

The use of technology to combat the illicit tobacco trade

Coding, verification, tracking and tracing of tobacco products and tax stamps

Introduction

A number of industries face a growing trend: new requirements to identify a consumer product in trade, to verify its authenticity and to trace it.

The Framework Convention on Tobacco Control, a World Health Organization treaty, identifies elimination of illicit trade in tobacco products as a key element of global tobacco control. The treaty requires in Article 15.2(b) that Parties should "consider, as appropriate, developing a practical tracking and tracing regime that would further secure the distribution system and assist in the investigation of illicit trade." Negotiations have begun on a supplementary treaty, or protocol, for combating illicit tobacco trade.

A system for tracking and tracing as required by Article 15.2(b) is not currently in operation anywhere in the world. This is a rapidly developing and technical area and partial systems exist in a number of countries. The purpose of this paper is to provide a reference source on currently existing systems for coding, verification, tracking and tracing of tobacco products and to identify some of the advantages and disadvantages of these systems.

This paper describes the use of codes and markings on tobacco packaging and tax stamps to allow a better monitoring of the tobacco trade. It also gives an overview of coding technologies that are used, or are in development, in the tobacco industry and other sectors.



1 The evolving coding technology

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1. The evolving coding technology

Coding on consumer products has been used for verification, identification, monitoring, stock management, tracking and tracing and improved collection of tax revenue. This section will describe coding technology already in use.

Coding and marking technology is evolving rapidly. There are indications, for example, that a proliferation of applications using radio-frequency identification (RFID) technology is only beginning. Research companies have predicted that the total market for RFID would be US \$26 billion in 2016, compared to less than US \$3 billion for 2006.¹

1.1 Barcodes: The first barcodes stored information in patterns of parallel lines of varying width and spacing from each other. The newer two-dimensional matrix code, as it is called, contains more data and stores information in patterns of dots, circles and images.

Most consumer goods bear barcodes that are used mainly for sales and inventory tracking; they refer to a product's brand category and the country where the barcode was issued. Barcodes can also be used for tracking a product's movement. Parcel delivery services, such as Federal Express and UPS, use such systems and pride themselves on their ability to locate a package at all times during its delivery.² When a company packs a box with a specific item, a Unique Identifying Number (UID) can be assigned. Companies that ship packages internationally, for instance, usually scan the UID of the packages at every stage of transport. That information is sent to a data server that allows the company and client to learn a package's precise location at any time during its shipping.

The European Union reached agreements in 2004 and 2007, respectively,

¹ IDTechEx (2006a), RFID Market \$2.71Bn in 2006 to \$12.35Bn in 2010 . RFID Forecasts 2006 to 2016: The latest research from IDTechEx, IDTechEx, www.idtechex.com/products/en/articles/00000409.asp.

² Non-smokers' Right Association, Smoking and health Action Foundation, Tobacco smuggling and contraband: a deadly threat, Ontario, 2007.

with Philip Morris International and Japan Tobacco International about controlling illicit trade in cigarettes. As part of the agreements, both PMI and JTI are marking master cases (containing 10,000 cigarettes each) with a unique barcode that can be read by a human or computer. The coded information includes the brand category, the product variant (a design of a cigarette package for a certain market), production date, place of production, the machinery and the hour, minute and second of manufacturing. This information can be obtained immediately by scanning the barcode or entering its unique number into a database.

To track cartons (containing 200 cigarettes) in some markets, PMI, as part of its agreement, is experimenting with a 2D matrix code on the teartape--the small plastic tape used to tear open the cellophane wrapping. The matrix code is unique for each carton. It is scanned at the production line and entered into the database, which links each carton with a specific master case. Such 2D barcodes have been viewed by the European pharmaceutical industry association as more effective than RFID (radio-frequency identification), but that group did not rule out use of RFID later, saying "RFID has many significant benefits and would certainly be a natural progression of the system."³

The barcodes have advantages. They are cheap to make, are standardised internationally and can be read by scanning machines or readers that don't need a specific computer program to transmit the data. Their disadvantage is that they are labour-intensive because of the scanning of the codes. In addition, they are visible and easy to counterfeit or to cut.

1.2 RFID: Radio-frequency identification (RFID) systems are made up of readers and "smart tags"- microchips attached to antennas. When it nears a reader, the tag broadcasts information stored in its chip. Readers can scan smart tags automatically when pallets with products bearing the tags pass along conveyor belts and through loading bays.⁴

³ EFPIA, Towards safer medicine supply. A vision for the coding and identification of pharmaceutical products in Europe, Brussels, January 2008.

⁴ The best thing since the bar-code, The Economist, February 6, 2003.

RFID systems are easier to manage than barcodes and don't require manual scanning. The RFID technology is, however, more costly than using barcodes or invisible ink: RFID tags cost US 15⁵ to 20⁶ cents a tag, and readers cost between US \$100 to \$1000.⁷ Additional concerns are the security of the system⁸ and protecting privacy if the microchip tags remain on packs once they are purchased, potentially identifying individual consumers.⁹ The use of RFID is already widespread in many areas such as passports, transportation, ticketing, counterfeiting, baggage-tracking in airports and livestock-tagging. Lowering its cost and updating the technology will create new opportunities. If cost-effective tags enter the market, possibilities for RFID would expand quickly. Research firms predict that 585 billion tags would be delivered in 2016, or 450 times the quantity from 2006.¹⁰

1.3 Invisible ink: In California, Brazil and Turkey, a new generation of high-tech, digital tax stamps is in use. Soon these stamps will be used in Canada.¹¹ This kind of stamp uses invisible ink and features a unique, covert code with data for each pack (containing 20 cigarettes). The tax stamps let you verify whether products are authentic or counterfeit, and the stamps can be encrypted with extensive information that is uploaded to a Central Data System. Costs of introducing this system have been assessed in Brazil at 1.7 US cents per cigarette pack.

The advantage of this invisible ink technique is security: the ink is invisible and difficult to counterfeit. In California, the tax stamps have been copied, but tax officials say that the codes encrypted within the stamp have never been

⁵ OCDE, Radio-Frequency Identification (RFID): A Focus on Information Security and Privacy, Paris, 2008.

⁶ Pagnamenta, R., Cigarettes are microchipped to beat fraud, The Times, 8 October 2007.

⁷ OCDE, Radio-Frequency Identification (RFID): A Focus on Information Security and Privacy, Paris, 2008.

⁸ Boggan, S., Cracked it, The Guardian, 17 November 2006.

⁹ OCDE, Radio-Frequency Identification (RFID): A Focus on Information Security and Privacy, Paris, 2008.

¹⁰ IDTechEx (2006a), RFID Market \$2.71Bn in 2006 to \$12.35Bn in 2010. RFID Forecasts 2006 to 2016: The latest research from IDTechEx, IDTechEx, www.idtechex.com/products/en/articles/00000409.asp.

¹¹ Lambert, S, Federal government hires Swiss-based firm to help fight counterfeit tobacco, The Canadian Press, January 9 2008.

broken. The disadvantage is that scanners for reading the code are developed specifically for each supplier of invisible ink and for each country. Outside Brazil, law enforcement officials can not read the codes of the Brazilian tax stamps--unless Brazilian authorities supply the scanners.

1.4 Physical fingerprints: One new solution advanced to fight global counterfeiting relies on a product's microscopic structure and is called the "physical fingerprint." A science writer explained it this way: "On the microscopic scale, paper is made up of tiny fibres in random orientations, which is unique in its structure. On a mass production line, each product is scanned and its unique laser fingerprint is recorded on a protected database. When someone wants to check if a product is genuine, he simply scans the fingerprint region, and the database tells you if you have a match."¹² This technique can be used for mass consumer products, but its cost might explain why it is not used more commonly for identification and tracking.

1.5 Code Verification System is a 2D barcode scheme. It makes use of an unique encrypted 12-character number to identify and authenticate a pack of cigarettes.¹³ The number, linked with a digital signature, can be read by a human or by a computer. By introducing the number in the data base or scanning the code, a code verifying computer programme will determine whether the code is authentic or not. As part of PMI's agreement with the European Union, the company is experimenting with printing the CVS codes on individual cigarette packs in the German and Peruvian markets. The code has information about the place of manufacturing, the machinery, date and time of production and brand. PMI estimates that the application of the codes to the product packaging has a minimal impact on the manufacturing process and a very low application cost.¹⁴

¹² Fisher, R., Foolproof fingerprints: the counterfeit killers, New Scientist, 23 April 2007.

¹³ Bacheldor B, Philip Morris Intl. seeks to make serialized bar codes work with EPC network, RFID Journal, October 8, 2007. <http://www.rfidjournal.com/article/articleprint/3668/-1/1/>

¹⁴ Comments by Philip Morris International on the Public Consultation Paper in preparation of a legal proposal to combat counterfeit medicines for human use, Brussels, May 2008

A similar system is used for checking authenticity of cigar boxes. The system relies on a special code that is placed on a cigar box before it is sealed and on a paper ring put around each cigar before it is wrapped in cellophane. A cigar smoker taps the code into his mobile phone and gets back a text that verifies authenticity.¹⁵ Also, the European pharmaceutical industry intends to use for reimbursed products a similar system, to verify a product's authenticity at a pharmacy.¹⁶

CVS has a very low cost and is easy to administer. However, credibility is low when a company that makes products administers their verification. An independent entity, without an interest in the outcome, should have responsibility for verification.

http://ec.europa.eu/enterprise/pharmaceuticals/counterf_par_trade/doc_publ_consult_200803/88_philip_morris_intl.pdf

¹⁵ Overstreet R, Texting authenticity, Tobacco Journal International, nr6/2007, p.70.

¹⁶ EFPIA, Towards safer medicine supply. A vision for the coding and identification of pharmaceutical products in Europe, Brussels, January 2008.

2. The coding technology in the tobacco sector

In this section, we will describe coding technology now used in the tobacco sector. That sector faces a significant challenge; cigarettes are a mass consumer product, and to succeed globally, the coding should apply to the 290 billion cigarette packs sold each year.

2.1 Authentication and verification of tobacco products

The main objective of **authentication** is verifying immediately whether a product is genuine.

In most countries, customs authorities rely on the tobacco industry to determine whether a product is genuine or counterfeit, a process that can take considerable time and may be deemed unreliable. Verification techniques by the industry vary.

Since 1 May 2005, British American Tobacco products have carried a taggant on the self-adhesive teartape.¹⁷ A taggant, a chemical element added to the ink, can be recognised by a scanner. The taggant enables BAT to determine if the products are genuine or counterfeit when employees check the teartape with a small, hand-held reader.

From 1st October 2007, all cigarette packs manufactured for the United Kingdom duty-paid market bear a covert security feature that allows authorities to instantly verify the authenticity of a product on retailers' shelves. Details of the anti-counterfeit technology are not being disclosed and are the result of a voluntary agreement between industry and government. The technique is probably similar to the BAT taggant technique.

¹⁷ British American Tobacco, Guide to fighting illicit trade, Anti illicit trade unit, September 2005, London.

In Malaysia, a security mark with a visible feature and an invisible feature has been applied since 2004 on each cigarette pack headed for the domestic market and for duty-free sales. The mark is applied on factory production lines. Enforcement officials can scan the mark and learn immediately whether a product is counterfeit. These markings are not linked to tax stamps and do not contain additional data.

Digital tax stamps have been in place in California since January 2005 and were introduced in Brazil and Turkey in 2007. Scanning of the tax stamps allows immediate detection of counterfeit cigarettes.

Code verification systems have also been used to determine whether a tobacco product is genuine. (see section 1.5)

Despite progress made in recent years, the need for independent, immediate and reliable identification of counterfeit cigarettes is clear.

2.2 Digital tax stamps.

The main objective of **digital tax stamps** is improved collection of tobacco tax revenue.

Digital tax stamps have been introduced in California, Brazil and Turkey and will be introduced in Canada.

2.2.1 How does the digital stamp system work in California?

2.2.1.1 The illicit trade problem in California: The California Board of Equalization estimated in 2001-2002 that 25% of the state's retailers were selling counterfeit cigarettes, resulting in a loss of revenue of US \$238 million.¹⁸

¹⁸ California State Auditor, Implementation of State Auditor's Recommendations, Audits released in January 2005 through December 2006, Report NO. 2007-406, February 2007, Sacramento.

2.2.1.2 The response: Authorities introduced licensing obligations, high-tech tax stamps and investigative authority to better control the distribution chain. In January 2004, the Cigarette and Tobacco Products Licensing Act was introduced, requiring licensing of all entities engaged in selling tobacco products within the state. Starting in January 2005, California required use of tax stamps that were harder to counterfeit than older tax stamps. Stamping machines applied this new generation of high-tech tax stamps using invisible ink and featuring a unique, covert code with product data related to each cigarette pack that can be uploaded to a central Data Management System. Not only do the stamps allow verification whether a product is authentic, but they also are encrypted with this information:

- Name and address of the distributor affixing the stamp
- The date the stamp was affixed
- The value of the stamp

Retailers and distributors can easily detect counterfeit cigarettes by using specific hand-held scanners. Law enforcement field inspectors are equipped with more sophisticated scanners, which give them access to a whole range of data. Investigators can scan codes on the tax stamps at the point of retail sale, verify whether appropriate stamps are affixed to corresponding packs of cigarettes and cross-check a distributor's name, address, and stamping date against the distributor's invoice to a corresponding retailer. Each year, inspectors visit 10,000 retailers out of a total of 40,000.¹⁹

California does not manufacture cigarettes, but it imports 1.2 billion cigarette packs annually. In distribution centres, cigarette cartons are opened automatically, the tax stamps are applied to each pack and the cartons are closed again. Activating the unique code at a distribution centre is possible on packing machines operating at a speed of 600 packs a minute.²⁰

¹⁹ The information in this section has been collected during a visit at the State Board of Equalization in Sacramento, California on 16th November 2007.

²⁰ Ibid.

2.2.1.3 The evaluation: Results of this system have been evaluated favorably. Its costs have been calculated at US \$9 million per year in return for significant additional tax revenues on cigarettes – an additional US \$75 million was collected between January 2004 and March 2006 as a result of the licensing act and the tax stamps.²¹ The estimated loss from cigarette tax evasion dropped from US \$292 million in 2003 to US \$182 million in 2006.²² Investigators have tracked retailers' tax compliance since the law took effect; their reports suggest that seizures of counterfeit products at retail locations declined, as did the percentage of retailers carrying counterfeit products.²³

In combating illicit trade, one measure is rarely effective when implemented alone. Tax stamps and coded information should be implemented in combination with other measures, such as licensing, to be effective. California law sets fines of up to US \$25,000 for possessing, selling, or buying counterfeit cigarettes or fraudulent cigarette tax stamps.²⁴

A spokesman for Philip Morris has recently claimed that criminals were able to counterfeit the new California stamps easily.²⁵ State tax officials in Sacramento, Calif. refuted that statement; they said that the tax stamps have been copied, but that codes within the stamps have never been broken.²⁶

2.2.2 How does the digital stamp system work in Brazil?

²¹ *ibid*

²² Betty Yee announces new cigarette, tobacco tax loss estimates, State Board of Equalization, California, News release June 27, 2007.

²³ Bureau of State Audits, California State Auditor, Board of Equalization: Its Implementation of the Cigarette and Tobacco Products Licensing Act of 2003 Has Helped Stem the Decline in Cigarette Tax Revenues, but It Should Update Its Estimate of Cigarette Tax Evasion (29 June 2006, Report no 2005-034).

²⁴ Hong, M., Barnes, R., Glantz, S., Tobacco control in California 2003-2007: missed opportunities, University of California, San Francisco, October 2007.

²⁵ Faherty, C., Officials Butting In on Cigarette Counterfeits, New York Sun, May 25, 2007.

²⁶ Personal communication David Gau, Deputy Director, State of California, Board of Equalization, November 16, 2007.

2.2.2.1 The illicit trade problem in Brazil: Since the mid-1990s, illicit tobacco trade has been a concern for the Brazilian authorities. In 1998, Brazilian manufacturers were exporting 34 billion cigarettes²⁷ to neighbouring countries, and many were returned illegally to Brazil as contraband. To deal with this problem, the government imposed an export tax of 150% on cigarettes to neighbouring countries. Exports of cigarettes declined rapidly, but cigarette smuggling continued as newly established factories in a neighbouring country fuelled the contraband market. According to the Brazilian Ministry of Finance, some 21 billion cigarettes were smuggled into Brazil in 2006, representing a loss of revenue of US \$340 million.

In addition, only Brazil's two major cigarette companies were paying cigarette taxes. Fourteen smaller national cigarette companies, which produced 16 billion cigarettes annually, were not paying the cigarette tax on industrialized products (IPI), which is responsible for 70% of the total federal revenues from the sector. That represented a revenue loss to the Brazilian government of US \$280 million in 2006. Overall, illicit cigarette trade represented 35% of the market in Brazil in 2006: 20% smuggling from neighbouring countries and 15% from illicit domestic manufacturing.²⁸

(Brazil is one of the main cigarette manufacturing countries in the world. It has 16 companies producing 5.3 billion cigarette packs annually, located at 19 manufacturing sites. There are 145 production lines using 16 different cigarette machineries.)

2.2.2.2 The response: To tackle illicit domestic manufacturing, Brazil mandated licensing of its manufacturers. Non-compliance with the law or failure to pay taxes could lead to withdrawal of a license and closure of a factory. In addition,

²⁷ Fisch, M., The illegal cigarette market in Brazil. A case study. A non-paper commissioned by the WHO TFI for the technical briefing during the first session of COP of the WHO-FCTC, 6-17 February 2006, Geneva, Switzerland.

²⁸ The information in this section has been collected during a visit, organised by the Brazilian Ministry of Finance and the Brazilian Mint, on the Brazilian high-tech tax stamp system from 16 to 23 May 2007 for a delegation of experts of illicit tobacco trade.

an integrated control and monitoring system for cigarette production became obligatory and has been operating since December 2007. The Ministry of Finance implemented installation of automatic cigarette production counters at each production line. It mandated the launching of a digital tax stamp system, with capabilities for identifying each individual pack.

The new law's purpose was to ensure that all due taxes were collected on cigarettes produced in Brazil. In addition, under the new system it is possible to quickly distinguish genuine from counterfeit cigarettes and to verify the authenticity of the tax stamps applied on the packs by manufacturers. The system also allows the government to establish exactly how many cigarettes Brazilian manufacturers produce.

The high-tech tax stamps are produced in the Brazilian Mint. Each stamp gets a unique code for each cigarette pack. There are four main tax categories for cigarettes, and the stamp for each tax category has a different colour. After stamps are produced, they are transferred to one of the manufacturing sites under strict security. Then the tax stamps are applied to the packs, and a camera at the production line activates codes on the packs. Activation of the code is possible on machines operating at a speed of 700 packs a minute. The codes contain product data for each cigarette pack, which is uploaded to a Data Manager Server under the control of the Ministry of Finance. The stamps are encrypted with the following information:

- Name of the manufacturing site
- The date the stamp was validated
- The tax category of the stamp²⁹

If a manufacturer uses tax stamps whose codes are not detected, are not allocated to that specific manufacturer, or do not match the fiscal category of the pack, the Data Manager Server will issue an alert to the Secretariat of Federal revenues to start an investigation.³⁰ In this system, inspectors, retailers

²⁹ Ibid.

³⁰ Fisch, M., The illegal cigarette market in Brazil. A case study. A non-paper commissioned by the WHO TFI for the technical briefing during the first session of COP of the WHO-FCTC, 6-17 February 2006,

and distributors can easily detect counterfeit cigarettes by using specific hand-held scanners. Law enforcement field inspectors can have access online to package-related data available on the Data Manager Server by scanning the code.

The law stipulates that tobacco manufacturers must pay the costs of introducing the digital tax-stamp system. Those costs have been assessed at 1.7 US cent per cigarette pack.³¹ Costs to the government are minimal, as are the costs borne by tobacco manufacturers.

2.2.2.3 Evaluation: The Brazilian digital tax-stamp system was only fully implemented in March 2008, so it is too soon to have results.

Installation of cigarette production counters, the high-tech tax-stamp system and licensing of the manufacturers were primarily developed to address that 15% of the illicit domestic trade generated by Brazil's small national manufacturers. Within three months after the programme took effect, two manufacturers were closed down for non-compliance with the licensing rules.³² It is expected that the system will have limited impact on the smuggling of cigarettes from the neighbouring countries.

2.2.3 How does the digital tax stamp system work in Turkey?

2.2.3.1 The illicit trade problem in Turkey: Turkey has a huge problem of tax evasion for tobacco products and alcoholic beverages. It is estimated that 80% of Turkey's wine production has been sold without taxes. No exact data are available on the evasion of cigarette taxes.³³

2.2.3.2 The response: A digital tax-stamp system, similar to the system in

Geneva, Switzerland. An overview of the legislation in Brazil can be found on the website of the Ministry of Finance: http://www.receita.fazenda.gov.br/Novidades/nov_legis.htm

³¹ Personal communication Marcello Fish, 4th December 2007.

³² Personal communication, Marcello Fish, 11th July 2008.

³³ Information provided by Charles Finkel, Sicpa Company, 20/11/2007.

Brazil, using invisible ink and featuring a unique, covert code with product data for each cigarette pack, was introduced in Turkey in 2007. The system was aimed at both tobacco products and alcoholic beverages, specifically, 5.7 billion cigarette packs, 120 million bottles of wine and spirit and 1.4 billion tins or bottles of beer.³⁴

The system applies to cigarettes made in Turkey and to legally imported cigarettes. That is its chief difference with the similar tax-stamp system in Brazil, a country that does not import cigarettes. In Turkey, the tax stamps are applied on cigarette packs in foreign and domestic manufacturing sites. For domestically made cigarettes, codes on the tax stamps are activated at the manufacturing site, and for imported cigarettes, they are activated in one of the three customs ports.

2.2.3.3 The evaluation: The Turkish digital tax stamp system became obligatory beginning in July 2007,³⁵ and it is too early to have results.

2.3. Tracking and tracing systems

The main objective of a **tracking and tracing** regime is to facilitate investigations into tobacco smuggling and identify the point where tobacco products are diverted to an illicit market.

Why have an international tracking and tracing system? According to the WHO Expert Group,³⁶ “an international tracking and tracing regime would help prevent, detect and eliminate the illicit trade of genuine tobacco products, making it more difficult for smugglers. Such systems would need to be

³⁴ Ibid.

³⁵ Ministry of Finance, General Communique regarding the banderol – applied product tracking system for tobacco products and alcoholic beverages, Official Gazette NO. 26553, 15/06/2007.

³⁶ ‘Elaboration of a template for a protocol on illicit trade in tobacco products’ (World Health Organization, Conference of the Parties to the WHO Framework Convention on Tobacco Control, second session, provisional agenda item 5.4.1, A/FCTC/COP/2/9, 19 April 2007) 8.

implemented at an international level, rather than each entity developing its own domestic system, in order to ensure that tracking and tracing across borders could be facilitated. The approach is both proactive, in that tracking provides information and verification to law enforcement agencies, and reactive, in that tracing provides an opportunity to identify the participants in the illegal trade whenever an audit or a seizure is made. A tracking and tracing regime would allow for a detailed analysis of individual seizures of genuine tobacco products and an analysis of smuggling trends on larger scales. It will also provide an opportunity for the identification of the point of diversion of tobacco products to the illicit market.”

The main components of a tracking and tracing regime are

- A secure and unique product code which identifies the product
- Transmission of the product code through scanning, manual uploading or radio emission.
- A data server.

Implementing a tracking and tracing regime is one obligation of agreements between the EU and tobacco companies PMI and JTI.

2.3.1 Tracking and tracing and the EU-PMI agreement

2.3.1.1 The illicit trade problem in the EU: In the 1990s, cigarette smuggling was a significant problem in the EU. In 1996, US cigarette companies were exporting billions cigarettes under the transit regime to Europe. The cigarettes disappeared--mostly during transport--and ended up in the illegal markets of Italy, Spain, Germany and other EU countries.³⁷

In 2000, the European Commission and ten EU Member States filed lawsuits against international tobacco companies for smuggling. On 9 July 2004, the European Commission, together with 10 Member States, concluded a 12-year agreement with PMI, covering the entire European Community. It includes a system to combat future cigarette smuggling and counterfeiting and

³⁷ Joossens, L., Raw M., “Cigarette Smuggling in Europe: Who Really Benefits?” Tobacco Control, 1998; 7:66-71

ends all litigation among the parties in this area. By the end of 2007, by 26 of the 27 EU member states (with the exception of UK) had signed the EU-PMI agreement.

2.3.1.2 The response: The EU-PMI agreement obliges Philip Morris to put in place a tracking and tracing system.³⁸ PMI marks all packs or cartons with embossed codes or other markings containing information on:

- (a) date of manufacture of the product,
- (b) manufacturing facility,
- (c) machine of manufacture, and
- (d) shift during which the product was manufactured.

In addition, PMI marks master cases with unique, machine-scannable barcode labels before selling them to a first purchaser. The labels also contain a human-readable translation (i.e., spelled out in letters and numbers). These labels permit linking the code with product information on the packs and also with information in a database, such as:

- (1) First Purchaser name and order number,
- (2) Shipment date,
- (3) Destination of shipment,
- (4) Point of departure from the final factory or warehouse,
- (5) Consignee to whom the product was shipped, and
- (6) Intended market of retail sale.

This information can be linked to the sales price and the invoice of shipment to the first purchaser.

The database is managed by PMI, with access for authorized members of relevant agencies in the member states or the European Commission. For seven sensitive markets in 2008, where smuggling is likely, the database has information on second purchasers. The database is searchable by customer order or master case barcode number. It is available 24 hours a day. Authorized

³⁸ The EU-PMI provisions on tracking and tracing are available on line at http://ec.europa.eu/anti_fraud/budget/D.pdf

persons send an email to the database with the master case barcode number and get an automatic reply.

PMI produces around 770 billion cigarettes globally each year. Since 2004 Philip Morris has labelled 200 million master cases, containing a total of two trillion cigarettes, with unique barcodes that can be scanned by machines before the cigarettes are sold to the first buyers in the distribution chain..³⁹ The main problem with the unique labelling of the master cases is that smugglers are aware of the new PMI coding system and will repack the cigarettes in new master cases or cut the codes, which are visible, from them.

Under its agreement with the EU, PMI must continue research and development in technology for improving coding on cartons and packs. PMI has gradually introduced this year tracking of cartons in smuggling sensitive markets, such as Russia, Ukraine, Romania and Lithuania; a data matrix code on the teartape is scanned, is registered in the database and links each carton and a specific master case. PMI also is experimenting with applying unique and human-readable codes on individual packs in the German market, based on the Code Verification System (CVS: see section 1.5). CVS is an encrypted, serialized 12-character number used to identify and authenticate each pack of cigarettes.⁴⁰ The CVS code is linked with the place of manufacturing, the machinery, date and time of production and brand information. So far, codes on individual packs are not linked to the unique coding of the cartons or master cases and are not part of the tracking system for them.

Since the codes are human-readable, they are easy to counterfeit. However, checking the database would easily permit a person to verify whether a code is authentic.

³⁹ The information in this section has been collected during a visit, organised by the European Anti Fraud Office (OLAF) on 8 July 2008 in Neufchatel, Switzerland.

⁴⁰ Chanez P, Fradet E, Tracking & Security at Philip Morris International, Chicago, October 2007, power point presentation available at <http://autoid.mit.edu/ConvocationFiles/PMI%20%20EPC%20symposium%20presentation.ppt>.

2.3.1.3 Commentary: Tracking and tracing provisions of the EU-PMI agreement are global, applying to all PMI factories around the world. The provisions are easy to manage and promise useful information for investigators and law enforcement officials. It is the start of a complete tracking regime through the whole distribution chain; the actual system includes the first purchaser, and in some markets the second purchaser, but not necessarily all purchasers.

The tracking of cartons and identification of individual packs is gradually being put into place. Tracking at carton and pack level is essential, as markings on master cases can be easily removed. So far, codes on the individual packs are not linked to the unique coding of the cartons or master cases. Linking codes from individual packs with cartons and master cases is essential, and feasible with the existing technology. An additional reader on a cigarette production line, for instance, could transmit individual pack codes to a database without slowing down packaging of the cigarettes. In Brazil, for instance, reading the unique code on individual packs on the production line is possible at a speed of 700 packs (or 14,000 cigarettes) a minute.

2.3.2 Tracking and tracing and the EU-JTI agreement

2.3.2.1 The illicit trade problem in the EU: On 14 December 2007 the European Commission, together with 26 Member States of the European Union, concluded an anti-illicit trade agreement with Japan Tobacco International. It ended litigation among the parties in this area.⁴¹

2.3.2.1.2 The response: Under the agreement, Japan Tobacco companies shall make commercially reasonable efforts to develop and implement tracking and tracing technologies and procedures, provided they are proven to be commercially and technologically feasible, to enable them progressively to mark master cases, cartons and/or packs of Japan Tobacco cigarettes carrying International Japan Tobacco Trademarks with labels, codes or other information

⁴¹ The EU-JTI agreement is available on line at:

http://ec.europa.eu/anti_fraud/budget/cig_smug/2007_en.html

that allow for the complete identification of the:

- (a) intended market of retail sale;
- (b) first purchaser name and order number;
- (c) shipment date;
- (d) shipment destination;
- (e) point of departure;
- (f) consignee;
- (g) product description;
- (h) date of manufacture of the product;
- (i) manufacturing facility;
- (j) machine on which the product was manufactured; and
- (k) production shift.

The JTI tracking and tracing provisions for master cases had been put into practise in June 2008. It is a system similar to that developed under the PMI agreement, as the master cases contain a machine-scannable and human-readable World Wide Unique Identifying Number. That number refers to product description, date of manufacture, manufacturing facility, the machine on which the product was manufactured and the production shift. The master case labels are registered in a central database, and a new label is fixed on the pallet with all codes of the master cases. (The database is managed by JTI, with access of registered government bodies through email.⁴²)

When a pallet arrives in a warehouse, an association confirmation sheet (a receipt with data on the master case and pallet labels) is registered in the database. And when the cigarettes are sent to the first customer, information on the intended market of retail sale, the first purchaser name and order number, the shipment date, the shipment destination, the point of departure and the consignee is linked in the database with the master cases, the pallet labels and association confirmation sheet.

⁴² The information in this section has been collected during a visit, organised by the European Anti Fraud Office (OLAF) on 14 July 2008 in Trier, Germany

JTI plans Implementation of tracking and tracing technology at carton level for 2009.

2.3.2.3 Commentary: This system is a positive development, but tracking and tracing at both carton and pack level are essential as markings on master cases can be easily removed.

Conclusion:

Governmental requirements for identifying and tracing tobacco products will intensify in upcoming years. The coding technology is evolving quickly and offers opportunities for governments to control and monitor the tobacco trade.

A tracking and tracing regime for tobacco products is being considered as one of the obligations in the FCTC protocol on illicit trade in tobacco products. This paper provided some background information on coding technologies that are already used or are in development in the tobacco trade and other sectors. The challenge in the tobacco sector is that cigarettes are a mass consumer product, and the coding should apply to 290 billion cigarette packs that are sold globally each year.

Definitions:

- **Authentication:** verifying whether a product is genuine or counterfeit.
- **Barcode** is a way to represent information that can be read electronically by a machine.
- **Barcode reader** (or **barcode scanner**) is an electronic device for reading printed barcodes.
- **Cigarette packaging:** a cigarette pack frequently contains 20 cigarettes, cartons frequently contain 10 packs or 200 cigarettes and master cases frequently contain 50 cartons or 10,000 cigarettes.
- **Covert codes** are hidden from the human eye.

- **Counterfeit products** bear a trademark without consent a trademark owner's consent.
- **Digital tax stamps** have unique codes that allow their authentication and the electronic tracking of legally issued tax stamps.
- **Electronic Product Code** is a scheme that goes beyond a barcode and helps identify a manufactured product.
- **Overt codes** are visible.
- **Radio-frequency identification:** this technology allows identification of a product and tracking it through use of a microchip, an antenna, and transmitters (readers) that use microwaves.
- **Tracing** means re-creating the route taken by products through their supply chains.
- **Tracking** means monitoring the route taken by products through their supply chains.