to your Code Assurance solution, you gain centralized single-point message creation and the ability to push policy-compliant, quality checked codes out to all your printers. You gain the ability to ensure the right codes are going on the right products, reducing risk, rework and recalls while protecting the brand reputation. Plus you streamline data management and simplify changeover to drive productivity gains and support your automation goals.

Peace of mind comes as standard

Videojet Technologies is a world-leader in the product identification market, providing in-line printing, coding, and marking products, application specific fluids, and product life cycle services.

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 ink jet (CIJ), thermal ink jet (TIJ), laser marking, thermal transfer overprinting (TTO), case coding and labeling, and wide array printing, Videojet has more than 345,000 printers installed worldwide.

Our customers rely on Videojet products to print on over ten billion products daily. Customer sales, application, service, and training support is provided by direct operations with over 4,000 team members in 26 countries worldwide. In addition, Videojet's distribution network includes more than 400 distributors and OEMs, serving 135 countries.



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