

Tonejet: Delivering a Complete Solution for Packaging

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Abstract

The Tonejet process enables printers and brand owners to produce superb, high resolution, colour images on any material with the throughputs and cost levels that are required for the transition into the truly mass market. In this talk we will set out Tonejet's latest technological and product developments and describe how Tonejet systems are being used to create and grow new markets in the packaging sector.

Package Printing: The Opportunity

Consumer package printing represents a huge opportunity for the digital printing community. At \$200 billion the market represents about one third of the entire print industry. The market is healthy, profitable and growing. Importantly the same advances in Information Technology that are shrinking other print markets are acting to enable the move of digital printing into packaging. The key benefits of digital printing: lower stocks, greater responsiveness and mass customisation will drive change and transform the whole supply chain.

The Requirements of the Package Market

The requirements of the packaging market are amongst the most stringent in the printing world. The print must be high quality and robust but at the same time cost competitive to apply.

A wide range of substrates are used including plastics, metal and glass. The printed package must be able to withstand high humidity, a wide temperature range and substantial mechanical wear and tear. All this places severe demands on the decoration process.

Today a wide variety of traditional print processes, inks and curing mechanisms are used to decorate packages using conventional printing. This underlines that any digital print process wanting to make a major impact on this important sector will need to address a wide variety of requirements highly cost effectively.

The Tonejet Process and How It Meets the Requirements of the Packaging Market

The Tonejet print process has been developed with an understanding of the requirements of the packaging market.

The Tonejet print head consists of a fine array of ejectors each fed with Tonejet ink and each addressed by its imaging control electrode. The Tonejet ink is a suspension of pigment particles in Isopar, an inert carrier liquid. The role of the ejector is to shape the ink meniscus so that it responds very rapidly to the electrical imaging pulse. As the pulse is applied, the meniscus moves forward to create a fine jet of fluid that is accelerated onto the packaging substrate. Importantly, the electrical force acts directly on the pigment particles themselves and this not only gives

excellent temporal response but also means that the ejected drop is more concentrated than the ink that flows around the printhead.

Tonejet's process simultaneously delivers the three key requirements:

- High image quality on all packaging media
- High throughput and uptime
- Low cost per printed package.

High Image Quality on All Packaging Media

The Tonejet process offers continuous greyscale control without any compromise to the overall throughput. By putting down a series of individually controlled concentrated drops of pigment the Tonejet printer is able to create very high quality images onto any packaging material. A Tonejet printer will deliver dots across the range 25 to 60µm representing ejected volumes of 0.4 to 2 picolitres.

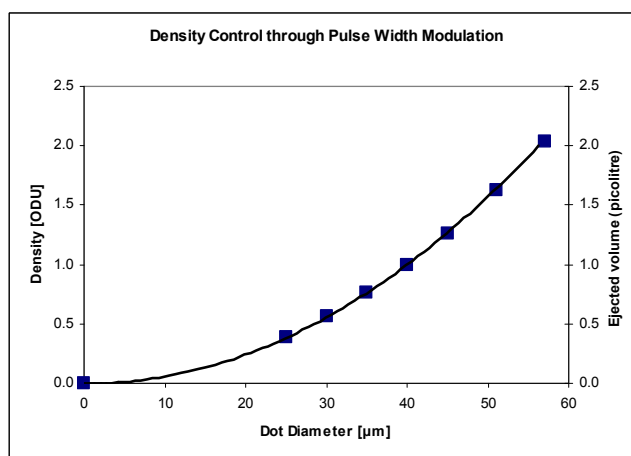


Figure 1: The Tonejet process offers continuous density control. The resulting control of dot size and ejected volume gives very high quality images with a low pile height.

High Throughput and Uptime

Tonejet ejection takes place from an ejector rather than a nozzle. By careful design of the ejection region the jet angle remains tightly controlled and consequently superb structure-free images are obtained without the need for interleaving. By using continuously flowing ink running through an open structure it is possible to ensure that high quality printing is delivered continuously over many hours. An automatic periodic clean ensures that the system delivers high quality, high throughput and high uptime.

Low Cost per Printed Package

Thanks to the high pigment content of the printed dots, Tonejet images have excellent image density but low pile height. This ensures that the ink component of the cost is comparable to conventional ink costs and far lower than that for other digital print systems. With the high system reliability and high consequent utilisation the overall Total Cost of Ownership is highly attractive,

making Tonejet based systems suitable for the whole span of print runs, as illustrated in Figure 2.

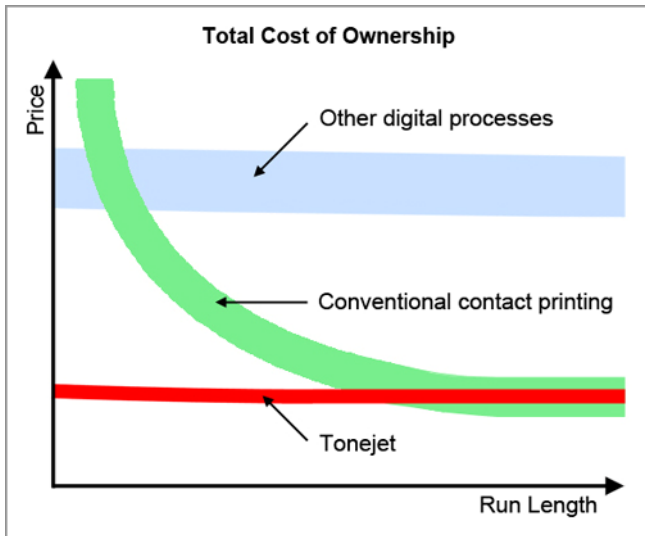


Figure 2: Total Cost of Ownership - Tonejet decoration is cost competitive with conventional printing even for long print runs.

Printing Commercial Packaging Digitally: The Tonejet Can Printer

Tonejet has worked with Ball Packaging Europe to create the first machine that can create production quality cans to enable entry into the commercial market. At the core of the system is the 172mm printhead, a single unit which spans the entire can. The machine takes in white basecoated cans and is able to decorate each can individually, Figure 3. This not only vastly increases the options for decoration but also creates a better looking can.

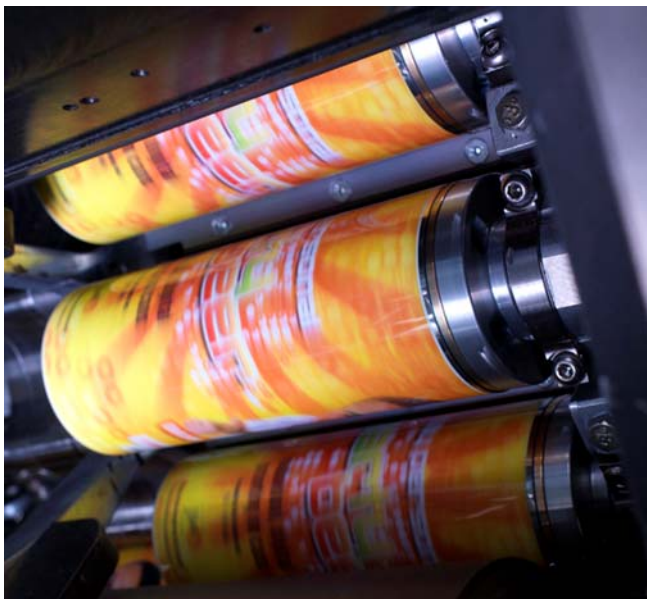


Figure 3: The Tonejet can printer offers can-to-can variability and creates a better looking can.

Ball Packaging Europe announced this landmark capability at the Brau fair in Nuremburg, Figure 4. This machine is now installed in one of Ball's can plants in Germany.



Figure 4: Ball Packaging Europe announced their landmark capability at the Brau fair in Nuremburg. More than 100 designs were brought together to form this display.

A Platform for Film and Paperboard Printing: The Delta 2 Printhead

While the beverage can industry is important, 250 billion cans are made each year worldwide, the market for film and paperboard packaging is even larger. The Delta 2 printhead, Figure 5, has been developed to deliver a flexible solution into this important space.



Figure 5: The Delta 2 printhead is used to build up modular systems to decorate film and paperboard.

The Delta 2 head enables the customer to specify a modular system with widths from 0.1m to 1.4m in 0.1m increments and any number of colours.

The Tonejet Ecosystem

Tonejet delivers systems and solutions to its customers through a three pronged structure. Tonejet itself provides the print engine: the printheads, fluid management system, drive electronics, data and system control. It sublicenses ink supply to internationally recognised partners; Sun Chemical and INX will be supplying Tonejet ink for the Ball system. The underlying press hardware is provided by a third partner. In some instances that partner is the customer itself, Ball developed the underlying can handling system for their machine, but in other cases we team up with a separate hardware partner.

This arrangement, Figure 6, gives the customer the freedom to choose how the solution is delivered together with the confidence that the delivery team will have the flexibility to adapt and capability to deliver as their business develops and grows.

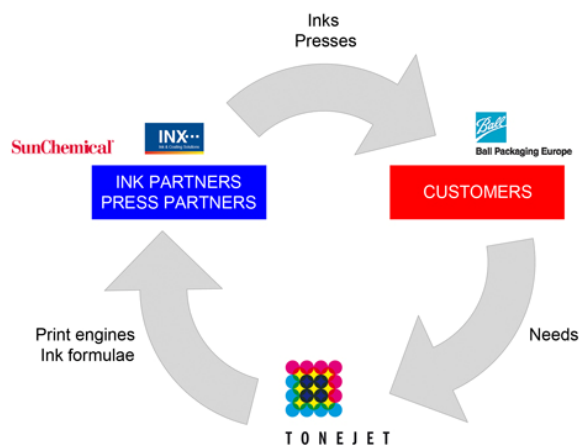


Figure 6: The Tonejet Ecosystem. Tonejet works with its customers and ink and press partners to provide an end-to-end solution.

Tonejet will be delivering systems across the range of packaging applications, Figure 7.

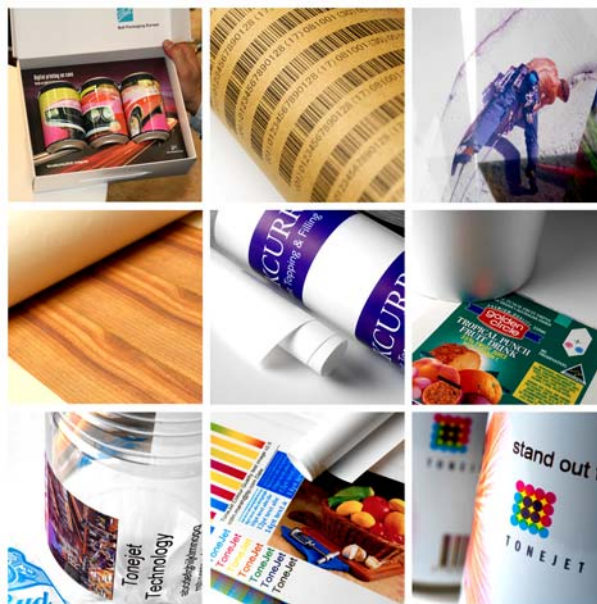


Figure 7: Tonejet prints onto all packaging materials and will be delivering systems across the range of packaging applications.

Biography

Guy Newcombe has been directly involved with the development of Tonejet technology and products since its inception, some ten years ago. In that time he has lead the Tonejet printhead, ink science and print performance programmes, along with a number of customer programmes. Today, Guy is Chief Technical Officer at Tonejet Ltd.

Guy is a graduate of Cambridge University and holds a PhD in Physics from the Cavendish Laboratory.