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# Nanotechnologies, psychology and Optaglio

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Effectiveness, flexibility and full control are the critical priorities in supply chain management. But the fourth question is also asked frequently. Are you sure that products in your supply chain are genuine?

The value of the global market with counterfeited goods and components now exceeds 1 700 billion USD. It should be significantly more than 2 000 billion by 2022, according to OECD estimations. The overall impact is about 5 000 billion USD and still growing. The counterfeiters operate entire manufacturing plants, with production capacity comparable to original producers. Counterfeiting has become a critical issue across the markets.

There are many ways of combatting counterfeiting. In the best possible scenario, the products circulate between a few organisations and each step is supervised. Under such conditions, high trust into genuineness can be created.

However, with growing number of organisations involved and borders crossed, the risks of infiltration with fakes go up rapidly. Once the counterfeited product is accepted as genuine, no tracking can help. In trade schemes with hundreds of dealers and inclusion of second-hand product, no system can protect the entire market.

It is the reason why the other way of protection is often applied. It can be used either separately or in combination with tracking. It is based on the same principle as banknote protection. The protected item is equipped with security elements that cannot be imitated. The user can identify a genuine product easily, without the need to be informed about the history.

From logistics management point of view, it is critical to include monitor points for checking the presence of protection elements on products or packaging.

Proven security elements say that protection elements must ensure the following three features.

**INIMITABILITY.** This feature means that nobody can imitate the element with reasonable costs. The best products cannot be imitated at all. Optaglio, as an example, uses electron beam instead of the laser. This electron beam is exceptionally narrow, up to 5 million DPI. It is directed using unique mathematic algorithms that cannot be derived from ready holograms. Immitation is out of reach even for scientific laboratories.

**SELF-DESTRUCTIVENESS.** It must be ensured that elements cannot be moved to other item or even modified. Optaglio's solution is manufacturing of holograms consisting from thousand of tiny pieces. Any handling attempt results in irresistible desintegration of the hologram. For protection of plastic (polycarbonate) items, Optaglio offers a unique patented solution. The hologram

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is printed directly into polycarbonate to create a single seamless unit with a visual effect inside. Visual effect deteriorates with any change of the item.

**DISCERNABILITY.** Even the best hologram protects only if the supervising person can identify genuine elements and counterfeit elements. If the visual effect is based just on the logo and letters switching, it is likely that any effect with the same logo will be accepted as genuine. It is therefore necessary that each protection element includes something striking, moving, with changeable colors, emerging objects – a figure, animal, flower, car etc.

However, some effects are easy for experts and cannot be identified by ordinary users. Untrained eyes see differently, especially under stress, poor lighting etc. Optaglio's experts spent thousands of hours on research and discussions with policemen and law-enforcement experts. They understand that no protection element can be considered on its own. We must see complete couple element – inspecting person, eventually include other factors.

It is the reason why Optaglio runs its behaviour research laboratory equipped with appliances, such as eye cameras and environment simulators. The research focuses on a range of topics, including user ability to discern between similar stimulus, the impact of tiredness and stress, motivation programs, most frequent mistakes, viewing advancing etc. Moreover, they test gamification and other advanced concepts. Ideally, all activities should result in a hologram tested by people similar to those who will inspect it in real life, as well as a methodology for inspection and training.

The principal conclusion is that reliable anti-counterfeit protect must include technology and behaviour science. Both factors are vital – an advanced solution and people who work with it.

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