The supply chain of coding errors

Consumers, business partners and the regulatory authorities demand ever more accurate on-pack coding and information. Are processes and today’s Thermal Transfer Overprinters up to meeting that challenge?

Executive summary

- Improved legibility, more variable data, better chosen print locations, faster production lines and more problematic flexible packaging formats are all putting coding under the microscope.
- Coding errors affect product quality and drive unacceptable costs throughout the enterprise 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 labelling 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.
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 repack. 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.
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 rework 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.

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.

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 countermeasures 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.

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

Costing the errors in the error tracking 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.

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:

- Capital investment costs: 94,000€
- Equipment running costs: 54,000€
- Scheduled maintenance and time set-up: 177,600€
- Coding errors: 50,200€

Total: 291,200€

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Non-operational time: 50,200€

Running costs: 54,000€

Invest: 9,400€

Annual cost element

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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.

These Four Pillars are:

1. **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.

2. **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.

3. **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. For example, our new 1,200 meter ribbon can help improve productivity by at least 10%.

4. **Uptime advantage** – our product range is designed to minimize both planned and unplanned production line hold ups, caused by everything from coding errors to ribbon changeovers or breaks.

**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 pushed 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.**

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.

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.

**Poka-Yoke**

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:

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: 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 interest and impact an 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.**

**Poka-yoke**

**and its role in Code Assurance**

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

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

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.

From individual operator interactions to facility-wide automation
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 labelling improvements.

These packages need to work with existing send, 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 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 labelling 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’s 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 ensure 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 labellers across your enterprise.

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 such as GS1-128 bar codes, seamless connectivity to a wide range of databases, print preview for confirmation of the finished design and many other advanced features.

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, labellers 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 SCAMPION® interface, 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.

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 changeovers to drive productivity gains and support your automation goals.

Getting started with Code Assurance

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:
- the DataFlex® line of Thermal Transfer Overprinters
- the 2300 series of high-resolution case printers
- the 8510 Thermal Ink Jet printer
- the new VideoJet 1550 and 1650 small character Continuous Ink Jet printers, which are designed to deliver industry-leading runtimes and availability.

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