

Packaging and Envelope Materials, A New Horizon for Digital Printers

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Abstract

Digital printing has come a long way, but so have new product applications and digital printing and envelope manufacturing are starting to merge. Last year 223 billion envelopes were produced in the United States, 38 billion of which were in packaging or packaging related applications. With mail volume on a slow decline, the envelope manufacturing industry has sought out new markets and applications for our products. Personalization and packaging have come together to create new opportunities for envelope manufacturers and the technology providers that work with them.

Traditionally the industry has printed using flexographic and offset processes, however, new barcode symbologies and the evolution of more, smaller mailings have led the industry to explore personalization strategies. Ink jet printing has primarily been used for addressing in the past but in line folders and gummers have given new opportunities for higher speed digital printers to be used in direct mail applications.

The paper presented will explore the past of the envelope manufacturing industry in terms of the materials that have been used and its evolution toward new printing and personalizing technologies as it has moved into packaging and custom envelope fabrication.

Most people do not think very much of an envelope. After all, it is just a covering on a mailpiece or package and it is often discarded after use. Yet, there is a great deal of thought and design that goes into an envelope and the technology of printing the envelope is bringing envelope manufacturers into an entire new era of product opportunities beyond use in the mail.

Background

The machine fabricated envelope industry started in 1850 in America with the introduction of the French made "Rabatte" or "Rabbit" machine, first brought to New York by Henry Berlin. From this machine came six more patents and soon envelope machines were producing envelopes, by 1870, at the blinding speed of 160 envelopes per hour, folded and gummed. By 1920, new machinery developments offered by the Staude Company and F.L. Smithe Company created larger envelopes that were used in packaging auto parts, to clothing, to books to shoes [Benjamin, *History of Envelopes, 1840-1900*, EMA, pp.5-6]. In fact, in the 1930's, envelopes were a convenient form of packaging used with almost everything.

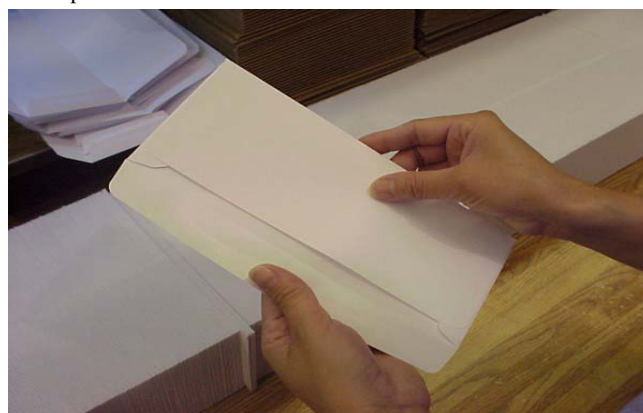
The mailing industry in America grew from only 25 million mailpieces in 1940 to 212 billion mailpieces that are in the postal system today and the industry grew with the mail. The packaging applications of the 1930's in envelopes gave way to plastics in the 1950's and the industry never looked back as it grew at double-digit rates. While printing on envelopes began slightly before the American Civil War, it was always an off-line process, first using stone lithography, later letterpress and by the 1960's

evolving into offset lithography and flexography. The image on the face of the envelope became more important than the envelope itself as those of you who ever received a Publishers Clearinghouse Envelope, a prestigious credit card offer or a vacation opportunity can see. By 2003, envelopes used for direct mail has outpaced envelopes used in commercial transactions. In 2007, our industry fabricated 223 billion envelopes and we should produce 235 billion in 2008, with most of the growth in packaging [Benjamin, *Industry Trends*, EMA, 2008]. Digital printing also grew in usage during this period in our industry.

The Materials

Only about eight percent of the envelopes made today are from non-paper materials. The envelope is still a paper-based medium but it is quickly evolving to use other paper (uncoated free sheet). The industry uses a variety of different basis weights but 24 lb is standard. We also use Kraft papers in our packaging and mailing applications for larger containers. I have included a brief glossary at the end of this paper if there are any unfamiliar terms. More of our packaging envelopes are made out of Tyvek, a spun bonded olefin, from tri-laminates (paper, film, paper), or hybrids, plastic "rick/rack" and paper. We even use 20 mil and greater polystyrene films in some of our bag applications [*Fundamentals of Envelope Manufacturing*, EMA, 2002].

In 1901, the window envelope was invented by Americus Callahan, a Chicago office supply salesman and by 1903, the White House was using window envelopes for correspondence [Benjamin, *History of Envelopes*]. Packaging envelopes with windows were introduced in 1920. The early



"films" were an oiled cellulose material that created a translucent effect so that you could see the contents but not clearly. By 1930 the industry had developed glassine, another product made with cellulose and high temperature. Cellophane, another cellulose based material, was introduced in the 1930's and used to keep cigarettes from drying out but also used in window films. It was not until the mid 1950's that plastic films were used, mostly

polystyrene. In today's green environment a good amount of the window film used in our industry is made from cornstarch, created into polylactic acid and then thermoformed into films.

No horse was ever slaughtered to make gum for an envelope. Since the very beginning it has all been made from various cornstarch applications. Prior to 1950, envelope makers would formulate their own gum on the factory floor but today it is made by adhesives companies with strict adherence to quality as gums not only come in contact with postal mailing equipment but also human skin.

The reason consumers continue to use envelopes is that they are a physical form of commerce; in essence, they touch everyone that receives an envelope. Scholars have studied the "mail moment" and learned that next to embracing one's spouse, it is the mail and packages received in the home that get attention. Everyone likes a surprise, and every day packages and mail are in the household, most are opened [United States Postal Service, *Mail Moment Study*, 2003].

The Merger of Digital Printing Technology and the Envelope and Package

In 1996, the envelope manufacturing industry started experimenting with inkjet technology. These early print heads only dispensed small quantities of black ink used in addressing mailpieces and printing indicia. A few mailings had sequentially numbered mailpieces, coupons that were personalized and a few other applications. Envelope barcoding went back to the 1960's when product sold through supermarkets and stationers had to have a UPC code. Offering envelopes were ink jet printed in the mid 60's on ward, in some cases with ink jet technology developed by the industry.

1997 was an important year for the industry because we started to think in terms on placing more machine-readable codes on the face of the envelope or machine fabricated devices inside the envelope. From the 1960's we had placed barcodes on the face of the envelope, primarily POSTNET, a coding symbology developed by the United States Postal Service to start to make mail machine readable. POSTNET offered little more than an ability to encode five digits of ZIP code which enabled mail and packaging to be sorted to a city or town post office, but little else. Since we did not have an Internet in commercial use at that time, there was no tracking of the mail or packages; you just got what you got [United States Postal Service, *History of the Postal Service*].

By the early 1980's the USPS implemented a nine digit POSTNET code and now we could sort mail down to the delivery post office level. By 1985, two more digits were added and we could now sort by carrier route and house. Other symbologies were



also introduced. A Facing Indicator Mark, showed the front side of the mailpiece and package. Later a route tracking code was appended on the back of the envelope or package that enabled mail and packages to be presorted by carrier route but we were not "smart" yet.

Ink jet and laser printing started gaining speed during this time and roll-to-roll solutions started to be added. However, by the early 1990's we were still in black and white and printing on both sides of the paper slowed down press applications to about 150 images per minute. At the same time, the average envelope

machine was fabricating packages at 1,000 units per minute but only with static imaging. We were still not "smart" yet.

We were very influenced by Dataglyphs© developed by Xerox Park in the late 1970's and well into the 1980's. We were most interested in how we could imbed instructions or print instructions into images on envelopes and how they could be read by consumers. Unfortunately, the absence of broadband, useful readers and/or cameras in the American household of the mid 1990's limited the use of this technology and Glyphs© were a proprietary technology of Xerox.

Our industry started working with the MIT Media Lab in

1997 and shortly thereafter we had the Postal Service involved in the Media Lab. We worked with Escher Labs, located walking distance to the MIT Media Labs to develop some postal applications like stamps with imbedded security devices shown in the picture to the left.



We created a joint industry/Postal study group of Scientists and Engineers, called the Intelligent Document Task Force, to examine candidate technologies for application on mail and packaging. We not only met with MIT, we visited Digimark, DOW, Dupont, Hewlett Packard Labs, IBM Labs, International Paper Research Center, Kodak, Motorola, Pitney Bowes Technology Solutions Center and the Sandia National Laboratory. By the time we completed our visits we had a broad library of candidate technologies to review. In 2003, the Intelligent Document Task Force became an advisory committee of the United States Postal Service and named the Mail Technology Strategy Council. We still meet once per quarter to discuss candidate technologies and packaging and mailing applications in an open forum [EMA Foundation for Paper Based Communication, *Report of the Intelligent Document Task Force. Volume I and II*, 1999 and 2000].

Our Journey Moves Forward

The introduction of the Intelligent Mail Barcode (IMB) by the United States Postal Service in 2003 has brought even greater incentives for the industry to implement digital printing solutions in its plants. Not only is research showing that personalization of mail improves response rates, but the creation of a unique identifier on every piece of mail or package going forward will be a requirement to receive an automation discount from the Postal Service. Even more significant, the "intelligent envelope" has now become a reality as developments in packaging and labeling converge with envelope manufacturing technologies to produce new products. Three major trends need to be briefly examined: The trend for mail to be different, the trend toward personalized graphics and the trend toward intelligence on packaging beyond barcodes.

Mail is Different

The challenge for those that produce mail and those that manage postal services in the future is how they create a platform for product innovation. In essence, there is a need for a more open (network-centric) innovation movement [L.A. Pintsov and A. Obrea, *Postal Reform and Product Innovation*, Center for Research

in Regulated Industries, Rutgers University 2008]. The authors argue that an interface platform can be created that effectively leverages the trends of e-Commerce and internet-enabled communication into the postal sector. They have proposed a new integrated product innovation and consumption framework where product design is shaped through an Extensible Postal Product Model and Language (EPPML). Using EPPML products can be customized interactively and printed digitally via remote printing applications including the requisite Postal Service indicia's and Internet documents created, tracked and traced all in a simple fabrication system. With the wide spread adoption of electronic communications by postal operators, a postal network can become both a document fabrication system and a delivery and destination network thus eliminating significant costs and inflexibility from the current method of handling mail.

Graphics are More Personalized

Consumers are loudly speaking that they want more control over their communication choices and as a result mail must be targeted, more personal and less costly to produce. The average response rate of direct mail today is 2.15 percent, of targeted email it is even less at .3 percent. Where there is too much communication to consumers, the result is anger and calls for governments to do something about the quantity of mail being received in the American household. Industry is responding through the digitization of processes that produce mail, the improvement of addressing and recycling of used mail and more personalization to improve graphics. The mail shown here is totally digital including the stamp and has tracing and tracking marks on it and is personalized.



Intelligence on Packaging

The next horizon for the industry will be fabricating intelligent devices that will be placed on the packaging we produce that facilitate security, tracing and tracking of packages. We have been experimenting with printable RFID and also the potential of LED arrays on packages to assist in the picking process. Printable

security devices are also being researched to protect the contents of a package and we have even looked into animated graphics as a marketing device. All of these technologies are digitally applied and may be part of our product offerings in the future [Benjamin, *Industry Trends 2008*, EMA]. From a simple white envelope with a gold embossed "Oscar" on the front to a digitally fabricated envelope, envelopes still get the attention of the consumer and have an important part to play in the future of digital printing and packaging.

Author Biography

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