Analysis

Business Development Services

Production Printing & Media

January 2012

Tonejet Today: An Update

Service Area (s)

Business Development Strategies Packaging

Color Digital Label & Packaging

Comments or Questions?

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Introduction

Tonejet Ltd., the developer of a proprietary print technology that combines electrostatic and drop-on-demand inkjet printing, had its biggest news in 2009 with the announcement that Ball Packaging Europe had become a customer. Ball Packaging is one of the world's major packaging manufacturers. This month, we offer an update on Tonejet, whose technology has great promise in a range of package printing applications.

Key Findings

- Tonejet technology is able to print process color images on non-porous media, such as metal. For one year, the company has printed commercial lots of beverage cans in line with conventional printing at Ball Packaging Europe (Hassloch, Germany).
- Tonejet installed its latest technology at Ball in 2011, replacing the first Tonejet print engine. Tonejet says the change doubled productivity and cut parts count by 60%.
- Tonejet says its inks are non-toxic and meet FDA and EUpia standards for indirect food contact.
- Images printed by Tonejet have low film weight, which helps metal recycling processes and improves the look and feel of the images on metal cans.
- Tonejet digital printing is still tiny compared to the conventional printing that Ball Packaging Europe does in Hassloch, but its use there is now growing.
- Tonejet Ltd. aims to grow short run process color printing of metal cans and other metal packaging, and to expand into other uses such as labels and flexible packaging.

Recommendations

InfoTrends has a few recommendations for clients regarding Tonejet technology:

- Be aware of this technology and its possibilities. Tonejet is a fairly new member of the family of inkjet technologies, and it is especially able to print non-porous media.
- Tonejet Ltd. could be a partner to a range of enterprises, from printer manufacturers to converters to consumer goods manufacturers, for various industrial applications.
- Tonejet technology should be considered as an alternative for label presses, where UV curing piezo inkjet is still a young competitor to EP presses.
- Other packaging categories, such as flexible packaging, though, would welcome efficient short run printing, but now have little or no CMYK digital print.

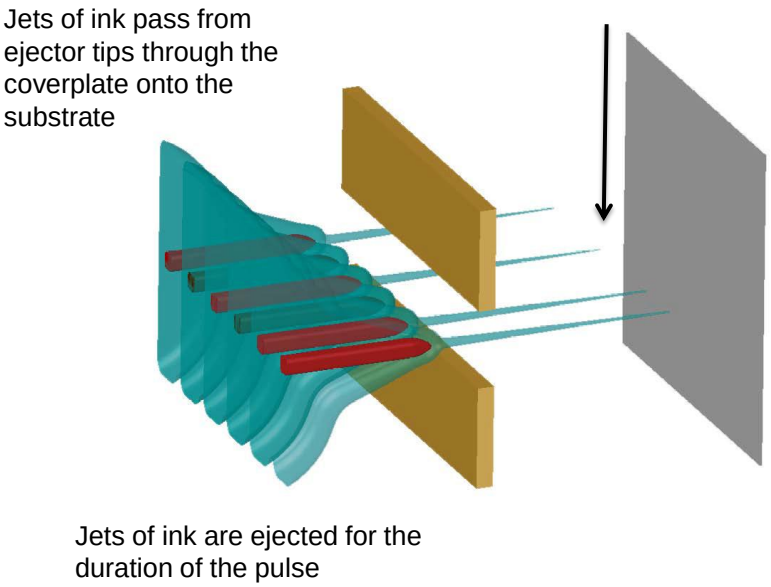
History & Status of Tonejet Technology

Tonejet Ltd. (Cambridge, U.K.) first came to our attention in 2009, when this inkjet technology developer announced that Ball Packaging Europe would install a Tonejet print engine at one of its packaging plants in Germany to print metal cans in full process color.

That news made the Tonejet printing process itself a focus because it is a mix of electrostatic and drop on demand inkjet printing. It is essentially a new member of the inkjet family, and one that is highly capable of printing non-porous surfaces without UV curing. In this report, we will examine Tonejet's history since its 2009 announcement and consider its prospects.

First, what is Tonejet technology, and what makes it worthy of special attention? Briefly, Tonejet is an electrostatic process whereby charged particles suspended in an isopar are ejected, not through a nozzle as in piezo inkjet, but rather off the tips of individual "ejectors." At a microscopic level, these look like the tines of a comb; ejection of droplets occurs with the introduction of electrical pulses. According to Tonejet Ltd, this nozzle-less process eliminates the problem of clogging that is a concern with piezo inkjet. As a result, Tonejet says that its technology allows the variable jetting of very small droplets, from 0.4 picoliters (pL) to 2.0 picoliters, thus enabling the printing of high resolution images at speeds compatible with industrial processes.

Figure 1: Schematic Diagram of Tonejet Ejector Tips



Source: Tonejet Ltd.

This schematic diagram is from a Tonejet Ltd. presentation, which can be found at http://www.tonejet.com/content/documents/Tonejet_NIP26_presentation.pdf.

As to why it deserves special attention, Tonejet's installation at Ball Packaging may be the world's only process color print engine operating in-line with conventional can manufacturing. Other color digital can printing systems do exist, but they are extremely rare and are for off-line use. In inkjet, INX Digital has offered a system based on UV curing piezo inkjet since 2009, but it is reported to be slow in actual use, at less than 10 cans per minute, and the company has only a handful of installations. In electrophotographic, HP Indigo has demonstrated that its liquid electrostatic technology can print metal directly, but InfoTrends knows of no commercial installations from HP Indigo that are doing so today—not among can manufacturers or among label converters who are targeting adjacent applications.

Figure 2: Photo of Metal Cans Printed with Tonejet Technology, Prior to Crimping and Capping

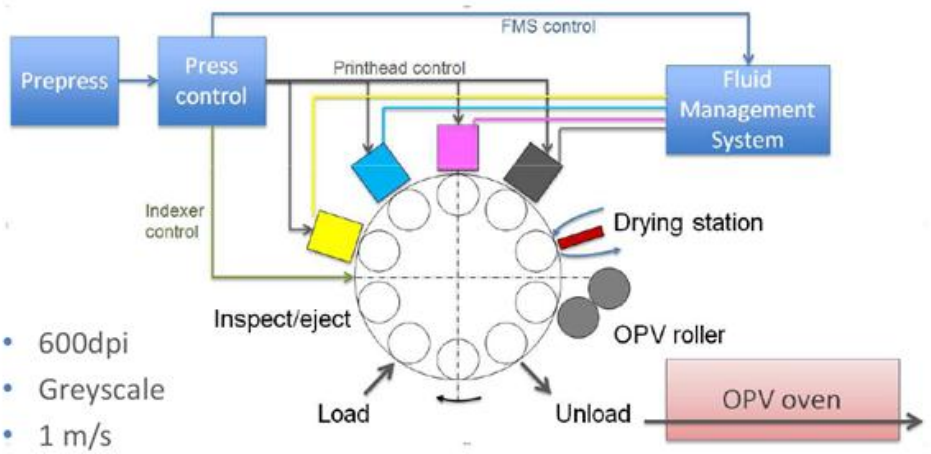
Source: Tonejet Ltd.

Regarding Tonejet's recent history, Ball Packaging Europe is still the company's only publicly acknowledged customer. Ball Packaging Europe, however, has made great progress with its Tonejet beverage can print engine, in terms of the system and also the marketing of its print capability. To review the basic system at Ball Packaging Europe:

- Ball feeds in metal cans that are pre-coated with a white base
- Tonejet prints CMYK images up to 105 mm wide onto cylindrical metal cans
- Printing includes a thermal ink drying station, then varnishing over the whole image, then an oven to cure the varnish
- After the cylinder is printed, varnished, and cured, it is necked before dispatch to the filling plant, where capping takes place
- The cans are two pieces, each comprising a formed can and a metal cap
- Speed is up to 120 cans per minute
- Resolution is 600 x 600 dpi, with four levels of greyscale

- Ink droplet size is variable from 0.4 pL to 2.0 pL
- Typical run lengths are in the low thousands of cans, but can range as high as 250,000

Figure 3: Schematic Drawing of Tonejet Can Printing System



Source: Tonejet Ltd.

Loading, securing, and handling of the cans is performed by proprietary automation designed by Tonejet and Ball Packaging Europe. The term "OPV" refers to "overprint varnish." This schematic plan underlies the system picture in Figure 4, below.

The specifications cited above reflect the advances that Tonejet and Ball Packaging Europe made in 2011, when Tonejet installed a second generation print engine at Ball's Hassloch plant—one that replaced the first installation and doubled its productivity. Close data about the Ball beverage can printing system is proprietary, but several facts about it are public. The print system is located in-line with Ball's main can print production; cans are diverted from the production line, printed and varnished with the Tonejet system, then merged with the output of Ball's conventional offset print system. All the cans then go together through downstream processes, in particular shape forming, in which cylinder ends are necked. Finally, using scannable symbols, the system automatically separates the Tonejet-printed from the stream, for separate distribution to Ball's brand owner customers.

The photo below shows the Tonejet printing system at work in Hassloch, Germany. Note the controller and interface at left, and the cans, pre-coated in white, descending via conveyance from the floor above, with printing and varnishing to follow.

Figure 4: Photo of Tonejet Can Printing System at Ball Packaging Europe

Source: Tonejet, Ltd.

To complete the printing process, the Ball digital beverage can printer based on Tonejet has surmounted a number of challenges:

- Jetting onto a fully non-porous surface in a cylindrical shape
- Producing a smooth finish with a glossy varnish
- Maintaining flexibility of ink and varnish during necking of the can top
- Resisting heat during post processing up to 230° Celsius
- Resisting abrasion during movement on conveyor lines and during packing
- Meeting ink component standards of FDA and EUpia for indirect food contact

Tonejet Ltd. designs and manufactures its own printheads, as well as the other major components of the Tonejet print engine. The company has two ink partners who also deserve credit: Sun Chemical and INX. They worked within the specifications of the Tonejet imaging process to create inks from essentially the same components as the inks used by Ball's conventional presses and to jet pigments at up to 18% of droplet volume. The Tonejet inks are made of organic pigments carried in isopar (a pure form of paraffin) and thus are a light solvent. Inks are also formulated to have surface energy level of 22 mN/m (mili Newton per meter), which is much lower than the surface energy level of metal cans (about 38 mN/m) and therefore is not subject to beading on a slick, non-porous substrate. The images printed on cans by the Tonejet print system at Ball have a film weight of just 0.1 grams per square meter. Tonejet claims this amount is a small fraction of the film weight per square meter from printing by UV curing piezo inkjet.

Business Case for Digitally Printed Cans

The most important achievement in partnership between Tonejet Ltd and Ball Packaging is that, for at least a year, Ball Packaging Europe has been able to offer customers an economic option for printing short runs of cans with print quality to match or exceed Ball's traditional process. The main motivations for beverage brands to print short runs of cans are the same as the ones that spur many brands to print short runs of labels: flexibility in targeting markets with specific print, the ability to test new designs, and a waste-free approach to inventory.

"With an installation of the type seen at Ball Packaging Europe, you can change or add designs at essentially no cost," said Ray Southam, CEO of Tonejet. "This digital print system mainly prints short runs of fixed images, but it can print longer runs and it can even do true variable print, with each can different."

Southam further explained that with conventional can manufacturing, the minimum order for a new design is about 400,000 cans. With the Tonejet beverage can printing system, the minimum order may be only a few thousand cans. What can the brand owner customer do with a few thousand? Test runs are a good example, as are short runs for target marketing. Less obvious uses have also sprung up, though, such as cans with prizes in them, gifts, or lottery tickets. Meanwhile, there are digital print runs that are much higher than a few thousand. Southam notes, however, that while the Tonejet printer has been a success at Ball Packaging Europe, Ball's overall can production is still overwhelmingly printed by conventional means.

"Green" Advantages

While on-demand printing is attractive in terms of sustainability because it cuts waste, the Tonejet process has another "green" advantage in terms of recycling. As it turns out, Tonejet's low film weight per image helps with the deinking of aluminum cans. This occurs after shredded cans are fed into an oven heated to approximately 400° Celsius, hot enough to vaporize inks and varnishes, but not enough to melt aluminum. Once deinked and purified, the aluminum scrap is fed into a melting pot in a conventional furnace, operating at a much higher temperature.

One of Tonejet's advantages is that the film weight of its images is low enough that the deinking oven easily burns off the ink layer without igniting the underlying aluminum. Tonejet notes that the film weight of UV curing piezo inkjet, a possible competitor for digital printing of cans, is much higher. UV inkjet ink film will not go through the deinking efficiently or will ignite, raising oven temperature enough to melt the aluminum. (As a rule, aluminum recycling requires the contaminant level to be less than 4% of the weight of the aluminum for deinking to work, and UV inkjet images may exceed this level.)

Currently, Ball Packaging Europe is using the Tonejet print system to decorate steel cans rather than aluminum, but even in the recycling of steel the low film weight of Tonejet images confers some advantage in recycling. Meanwhile, the beverage industry moves more and more toward aluminum worldwide. According to the U.S. beverage industry, 95% of beverage cans are aluminum. In Europe, where about half the cans are aluminum, the share is growing. The higher financial return on aluminum recycling, as well as lower transport weight, are two key reasons for the change.

Future Developments

Tonejet's strategic focus is on metal cans and other forms of metal packaging, but it expects to expand beyond these categories. Two-part metal cans (the type printed by Tonejet at Ball Package Europe) are an especially attractive target because of their ubiquity—global consumption is said to be about 250 cans billion per year—and the almost universal use of analog systems to print them. Meanwhile, among the thousands of brands that use cans for packaging beverages, there is widespread interest in being able to print on demand at least occasionally for tests, for target marketing, and for other reasons.

Where will Tonejet develop other markets? Some health and beauty products are delivered in metal packaging, usually in aluminum tubes, as are some pharmaceuticals. These are small applications compared to beverage cans, but in contrast to beverages they also often require short runs. After metal packaging, flexible packaging is a target for Tonejet. That category is mainly used for food packaging and, therefore, Tonejet believes its inks will be an attractive option among digital solutions. Tonejet says that all the components in Tonejet inks are non-toxic, and that none is cited by the FDA or other food regulatory agency for toxicity. While UV curing inkjet inks can also print the slick surfaces of flexible packaging, their limited use there has sometimes been problematic, due to concern about the migration of ink monomers.

Final focal points for Tonejet in 2012 and beyond are white inks and near-line or in-line printing at the manufacturer, rather than the converter. On white inks, Tonejet has done extensive development already. Once these are set for commercial use, white inks will cut out the need for a base coat of white, and they will also allow the printing of fixed decoration or variable print in white, directly on metal and other materials. Regarding near-line and in-line printing, Tonejet is working now with big global brands to study options for printing near-line or in-line in their manufacturing operations—thus taking short-run printing away from converter partners and putting it within the brands' own four walls.

InfoTrends' Opinion

Tonejet technology is a highly promising addition to inkjet tools that printer manufacturers, converters, and even consumer goods manufacturers can use to print packaging in process color. Ball Packaging Europe's implementation of Tonejet technology is good evidence that Tonejet technology is reliable enough and productive enough to be used in line with industrial printing of packaging.

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Robert Leahey has many years of experience in consulting to the peripherals and supplies industries. At InfoTrends, his main work has been to conduct custom research projects, most often on inkjet, thermal, and color laser technologies used for commercial and industrial applications.

Comments or Questions?