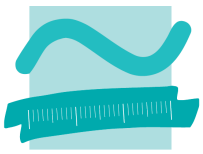
TFH Language Award 2007

Scent Encapsulated in Printed Products

New Technologies and Economic Developments



TECHNISCHE
FACHHOCHSCHULE
BERLIN
University of Applied Sciences

Author: Heike Rose, s739424
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Content

1 Introduction

The first examples known to use printing methods originated in China and can be dated back to before 220. [Gräfe, 1955] Still, in the 15th century, only a few selected people could read and write. Books were rare and expensive. The invention of movable type letters by Johannes Gutenberg around 1450 was like a revolution. As a result, the printing industry evolved.

Today printing processes use much more sophisticated technologies. But, for the last few decades, printed products have to compete with other media like online publications, radio and TV. Therefore, printed products will disappear is predicted if they do not offer any advantage compared to other media. Consequently, new concepts have to be developed that improve the attributes of printed material like packages, books and newspapers. Using flavours in print is a concept with such promising prospects.

2 Advantages of Scent

Scent is a multi-sensory medium that directly links smell to emotion and reproduces a memory of an experience made in the past. A well chosen scent will increase the value of a product and create a message in the way of the AIDA model: At first the scented product attracts the **A**ttention of a customer. As a result, his or her **I**nterest is caught and a **D**esire is aroused which ends in an **A**ction, e.g. to get more information or even buy the product. Bob Bernstein, president of Scentisphere, producer of scented products, once said, “What we’re finding now is that there’s a dramatic increase in sales — 20 percent or so — directly attributable to scent marketing.” [Trela, 2007]

About 1,000 different scents are already offered by companies like Concord Litho, one of America’s largest independent printers. Any scents not available on stock will usually be created within five to seven weeks. [Sherburne, 2007] Popular scents are food flavours, e.g. chocolate and coffee. Nevertheless, new products are developed every day on customer requests. They are more expensive and their production is, of course, more time-consuming. But a unique flavour can be an important competitive advantage.

Scented products are useful in various opportunities:

- About 70 per cent of buyers decide by scent whether or not a product is bought. [Sherburne, 2007] If a scented label is added on a package for toothpaste or shampoo, customers don't need to destroy the package to get an impression of the product's flavour.
- The senses of smell and taste are connected. A human tongue is mainly able to distinguish sweet, sour, bitter, salty and umami. The seemingly distinctive taste is a result of smell. That means, scented packages can be used to imitate food.
- The interaction of the customer with a scented product is — compared to an odourless product — remarkably better. Normally, an advertisement gets an average interest of about two seconds. [Lehmann, 2006] By adding a pleasant scent, the effect on the customer increases and he or she will recall the brand more exactly during shopping.
- Scented products still offer a high level of novelty. A particular scent helps to build up a brand. The scent becomes part of the Corporate Identity of a company. It can even be used for stationary, business cards and so on.
- Some printed products like plastic materials of packages have an unpleasant odour. This can be masked eventually by a carefully chosen scent.
- Last year the scent of the newly introduced Calvin Klein fragrance "Euphoria" was put on a cotton pad and sealed in a foil insert of magazines. When rubbing the pad on the skin the scent remained for about twelve hours. The campaign turned out to be a success. [Trela, 2007]
- Recently, in April 2007, the NBC used scented cards in a TV show. The cards with six different scents had been printed in a TV Guide magazine and the members of the audience were asked to scratch them free during the show. [Dana, 2007]

3 Scented Printed Products

The scent of a product is based on capsules containing the flavour. There are mainly three methods to place the capsules in or on the printed material. Nevertheless, the actual implementation might vary in detail depending on the specifications of the printing process.

3.1 Scented Strips

Scented strips can often be found in women's fashion magazines, especially in ads for perfumes. They are composed of a gelatine-based slurry mixed with glue. [Dana, 2007] The strip has to be peeled away to break open the big scented capsules embedded in the slurry and the fragrance or perfume oil is released. They can be produced economically, but the scent does not remain for long. Often it is even released prematurely because of too much pressure during production or transport.

3.2 "Scratch and Sniff"

"Scratch and sniff" labels became popular in the 1980s. [Sherburne, 2007] They have especially been used since then for kids' stickers and pressure sensitive labels. The scented capsules are mixed in a water-based slurry and applied with an extrusion head or a rubber flexo plate. [Follmann] Unfortunately, the applied paste tends to blur or obscure images. Some extra time will be required to dry the label. Therefore, the scented label should be produced in advance.

To release the scent, the surface of the label has to be vigorously scratched. Nevertheless, after only a few times, the scent is gone. Costs are, according to Donna Federici, Senior VP of Sales and Marketing for Sexy Hair, about 10 per cent higher compared to non-labelled products. [Packaging Digest, 2004]

3.3 Scented Varnishes and Inks

The technology adds teeny polymer capsules to varnish or ink. That considerably accelerates the process of completing a printed product with a desired fragrance. The scent will not be released before using mechanical treatment, e.g. scratching, and withstands the heat of a printing machine without bursting. The method to release the scent is less destructive than by "scratch and sniff" labels. Depending on the mixture of the microencapsulated varnish or ink the scent lasts very long and its release can be controlled.

Thus Ali Westcott, Director Marketing & Communications for Concord Litho, stated in an interview that “a product with this scented varnish can be stored on retail shelves for more than five years.” [Dana, 2007] Micro-Scent Inc. even promise on their website that “the fragrance will remain intact inside its microcapsule waiting to be released for forty years or longer”. [MicroScent]

Another significant advantage of the technology is that it is nontoxic and therefore often used for olfactory packages, e.g. for food. When the scented varnish is printed, virtually no visual effect to the printed graphics beneath can be seen due to the clear mixture. The technology is about 40 [Dana, 2007] to 50 [Sherburne, 2007] per cent cheaper than that for scented strips.

4 Microencapsulation

4.1 History

Particularly scented varnishes and inks use microencapsulated flavours. Scientists of National Cash Register Co. accidentally discovered microencapsulation in 1954 while developing carbonless paper. [Madehow] Soon afterwards the importance of the discovery became obvious: almost endless possibilities came about.

4.2 Design

Microencapsulation works on the physical concept that water and oil do not mix. Nearly anything that is not water-soluble can be encapsulated. Even solids are feasible. There are various possibilities of how microencapsulation can be accomplished. The complex coacervation technology used by Micro-Scent Inc. is described as an example: [MicroScent]

At first the oil which provides the desired fragrance is energetically stirred to get an emulsion. In the next step, the so-called complex coacervation has to be achieved: An odourless substance encloses the droplets of the emulsified fragrance. It enwraps the droplets like balloon shells and protects the fragrance against a premature release. The final compound of the microencapsulation process should consist of about 80 per cent of the desired fragrance and about 20 per cent of the odourless substance. [Lehmann, 2006]

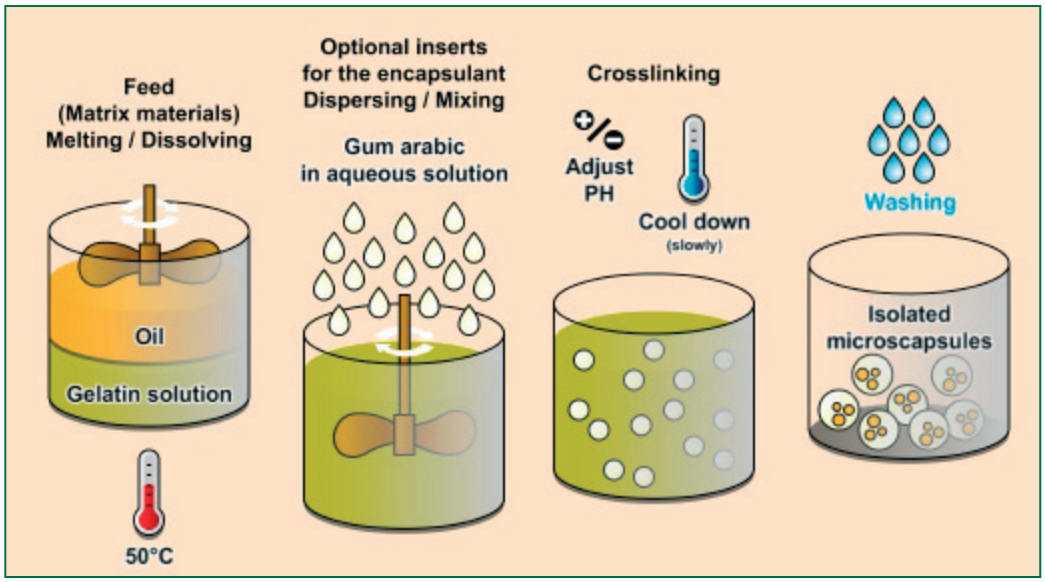

Figure 4.1 Schematic diagram of the process of complex coacervation. [Gate2Tech]

Because of high temperatures in the later printing processes the oil-based substance has to be moderately volatile. The odourless substance mainly contains gelatine and gum arabic and is said to guarantee a long remaining scent. The encapsulated fragrance can be dispersed into varnish or ink. The mixture has to be hermetically sealed and, in this way, it is preserved.

Before printing the compound has to be carefully stirred to avoid an inconsistent dispersion. Nevertheless, the finished compound should not be stored for too long. About 2—3 per cent distant pieces have to be mixed in to ensure that most of the scented capsules outlast the printing process. [Lehmann, 2006] The printed material must dry properly. At the end the former wet capsules become brittle and will release their fragrance by mechanical treatment.

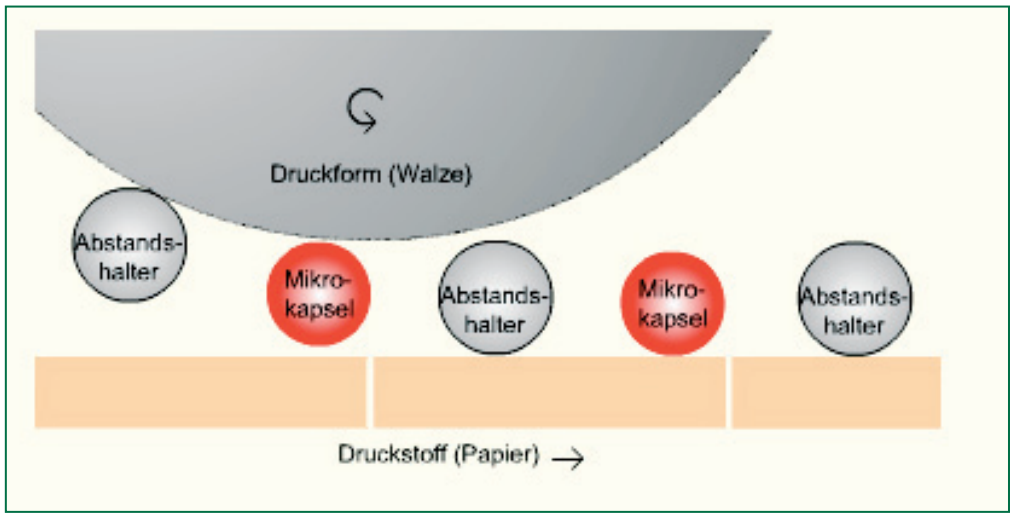

Figure 4.2 Distant pieces (grey) protect the microcapsules (red) against a premature release during the printing process. [Chemgapedia]

The size of the tiny capsules can differ from 1 to 20 micrometers in diameter, but mostly it measures about 6 micrometers. The bigger they are, the less mechanical stability they have. The reason is the increasing instability of the capsule walls. Having that in mind, the pressure that is necessary to destroy the capsules can be chosen. Hence the best result is achieved by using more capsules that are less protected. [Lehmann, 2006]

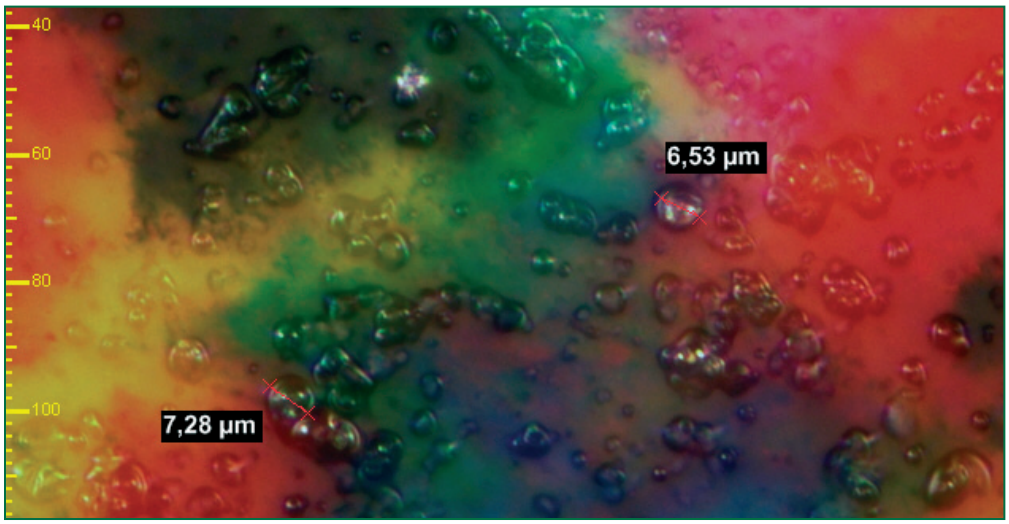

Figure 4.3 Microscopical sample of dispersed capsules in offset printing. [ChemgaPedia]

Capsules which are produced for scented inks and varnishes normally remain intact up to a temperature of 200 °C. [Lehmann, 2006] That ensures that they will not boil during the print process. Flavours containing alcohol cannot be applied and have to be substituted by alternative substances.

4.3 Conditions Required

The size and placement of the scented area can be chosen, but the area should not be smaller than 2x2 inches to receive a distinguishable result. The scented area should be marked, e.g. by means of a dotted line, so that the customer becomes aware of the add-on. Depending on the size of the scented area, more or less flavour is released.

It is recommended to print the capsules at last, which means that the scented varnish is often the “fifth colour”. That protects the capsules from a premature deterioration and avoids even the slightest alteration in colour. Apart from that, ink might not be the best choice because, in the majority of cases, it will be printed on screen tints that will reduce the printing area remarkably. It is recommended to mix about 13 to 20 per cent microcapsules in the ink or varnish. [Lehmann, 2006] Among other things, the quantity depends on the consistency of the ink (sufficient tackiness) and the printing process used.

Microencapsulated varnishes and inks can be applied in almost any print process. Still, the best results will be achieved by sheet fed and web offset overprint varnish. [MicroScent] Nevertheless, using microcapsules for flexo, screen and gravure printing is possible as well — taking into account the different production requirements. For heatset printing siccatives are necessary to accelerate the drying process. The oil-based substance must not evaporate too early. In coldset printing, remaining solvents do often not evaporate soon enough. The scent disperses with that of the flavour and leads to an annoying effect. Furthermore, the capsules can also be included in UV (ultraviolet) and EB (electron beam) technologies. [Scentisphere] But especially UV varnish, having a strong inherent smell, is very firm after hardening. That might entail some difficulties when scratching the area to release the scent.

Scented varnishes or inks work best on dull or vellum papers because the coating gives the material a matt-finished appearance. As to the colour of the ink, there will not be a perceptible change. Especially “rub and smell” products should not be printed on newsprint paper. The material itself probably would not withstand the scratching.

While using scented varnishes or inks, printers need not modify the printing process very much: Depending on the fluid, it might be necessary to adjust several parts of the machine, e.g. speed of the machine, condition of analox rollers, printing pads, drying time and so on. If there are too many pigments included in the concentrate, the binder will no longer be able to bind and transport the pigments. As a result, the ink or varnish is piling-up on rollers and the rubber blanket. In such cases, the microcapsule to ink proportion must be reduced by adding varnish or printing oil. Furthermore, the machine speed should be reduced too. To ensure a maximum ink or varnish transfer to the paper, the minimum quantity of damping solution should be used. [Lehmann, 2006] The most distracting feature is the smell, because the concentrated flavour spreads all over the pressroom where it stays for a considerable period of time.

4.4 Practical Application

The scent of the capsules can be released by various treatments. The most common ones are rubbing, pressing, cutting and scratching. In the following, some examples are listed to give an impression of the versatile technology:

- Follmann & Co., a German company operating in the international chemical industry, divide the release of fragrance oils into three fields of application: “Tear and Smell” (scented labels that capture the desired fragrance as a gel), “Lift and Smell” (scented adhesives for sealing paper tabs) and “Touch and Smell” (scented varnishes and inks that can be coated on almost any printable area). [Folco Scent]
- When products like an envelope are torn open, a fragrant can be released. The scented capsules are part of the glue. It is essential for a proper hold of the glue on the material that the applied strip is at least one centimetre in width. The consistency of the glue has to be carefully chosen because the product must be opened between the sheets to release the scent. Some disadvantages of that concept are comparatively high production costs and the need to open the flap to release the fragrance. [Lehmann, 2006]
- Instead of printing the scent on paper, the material can be permeated with gelatine-capsules. The capsules infuse the whole sheet and ensure a considerably stronger scent compared to products that have been produced by a conventional method.
- For any flavours released continuously, fillers are often used to temporarily bind the scent to the ink or varnish. The scent diffuses after a defined period of time.

Costs depend on quite a lot of factors, but will probably go down in case the technology becomes more popular. For instance, one kilogramme of a standard scent costs between 100 and 200 Euros. And for a brochure with a run of 50,000 copies some extra costs of about 600 Euros have to be kept in mind. [Lehmann, 2006]

5 Summary

Countless applications are conceivable for scented printed products. They can be attached to mailings, advertisements in magazines or newspapers, to outer packaging, and so on. Especially olfactory packaging is a growing industry for flavoured print products.

The scented and aromatic oils are mainly released continously or by means of mechanical treatment. In most cases, the latter one will be the better choice, because customers get the chance to release the flavour controlled. Apart from that, the scent lasts longer than the one produced by continuous technologies which usually remains just a few days.

But using scent is not only a chance but also a risk. Since, if there are too many scents, it will just be annoying for the customer, and the advantage will soon become a drawback. Furthermore, the scent itself should be carefully chosen: A scent might have an attractive flavour but, surrounded by other scents, like the scent of ink, or due to high temperatures, the flavour could unwillingly change. To approve scents, samples on small patches can be made.

Scents can manipulate our perception of products. Customers have the right to know the reason why decisions are made. Scents should therefore carefully be chosen. Keeping that in mind and using the technology deliberately, microencapsulated scents offer fascinating chances for printed products.

6 Table of Figures

7 Bibliography

ChemgaPedia:

ChemgaPedia — *Mikroverkapselung*

Chapter: Verwendung – Druckindustrie, Cursus: 98650

Link: http://www.chemgapedia.de/vsengine/vlu/vsc/de/ch/16/tc/microcaps/microcaps.vlu/Page/vsc/de/ch/16/tc/microcaps/microcaps10.vscml.html

Access: September 4, 2007

Dana, 2007:

Dana, M. — *Scented Varnish*

Boston Print Buyers, Published: July 5, 2007

Link: http://www.bostonprintbuyers.com/printtips/07-05-07.html

Access: July 29, 2007

Gate2Tech:

Gate2Tech — *Complex Coacervation*

Chapter: Technology

Link: http://www.gate2tech.com/article.php3?id_article=12

Access: September 4, 2007

Gräfe, 1955:

Gräfe, R.; Olivet, J. — *Papier und Druckfarbe*

First Edition, Berlin: Verlag Volk und Wissen, 1955

Folco Scent:

Follmann & Co. — *Folco Scent®. Printable Scents.*

Product Information by Follmann & Co.

Link: http://www.folcoscent.de

Access: July 29, 2007

Follmann:
Follmann & Co. — *The World of Small Capsules*
Product Information by Follmann & Co.
Link: http://www.follmann.de/sites/index.php?
option=com_content&task=view&lang=en&id=22
Access: July 29, 2007

Lehmann, 2006:
Lehmann, K. — *Duftende Drucksachen*
Paper of the Compulsory Optional Subject Quality Management Print
TFH Berlin, Published: December 21, 2006

Madehow:
Madehow — *How Products are Made*
Volume 3, Section "Scratch and Sniff"
Link: http://www.madehow.com/Volume-3/Scratch-and-Sniff.html
Access: August 14, 2007

MicroScent:
Micro-Scent Inc. — *The History of Micro-Scent*
Product Information by Micro-Scent Inc.
Link: http://www.microscent.com/?History
Access: July 29, 2007

Packaging Digest, 2004:
Packaging Digest — *Design Trends*
Section "Bottles get Fresh with Scratch-and-Sniff Labels"
Published: September, 2004
Link: http://www.packagingdigest.com/articles/200409/dt1.php
Access: July 29, 2007

Scentisphere:

Scentisphere — *Scent-Vertising — Scent Makes Brands Come Alive. Rub'nSmell Improves the Effectiveness of Print Advertising.*

Product Information by Scentisphere

Link: http://www.scentisphere.com/scent_vertising.htm

Access: July 29, 2007

Trela, 2007:

Trela, R. — *Scent. Marketing Is Wafting Your Way*

PrintSolutions, Published: February, 2007

Link: http://www.printsolutionsmag.com/issues/february07/page38.stm

Access: July 29, 2007

Sherburne, 2007:

Sherburne, C. — *Concord Litho: On the Scent of New Profits*

Interview

What They Think, Published: June 27, 2007

Link: members.whattheythink.com/home/070627sherburne.cfm

Access: July 29, 2007