

Safeguarding Assets

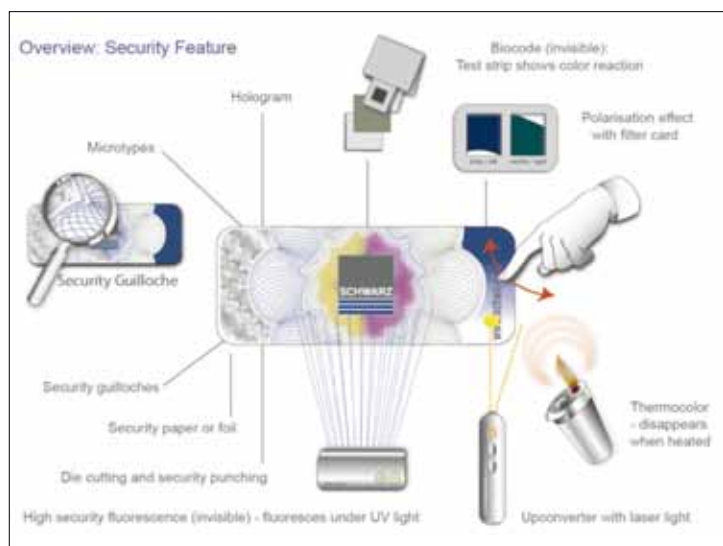
Understand the ways to authenticating and protecting packages.

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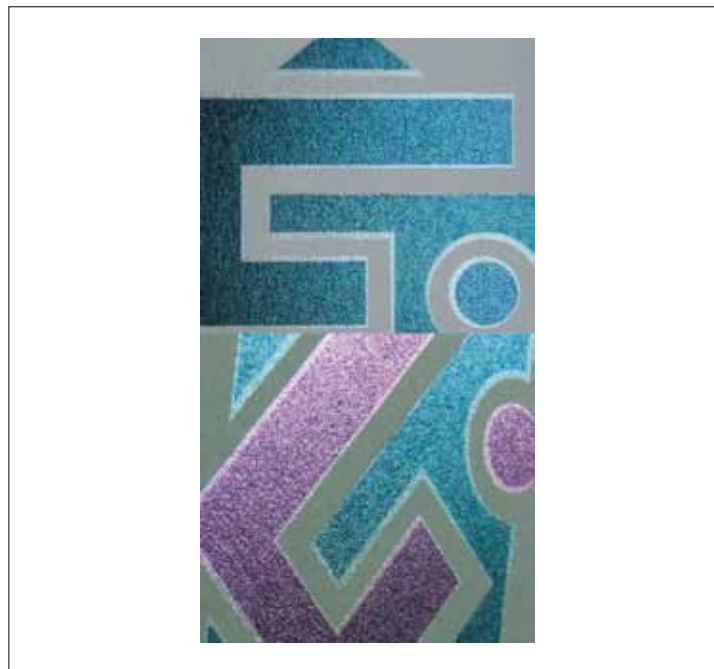
Counterfeiting affects the intellectual property legal system negatively and brings detrimental economic and financial consequences to the society, as forged goods cause harm to humans in many ways. Counterfeited food, tobacco products, alcohol, prescription and over the counter drugs, as well as personal care products may induce unsuspected human suffering and even death. Individuals may also be at risk if they were to consume products that are contaminated with poisonous ingredients.

Every year, companies incur huge financial and intangible losses due to counterfeiting, parallel trading and false warranty claims. Manufacturers and consumers face a difficult task to limit their risk of exposure to such criminal activities. Common anti-counterfeiting solutions can often be imitated, as they lack multi-functional security features for seamless integration into established supply and distribution chains. Very often, the cost and performance efficiency of such authentication solutions could not be measured.

Machine-readable barcodes, human-readable 12-digit serial



[Features of security printing technology.]



[Using multi-tone optically variable ink fluorescence.]

numbers, holograms of various grades are often used on packages to protect and identify genuine products in the market. However, such methods may be ineffective as illegitimate parties have greater access to manufacturing and printing technologies over time. They also employ sophisticated means to infiltrate copied or overrun products into the distribution chain.

Meanwhile, organizations such as the International Anti-Counterfeiting Coalition or IACC have conducted studies on how negative consequences of international intellectual property theft had hurt the economy, threatened public health and safety, and contributed to organized crimes. Reports in 2008 have even correlated counterfeiting and piracy as sources of terrorist funding.

Therefore, it is of utmost importance for companies and users to employ effective methods to protect and identify their products. These methods can contribute to overall cost savings, as well as increase revenue previously lost to counterfeiting activities and brand awareness.

Authenticating products

To provide authentic products to consumers, manufacturers should consider using a combination of security printing



Figure 1: An image with covert security features viewed under (from left) visible, ultra violet (UV) and infra-red (IR) light.]

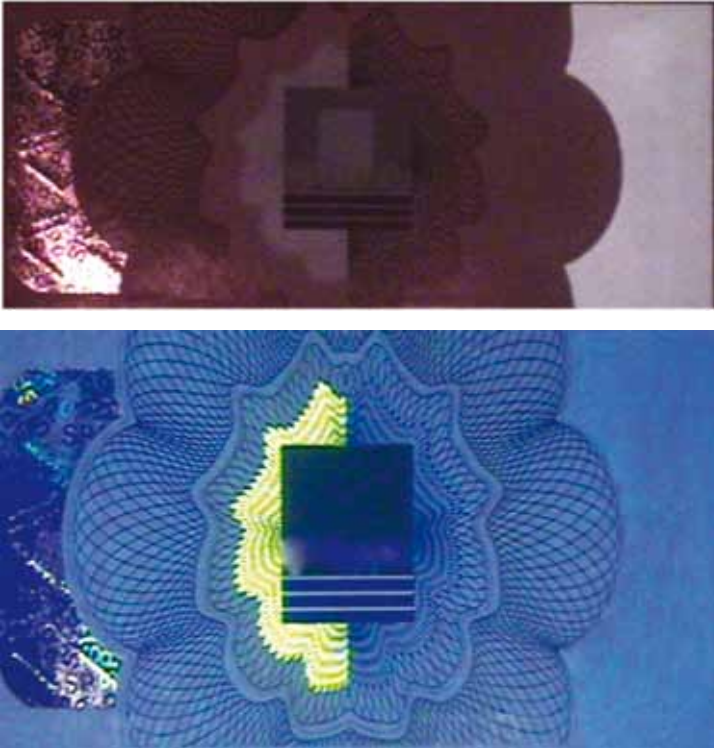


Figure 2: An image with covert security features viewed under (from top) patent Chromatic Luminescence and UV fluorescence light.]

technology, trade and trace services and adhesive and substrates when designing the security solution. Security printing technology generally involves multiple tiers of features and various printing technologies, which can be overt, covert or forensic. Table 2 shows more details.

• Overt technology

Using overt security in packaging, one can easily see the security features such as holograms, temper-evident substrates, as well as the presence of color-changing and thermochromic inks. It is a common and convenient method for companies to authenticate their products and for end users to identify their purchases.

There has been an increasing demand for security guilloches and microtext, as well as relief effects in security systems today. These features are based on printing techniques and provide reasonable costs for additional security.

Security guilloche designs are created using high-precision and

multi-color printing processes, which can be inspected under a high power magnifier. The designer can create unique graphical composition by adjusting the concentration in a guilloche or vary the thickness of a printed line cyclically for each turn or revolution of the generating function.

The guilloches can work within certain limits set or outside these specifications when a new generation of styles is required. A new feature may produce a color modulation of a printed line, where the line changes color according to selected parameters when creating the guilloche, thereby adding security to the design and simulating an intaglio inking-by-area effect.

On the other hand, relief effects are made from a line pattern or guilloche with its variations. They can also be created according to a key line-art or gray scale image, text or both, which can generate automatically edited relief effects with a height proportional to the amount of light on a package.

• Covert technology

Covert features on a package are seen using physical aids such as ultra violet (UV) fluorescence images printed by UV security inks, and infra-red (IR) invisible inks that are generally used with IR visible ink. When viewed under a designated scanner, the IR invisible ink could not be seen, thereby verifying an authenticated item (see Figures 1 and 2).

Figure 3 shows the use of IR fluorescence, which has similar effects as those of UV fluorescence. The IR ink is excited by IR light source of between 800 nm and 900 nm that emits fluorescence in the visible spectrum. The visible fluorescence is available in various colors and/or in combination with other security features. This security feature is often referred to as “anti-stokes” or “up-converting”. These inks are generally invisible to the naked eye. Counterfeiters are usually unequipped to handle this technology as these IR solutions are not widely available and the readers are costly.

Rather than using original color-changing inks on packages that could be seen at different angles easily, there is a multi-level security system whose first level of security consists of an unambiguous color-shift that is simple for consumers to authenticate. The second level is seen when product authenticity

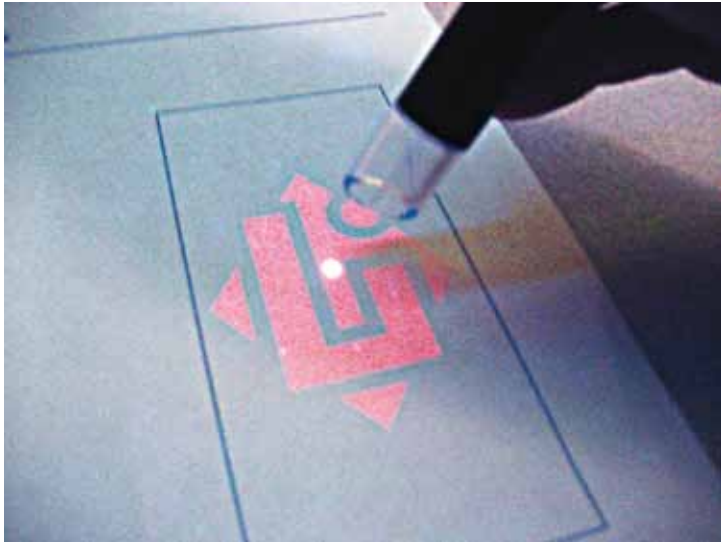


Figure 3: Using IR fluorescence as a security feature on packages.

inspectors and customs officers use polarization filters to detect a light polarization effect on packages. This effect is also visible even under poor lighting conditions. Using a combination of these features will therefore prevent opportunists from imitating valuable products.

Forensics technology

Forensic authentication security is considered as the highest level of product verification technology that provides unique data to resolve liability claims or proof of ownership in court. It uses taggants, which are security features that generate chemical signatures or reactions. They can be embedded into an adequate carrier material that permanently marks a product. This signature can be detected using a reading device or another forensic inspection solution such as a control strip, which is custom-tuned to the properties of the signatures code and immediately verifies the presence or absence of the code.

The taggants can be applied to mediums and carriers such as inks, paper, polymeric foils, holograms, plastics, natural or synthetic fabrics and metal. They can also be mixed with inks, which a concentration of one part per million (ppm) is sufficient for reliable product authentication. They are durable and are unaffected by harsh environmental factors such as wear and tear, as well as humidity. Taggant-added inks can be printed on various paper and plastic substrates. Some can even be detected outside line-of-sight. They may be over coated with another print and combined with further security features to increase the level of covert security.



Using optical taggant inks and detectors (left) on packages (right).

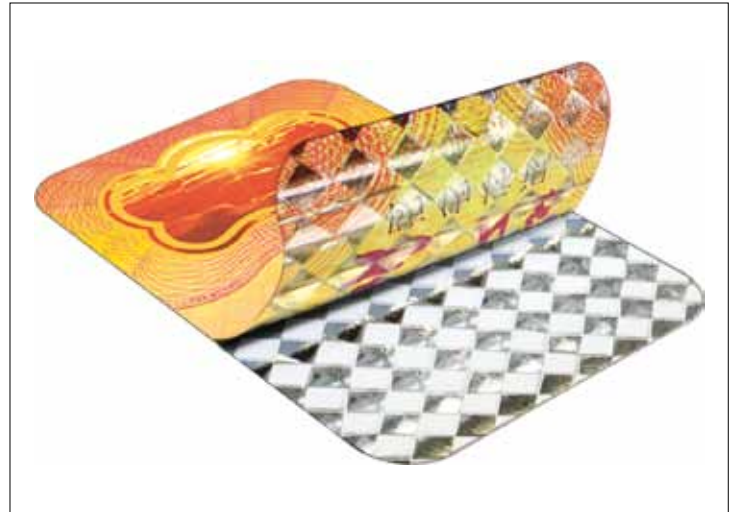


Figure 4: An example of label with adequate substrate thickness, suitable adhesive type and temper evident features.

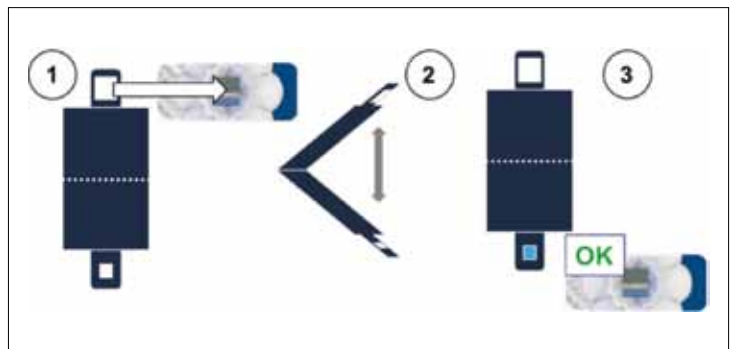
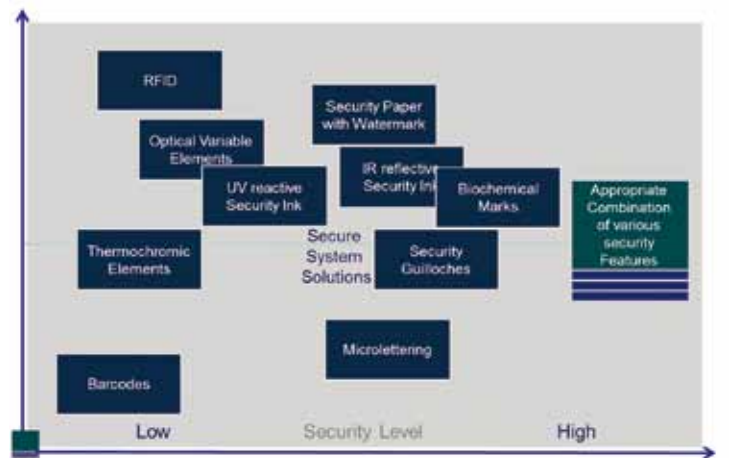


Figure 5: Detecting the third level of security on a package using forensic means.

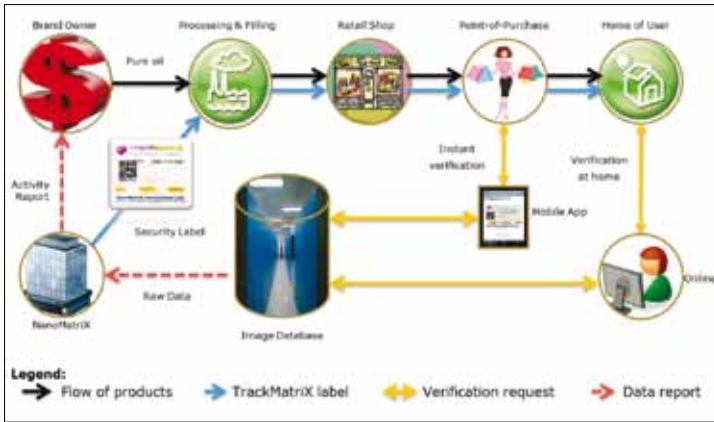


A modified Boston Matrix to illustrate the correlation between strength of security features in packaging and cost.

Substrate, adhesives and materials

The type of adhesives used for a security label often depends on the substrates and product surface characteristics that the label has to adhere to. Packages that are stored in the cold chamber during transportation will require labels that can maintain adhesion at these low temperatures.

There are adhesives that work best for smooth surfaces but not on boxed or blister-packages. To avoid tampering of products by opportunists, manufacturers should consider using combinations



[Figure 6: Process of a track and trace service.]

of materials used and the features of adhesives such as the strength and resistance to the environment (see Figure 4).

Using security features

An effective authentication solution should include multiple tiers of security features, which can include a combination of visible and invisible security markings on product labels or packaging. Using printing and verification methods, the product can show evidence of marking substances and the presence of the producer’s security markings. There are at least three levels when classifying general security features.

The first-tier security features are identified without the use of equipment. They include overt features such as guilloche patterns or holographic elements. On the other hand, tools are required to determine the presence of second-tier security features such as industry-controlled fluorescence colors, micro lettering, barcodes and quick response or QR codes on packages. Lastly, third-tier security features are detected forensically and are known to a small group of individuals (see Figure 5).

Track and trace

Besides assuring stakeholders of authentic products, an efficient and seamless security solution provides viable track and trace capabilities in the supply chain, which offers product information such as details of product manufacturer, country of origin, final destination, the date of manufacture, distributors, wholesalers and exporters. Such information could assist regulators in investigations when they detect injuries or counterfeit goods in the supply chain. This requires products to contain specific and secure product features such as those found on a customized security label. Each label should also have a unique serial number that is encoded with a cryptographic algorithm to prevent counterfeiting.

A track and trace service usually has an authentication device such as a security label, an image database, an online verification via mobile/smart device or the Internet, and a reporting system. This service enables manufacturers to control the supply and distribution of their products, verify their goods at the point of purchase, and enhance their brand image and customer relationship management or CRM (see Figure 6). This service also

generates reports on the logistics of shipment, as well as verifying and detecting suspicious activities on the products. Extended reports can also be created to provide data for marketing purposes.

Conclusion

A product authentication strategy can only be successful if it is directed and supported by the top management of a company. There is also a need for them to set measurable goals to periodically monitor progress and success in the market.

While there is no fool-proof authentication solution in the industry, manufacturers can select the most appropriate security system and build an effective authentication strategy by integrating various security features into one solution that is difficult to tamper with, imitate or copy. This process is quite comparable to banknote printing such as the Euro banknote, which is one of the most secure documents ever manufactured with several security features.

An adequate and trusted security solution for authentic goods should ideally have the following features.

1. A security solution with visible and invisible features.
2. A product with a unique serial number that correlates to that on the package and the accompanying shipping documents.
3. Goods should be produced in a secured production facility such as one that is certified for printing governmental security documents or handles highly confidential security designs.
4. A track and trace service that ensures the visibility of products in the supply chain.

By employing such a solution, manufacturers can protect consumers’ interests and prevent the availability of fake products in the market. 🌐

Category	Year	Loss due to counterfeits, in billion USD
Drugs	2009	200.0
Electronics	2004	100.0
Clothing	2008	12.0
Cigarettes	2007	4.0
Cosmetics	2004	3.0
Alcohol	2008	1.0

[Table 1: Black market products by value. (Source: Havocscope Black Markets).]

Level	Category	Validation process	Product examples
1	Overt	Human senses	Special visual effects and color changing inks
2	Covert	Use of mechanical aids	Invisible security ink and special labels
3	Forensic	Laboratory	Taggants and micro-or nano particles

[Table 2: Features of security printing technology.]