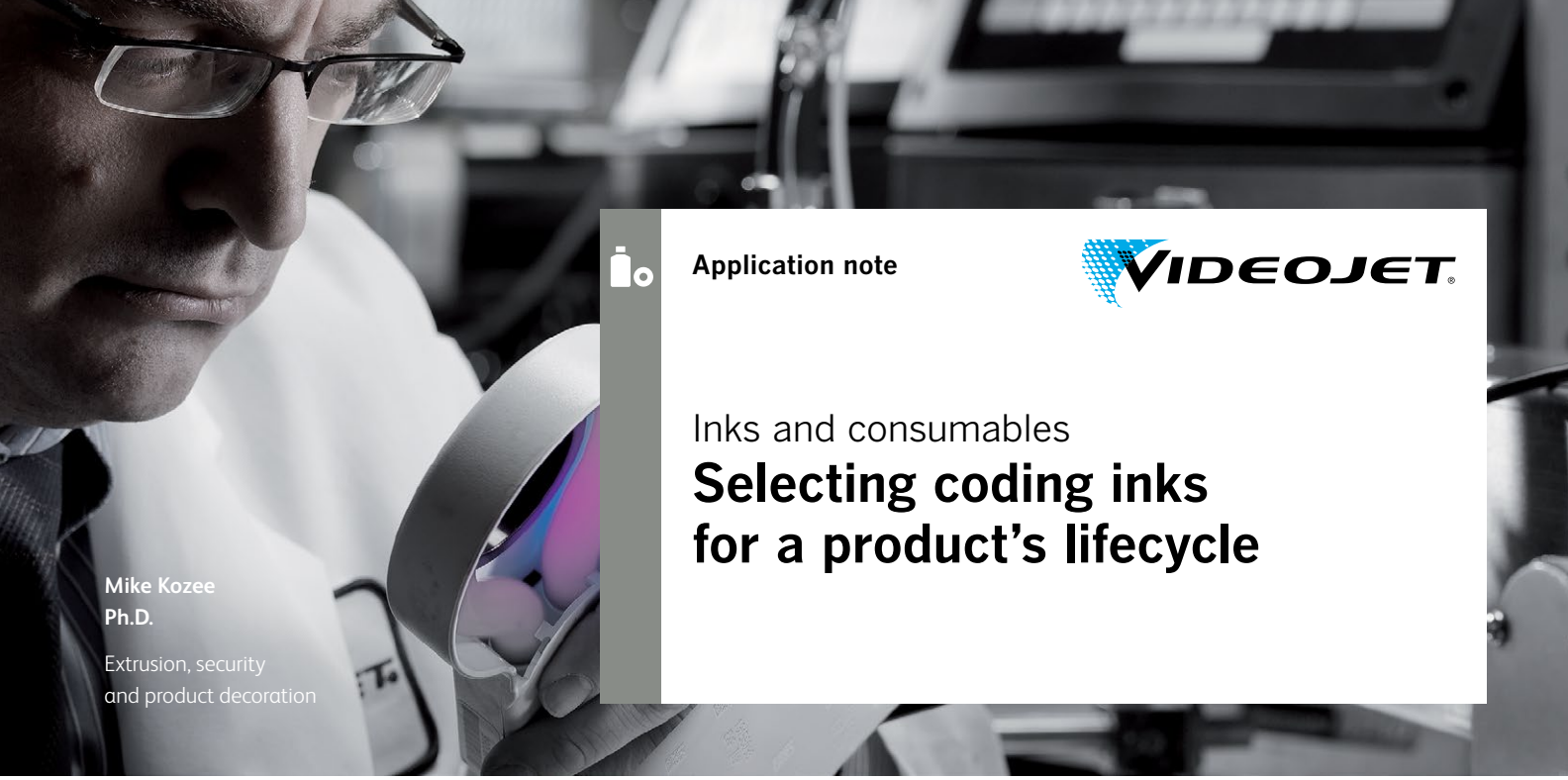


Application note

Inks and consumables

Selecting coding inks for a product's lifecycle

Mike Kozee
Ph.D.

Extrusion, security
and product decoration

The heightened attention to product traceability has brought about a greater need for manufacturers to identify and track products and components, not just from point of manufacture to initial customer, but throughout the entire product lifecycle.

Product Manufacturing environment

Product condition

Transportation

End-customer use

Recycle/return

The challenge:

Successful traceability relies on the effective application and lasting durability of readable, high-quality codes, codes that may, over time, endure a variety of challenging conditions and environments.

Traditionally, packaging professionals have selected a coding solution and ink to match the substrates they are marking on. Of course, substrate selection has an important influence on ink selection – but the consideration should not stop there. In almost all cases the printed code is of value only if it survives for the anticipated life cycle of that product.

Videojet advantage:

Videojet has been solving customers' life cycle application challenges for over 40 years. How do we address these challenges?

Over the years, we have developed and formalized well established test methods and processes intended to simulate an array of the most demanding customer use environments. We test in ways that replicate our customers' toughest applications and the conditions their products experience throughout their entire life cycle. Further, we conduct rigorous field trials where we encourage customer participation to ensure the ink and printer perform in the targeted application.

The lifecycle environment

One of the most common pitfalls in ink selection is not evaluating the full range of conditions that a product will endure throughout its lifecycle. While a manufacturer may conduct a full assessment of the ink code performance through every step of the manufacturing process, it is just as important to look at what happens once the product leaves the plant.

The required longevity of the code can be measured in years, days, or even hours. For example, a cable manufacturer selects an ink to match adhesion to HDPE jacket material, but then also must consider how that cable is used in its power transmission environment. It must survive through a range of challenging handling methods, potential exposure to chemicals and the environments in which it is used, potentially over many years. On the opposite end of the spectrum, in a meat packing facility, a temporary internal tracking and quality code is applied to individual meat trays, which are then reused within a matter of hours.

The temporary code is removed in a caustic wash, the tray is sanitized, a new traceability code is reapplied, and the process starts over again. This application encompasses a robust set of code requirements, but over just a relatively short life cycle. Another interesting example is how "temporary" codes are used in 'Brite Stocking' applications where manufacturers need to postpone labeling due to the efficiencies of bulk production and storage. Alpha-numeric or bar code applications enable labeling deferment so manufacturers can maximize efficiencies.

These typically have modest code life cycles measured in days or weeks, but these applications too can present demanding code legibility and durability requirements, such as penetrating moisture and oils that may be present on the can, or resisting retort or autoclave processing.

So in addition to material selection, customers need to consider the expected life cycle of the code itself, whether that life cycle is measured in hours, days or years.

"By thinking about the lifecycle environment, manufacturers can properly work with their ink supplier to make sure they get a code that best matches their own and their customers' expectations for code quality and durability."

John Garrett
B.S.

Sr. Chemist
Substrate analysis

The use of codes and their importance

A long lasting, durable print is becoming increasingly important as codes are used for a wider variety of processes and reasons.

Codes can be used in automotive part marking to aid in visual assembly through color code recognition or instructional messaging.

Codes are used by food manufacturers to trace products within the supply chain, convey freshness to customers and inventory guidance to distributors, but also to limit manufacturer's product liability and/or recall exposure risk.

Coding is also used to convey safety and regulatory information, to confirm products are specifically manufactured and tested to comply with specific building safety codes in which they are selected, installed, and later inspected.

The growth in longer and more global supply chains, and exposure to a wider variety of environments throughout that supply chain, has placed huge emphasis on the printed code.

Legibility and durability

Selecting inks for lifecycle is a function of legibility and durability. Legibility is typically determined by visual contrast against a given substrate, and print quality for consumer or automated reading and verification.

The latter is especially critical in supply chain control points to ensure high bar code read rates and efficient inventory stocking and picking operations. Durability is a function of aligning substrate properties with ink code adhesion - resilience of the ink matching surface condition and characteristics of the product material, and considering the customer use model and life cycle within the manufacturing processes and beyond. That could be whether the ink code/ product is touched, bumped, rolled or pressed against adjacent products during its manufacturing process.

For example, codes on the bottom of cans may exert pressure and abrasive effects on codes during automated handling and cooking processes. These challenges can be very different compared to how a product is used, or what environments are experienced out in the supply chain.

These environmental factors can include refrigeration, high temperature, or post-process product-to-product contact which may occur during handling, repacking, or transportation.

宝胜集团
BAOSHENG GROUP

Baosheng Group case study

Baosheng Group based in China, worked with Videojet to help find a solution to their need for a high contrast pigmented ink code onto dark colored cable that would also endure a tough product lifecycle and tough coding conditions.

Established in 1985, the Baosheng Group is China's largest and most competitive cable manufacturer. Listed in the Top 500 Enterprises of China, Baosheng employs some 3,000 people and enjoys sales reaching 8 billion yuan (approximately US $1.27 billion).

Baosheng produces a wide variety of general-purpose power and communication cables and wires, as well as specialty cables for the mining and marine industries.

Baosheng's Ju ChaoRong, Director (Section Chief) of Technology Management, explains the company's coding needs,

Tough environment leaves printers reeling

While the Videojet inks have always lived up to Baosheng's expectations and high production output, the printers operate in a particularly challenging environment. Extreme humidity and wide temperature swings are frequent problems, due to the monsoonal weather that affects China's Jiangsu province throughout spring and summer.

According to Wan JiaQin, Manager of Facility and Technology at Baosheng,

"The plant is exposed to external weather conditions, which can swing widely with changes in the seasons or even the day. The environment can range from cold and damp on any given morning to hot and dry by the afternoon."

These conditions can cause problems for early-generation Continuous Ink Jet printers running pigmented inks, as they are designed to connect to production plant air compressors which are drawing the air from the outside environment. Videojet recommended their 1710 High Contrast Continuous Ink Jet printer, running pigmented ink. The Videojet 1710 coder is specifically designed to deliver the toughest of pigmented inks in even the harshest of environments – without clogging the printhead. Pigmented high-contrast inks are of particular importance to customers like Baosheng who need to create highly legible regulatory codes, installation information and branding marks on dark substrates.

Ju ChaoRong explains,

"Ours is a tough operating environment. And the Videojet 1710 thrives in it. What's more, the Videojet high-contrast inks are visible across our range of substrates... the ink dries very quickly with excellent adhesion, supporting our fast production speed."

Videojet's ink development test methods

Over two dozen unique test methods have been developed and standardized to align with customer legibility and durability requirements. Several of which include:

Ink code attributes	Parameters	Standardized LTWD ink code test methods
Ink Code Legibility	Visual Contrast	• UV resistance (Q-Sun 3100HS 3-bulb fadeometer) • Print contrast signal (Code Scan contrast) & dot size • UV fluorescence intensity • Blue Wool ASTM
	Bar Code readability (linear/2-D), GS1, ISO/IEC 16022 standards	• PCS (PCR + PRD) • Edge Acuity (linear) • Print growth, axial uniformity (2-D) • Error correction
Ink Code Durability (Production Plant)	Substrate Matching Adhesion	• Scratch & scuff • Line lubricant penetration • Condensation & moisture penetration
	Material Handling Production Processes	• Dry time, scratch and scuff (tack-free) • Autoclave retort, high temperature processing • Pasteurization resistance • Caustic wash removal • Solvent removal
Ink Code Durability (Product Life Cycle)	Ink Code Resilience (Customer Uses & Ambient Conditions)	• Scratch, scuff and finger rub resistance • Refrigeration/condensation resistance • Water-fastness • Product-to-product transfer and abrasion • Pressure sensitive tape removal • Pink pearl eraser • Solvent immersion (automotive, brake fluids, transmission, fuel oils) • IPA spill resistance • Ice bucket immersion • Mil-Spec 202F soak and abrasion

Sherry Washburn
M.S.

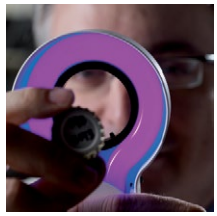
Lead Chemist
Food processing and postal inks

“These tests help assure codes on products remain visible and readable through automated processing, and that they survive temperature and environmental exposure to solvents and caustic chemicals. Further, these tests help assure that the appropriate code contrast can be maintained despite exposure to indoor and outdoor UV.”

Russ Peters
B.S.

Technician Manager
Ink/Printer environmental test and qualification

Standardized code durability test methods test product to product code contact adhesion, and production line abrasion. We simulate customer manufacturing environments to test adhesion despite condensation and surface contamination such as mold release agents on plastic parts and lubricants on machined metal parts.



The bottom line

When it comes to choosing an inline variable coder, picking the right printer can have a meaningful impact on your production line uptime and throughput. Selecting the right ink is equally critical to help ensure both efficient manufacturing and codes that live up to your expectations throughout the life of your products.

Let Videojet help you select the right combination of printer and ink to meet your production objectives and product performance needs.

Call **800-843-3610**
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