SOPHIC
CAPITAL

COUNTERFEITING

An Industry 3 Times Larger than the Illicit Global Drug Trade

October 27, 2014

Counterfeiting is a high-margin $654 billion growth industry largely run by criminal organizations that have few disincentives to stop. Anti-counterfeiting laws and punishment are non-existent in many jurisdictions, leaving the responsibility of abating the flow of fakes to enterprises. Legacy anti-counterfeiting technologies, such as barcodes and holograms, can be duplicated. However, a new generation of technologies are already in the field or about to be unleashed upon the counterfeiters. We detail some of the more interesting technologies in this report and highlight several companies participating in the market including a Sophic Capital client Nanotech Security (NTS-TSXV).

Sean Peasgood, CEO

(416) 565-2805

Sean@SophicCapital.com

Introduction

Counterfeiting is at least a $654 billion industry[i]. From fake handbags to fake MBAs to even faking your own death with a fake death certificate to cash in an insurance plan, counterfeiting has wormed its way into every aspect of our lives. The World Bank[ii] pegged 2013 global GDP at $73.9 trillion. Using the $654 billion estimate, this means that counterfeiting contributed almost 1% to global GDP. We note that this $654 billion estimate undervalues the true counterfeit market size since it only considers 26 industries. **In fact, the International Chamber of Commerce believes that global counterfeiting and piracy could be a $1.7 trillion industry by 2015[iii].**

Counterfeiting offers tremendous profits with little chance of getting caught. With millions of people employed by the global counterfeit trade, the chances of getting caught are slim. This is especially true for those at the top of the counterfeit goods supply chain, who, in many cases, are criminal organizations. Often, these organizations have penetrated governments to facilitate their activities (counterfeiting, drug trafficking, human smuggling). José Grinda, a Spanish prosecutor who has fought eastern European criminal organizations, noted that he often has difficulty distinguishing the interests of these organizations from their host governments[iv].

Counterfeiting offers tremendous profits with little chance of severe penalty. In many countries, counterfeit laws, or enforcement of counterfeit laws, are non-existent. Even in developed countries that typically enforce anti-counterfeiting laws, punishments do little to deter counterfeiting activity. Consider the case of Frank Bourassa, a Canadian counterfeiter whose operations had the capacity to print $250 million worth of fake U.S. banknotes per annum. After a four year search for the source of the bills, (which were put into circulation by the mob), Bourassa was caught, but the Canadian justice system meted a 1.5 month sentence and a $1,500 fine[v].

$18 "Nike," "New Balance," and "Levi's" for sale in Medellin, Colombia
Photo by Marcel Valentin

So what; no one gets hurt. Not true. Counterfeit goods harm individuals, businesses, and economies. Goods such as "prescription" pills are often made under unsanitary conditions using toxic materials such as paint; counterfeiters often exploit children and migrants at slave wages; counterfeiters don't pay taxes, so guess who that responsibility falls upon? You. Counterfeiters steal corporate profits which harms employees, shareholders, and pension funds. So, it's time to end the myth that counterfeiting is a victimless crime.

Sadly, people will die from counterfeit goods. Interpol[vi] estimates that 10% to 30% of all pharmaceutical drugs in circulation in the world are counterfeit and that up to 1 million people will die annually from counterfeit pharmaceuticals.

Counterfeit Money is *NOT* the Biggest Market

www.currencyguide.eu

The global counterfeit money market is actually small compared to the counterfeit packaged goods market. From 2005 through the first half of 2014, the Bank of England[vii] removed £81 million of fake notes from circulation. In the last fiscal year, U.S. authorities recovered about $89 million in counterfeit money[viii]. And using European Central Bank data, we estimate that about €17 million worth of fake Euros were recovered in the second half of 2013[ix]. We admit that these numbers represent only what was recovered and not what is in circulation. However, the numbers are low compared to counterfeit packaged goods – the U.S. Customs and Border Protection alone seized $1.7 billion in counterfeit goods in 2013[x] (up from 1.2 billion in 2012.)

What's the largest counterfeit market? Let's just say be careful with your prescription drugs, especially when ordering them online. Prescription drugs are the largest market for counterfeit goods, worth $200 billion[xi] annually (for comparison, the global illegal drug trade is estimated at $246 billion[xii].) Be careful if you order your prescriptions online because the World Health Organization[xiii] estimates that over half of online pharmaceutical vendors are selling counterfeit drugs. Be especially careful of company websites stating they are "Canadian" because the FDA[xiv] found 85% of the drugs being promoted as "Canadian" came from 27 other countries, and many products were counterfeit.

Anti-Counterfeiting Technology Market Forecast

Given that counterfeiting is an industry worth hundreds of billions and there is little risk of getting caught or punished, what can enterprises do to protect their intellectual property (IP)? Enterprises are fighting back. Many have hired full time staff dedicated to tracking down counterfeit goods through the supply and distribution chains. The majority have implemented (or are thinking about implementing) technologies that validate their products' authenticity. These technologies comprise the anti-counterfeit packaging market.

The global anti-counterfeit packaging market was worth about $57 billion in 2013 and could grow to about $143 billion by 2020[xv]. This represents a 13.9% CAGR. Worldwide security printing (barcodes, holograms, special inks, etc.) could become a $35.3 billion market by 2018[xvi], and the global pharmaceutical anti-counterfeiting technologies market could reach $1.1 billion[xvii] in 2014.

Anti-Counterfeiting Technologies

Enterprises need to protect their IP through their supply chains and distribution channels. Counterfeit parts can devastate a product and a company's brand, and enterprises need to be vigilant to ensure that all components meet minimum design and safety standards. Ideally, enterprises can track and trace components through the supply chain and the finished product in the distribution channels. However, this involves large costs, chiefly through conducting due diligence and audits of suppliers and vendors. The costs are especially onerous in the electronics industry where thousands of components can be used in the manufacturing process. And sadly, these costs offer no return for the company when consumers complacently purchase known counterfeit goods.

A product's package typically provides a way to validate a product's authenticity. Traditional anti-counterfeiting methods involve tamper-resistant packaging and/or special labels. But these solutions can be inadequate. Counterfeiters can inexpensively duplicate labels, especially since the labels are on the products and provide a blueprint. Even easier to copy are barcodes, which account for over 60%[xviii] of the track and trace market. Many enterprises use barcodes for anti-counterfeiting, hoping that the barcodes will offer enough protection to distinguish the fakes from the real products. We consider this wishful thinking.

Exhibit 1 details some of the technologies for product authentication, but we note that each has a workaround for counterfeiters. High density barcodes are easy to copy; some holograms are duplicated with inks embossed on foil; not all product packages will accept inks; security materials require high R&D; and, tags and taggants typically have high verification costs.

Anti-counterfeiting packaging is evolving. We highlight a few older and newer technologies that enterprises can use to protect their IP.

Exhibit 1: Technologies Available to Thwart Product Counterfeiting

Technology	Level of Defense	Comments
High density 2D / Matrix bar codes and other coding technologies – including mass serialization and surface feature authentication	All secondary levels of defense since they require some form of checking tool and none supply an almost instantaneous result	Mass serialization and 2D matrix codes could be considered as the strongest competitors to RFID since they can all be consumer activated
Security Holographic Devices including Holographic Threads (OVIDS / DOVIDS) and Photopolymer devices	Most operate on a primary level. However secondary and tertiary levels of checking can be built into the technology	To be truly effective authentication needs to be unambiguous. Since the checker needs training in order to understand what he's looking at holograms fail in this respect at consumer level
Security Inks & Coatings	Most operate on a primary level. However secondary and tertiary levels of checking can be built into the technology	To be truly effective authentication needs to be unambiguous. Only color shifting inks supply an effective answer to consumer validation and they can be compromised
Security Materials / Substrates - Papers / Security Polarizing Films / Hidden Image Technology / Digital Watermarking	Most operate on a primary level. However secondary and tertiary levels of checking can be built into the technology	To be truly effective authentication needs to be unambiguous. Since the checker needs training in order to understand what he's looking at these systems fail in this respect at consumer level
Tags & Taggants (Chemical and Molecular Coding), Nano- technologies	All these technologies operate at secondary or tertiary level	Consumers are unable to check for these features as they have no method of validation

Source: GS1, *RFID for Anti-Counterfeiting*, 2010

RFID (Radio Frequency Identification)

www.optelvision.com

Track and trace RFIDs could grow 20% annually through 2019 and become a $35.2 billion market[xix]. RFID chips are tiny devices that store data. They transmit the data when readers send them signals (readers can scan thousands of RFIDs simultaneously.) In terms of anti-counterfeiting, enterprises can embed RFID chips with unique, encrypted, product identification codes and attach the chips to the products, allowing the enterprises to track the products through the distribution channels. RFID chips have the additional benefits of alerting enterprises to product package tampering and allowing consumers to verify the authenticity of a product via smartphone and tablet applications.

NXP (NASDAQ:NXPI) is a RFID leader making inroads in the anti-counterfeiting space. To combat wine-forgery, Groupe Duclot, a French wine and spirits distributor, has implemented a NXP-based solution to guarantee the authenticity of a special collection of 9 Bordeaux wines. Aki Choklat, a U.K. shoes and accessories designer, is also using NXP RFID tags to give its designer handbags unique identifiers that customers can use to authenticate the bag's brand.

Intermec (NYSE:IN), which Honeywell bought in December 2012, is a workflow performance company supplying a broad range of computer, printer, scanning, and RFID products. One anti-counterfeiting solution they offer is a packaging label embedded with an RFID chip and coated with a security ink that can only be read with ultraviolet light.

Pigments

Pigments have a special role to detect counterfeit products and currencies. They can be added to plastics to identify products, shift colours on banknotes, or embed taggants such as uniquely shaped particles or infrared markers undetectable to the human eye.

JDSU (NASDAQ:JDSU), the optical network company, provides anti-counterfeiting pigments and taggants via its Optical Security and Performance Products division, which generates about $50 million in quarterly revenue. The company is targeting banknotes, high-valued documents, and pharmaceuticals. The five Euro note uses JDSU's optically variable magnetic pigment, an ink that is aligned with magnets before it cures.

www.new-euro-banknotes.eu

Nanotechnology

Nanotechnology deals with things that have dimensional tolerances of one nanometer (nm), or one billionth of a meter. This is the scale of hemoglobin and DNA. Products and packages become near impossible to counterfeit by embedding nano-devices or by manipulating their surfaces. The capital costs for equipment and the time and money needed to crack encoding algorithms consume too much margin to make a counterfeiting operation worthwhile for most criminals.

Laser Surface Authentication (LSA®)

LSA® nanotechnology is nearly impossible to counterfeit because it relies upon the marriage of the physical and computing worlds. The method involves shining a laser across a package's surface, recording the reflected light, and applying algorithms to the collected data, thus forming a unique fingerprint for *each* package. To validate a product's authenticity, enterprises require a field scanner and Internet connection. This makes the product near impossible to duplicate or tag since counterfeiters would need to perfectly reconstruct that microscopic imperfections of a package's surface *plus* know the algorithms *plus* register the fingerprint.

INGENIA Technology is a U.K.-based company that has patented the process. The company claims success creating identifiers from paper, cardboard, plastics, metals, ceramics and textiles. It does not divulge customers, with the exception of Cartondruck[xx], a German carton producer.

Holograms Need to Evolve

A hologram is a three-dimensional object created from an image's scattered light. The principle of holography was formed in 1947 by Dennis Gabor, who won the Nobel Prize in physics in 1971 for this discovery. Commercially, in 1984, Johnnie Walker scotch whiskey utilized a hologram to combat product counterfeiting[xxi]. And, in 1988, Glaxo became the first company to implement holograms to protect its pharmaceuticals[xxii].

In 1988, the first currency holograms appeared on Australian and Austrian banknotes[xxiii]. Other currencies rapidly adopted the technology; first, as images and later with holographic stripes or a combination of the two. Treasuries embraced holograms since the images were difficult and costly for counterfeiters to duplicate; plus, the 3D images made it easy for people to validate a note's authenticity.

Holograms can be copied. Although most fake holograms are unlikely to fool the product's original owner, they can fool retailers and consumers. Most consumers and many retailers are unlikely cognizant of what differentiates a product's real hologram from an imitation (a motivating factor for criminals to duplicate packaging holograms.) And duplicating a hologram need not be a complicated or costly process; the Internet abounds with step-by-step guides illustrating successful methods for copying holograms.

Nevertheless, holograms generate billions of dollars. As the main technology to deter counterfeiting, holograms continue to be a good business. Legacy research suggested that **the global holography market for industrial applications could reach $16.7 billion[xxiv] by 2017.** As

new holographic technologies evolve and as counterfeiters become more adept at copying passable replicas to the untrained eye, we believe this number could swell.

Beyond Banknotes

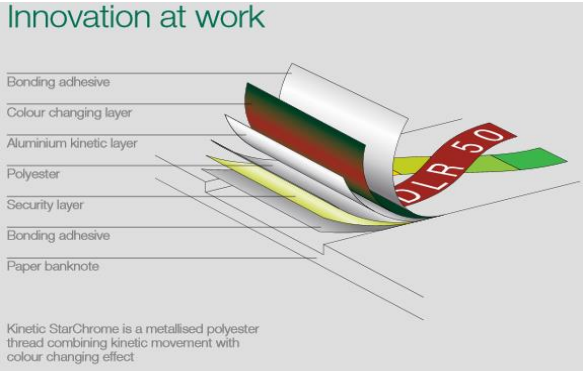
ITW Covid Security Group, a division of Illinois Tool Works (NYSE:ITW), manufactures polymer-based security materials and optically variable security laminations. In October 2011, the company announced the acquisition of France's Fasver, which added a portfolio of holographic, colour and image shifting, and metallized security solutions. The company doesn't appear to focus on the banknote industry; rather, it targets brand and identity protection markets.

Holograms Helped OpSec Security's Annual Turnover

OpSec Security (LON:OSG) is a global leader in government identification and IP protection. OpSec's customers include over 300 companies (Fuji, Pioneer, HP, and LG are some) and 50 government agencies. In September 2012, OpSec purchased JDSU's holographic security segment, a $5 million/quarter business[xxv], for £7.5 million. The acquisition helped year-over-year turnover to grow about 7% to £55.5 million in the 2014 fiscal year with the Brand Protection segment contributing about 58% of revenues.

We Believe the Best Holographic Security Applications are on Banknotes

Although we stated that money counterfeiting is the smallest market, we highlight some of the major banknote manufacturers. Our reasoning is that banknote manufacturers likely have the best holographic technologies which could explain why counterfeiting in this vertical is small. And central banks are likely to adopt many of these technologies in the estimated 130 to 160 billion[xxvi] banknotes printed annually.



De La Rue 2014 Annual Report

A Business Printing Money

De La Rue (LON:DLAR), the world's largest commercial money and passport printer, increased revenue 6% year-over-year to £513 million in 2014. Over 66% of revenue came from the currency segment, with the balance coming from identity systems, security products, and cash processing solutions. Growth in the currency segment continues: In October 2014, De La Rue signed a 10-year contract with the Bank of England to print Sterling notes.

De La Rue believes the use of holograms in currencies is "levelling off." The 200 year-old company (which has been involved in the production of over 150 national currencies) notes that 42% of new banknotes issued since 2011 have implemented colour-changing features, with 40% of them using colour-changing threads[xxvii]. The company stated that holograms were strong in the 1990s and 2000s, and although holograms continued to be widely used, their adoption appears to be "levelling off[xxviii]."

Seeing is Believing

Louisenthal, a subsidiary of Giesecke & Devrient, is a manufacturer of banknote paper, security paper, and security features. In addition to a wide-range of holographic threads, the company offers a banknote technology in which clear windows embedded with holograms, colour-changing, and 3D effects allow users to engage the note and verify its authenticity.

Accepting Paul Revere's Challenge

Crane Currency is a 200-year-old banknote manufacturer[xxix] that has been the sole supplier of U.S. banknote paper for seven generations. Lore has it that during Paul Revere's famed midnight ride, the patriot stabled his horse at a paper mill run by Thomas Crane and asked him to create notes for the colonists taking up arms[xxx]. Since then, Crane has continued to evolve banknote security features. Both the U.S. Department of the Treasury and the Bank of England use Crane's MOTION Switch technology, an animation that switches between images when a note is tilted.

Stamping out Counterfeits

KURZ is a major supplier of hot stamping technology, a method where heat transfers a foil image onto a surface. The company has hot stamping hologram products, self-adhesive labels, laminating foils, and tear stripes. Over 100 countries implement the foil-based optical solutions of KINEGRAM, KURZ's daughter company, to secure their governments' documents and banknotes.

Security from Butterfly Wings

Although holograms are levelling off for currency security, colour-changing technologies are having a good decade. De La Rue[xxxi] notes that colour-changing technologies work, are robust, and the public recognizes them. Stripes and threads are popular and difficult to copy, and central banks like to combine them with holograms for added protection. Given that colour-changing technologies are popular, we highlight a solution that has not been implemented in the currency market and is easily adaptable to commercial packaging, a market potentially worth $143 billion by 2020.

Nanotech Security (TSXV:NTS), a Sophic Capital client, supplies KolourOptik, an anti-counterfeiting, nanotechnology solution based upon the optical properties of the blue morpho butterfly. KolourOptik creates a grid of nano-sized holes that replicate the interaction light has with this butterfly's wings. The result is the creation of vibrantly-coloured images that appear similar to LEDs when illuminated. Enterprises and central banks can apply this anti-counterfeiting solution on a variety of surfaces, including: metals, plastics, acrylic, cloth, and paper, without the need for dyes or pigments.

www.nanosecurity.ca

Because KolourOptik can be applied to almost any surface, the anti-counterfeiting security tag can be embedded not only onto packaging but also directly onto products which, unlike holograms, cannot be peeled off. Also, due to how the nanostructures interact with light, data can be stored in these security features that can easily be read with an optical reader. Both of these features make KolourOptik stand out from traditional holograms.

On August 26, 2014, Nanotech announced the acquisition of Fortress Optical Features. This acquisition moved Nanotech into the optical thin film space, a technology developed by the Bank of Canada and sold to Fortress in 2011 yet utilized by 11 international currencies. This thin film technology produces vivid and bold colour shift film for banknote security threads.

Nanotech expects to increase its presence in the thin film market, with an initial focus on banknotes. But it is also working on a new technology where KolourOptik is layered on top of the optical thin film technology to create an even more secure banknote feature with multiple levels of interactivity and authentication.

Risks of the Space

Many jurisdictions don't enforce the laws. No matter how much enterprises invest to protect their IP, they don't benefit if jurisdictions fail to protect property. Not only do nations need to protect property and enforce anti-counterfeit laws, but they also need to raise awareness amongst their populaces regarding the dangers and illegitimacy of the counterfeit industry.

Little international cooperation for breaking counterfeit rings. Thirty-one nations have participated in the Anti-Counterfeiting Trade Agreement (ACTA) negotiations that would establish international standards of property rights enforcement. To date, only Japan has ratified the agreement with discussions continuing in the other signatories' jurisdictions. However, the fact that only 31 nations are signatories demonstrates to us how low of a priority property protection is in many parts of the world. As we previously stated, if governments don't care about property rights, then no amount of technology will protect IP.

Conclusions

Although counterfeiting probably will never be eradicated, international cooperation, tougher laws, and enforcement of those laws will help to reduce the problem. Outside of preventing the counterfeiting of money, many governments don't seem to be interested in clamping down on the production and sale of counterfeit goods, even though criminal organizations are the largest beneficiaries. Counterfeit goods provide employment (with horrible pay and likely no benefits), cheap goods (regardless of whether or not the consumer knows the brands are not genuine), and sometimes kickbacks to corrupt government officials. Where laws do exist and are enforced, enterprise have a vested interest to ensure their IP is protected.

New technologies are emerging that will help enterprises to protect their IP. These technologies not only secure profits for enterprises and their shareholders, but also protect

consumers from dangerous fakes such as imitation prescription drugs and children's toys. Many of these technologies can also help governments to secure their money supply and high-value documents such as tax-stamps.

New technologies must stay a step ahead of the counterfeiters. No anti-counterfeiting technology is invulnerable; however, new technologies, such as pigment taggants, encoding the microscopic imperfections of packages, and grids of nano-sized holes that create vibrant LED-like holograms, reduce the probability that criminal organizations could duplicate the product. Even if criminal organizations attempt to copy these technologies, the investment required would reduce margins and provide less incentive to replicate the products.

We recommend that investors seeking to invest in a pure play company providing a next-generation, anti-counterfeiting technology, should consider Nanotech Security, a Sophic Capital client.

Acronyms Used in this Report

3D	three dimensional
ACTA	anti-counterfeiting trade agreement
CAGR	compound annual growth rate
IP	intellectual property
LED	light-emitting diode
LSA®	laser surface authentication
nm	nanometer
RFID	radio frequency identification

References

[i] Havocscope, *Anti-Counterfeiting News and Counterfeit Goods Statistics*
[ii] The World Bank, http://data.worldbank.org/
[iii] Jeffrey Hardy, *Confiscating the proceeds of IP crime: a modern tool for deterring counterfeiting and piracy*, International Chamber of Commerce, page 1, October 2013
[iv] Moisés Naím, *Mafia States*, Council on Foreign Relations, May/June 2012 issue
[v] Rhonda Schwartz and Brian Ross, *Master Currency Counterfeiter Prints Millions, Says 'Screw You' to US*, ABC News, May 9, 2014
[vi] John Montaño, *Un millón de personas mueren al año por medicamentos falsos: Interpol*, El Tiempo, October 23, 2013
[vii] Bank of England, *Counterfeit Bank of England Banknotes*, 2014
[viii] Del Quentin Wilber, *Woman With Printer Shows the Digital Ease of Bogus Cash*, Bloomberg, May 7, 2014
[ix] European Central Bank, *More counterfeits in second half of 2013 but overall number remains very low*, January 13, 2014
[x] U.S. Customs and Border Protection, *CBP Fiscal Year 2013 in Review*, January 17, 2014
[xi] Havocscope, *Ranking of Counterfeit Goods*
[xii] Global Research, *Cocaine, Heroin, Cannabis, Ecstasy: How Big is the Global Drug Trade?*, May 8, 2014
[xiii] WHO, *Medicines: spurious/falsely-labelled/ falsified/counterfeit (SFFC) medicines*, May 2012
[xiv] FDA, *FDA Operation Reveals Many Drugs Promoted as "Canadian" Products Really Originate From Other Countries*, December 16, 2005
[xv] Allied Market Research, *Global Anti-Counterfeit Packaging Market*, March 2014
[xvi] Smithers Pira, *Worldwide Security Printing Market to reach $35.3 billion by 2018*, February 20, 2014
[xvii] ASDReports, *The Global Pharmaceutical Anti-Counterfeiting Technologies Market will Reach $1.11Bn in 2014*, January 6, 2014
[xviii] MarketsandMarkets, *Anti-Counterfeiting Packaging Market by Technology*, August 2014
[xix] Ibid.
[xx] package-gateway.com, *Technology to trump counterfeit packaging*, January 19, 2012
[xxi] IMHA.org, *History*, International Hologram Manufacturers Association
[xxii] Ibid.
[xxiii] HOMAI.org, *Global currencies continue to bank on the benefits of holography*, January 8, 2010
[xxiv] PRWeb, *Global Holography for Industrial Applications Market to Reach US$16.7 Billion by 2017, According to New Report by Global Industry Analysts, Inc.*, March 15, 2012
[xxv] JDSU, *JDSU Announces Sale of Holographic Security Product Line*, September 19, 2012
[xxvi] Ylan Q Mui, *Crane has provided the paper for U.S. money for centuries; now it's going global*, The Washington Post, December 13, 2013
[xxvii] De La Rue, *Trends in banknote features*, page 2, 2013
[xxviii] Ibid.
[xxix] Crane Currency, http://www.crane.se/start.html
[xxx] Ylan Q Mui, *Crane has provided the paper for U.S. money for centuries; now it's going global*, The Washington Post, December 13, 2013
[xxxi] De La Rue, *Trends in banknote features*, page 2, 2013

Disclaimers

The particulars contained herein were obtained from sources that we believe to be reliable, but are not guaranteed by us and may be incomplete or inaccurate. The opinions expressed are based upon our analysis and interpretation of these particulars and are not to be construed as a solicitation of offer to buy or sell the securities mentioned herein. Sophic Capital Inc. ("Sophic Capital") may act as financial advisor, for certain of the companies mentioned herein, and may receive remuneration for its services. Sophic Capital and/or its principals, officers, directors, representatives, and associates may have a position in the securities mentioned herein and may make purchases and/or sales of these securities from time to time in the open market or otherwise.