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FAILURE FREQUENCY OF ELEMENTS OF THE SYSTEM OF DIGITAL TACHOGRAPHS IN THE ASPECT OF LEADING DIGITAL TACHOGRAPHS OF THE SECOND GENERATION

Abstract. The paper presents main legal rules introducing the digital tachograph system main requirements which must be fulfilled by producers of digital tachographs in order to get the type approval, possibility of future requirements of digital tachograph, main functions of digital tachograph, characteristics of participant of digital tachographs system and their tools of the identification, acting and setting of authorize workshops in Poland and Europe Union, accessible methods of check and calibration of digital tachographs and their description, based on Commission Regulation (EC) No 1360/2002 of 13 June 2002, replacing the Annex 1B and Polish law. These paper also presents current level of implementation of digital tachograph system in Europe in light of introduction of digital tachograph second generation.

Key words: digital tachograph, driver card, workshop card, control card, company card, workshop

Introduction

The legal basis for the introduction of such system is Council Regulation (EEC) No 2135/98 of 24 September 1998 amending Regulation (EC) No 3821/85 of 20 December 1985 on recording equipment in road transport. Annex 1B of this Regulation contains the technical specification for digital tachographs.

Commission Regulation (EC) No 1360/2002 of 13 June 2002 replacing the Annex 1B is an actual detailed technical specification for digital tachographs. In accordance with new regulations the inspection system consists of the following elements:

- a digital tachograph VU (*Vehicle Unit*), recording the driver and vehicle operation performance,
 - a speed sensor, supplying the vehicle unit with relevant data concerning the vehicle speed and distance travelled,
 - chip (data) cards intended for recording the data and identification of the system users.
- For the conformity reasons all admitted equipment must fulfil three stages of tests:
- security test – test verifying the fulfilment of all requirements concerning the security, as listed in Annex 10 to the Commission Regulation (EC) No 1360 of 13 June 2002,
 - functional test – test verifying the requirements concerning the functionality of the equipment; the tests are specified in Annex 9 to the Commission Regulation (EC) No 1360/2002 of 13 June 2002,

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- interoperability test – test for verifying the abilities of a considered equipment to interoperate with other equipment; such tests are performed by only one laboratory under the supervision of the European Commission (this task is given to the Joint Research Centre at Ispra); only equipment fulfilling these two tests mentioned above can be admitted to this test.

The vehicle unit of the digital tachograph ensures the following functions:

- measurement of speed – ranging from 0 to 220 km/h with accuracy of 0.1 km,
- monitoring the insertions and withdrawals of chip cards,
- displaying and recording the data on the chip cards,
- limiting the data access for various group of users,
- measurement of time,
- measurement of displacement – the equipment records a distance travelled with accuracy of 0.1 km and stores distances travelled by a vehicle of each of last 365 days,
- monitoring and recording the driver’s activities,
- monitoring the inspection procedures,
- monitoring the activities carried out by the workshops,
- loading the data concerning the performance of activities: (information on a place of beginning and ending the work day, information on the driver’s activities being performed before inserting a card into the tachograph),
- providing the access to the information data for the transport companies,
- warning (monitoring and recording the data concerning the infringement of regulations and recording the data by the peripheral equipment).

Digital tachograph cards

A characteristic feature of the digital tachograph is an integration of all users of the recording equipment in road transport (fig. 1). The users can be classified in four groups having different rights and obligations, namely:



Fig. 1. View of cards in digital tachograph system in Poland

- driver – while being inspected the driver is requested to present the data card and/or printouts of the current week and the last day of the preceding week if he has driven a vehicle equipped with an analogue tachograph (white card),
- control service – a personnel of the control service is equipped with a controller's data card (blue card),
- personnel of service workshops – is equipped with a workshop data card, which allows to install and adjust the settings of a given tachograph; a calibration unit is connected to the tachograph connector provided (red card),
- personnel of transport company – is equipped with a company data card, which allows to display the data intended to be used by the fleet management systems (yellow card).

Calibration of digital tachograph

The tachograph can be installed by the manufacturers of vehicles (it applies to the newly produced vehicles) or by the authorised workshops (if it had not been installed yet in a given vehicle or if its replacement could be required).

According to the Annex 1B provision no 243 the installed tachograph has to be activated before the vehicle, on which it is mounted, leaves the installation place.

Before commissioning the vehicle it is necessary to perform the calibration of the installed tachograph. The calibration process includes:

- displaying the data (in case if it is not the initial calibration),
- determining the diameter of the vehicle tyre (based on the measurement),
- determining the characteristic coefficient of the vehicle,
- determining the constant of a tachograph [imp/km],
- loading the recording equipment with data,
- preparing the identification plate and placing it on a recording equipment,
- sealing with leads.

After leaving the authorised workshop the vehicle equipped with a calibrated tachograph can be used. Every two years the vehicle-tachograph set must be subjected to an inspection in the authorised workshop and to the re-calibration procedure afterwards.

The tachograph can be also sold and reused in another vehicle. Such operation requires dismantling the tachograph from the vehicle by a recognised workshop. Next the tachograph is installed in another vehicle and after a new calibration performed the vehicle can be put in operation.

After a time specified by the manufacturer the tachograph is dismantled from the vehicle by the recognised workshop and withdrawn from the exploitation.

Running of authorized workshops

Since the installation of the recording equipment in the vehicle up to a moment of its commissioning some actions must be done which result in the introduction of a new vehicle-

tachograph set to an European digital system. According to the provisions of the European regulations (Council Regulations (EEC) Nos. 3820/85, 3821/85, 2135/85, and Commission Regulation (EC) No 1360 with Annexes) every digital tachograph before entering the system is subjected to the activation and calibration procedures. Moreover, the installed and activated vehicle-tachograph set must be periodically checked regarding its conformity with the metrological needs specified in the relevant regulations (Annex 1B to the Commission Regulation (EC) No 1360/2002). It can happen that during the operation of the recording equipment a necessity of repair or replacement, and, in an extreme case, even withdrawal of its damaged elements occurs. For these reasons a network of the professional workshops is needed, which will provide a satisfactory basis for the digital tachograph servicing.

The authorised tachograph workshop is an organizational unit approved and certified by the Member State, authorised for performing the procedures and functions as follows:

- installation of the recording equipment and its activation,
- tests of the recording equipment;
- inspection of the recording equipment;
- displaying the information data (stored data of the vehicle unit);
- withdrawal of the recording equipment elements.

A basic duty of the authorised workshop is to guarantee that every vehicle-tachograph set leaving such workshop could meet the requirements specified in the Regulation (EC) No 3821/85 of 1985. According to the Annex 1B of the Commission Regulation (EC) No 1360/2002) of 2002 an installation process is defined as an assembling the recording equipment (a vehicle unit and speed sensor with a necessary cables in the vehicle.

In reality the installation procedure consists of five stages:

- a preliminary inspection of the recording equipment,
- assembling the recording equipment,
- loading the vehicle unit memory with given values of the calibration information parameters,
- sealing with leads the places of the speed sensor installation,
- assembling the installation plate (plaque).

The preliminary inspection of the recording equipment includes:

- a visual inspection – aims at a detection of any possible mechanical defects and checks a completeness of the delivered equipment according to the manufacturer's specification,
- verifying the indication errors: concerning the distance travelled, speed value and time measurement.

In case of the digital tachograph, in comparison to analogue one, the recording errors for: a length of distance travelled, speed and duration of driving time are not subject to verification. The brand new recording equipment is delivered to the manufacturers of vehicles authorised for servicing the inactive digital tachographs. It means that all parameters have default values. For that reason a person installing the recording equipment is obliged to perform a preliminary calibration of the tachograph – i.e. to enter the setting values and the vehicle identification data. In case these parameter values are not determined (*available*), the chain type parameters will be marked with „?” and the numerical ones with „0”.

The installation is the only action when the setting the calibration data without the necessity of using the workshop data card is possible.

After completing the operations necessary for assembling the recording equipment, all connections, breaking of which can cause an undetectable interruptions in recording or data loss, should be sealed with leads.

The last stage of the tachograph installation is documenting the results, i.e. printing and assembling the so called descriptive plaque. The installation plaque must be also sealed with leads unless it is placed in a way making its removal without visible traces impossible.

The tachograph installed in the vehicle should be subject to the activation procedure before leaving the place of installation. The activation of the digital tachograph is a set of actions (operations) resulting in:

- readiness of the recording equipment for operation (i.e. recording the driver’s work time performance); the functions for recording and storing the data are being activated;
- activating the tachograph safety functions.

The tachograph activation is automatically performed by the first insertion of the valid workshop data card into the card reader and entering the correct PIN code. During the activation process the matching the speed sensor and vehicle unit occurs. All actions relating to the activation procedure should be carefully performed as repeated use of an incorrect PIN can result in a permanent interlock of the workshop data card.

The measuring stand for determining the characteristic coefficient of the vehicle (fig. 2, 3):

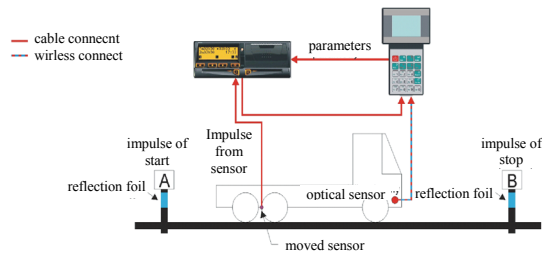


Fig. 2. Diagram of calibration of digital tachograph on road base

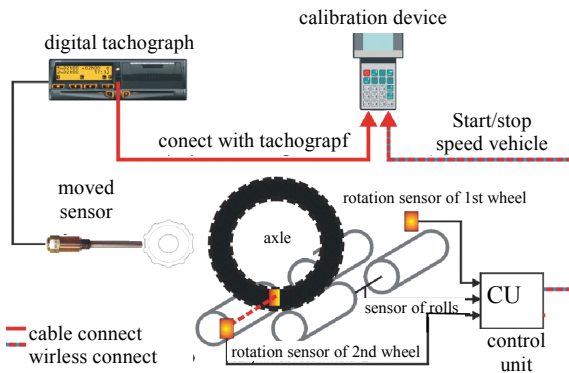


Fig. 3. Diagram of calibration of digital tachograph on work station

- the calibration certificate (period between the consecutive calibrations should exceed two years),
- the expert opinion certificate in case the usability of the instruments or measuring methods is not proved in another way.

Level of implementation of digital tachograph system

Level of introducing the system of the digital tachograph, leading it, was divided into the following elements:

- issue of digital tachograph's card,
- connect to TACHOnet system,
- approved of digital tachograph workshop,
- trained and equipped control services.

States which do not issue cards in the system of digital tachographs:

- Cyprus,
- Kosovo,
- Montenegro,
- Turkey,
- Serbia.

States don't connected to the tachonet: system

- Denmark,
- Hungary,
- Portugal,
- Bielarus,
- Croatia,
- Kosovo.
- Moldova,
- Montenegro,
- Russia,
- Serbia,
- Turkey,
- Ukraine.

States, which have not started methods of checking and calibrating digital tachographs:

- Greece (it passed requirements determining functioning of methods of the digital tachograph),
- Malta (it adopted the Italian system, drivers are going to Italy to carry checking and calibrating digital tachographs),
- Bielarus,
- Croatia,
- Kosovo.
- Moldova,
- Montenegro,

- Russia,
- Serbia,
- Turkey,
- Ukraine.

Almost all states accomplished training and equipping of control officers, with the exception:

- Greece,
- Portugal,
- Romania,
- Cyprus,
- Bielarus,
- Croatia,
- Kosovo.
- Moldova,
- Montenegro,
- Russia,
- Serbia,
- Turkey,
- Ukraine,

At present they are being led widely snitch works above introducing the system of digital tachograph in such states as Russia, Ukraine or Moldova.

Level of implementation of digital tachograophs system is presented in table 1 and in figure 4–14. They present situation of each country and connected do TACHOnet system, number of issued cars (cards: driver, company, workshop, control), number of approval tachograph workshop in country of Europe and situation with malfunction, stolen or lost cards.

The number of issued cards in individual countries of Europe enough is diversified. This number is depending on the size of the transport market in the given state and from the starting date of issuing cards to tachographs. Greece began issuing cards only in 2008 and she issued 1076 cards of drivers, in Germany in the period of 5 years 1600529 cards of drivers were issued, however in Poland 2916677 cards were issued in this period.

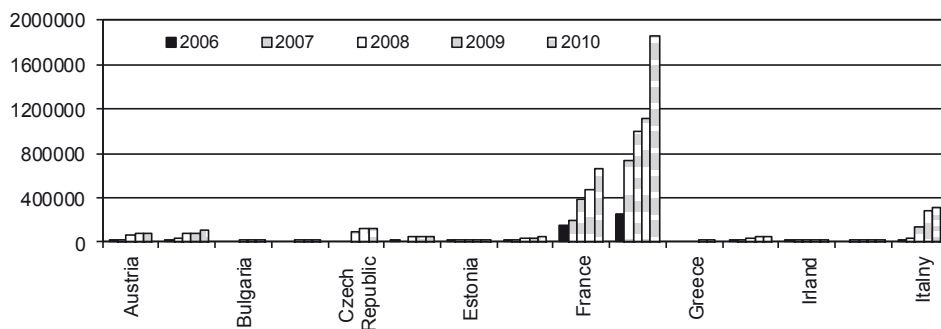


Fig. 4. Number of issued driver cards in Europe in 2006–2010 (part 1)

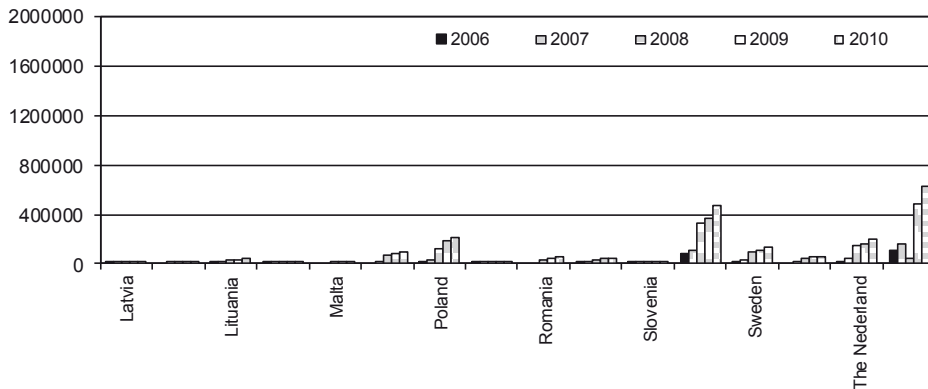


Fig. 5. Number of issued driver cards in Europe in 2006–2010 (part 2)

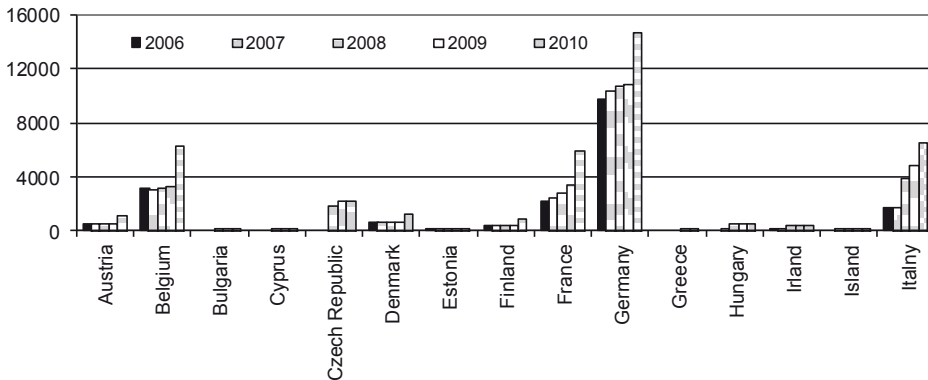


Fig. 6. Number of issued control cards in Europe in 2006–2010 (part 1)

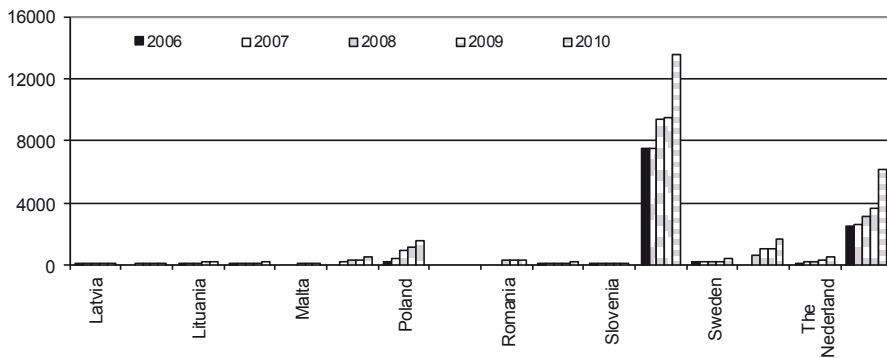


Fig. 7. Number of issued control cards in Europe in 2006–2010 (part 2)

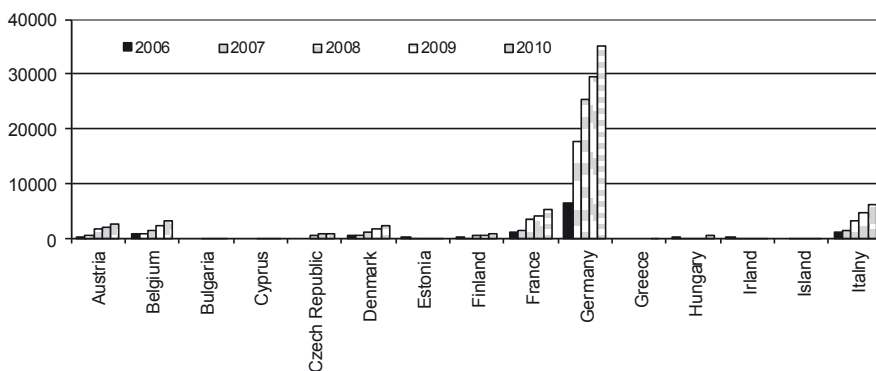


Fig. 8. Number of issued workshop cards in Europe in 2006–2010 (part 1)

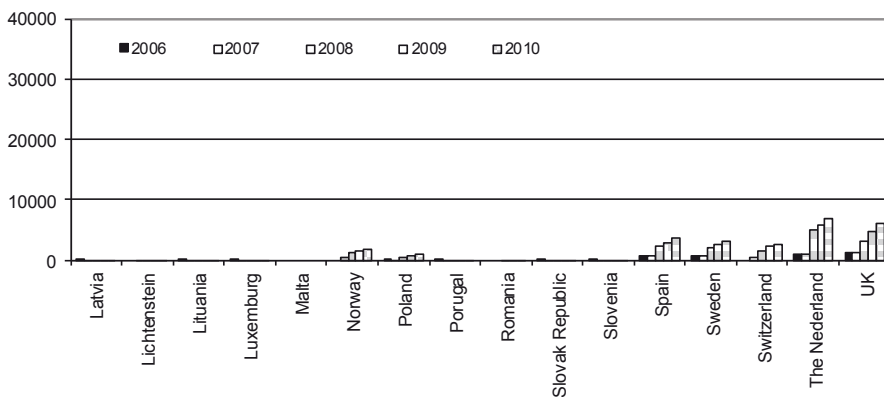


Fig. 9. Number of issued workshop cards in Europe in 2006–2010 (part 2)

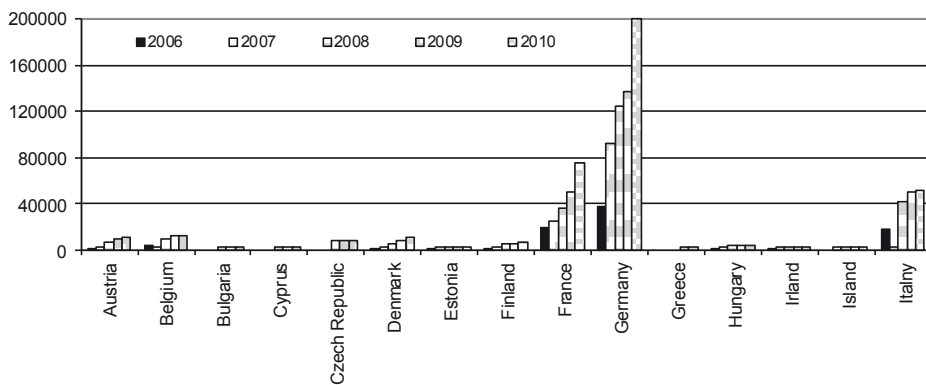


Fig. 10. Number of issued company cards in Europe in 2006–2010 (part 1)

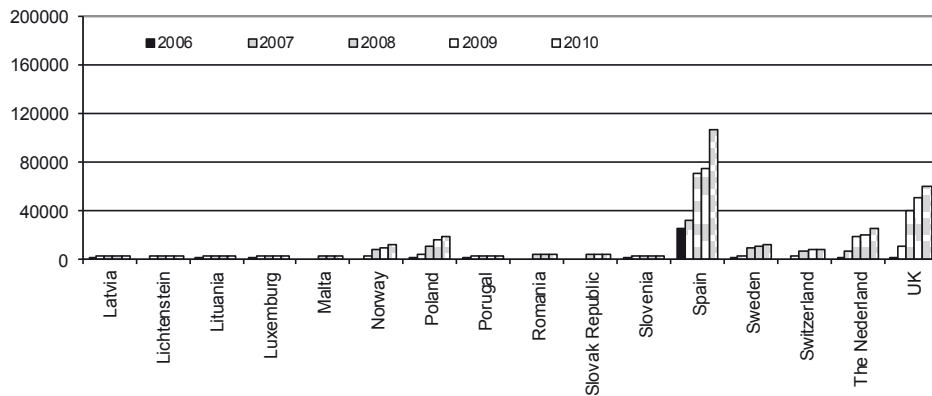


Fig. 11. Number of issued company cards in Europe in 2006–2010 (part 2)

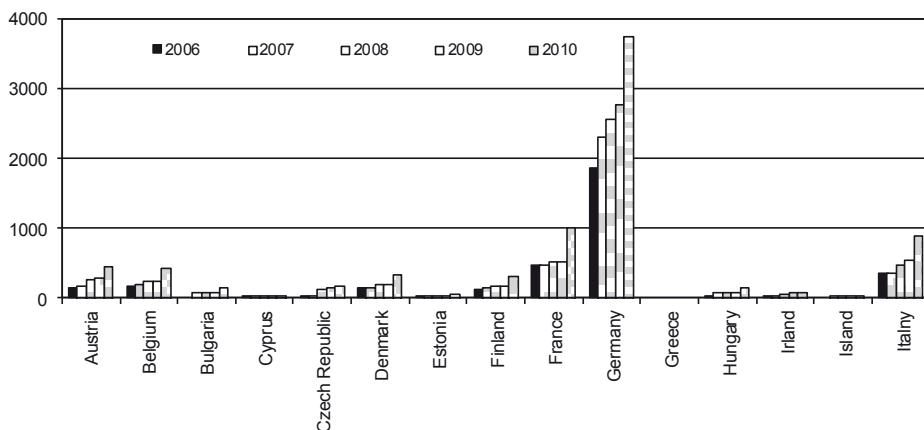


Fig. 12. Number of approved tachograph workshops in Europe in 2006–2010 (part 1)

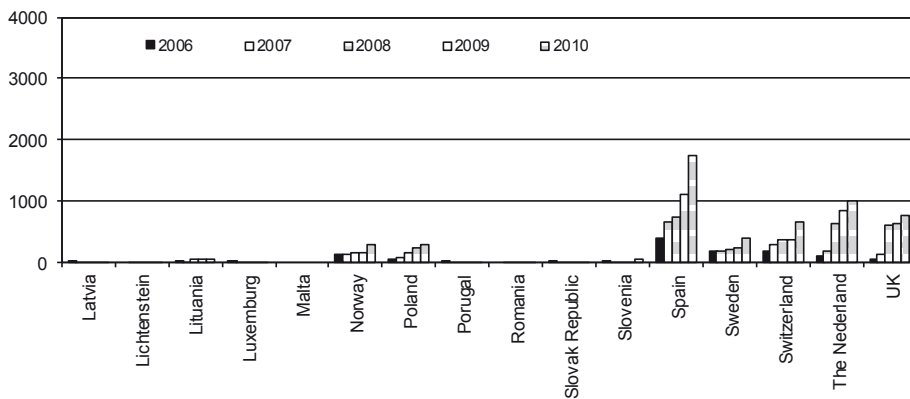


Fig. 13. Number of approved tachograph workshops in Europe in 2006–2010 (part 2)

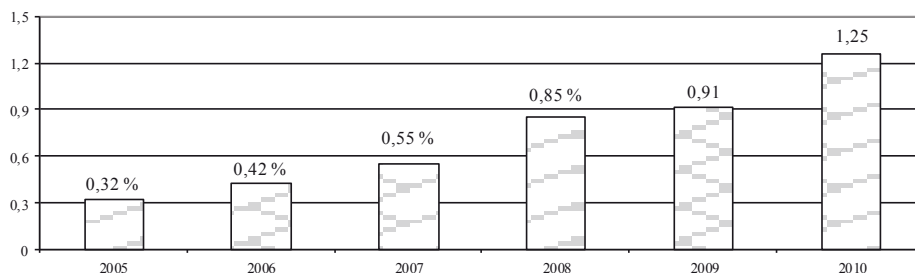


Fig. 14. Percentage participation of lost or stolen issued cards in 2005–2010

In the coincidence of time sheets, biggest their numbers were spent in Germany (19415), of Spain (9741), United Kingdom (8566), however in Poland (1469); in Greece to date 675 time sheets were issued.

In Germany they spent 51795 of workshop cards, and in Spain 3953, in Poland 1870. Malta, on account of the quite small transport marketplace, isn't inserting digital tachographs workshops.

The most cards for the entrepreneur stayed spent in Germany – 181742, in Spain 83213, in France 50193, in Italy 74825, however in Poland 22110, in Greece they only 145 were spent.

In the case of approved workshops, checking digital tachographs, the most of them stayed opened in Germany – 2548 points, in Spain of 1163 workshops, in Poland of 225 workshop points, in Greece 34 workshop points were opened.

On the land of states of Europe which led STC we have 32 institutions entitled to issue cards to tachographs. These institutions issued, in the period of STC functioning, 15680605 of all kinds of cards.

Table 1. Countries did not connect to TACHOnet system

Countries not yet connected to TACHOnet system		
EU countries: Hungary is in test phase. Denmark is in test phase. Portugal is in test phase.		
Countries not yet connected to TACHOnet system		
Non EU-AETR countries: All countries have a technical problem with connecting and technical functioning of european tachonet system.		
Countries are connected to TACHOnet system		
Austria Belgium Bulgaria Czech Republic Cyprus Greece Estonia Finland France Germany	Hungary Iceland Ireland Italy Latvia Lithuania Lichtenstein Luxembourg Malta Norway	Poland Romania Slovak Republic Slovenia Spain Sweden Switzerland The Netherlands United Kingdom

Summary

In Europe digital tachograph cards are issued by 32 card issuing authorities. In consecutive years of functioning of digital tachograph system the following number of cards were issued (table 2) and percentage participation of malfunctioned cards were (table 2).

Table 2. Number of issued and malfunction cards in 2005 to 2010

Year	Issued cards	Malfunction cards
2005	233087	0,32%
2006	1278954	0,42%
2007	1666613	0,55%
2008	1443636	0,85%
2009	4002033	0,84
2010	4736122	0,91

In light of introduction of digital tachograph second generation still we have a problems with connect to european tachonet system for inspectors from road transport inspection in different countries during control period. Only inspectors from road transport inspection in Germany have connection to tachonet system during process of check drivers.

The system of digital tachographs is using numerous systems of the cryptology to the purpose secured of access of not authorised persons but is being met much of examples of the manipulation of recording and recommendations of digital recorders.

At present many problems exist in the scope of functioning of the system of digital tachographs. It is possible to rate among it:

- connecting to the TACHOnet system for inspectors under carrying a road check is missing,
- numerous possibilities of the manipulation of recommendations of digital tachograph,
- possibility of erasing the memory of the card of the driver,
- frequent frauds of drivers which requirements concerning digital tachographs and the system of digital tachographs are enabling
- interpretation of records concerning individual elements of the system of digital tachographs is lacking the brightness,
- attempts to distort placing the digital tachograph during the term review.

They are these are problems which should be taken into consideration while preparing introducing requirements for the digital tachograph of the second generation (according to with Commission Regulation (EU) No 1266/2009 of 16 December 2009 adapting for the tenth time to technical progress Council Regulation (EEC) No 3821/85 on recording equipment in road transport).

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AWARYJNOŚĆ SYSTEMU CYFROWYCH TACHOGRAFÓW W ASPEKcie PROWADZENIA CYFROWYCH TACHOGRAFÓW DRUGIEJ GENERACJI

Streszczenie. Artykuł przedstawia główne prawne zasady systemu tachografów cyfrowych, który muszą być spełnione przez producentów tachografów cyfrowych w aspekcie homologacji typu oraz możliwości przyszłych wymogów w stosunku do tachografów cyfrowych. Wymagania te zawierają wymogi stawiane tachografom cyfrowym w aspekcie użytkowania przez kierowców jak i dopuszczania ich podczas okresowych kontroli, zarówno w Polsce jak i Unii Europejskiej w oparciu o rozporządzenie Komisji (WE) nr 1360 z 13 czerwca 2002 roku. Artykuł przedstawia również poziom implementacji poszczególnych elementów systemu tachografów cyfrowych w Europie w świetle wprowadzenia tachografu cyfrowego drugiej generacji.

Słowa kluczowe: tachograf cyfrowy, karta kierowcy, karta warsztatowa, karta kontrolna, karta przedsiębiorcy, warsztat