Printed Displays offer New World of Design Opportunities

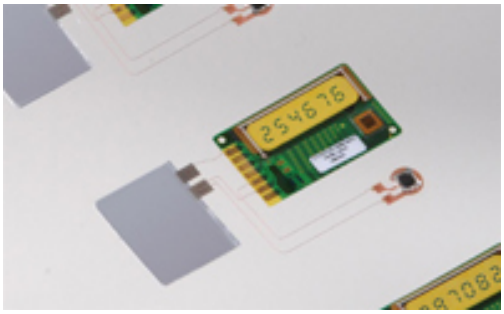
By Dennis Brestovansky, president and CEO of Aveso Displays

A new world of printed electronic display technology is evolving, offering unlimited opportunities for mass consumer and industrial applications. New flexible, printed displays are increasingly being integrated into a variety of everyday products including credit cards, product packaging, home-health diagnostics and even in apparel to combat theft and counterfeit.

Embedding this technology into everyday products offers consumers unprecedented levels of safety, security and convenience, opening the door to a multitude of uses not yet envisioned.

The Impact of OTP

In a time of massive and damaging fraud and information theft, One-Time Password (OTP) technology has been a widespread and thriving answer to protecting consumers. But the clunky design and single-use inefficiency of OTP fobs and tokens, popular with road warriors and office denizens, is quickly becoming so last century.



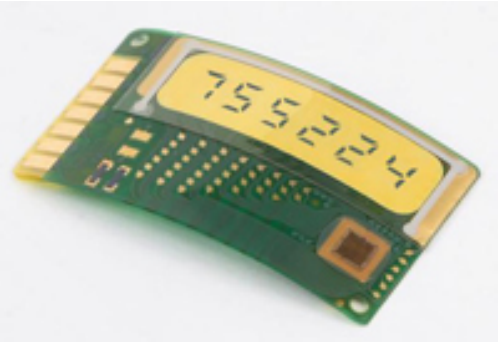
With the burgeoning implementation of printed electronic display technology, not only are cost efficiencies of production improved, but these displays offer a new realm of functionality and design opportunities that overcome the challenges and limitations of traditional fobs and tokens. With flexible printed displays, OTP technology can be used on bank cards or other plastic cards which fit easily into one's wallet.

This is significant because the employment of OTP is one of the most successful and widespread technologies developed to combat the devastation brought on by unscrupulous data theft and fraud, the reality of which is startling. Fraud and theft of corporate information has reached astronomically devastating proportions.

The news is rife with stories including that of TJX Companies, the parent company of T.J. Maxx and Marshall's, which in 2007 reported the theft of credit-card information for nearly 46 million credit and debit cards. The information was lifted by unknown hackers who had breached the company's computer transaction processing systems ultimately costing TJX Companies nearly $40 million.

Nonetheless, current applications of OTP have been limited to its use in ungainly fobs and tokens, but this new printed display technology offers a vast array of new design and use for OTP and other solutions.

Electrochromic Displays to the Rescue



Display technology is based on electrochromic display basically a color change in a material caused by the passage of an electric current potential which has been generating significant interest in academia and industry for its commercial application. Traditional electrochromic materials rely on a "redox dye" that must serve as both the redox material and the color-changing agent, resulting in an unsatisfactory tradeoff between contrast, lifetime of use and available color sets. By separating the function of the redox material and the dye, such as the case with electrochromatic displays, these new inks provide a novel family of high-contrast materials that are inherently stable, processable, and versatile, not only for OTP display applications, but a range of others uses as well, including smart labels, packaging and diagnostics.

OTP and Beyond

The benefits of OTP for designers are many, beginning with not only embedding OTP functionality, but extending those uses into multi-function cards that may likely include mag-strip accessible stored value and prepaid use functionalities. For instance, with this functionality one could have immediate access to remaining balance or transaction history, such as the number of ski-lift rides you have taken and how many more you have available.

In addition, because this data will be displayed on a card, there will be increased opportunities for designers to add additional information such as their company logo, phone numbers, or other instructions. This presents a variety of marketing

opportunities that fobs and tokens simply can't provide and gives organizations a way to strengthen their corporate branding.

For example, PayPal, a widely used online transaction fulfillment company, has been using such technology, branded as Security Key, with great success. Its users have expressed a high level of satisfaction in using these cards and are spreading the word. "Our logo is placed on the physical cards and packaging. We also purchased special PayPal ‘short codes' for the SMS version of PayPal Security Key," said Mike Vergara, director of consumer protections for PayPal. "Security Key provides customers additional protection for online account transfers and bill payments, while allowing customers to make larger value account transfers, and authorizes individual new payees."

The U.S. Army also successfully developed a breakthrough wearable display device prototype called the Digital Alert
Display Device (DADD). It is a lightweight, low-power, wireless display device designed to enable a soldier to send and receive text messages and situational alerts on the battlefield using an alphanumeric flexible display, basically combining a rugged display with an advanced communication device.

Availability & Costs

These flexible displays are now available worldwide. Cards can be embedded with flexible display OTP and manufactured using standard hot lamination processes to produce high-quality, long-lasting cards. Today, display and inlay technologies are available that drop right into existing card-making lines. Furthermore, cards with OTP technology now produce higher-contrast displays which are easier to read, more flexible and durable, making them much less likely to be broken than LCD-based tokens.

Manufacturing OTP cards with flexible displays can also reduce cost. These new convenient cards are suitable for high volume, cost-sensitive mass consumer manufacturing. In addition, total cost of ownership for these cards is lower. It is more cost effective to issue OTP cards with flexible displays because card fulfillment is significantly less expensive than fulfillment of unwieldy security tokens or fobs. Furthermore, OTP cards with flexible displays are significantly more attractive to issuers because they offer considerable cost savings over the lifetime of ownership.

Brands are increasingly interested in top-of-wallet presence. Cards that fit in wallets make them more convenient to carry and use than trying to keep track of security tokens or fobs. With OTP built into a bank card, for example, the first issuers of such cards will be able to leverage the added security function and grab the coveted top-of-wallet position.

Other Uses for Flexible Display Technology

Additional uses for flexible display technology include embedding into smart labels and smart packaging as well as diagnostics for chemistry, biotechnology and electronics, or even home use. With smart labeling and packaging, these new printed electronic components offer an array of custom displays that may include use in radio-frequency identification (RFID) antennas, displays, sensors, thin-film

batteries and photovoltaics. Custom displays may include time and temperature sensors, tamper-proof packaging, and anti-counterfeit functionality.

New vistas are on the horizon for diagnostics as well, as designers find favor with flexible display technologies' relatively low cost, simplicity, significantly improved and higher-definition readouts, ruggedness for demanding operating and production environments, low-operating voltage, paper-thin and full customizable flexibility, and dynamic cycling with permanent imaging, greater viewability over a wider angle, and their non-hazardous nature.

When integrated with a microcontroller, FPGA or SAIC to activate the display, they require no additional components while providing functionality from a single icon to full alpha-numeric. Such technological breadth makes flexible display technology a natural choice for simple, inexpensive home tests, for example, including those for pregnancy or blood glucose tests for people with diabetes.

Flexibility becomes the name of the game. As competition heats up, these new display opportunities will provide an exciting market edge and a new world of opportunity.

Dennis Brestovansky is president and CEO of Aveso Displays, a leading provider of flexible display components suitable for high volume, cost-sensitive mass consumer applications. He has extensive operational experience in materials-related businesses serving the display, semiconductor, and military industries, and is the author of more than 50 publications and patents.

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