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THE BENEFITS OF UNIVERSAL MARKING SYSTEM MANAGEMENT TO CONSUMER PACKAGED GOODS MANUFACTURERS THROUGHOUT THEIR PRIMARY, SECONDARY AND TERTIARY PACKAGING LINES

INTRODUCTION

Manufacturers of national brand and private label consumer packaged goods (CPG) and their packaging facilities—whether in-house or outsourced to co-packers— imprint a variety of different graphics, text, marks and codes on every level of packaging. That includes:

- **Primary packaging:** The material that comes in direct contact with a product, encasing or otherwise holding it. In distribution, this is typically the smallest unit size available for sale or that a consumer would use. For example, a can of soda, a paper or plastic pouch of dried soup mix, or a plastic wrapped four-pack of paper towels. For warehouse storage or retail display purposes, these units are called "eaches."

- **Secondary packaging:** The material outside of primary packaging that holds a group of primary packaged products together. For example, a stretch-wrapped tray of 24 soda cans, a cardboard box that holds four pouches of dried soup mix, or a multi-pack of eight rolls of paper towels. Alternately, the term secondary packaging can refer to a corrugated fiberboard regular slotted case (RSC)—or simply "case"— used to pack several eaches for shipping, storage or distribution. Retail Ready Packaging (RRP) or Shelf Ready Packaging (SRP) has gained popularity. A carton holding 24 boxes of macaroni and

WHITE PAPER

cheese, after the stretch-wrap or top half of the carton is removed, is placed on the retailer's shelf. A shopper picks product from the RRP or SRP. Time allocated to stocking shelves is greatly reduced and the supplier has the opportunity to create an appealing graphic on the carton.

- **Tertiary packaging:** The material used to contain multiple cases of products that have been unitized into a pallet load for bulk handling, warehouse storage or over-the-road shipping by trailer (or, for international trade, overseas shipping by container). Pallets and stretch wrap to secure the unitized load are the most common tertiary packaging materials.

The marks required on each type of packaging differ based on the level of handling for the package. Since the intent of primary packaging is to enhance the product's retail shelf appeal, branding, nutrition information and product-specific messages are generally pre-printed on the packaging materials before they are paired with their contents. Marking or coding on primary packaging is supplemental, and principally regulatory, in nature. These marks are intended to meet either product identification or traceability requirements established by the United States' Department of Agriculture (USDA), the Food and Drug Administration (FDA), or other regulating bodies. Such imprints—including "use by" or "best before" date codes, lot codes, barcodes and serialization marks—are marked directly on the package at (or close to) the time of packaging the product.

At the secondary packaging level, marks printed directly on the case tend to support the manufacturer's brand via logos and graphics, as well as indicate product, production and distribution information through batch codes, barcodes and large readable text that is visible to a picker or forklift driver from a distance. This is true also for RRP and SRP. Tertiary packaging marks relate primarily to storage, shipment and delivery, and are almost always printed on adhesive-backed paper labels to provide contrast when affixed to the clear film that wraps a unit load. These labels bear information to facilitate a pallet load's content and traceability, including product identification, batch codes, barcodes and inventory management data.

Adding to the complexity of managing markings for multiple packaging types is the fact that product range and variety continue to grow. Producers are perpetually

WHITE PAPER

testing the market, adding new products, or tweaking the quantities and packaging of existing items. This leads to a proliferation of stock keeping units (SKUs) and accompanying branding and traceability information that must be managed.

The variety of products, marks, required information, packaging substrates and form factors (such as porous fiberboard and non-porous plastics), and packaging processes requires operators of packaging lines to use multiple types of marking, coding and printing equipment. Among the most commonly used types are:

- **Continuous Inkjet (CIJ):** Typically used to mark primary packaging with date, time, batch codes, text, barcodes or logos, this non-contact form of high-speed printing (1,000+ feet-per-minute) can throw ink up to a distance of 0.5-inch onto non-porous substrates. The long throw distance enables marking onto curved shapes like cans and bottles. The inks used in CIJ typically break down over long periods of use, thus requiring periodic maintenance for filter changes.

- **Laser Marking:** For applying codes to a variety of materials—including glass, plastic, paper, cardboard, foils or coated metals—non-contact laser marking systems use high-powered light energy to etch (or discolor) markings onto the packaging material surface without additional inks or chemicals. Laser can also produce codes at high speeds and provides a throw (or focal) distance between 2 and 10 inches, depending on the lens used. Lasers can be used to mark primary or secondary packaging.

- **Thermal Inkjet (TIJ):** A cartridge-based inkjet system—with self-contained cartridges that include the print engine and ink—TIJ can mark at speeds above 1000+ feet-per-minute and throws ink at approximately a 0.125- to 0.25-inch distance. Improvements in TIJ inks allow for use of both water-based inks on porous packaging and solvent-based inks on non-porous packaging materials. With a printing resolution of 600 dots-per-inch (dpi), TIJ is ideal for printing 2D codes and barcodes onto primary packaging. Because the self-contained cartridge includes the print engine, whenever ink is replaced the print engine is also replaced, reducing maintenance requirements.

WHITE PAPER

- **Thermal Transfer Overlay (TTO):** Often used with form, fill and seal machines for marking of primary packaging, a thermal transfer print engine requires direct contact with a flexible packaging material to produce a mark. The system applies heat to a ribbon coated with wax, resin or a mix of both, to melt the coating onto a smooth surface, usually a plastic film. The motion of the flexible packaging may be either continuous or intermittent when marking; each requires a different form of TTO machine. TTO equipment does necessitate idle time to change ribbons and provide periodic maintenance to replace thermal transfer print engines.

- **Piezo Inkjet Printers:** Using solid-state Piezo actuator technology, these printers produce high-quality graphics, text and barcodes on secondary packaging. These print engines last a very long time (providing the faceplate doesn't get scratched or marred); automated cleaning systems prevent the need for manual cleaning, reducing the probability of scratches. For branding of large images on secondary packaging cases, nested Piezo actuators can be joined in multiples of 2- or 4-inch printheads to create larger-scale print engines. Print speeds range from 100 to 400 feet-per-minute with a typical throw distance of 0.125-inch.

- **Drop on Demand Valve (DOD) Inkjet Printers:** With print heads that employ a pressurized ink supply and electromechanical valves, these printers are generally used to imprint large character (0.5-inch or greater) variable, text-based information on large products or secondary packaging. DOD easily integrates with existing packaging lines. This technology efficiently jets both simple porous and non-porous inks with low maintenance for the lowest cost per mark of all technologies.

- **Automated Label Printer Applicators:** After utilizing either a direct thermal process (burning an image onto specially formulated label stock) or thermal transfer technology (applies heat to a ribbon coated with wax, resin or a mix of both, to melt the coating onto a standard paper-based label), these machines then separate the printed label from its paper backing and applies it directly to the secondary or tertiary packaging.   A tamp pad or roller is used to affix the label to the packaging. The use of a label stock can provide great contrast for

barcodes. However, pre-set label sizes may restrict the size and content of the label. Automated label printers require down time to change both label and ribbon stock, as well as periodic maintenance to change thermal print engines.

PRINT MANAGEMENT CHALLENGES FACED BY CPG PACKAGERS

Managing all these disparate factors—differing printing technologies and systems, breadth of packaging formats and materials, and copious amounts of variable information—can create a tremendous and time-consuming challenge for CPG companies seeking to get their products on to retailers' shelves as fast as possible.

That's because historically it has been extremely complicated to communicate directly and cohesively to all the different types and brands of printing technologies deployed on a single packaging line, much less throughout an entire plant. This poses considerable difficulty in managing lot number serialization, where primary product serialized data needs to be aggregated over multiple packaging stages—each with different marking technologies. Large, expensive custom integration projects are routinely employed to incorporate these disparate technologies into a manageable system. Add to that the challenge of integrating multiple plant locations producing the same (or similar) products and then storing and retrieving this information for use worldwide!

Without a centralized, universal controller platform that connects with enterprise resource planning (ERP), manufacturing resource planning (MRP) and warehouse management systems (WMS), the information to be output by each printer must be either manually entered or scanned from a work ticket ("traveler") at the appropriate production line controller. To facilitate production changeovers whenever a new product or different retailer's order is being run, an operator may need to visit each individual marking technology control panel and enter the required changes. The process is not only time consuming, but also—and most critically—prone to coding errors that can result in rework and scrap.

Further, without a centralized database to manage both production information and marking templates, it is particularly difficult to maintain consistency in code appearance and placement across products produced in multiple locations. For CPG

WHITE PAPER

manufacturers selling products throughout the global marketplace, managing the hundreds of message formats required for compliance with local country messaging requirements adds an additional layer of complexity.

Likewise, for producers and co-packers filling orders for specific manufacturers and retailers, it is critical to accommodate unique customer requirements. Whether the entire process is managed in house, or coordinated between two locations (for example, canning in one location, labeling and case packing at a second location), the marking systems used must be flexible in order to manage the broad range of requests. Among them: shorter, more frequent runs; retailer-specific coding, verbiage or graphics on one layer of the packaging; different orientations or arrangements of displayed information; or variable placement locations of shipping labels. Non-compliance may result in financial penalties in the form of chargebacks.

Finally, many CPG manufacturers seek to reinforce their brand and visually identify their case-level packaging with information beyond just barcodes and/or plain text. To do so, packagers use corrugated shipping cartons that have been pre-printed with graphic logos, brands, specific fonts and/or messaging. But maintaining an adequate supply of pre-printed secondary carton inventory can be costly in terms of box expenditures, storage space, and scrap due to obsolescence. And running out of the boxes required to support a production run might result in a short delivery, again triggering chargebacks from customers.

ADDRESSING CPG PACKAGING CHALLENGES WITH UNIVERSAL MARKING SYSTEM MANAGEMENT

To address the marking challenges faced by CPG packagers as they strive to get products onto their retail customers' shelves as fast as possible, Matthews Marking Solutions has developed the MPERIA™ universal marking system controller that easily accommodates the following:

- **Control of multiple print technologies:** MPERIA™ maintains consistent control of the different print technologies in operation throughout primary, secondary and tertiary packaging lines. As a single, centralized controller, the system manages and drives multiple devices and multiple technologies including: CIJ, laser, TIJ, TTO, Piezo, DOD and automated label printer

applicators. Utilizing plug-ins, MPERIA™ can accommodate print technologies from virtually any manufacturer. This capability allows for very simple integration of all marking technologies and related devices, such as encoders and scanners, employed on a CPG production line. MPERIA™'s single interface automatically populates, updates and validates lot number serialization throughout primary, secondary and tertiary lines, simplifying track and trace management.

- **Information changes:** Via both wireless and Ethernet connections, the system connects with ERP, MRP and WMS systems to transfer production information into templates maintained in a centralized database. This reduces coding errors and eliminates the labor required to modify locally stored information whenever an edit is made. MPERIA™ also features an intuitive, touch screen controller interface with built-in image editor for easy message creation and selection. This single interface enables data to be encoded on primary products, secondary cartons, and tertiary labels or film overwraps without the need to access or update multiple systems.

- **Customized label marking:** For product differentiation, more CPG producers and retailers are asking for the ability to delay certain elements of a label's printing so that customized messaging can be added during the packaging and production stage. MPERIA easily accommodates this request, linking to a database of label-specific information and dropping in the required information as the imprinting occurs, on-the-fly.

- **Consistency from location to location:** Because CPG manufacturers can operate anywhere from 10 to 400 (or more) different production facilities, maintaining consistency of imprinted information can be difficult; particularly when each printing system is updated manually. MPERIA™ eliminates this inconsistency by interfacing with and controlling every printer, regardless of physical location, to direct its output. The ability to maintain a centralized database of imprinting information that communicates automatically with all production lines, regardless of manufacturing location, yields tremendous cost savings. The system sends data to any printer it controls, and in some instances can communicate imprint design modifications and new (or revised) template layouts. Additionally, messages can be validated with only approved messages being eligible for production.

- **Production changeovers:** For operations with frequent changeovers—including both product changes and modifications required to meet the specific requirements of unique customers—MPERIA™ populates all line-side printing systems with the correct imprint information automatically to accommodate the next product's manufacturing run while minimizing scrap. It also incorporates integrated client and security levels to meet regulation coding and track and trace requirements. And, to reduce operational expenses, the system offers productivity assessments, monitoring the status of each printer in the network.

- **Direct carton marking:** CPG packagers who must meet inventory supply targets set by retailers, or who or are looking to leverage demand-driven production to minimize inventory levels and reduce stock-outs, can utilize MPERIA™ for direct carton marking. The on-demand imprinting of graphic logos, brands, fonts and/or messaging onto secondary packaging cartons made of corrugated fiberboard can be tied to specific products through the universal marking system controller. The universal network allows for communication between printing lines; for example, the imprinting of sell by and serialization data on bags of barbeque flavor potato chips on the primary packaging line can trigger the imprinting of the appropriate number of secondary cases with corresponding branding marks. On-demand printing minimizes secondary packaging costs because pre-printed cartons no longer have to be purchased, stored, inventoried or scrapped due to obsolescence.

CONCLUSION

Let Matthews' team help you seamlessly integrate the MPERIA™ universal print management platform with your existing CPG packaging production line. Implementing the platform will simplify print and information management throughout primary, secondary and tertiary packaging lines, helping you get your products onto retailers' shelves faster. Need a custom system? Matthews' Custom Systems team will work with your team, gaining an understanding of what is needed and will provide the solution that will meet your integration needs. Visit **www.matthewsmarking.com/MPERIA** to learn more about this unique system and to schedule your in-facility demonstration today.

WHITE PAPER

MPERIA™ can be implemented with any of the following Matthews Marking System print technologies:

The **VIAjet™ T-Series** high-resolution Piezo print head prints directly onto porous paper surfaces and includes two models: the T100 for side, vertical printing and the T100S for down, right angle printing. T-Series print heads produces high-resolution certification marks, barcodes, text, logos and other graphics at image heights up to 4 inches per head. Multiple heads can be grouped together to produce stitched images at unlimited sizes. To make accessing space-restricted production areas easier, and to extend the accessible print area, the print heads can be equipped with a 27.5-inch flexible umbilical ink feed tube that connects the print head to the ink tank. It utilizes specially formulated, highly pigmented inks that dry on contact to produce bold, crisp images with minimum bleed—ideal for precise barcodes and graphics.

The **VIAjet™ L-Series** high-resolution thermal inkjet print head prints 600 x 600 dots-per-inch (dpi) at rates up to 200 feet-per-minute (60 meters-per-minute)—much faster than other thermal inkjet printers. Depending on print density, the L-Series can achieve speeds up to 1200 feet-per-minute (360 meters-per-minutes – verify the 360 please.) Each print head can create image heights ranging from 0.5 to 2 inches. Mountable in either horizontal or down orientations, the print heads can be supplied by either single-use ink cartridges or bulk ink. To reduce ink consumption and improve uptime, the print heads feature an advanced nozzle design. The L-Series can be used with a variety of inks for both porous corrugated direct carton marking, as well as printing on coated or non-porous materials.

The **VIAjet™ V-Series** large character DOD print head features reliable valve technology to mark on porous and non-porous substrates, including paper, coated and uncoated corrugated fiberboard, and corrugated plastic. Its large character print output ranges from 3 to 127 millimeters (0.125 to 5 inches), and can be expanded by grouping multiple print heads to produce stitched images at unlimited sizes. Ideal for variable data marking coding of products for traceability purposes, the unit uses specially formulated pigmented inks that dry on contact.

The following Matthews' printers can be managed by MPERIA™ via plug-ins:

The **C84+** continuous ink jet small character printer provides fast, reliable coding onto food, beverage, and pharmaceutical packaging, as well as industrial applications. Its 10.4" touchscreen display is easy to use and makes message creation and editing

WHITE PAPER

simple. The C84+ prints up to 4 lines (0.05" to 0.61") at 1,050 feet-per-minute on porous or non-porous materials. The C84+ can be used with a variety of inks, including fast dry, non-MEK, and pigmented.

Matthews' complete line of **C02, diode, and fiber lasers** are designed to fit a number of packaging industrial and applications, and are flexible enough to mark in static or continuous mode on a variety of materials. Our lasers mark a variety of materials including glass, plastic, paper, cardboard, foils, coated metal, and building materials. With the longest focal distance in the industry, our lasers can be mounted far away from the production line. Laser coding doesn't involve any inks or chemicals, making it a very clean, eco-friendly and cost-efficient method of permanently marking product.

Matthews' Thermal Transfer Overprint product offering mark both flexible packaging materials and rigid or semi-rigid parts and materials. Our **Swing** unit can mark 600 x 600 dots-per-inch (dpi) on plastic film or paper and the **Coditherm** unit can mark 600 x 600 dpi on plastic, wood, leather, rubber, and coated metals. Our printers allow for high-speed printing of variable text, serial numbers, linear and 2D barcodes, and graphics, making these printers ideal for crisp, legible marks of the highest quality. In particular, thermal transfer printers can produce excellent quality barcodes with superior readability compared with other methods of printing.

About Matthews Marking Systems
Matthews Marking Systems, a member of Matthews International Corporation, provides product identification, branding and traceability solutions. With more than 160 years of experience, Matthews offers a full line of quality high-resolution, continuous ink jet, laser, drop-on-demand valve ink jet, thermal transfer, contact and indenting technologies. For more information on Matthews' products and services, contact Lyndsey Farrow, Matthews Marking Systems, 6515 Penn Avenue, Pittsburgh, PA 15206. Telephone (412) 665-2536, fax (412) 665-2550, www.matthewsmarking.com.

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