



Photonic Printing

Engaging Packaging
for the Connected World



Introduction

The history of printing starts as early as 3500 BCE, with Persian and Mesopotamian people using cylinder seals to certify documents written in clay, and other early forms including block seals, pottery imprints and cloth printing being in evidence.

The ubiquitous nature of innovation today within the print sector is therefore no surprise considering the longevity of its existence.

Fast forward in time and in the 15th century we saw the development of movable type and alphabetic scripts emerging to establish the book publishing industry. The human need to share and protect knowledge drove innovation in text printing and pushed providers to find unique ways to increase the speed and efficiency of image reproduction, while all the time reducing cost and complexity.

Today, printing technologies – thermal, pad, lithography, flexography, gravure, screen and digital inkjet – are commonplace around the world, meeting the needs of text and imagery communication in multiple industries, formats and on a range of substrates for a multitude of different applications.

Whilst the history of modern printing dates back to 1439 and the development of the Gutenberg Press, digital printing, the latest real breakthrough in print innovation, occurred only in the early 1990s with the vision of Mr. Benny Landa, who launched the world's first digital colour printing press at IPEX in 1993.

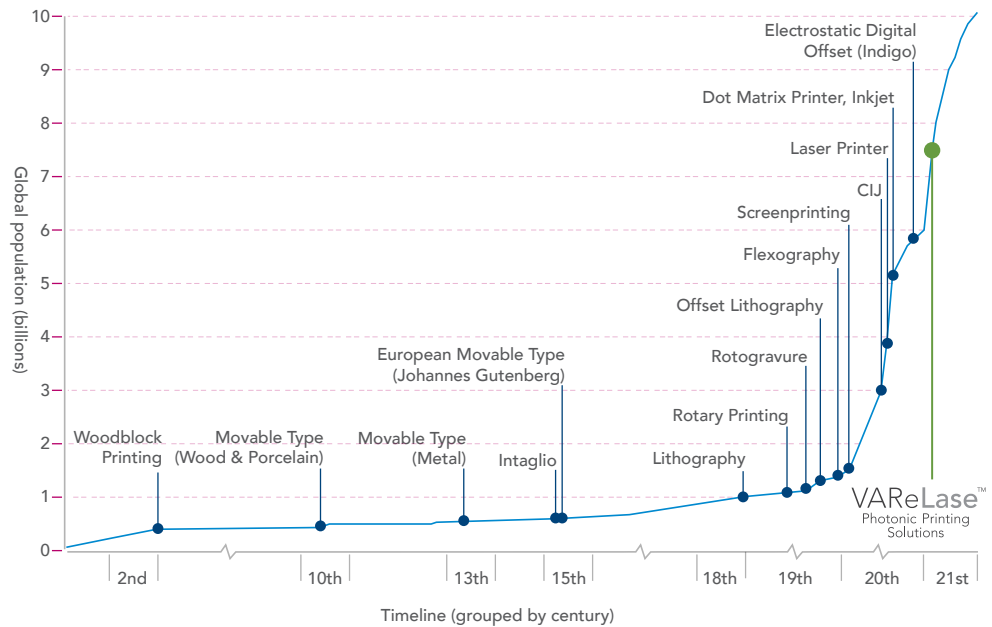


Figure 1: Advances in printing technology occur at periods of rapid global population growth.

The drive for innovation continues and it seems that advances in printing technology align with periods of significant global population growth (see Figure 1). Viewed philosophically, this suggests that as population increases there is a greater requirement for new print technologies to help satisfy the demands of more people and ever changing trends and tastes. Each new solution builds upon the foundations of what has come before to enable a closer connection between message sender and receiver.

Digital printing has been lauded as a revolutionary solution for commercial printing that would enable significant advantages to printers in terms of run length economics, print flexibility and service. Whilst digital printing has certainly secured its place in the home, office and engineering environments, its use is growing but still remains somewhat complementary to its contemporaries in the main high volume print market¹, packaging.

Digital printing, estimated at around 5% of label printing today, and more surprisingly less than 1% of overall packaging² printing today, offers significant benefits to printers seeking short run, cost effective, fast turn around work with acceptable quality.

Over recent years, project run lengths have decreased significantly and job complexities have increased across the packaging sector, with the use of intricate die cut designs, ever increasing numbers of tactile or special finishes, as well as the development of clever mass-customised marketing campaigns.

Take the Coca-Cola 'Share a Coke' campaign as a great example of digital printing. It enabled the printing of just 100,000 bottle labels with an individual name, over a flexo pre-printed substrate.



Digital printing allows printers to work to a tight deadline, for small jobs it is less expensive than its litho or flexo equivalents, frequent changes to substrate can be easily handled and the mock up / proofing process is simplified; the print proof is exact to the intended run.

However, despite continuous focus on improvement, the benefits of digital printing haven't yet been able to surpass conventional printing to properly address simple SKU reduction, language differentiation, improved forecasting accuracy, or the true personalisation of packaging.

Digital printing therefore largely remains in the domain of the traditional printer/converter of packaging, which is too far from the consumer stage to be truly responsive to change in real time. To make print more relevant and able to satisfy the ever changing trends and tastes, the printing process needs to move closer to the consumer.

A new generation of technology innovation is therefore required if printing is going to truly meet the needs of today's highly competitive, fast turnaround, packaging printing market. Printer converters are governed by brand owners and retailers who demand true, cost effective, innovation to drive their competitiveness, market share and ultimately, consumer loyalty to their brand.

Step forward Photonic Printing.

What is Photonic Printing?

Taken literally, 'Photonics' is an area of study that involves the use of radiant energy (such as light), whose fundamental element is the photon. Photonic applications use the photon in the same way that electronic applications use the electron.

Photonic Printing is a new printing technology developed by DataLase, that utilises light, specifically created by a laser, in combination with a pre-printed functional coating which is designed to be reactive to the light source. It unifies the benefits of traditional analogue print methods (typically flexography or gravure) with the flexibility and highly versatile nature of digital printing into a novel inkless-at-the-point-of-printing late-stage personalised printing solution (see Figure 2).

Photonic Printing involves a two-step printing process; one traditional, one new:

Step 1: A flexographic or rotogravure printer, using their traditional printing assets and methods, lays down a 'patch' of laser-reactive coating containing the patented DataLase pigment. Applying the patch should be considered in the same way as simply applying another colour to the print job, even though the functional coating can be transparent.

The patch size will depend on the specific end use application and can even cover the entirety of the substrate if so desired.

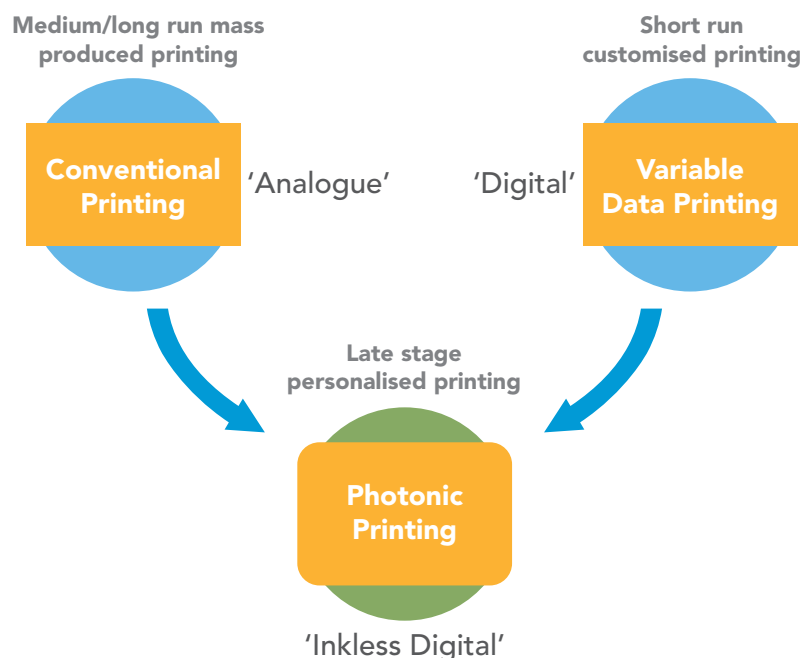


Figure 2 – Photonic Printing unifies analogue and digital printing to deliver truly personalised packaging solutions.



Figure 3 shows an example of a patch printed label for a bottled drink. The finished label, complete with DataLase patch, is then shipped to the printer's customer (e.g. the bottling company).

Step 2: At the packer/filler, in our example at the bottling company, the conventionally printed patch-coated labels have the variable data printed just before the labels are applied to the bottles by a Photonic Printing system, such as the VARELase Label Solution as shown in Figure 4. Essentially, the DataLase laser-reactive pigment contained in the coating changes colour once exposed to the laser (photons) providing a permanent, durable print.

Today's Photonic Printing technology enables the high speed printing of variable graphics, text and barcodes in high quality single colour with gradient capability. The variable data can include graphics, ingredient information, ethical sourcing statements, expiry dates/lot codes, allergen information, language variances, promotional codes or any other type of message relating to the product or consumer.

Similarly, Photonic Printing can deliver a consumer engagement marketing campaign for brands seeking to leverage exposure at key events. For example, during special events such as The Olympics, World Cup or any other sporting event, a tailored message for a specific market or event (local, regional, or national) can be printed, even down to the



Figure 3: An example of a patch printed label.



Figure 4: VARELase Label Solutions by DataLase prints variable data on the laser-reactive patch.

individual consumer level, printing personalised messages and offering analytically determined discount incentives. Whatever the event or the occasion, if there is an opportunity to use packaging to deliver relevant marketing campaigns that truly connect with consumers, whilst at the same time delivering highest value and returns for the brand, then Photonic Printing is the only solution.

The use of laser systems in industry is widespread, but this is generally for ablation processes and the marking and coding of expiry dates and lot codes only.

The ability to ablate with a laser is largely dependent on the specific substrate. Print speeds are also limited by the amount of information being printed, meaning there is little room for flexibility to adapt to changing future demands, particularly if the changes are driven by legislation. Photonic Printing is a much quicker printing process that enables high resolution graphics, text and barcodes to be printed at speed, and as long as the laser-reactive patch has been printed following DataLase best practice, the print quality will be consistent regardless of the substrate.



What are the benefits of Photonic Printing?

Benefits of Photonic Printing for the supply chain

By postponing the actual point of print to the latest stage of production, at the point of packing and filling or even at point-of-sale, brand owners are able to maximise their forecasting data accuracy and minimise waste. Analytically derived messages and personalised recommendations can be printed directly onto the product to help encourage impulse buying behaviour, brand loyalty and increased revenues. For example, for seasonal products e.g. sun tan lotion, if the weather forecast changes, discount codes or time-limited promotions can be applied to each product to boost what may become slacker sales than anticipated. This can happen in real-time, right at the point of the weather forecast update coming through to the packing hall. Time delays are eradicated and excess production quantities are avoided; this reduces costs, waste, inventory and maximises retailer satisfaction.

Photonic Printing enables single pack personalisation – individual packs (not runs) can be printed with variable information at the latest point in the supply chain. Traditional packaging printing methods usually involve pre-printing of pack stock keeping units (SKUs) which are stored for call off as needed. Photonic Printing negates the need for printing and storage of multiple SKUs. Generic information can be pre-printed and variable data, such as languages, flavours, or marketing messages, can be postponed to the last point prior to shipment. Only one SKU needs to be prepared in readiness, not multiple SKUs for the many demands of today's typical fragmented brand portfolio.

A reduction in SKUs supports inventory and transport reductions, cashflow improvements, as well as less overall waste. For instance, if a brand wants to carry out a personalised campaign that displays customers names on the bottle label, instead of running 100,000 labels of each name and then mixing the bottles in the packing process, taking 12 weeks to deliver the project end-to-end, each patch printed bottle label can utilise Photonic Printing by producing whatever combinations of names required just before the label is applied to the bottle; real-time, on-time and efficiently.

Using a pre-printed functional coating exposed to a laser light, at the latest point in the supply chain, eliminates consumables from production areas; no inks, no mess – just an efficient printing process that requires minimal operator intervention to help improve operational efficiency, increase productivity and enhance sustainability credentials.

Benefits of Photonic Printing for brands and retailers

In recent years, both brands and retailers have been subjected to significant change in the retail environment. With the advent of online shopping, the demands of the new i-generation, dominance of discounters and huge growth in start up brands created by internet trading, both parties are seeking new and innovative ways to make their products stand out from the crowd. They want to increase their consumer engagement and sustain the narrative to build brand loyalty and beat off the mounting competition.

Photonic Printing is an exciting and unique consumer engagement tool allowing true packaging personalisation and customisation, which is integral to brands' product

development and marketing strategies. By postponing the stage of pack printing to the latest point in the supply chain process and closer to the consumer, such as at the point-of-sale, brands are able to deliver late-stage, or even last-stage, customisation to their packaging, thus enabling real-time responsiveness to events, markets and consumer trends creating timely relevance and brand loyalty.

Packaging information can be tailored to a moment or occasion in a very short timescale. A celebratory message about a soccer score, the winner of the French Open or ITV's X Factor, for example, can be printed on products and be on shelf within hours of the event. Photonic Printing will necessitate advances in logistics and delivery to ensure that the consumer's appetite for the here and now through products and packaging is satiated.

As with all new technologies, a new digital infrastructure is required to integrate with brands' current workflow processes. Using a Photonic Printing solution removes the complexity for the brand owner whilst offering operational and marketing benefits. Graphics chain management becomes easier, providing brand owners the power to manage their own promotions at the touch of a button.



Having greater flexibility in using variable data enables the brand to offer enhanced consumer engagement opportunities to drive sales by printing more relevant content more often and more quickly. This high shelf appeal strategy creates a positive consumer packaging experience that lasts long after the point of purchase, generating long-term, even lifetime, product and brand engagement. Facebook reminds us of anniversaries and events by resharing previously posted images. What if a brand could offer a similar level of engagement through its products and packaging to keep consumers coming back for more? Photonic Printing makes all of this possible.

Personalised individual consumer-orientated marketing campaigns can also be executed to create greater relevance to the brand's target consumer group, driving higher value for the brand owner in turn.

In the food service and quick service restaurant (QSR) sectors, for example, Photonic Printing solutions, such as VARELase Cup Solutions by DataLase, can be connected to exploit consumer 'big data' developed by brands. Just by scanning a smartphone app at the point of purchase, or ordering ahead via a loyalty app, a personalised message can be printed directly on packaging that incorporates a DataLase patch, such as disposable paper cups.

The messages are tailored to the individual customer's recent purchases and preferences, offering competitions, promotions or discounts, to encourage repeat or higher value purchasing, driving engagement and loyalty.

With sustainability at the forefront of consumer concern and media attention, Photonic Printing can also be used to drive positive consumer

behaviour, encouraging appropriate disposal of a product, avoid littering and rewarding responsible recycling for example (see *Figure 6*). This helps brands and retailers meet their Corporate Social Responsibility (CSR) commitments and clearly communicates the importance the brand is placing on CSR in the way the pack is presented to them.

Finally, and again very importantly, in the light of recent food safety scares, late stage customisation of packaging can effectively be used to tailor allergen advice and nutritional information when changes are required at short notice. For example, an ingredient needs to be swapped out due to a stock-out situation or there is a legislative change mandated. One generic SKU can quickly have real-time variable data applied and the food safety challenge is resolved. With no consumables required, it is impossible to run out of appropriate labels to specify legally required information.

What next for Photonic Printing?

Photonic Printing is highly versatile and can be adapted to a wide range of packaging substrates and applications. It is currently targeted for use in the food and drink, home and personal care sectors and a wide range of QSR / food service applications.

The opportunities for increased supply chain efficiency and brand engagement are endless when Photonic Printing is deployed effectively in the new pack development process.



Figure 5: VARELase Cup Solutions by DataLase turns a generic paper cup into personalised packaging and can help encourage positive consumer recycling behaviour.



Photonic Printing is clearly set to change the way brands engage with consumers. It will revolutionise marketing campaigns, allowing consumer preferences, trends and emotions to be reflected in products, strengthening brand engagement and loyalty. It will truly give packaging a voice, making it a more valued part of the marketing mix, and will ultimately increase the time brands are able to engage with their consumers.

A true win:win technology, Photonic Printing unusually simplifies, not further complicates, the packaging supply chain process when it is introduced. Most new print innovations require some adjustment or adaptation to the supply chain and workflow to cope with the additional complexities of supply. In the case of Photonic Printing, the technology

can bring many advantages to the various stakeholders along the supply chain at significantly lower cost than other print alternatives, which is an added bonus when bringing a new printing solution to market.

DataLase is continuing to invest in the future of Photonic Printing and is excited about its potential. New and innovative Photonic Printing solutions are in the pipeline with the goal of providing the entire packaging world – from designer to converter to retailer and brand – with faster speed to market and reaction times, increased operational efficiency and further enhancement of brand engagement capability.

With the global population set to increase significantly over the coming years, the market is ready for new printing technology to enable brands to engage with consumers through packaging on a one-to-one level.

**This is the
age of Photonic
Printing – Engaging
Packaging for the
Connected World.**

Notes

*1 Packaging represents c.50% of all printing worldwide Bolanča S. et al.: Packaging Printing Today, acta graphica 26(2015)4, 27-33.

*2 According to Smithers Pira, digital packaging and label printing worldwide was valued at \$10.5 billion in 2015 – and the digital print for packaging market will grow by an average CAGR of 13.6% in constant value (real) terms to 2020, with a print volume CAGR of 16.2% globally. But this is changing as new digital equipment to print on cartons, corrugated, flexibles, rigid plastics and metals is being introduced. Despite this projected growth, digitally printed output currently only makes up a small percent of packaging. Just 5% of labels are now printed digitally and less than 1% of all other packaging is printed digitally.



For further information about DataLase Photonic Printing,
please visit: DataLase.com