

# Changing Data in Tachograph's Recording: a Case Study

Mateusz Sudowski, Beata Mrugalska  
*Poznan University of Technology, Poland*

The purpose of this article is to show how important it is to respect the rules of road safety related to the work of drivers and what the consequences of breaking them are. The problem of the manipulation of working time is widely discussed as it contributes to creating dangerous situations not only for operators but for other road users as well. On the basis of the questionnaire investigation, the most popular methods of changing data in analogue and digital recording equipment are described. On the basis of them, technological and organizational changes are proposed in the existing transport system.

**Keywords:** drivers, road transport system, tachograph, transport.

## 1. INTRODUCTION

Transport plays an important role in today's economy and society as it contributes to creating jobs and influences the development of manufacturing companies. Nowadays, this sector employs around 10 million people and accounts for about 5% of gross domestic product (GDP). The rapid development of domestic and international trade has mainly an effect on increasing demand for transport services. In European companies, logistics, such as transport and storage, is estimated to account for 10–15% of the cost of a finished product [1]. This situation leads to the willingness of delivering more and more goods in shorter period of time in order to be more competitive on the market. In order to achieve it drivers work faster, or in a longer period of time than it is allowed in the labour code.

Manipulation is a violation of regulations to falsify data records from drivers' time recording devices. It concerns all activities related to changes in tachograph indications, regardless of the accepted standards and regulations of the transport industry [2]. This problem is primarily known to inspection services, owners of transport companies and professional drivers throughout the whole Europe, not only in Poland. In recent years, the number of meetings of various European

organizations have taken place, bringing together inspectors across Europe. Among them the most widely recognized are: Euro ContrôleRoute, CORTE, Tispol, Masterclass, DG MOVE. The topics of such meetings are mainly digital technologies (data sharing/enforcement) and fair competition and workers' rights. The methods of manipulation and the most effective practices for detecting these violations are discussed in details. Their main reasons such as time pressure and severe penalties for not delivering the goods on time are also mentioned. It seems that in spite of the fact that drivers are aware of the consequences and also the amount of penalties that can be imposed on them, they often act irresponsibly not following the rules in force [3].

## 2. DEVELOPMENT OF TACHOGRAPHS

In 1939 it was the first time when the obligation of using tachographs was introduced into the law in the USA. In the first Western European countries it was legislated at the beginning of the 1960s. On 1<sup>st</sup> July 1970 in Geneva, the AETR Convention was established and during this meeting the European Agreement for the Work of Crews and Vehicles Performing International Road Transport was defined. The next step was to create the Regulation of the Council of the European

Economic Community (EEC) No 2135/98. The Council Regulation (EEC) No 3821/85 was established on 20<sup>th</sup> December 1985 and it was the first time when it concerned the issue of recording equipment in road transport [4]. The next changes into the law were introduced by the Regulation 2135/98/EC [5] and 1360/2002/EC of the European Parliament and the Council [6]. The most recent binding documents are the Regulation No 165/2014 of the European Parliament and the Council of 4<sup>th</sup> February 2014 on tachographs for road transport and repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and the Council on the harmonization of certain social legislation relating to road transport [7-8]. However, now it is possible to find the guidelines of the Regulation 165/2014. According to it, it will be required to install intelligent tachographs from June 2019. The recording equipment will have a satellite locating system that will allow accurately to record the route of the vehicle at any time. The data will be transmitted wirelessly via Bluetooth and microwaves to road inspections. The control services will be able to analyze tachograph data at a distance even without stopping the vehicle [9, 10].

### 3. MANIPULATING TACHOGRAPHS: A CASE STUDY

#### 3.1. MATERIALS AND METHOD

The present study was carried out among a group of 46 professional drivers who work in transport companies in Poland. The most of them were at least 35 and had more than 5 years of work experience (about 74% of all respondents). On the other hand, there was a small number of people under 25 and over 55 years old. Only 10% of the respondents worked as drivers for less than 3 years what can indicate that most of the people had an experience and knowledge of their work. Moreover, nearly 60% of the respondents provided services abroad. The vast majority of these drivers (76%) travelled more than 5,000 km, but not more than 15,000 km. More than 43% of the respondents declared that they spent from 4 up to 5 days at work. Only 11 respondents declared that they worked within the area of their residence and their routes did not last more than one day.

The data examined in this research paper have been collected by a questionnaire, which was handed out to a chosen group of professional

drivers. It consisted of 14 questions, however, 6 of them were used for the purpose of this study. They concerned general information about the respondents and the detailed investigation of the methods of changing data on analogue and digital tachographs.

#### 3.2. RESULTS AND DISCUSSION

In the research study a questionnaire was conducted whose results are shown in Figure 1.

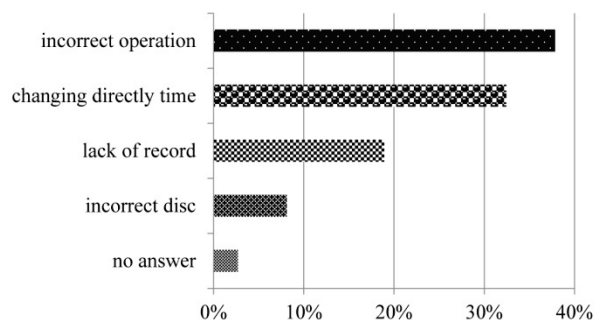


Fig. 1. Types of infringements on tachographs.

As it can be seen the most common infringement was the incorrect use of the recording device. Furthermore, 32% of the respondents interfered with their work time while 7 people (19%) replied that they infringed the tachographs because they did not have the required analogue tachograph disc. 3% of the respondents did not provide any information on how they infringe the working time of the tachographs.

Drivers often do not realize the misuse, or consciously cheat working time by using OUT function in digital tachographs. In order to do it, it is only needed to pull out the driver card from the tachograph slot and turn the OUT function on the tachograph menu. However, this mode is allowed to use in case of a road test of the vehicle. It concerns the situations when the vehicle was in the garage and there is a need to check the vehicle in traffic. It is also possible to use the OUT function in new or upgraded vehicles that are not authorized. If it is detected, the penalty will be the same as for driving without a card or with 2 cards.

Drivers can also influence their working time by using the card which belongs to somebody else. The most of the drivers use the owner's card, the relatives' one or that of other employees. However, it refers only to the digital tachographs because in a case of an analogue tachograph a driver can type in any surname on the dial. Such a violation can be only detectable on the spot by finding the wrong

card in the recording device. The inspectors are not able to verify previous unfair attempts. The exception may be only regular activities that may appear suspicious. The amount of fine is the same as for the offense associated with non-registration of driver activity, speed or distance of the vehicle.

Another method of manipulation is to use special equipment or items which interfere with the proper operation of the tachograph. If during a roadside inspection inspectors find such a system or device they may impose on a driver a fine of 2,000 PLN. Managers will also be given a penalty of 2,000 PLN for violation of regulations, and the owner of an enterprise is subject to a financial penalty of 5 000 PLN.

The owners of the vehicles manufactured between May 1, 2006 and October 1, 2012 usually use the magnets to manipulate the driver's activity time. A magnet with a precise magnetic moment is sufficient to attach to the pulse at the gearbox. In this way the digital tachograph is deceived and it starts to indicate the rest period when the vehicle moves. The method of discovering this manipulation is to stop the vehicle and read the data stored in the digital tachograph memory in order to analyze the selected time period. It is easy to find periods indicating a motion sensor error, thus raising the suspicion of using this type of manipulation. Such a magnet is often purchased in any metal or gardening shop. Some drivers have discovered that even their lorries have components of magnetic characteristics that allow interference with the work. For example, in SCANIA vehicles it is hidden in the centre drawer of the console whereas VOLVO trucks have a magnet in the access cap for Ad Blue. The designers designed it to bounce the gun while refuelling Ad Blue. Third generation digital tachographs are constructed in such a way that it was impossible to mount the magnet on the gear pulse. The difference lies in reading the data. The tachographs of the last generation are fitted with a second vehicle traffic signal. It comes from a board computer, and the motion sensor detects the change of magnetic field when the magnet is applied.

The next manipulation called lack of record results from the fact of driving without a card. The driver can pull it out of the tachograph slot when he finishes his shift. Then any activity will be not recorded on the card. However, traffic control can detect this fault by reading data stored in the digital tachograph. It is possible to verify the data back and find the periods and the number of miles travelled without a card in the device recording the

working time and activities of the driver. For this infringement, a fine of 2,000 PLN is given to a driver, 2,000 PLN for the managing person and 5,000 PLN for the company.

In the case of the analogue tachographs, the vehicle holders can get rid of the previously recorded tachograph discs. In the absence of roadside control such offense is undetectable. Inspectors can only guess that the recorded sheets are missing. The penalty can also be given for incorrect or illegible writing data on a circular chart.

#### 4. APPLICATION OF MODERN SOLUTIONS TO TACHOGRAPHS

In order to eliminate the possibility of driver's manipulation, modern technical solutions could be applied in the recording time devices of vehicles. The first one could refer to the driver's card system which should be based on the fingerprints of the card holder. This solution would be a breakthrough in the operation of digital tachographs, as all vehicles would be equipped with a fingerprint scanner. It could work as follows:

- 1) after logging in the card in the tachograph slot, the driver's fingerprints should be scanned in the scanner located on the dashboard,
- 2) the compatibility of the fingerprints on the card and on line reading would allow the driver to work properly,
- 3) in a case of divergence of the fingerprints, the vehicle would be locked.

Such a solution would prevent drivers from driving on someone else's cards. The driver would not risk using a non-card driver as getting rid of such a blockade could be only done by the road transport inspectors after paying a fine.

In addition, the increase of penalties should also discourage the drivers from manipulating the recorders. The drivers would pay more attention to the activities related to the recording of their working time. They would participate in the trainings and courses about the correct recording of data and activities.

The Road Transport Inspection could increase the number of inspections carried out on roads. If it was introduced simultaneously with a new higher driver tariff, drivers would be reluctant to change the tachograph data. Furthermore, mobile vehicle control stations would allow to control vehicles in the area of manufacturing and commercial

companies. The need of the introduction of such stations results from the fact that the most of cases of using unauthorized equipment take place in the companies where they load and unload goods.

Another suggestion could be the obligatory introduction of arrival/departure time of vehicles on transportation documents. Whenever a driver arrives or leaves the company such information should be entered. As a result, this information would simplify the verification of data stored on the driver card or analogue record. During loading and waiting periods, drivers are required to change their status of being on duty from activity to interruption of activity. The comparison of data from two sources would improve the reliability of the recorded data.

## 5. ERGONOMIC AND ECONOMIC EFFECTIVENESS OF THE PROPOSED CHANGES

The implementation of the proposed changes could bring both positive ergonomic and economic effects. The main ergonomic advantage is the impact on the health of drivers. Preventing drivers from manipulating their working time will reduce the rate of occupational diseases mainly associated with a high prevalence of back pain. The factors that contribute to such pain are prolonged sitting, awkward postures and exposure to whole-body vibration [11, 12].

The changes will also have a positive effect in economic terms. The proposed idea of introducing a single system will eliminate competition because any company will be not able to interfere with the working time of its drivers. It will not be able to execute more orders to increase the profit of the company.

## 6. CONCLUSIONS

Road safety assurance is one of the greatest problems of modern motorization. As the research results show a considerable amount of vehicle accidents is related to drivers falling asleep, especially on motorways. When drivers become fatigued, their attention and alertness decrease. In order to better assure the compliance of road transport with the health and safety law and standards, the provisions on usage of time recording devices such as tachographs were introduced. However, their respect is not always achieved what is particularly visible when controls of vehicles are done.

In this paper the problem of professional drivers' working time infringement was presented. The most common manipulations such as incorrect operation, attempt to changing time directly and the lack of records were determined, what contributed to the proposal of organizational and technical changes to prevent or eliminate driver manipulation malfunctions.

## REFERENCES

- [1] European Commission, Transport sector economic analysis, <https://ec.europa.eu/jrc/en/research-topic/transport-sector-economic-analysis>.
- [2] Rychter, M., Sulek, P., & Smieja, M. (2016). The correctness function of intelligent device recording in aspect used and their safety. *Journal of KONES*, 23(3), 419-426.
- [3] [http://www.euro-controle-route.eu/site/files/tekstfotos/12-ECR-AnnualReport\(NO-001\)EN.pdf](http://www.euro-controle-route.eu/site/files/tekstfotos/12-ECR-AnnualReport(NO-001)EN.pdf)
- [4] Council Regulation (EEC) No 3821/85 of 20 December 1985 on recording equipment in road transport.
- [5] Council Regulation (EC) No 2135/98 of 24 September 1998 amending Regulation (EEC) No 3821/85 on recording equipment in road transport and Directive 88/599 / EEC concerning the application of Regulations (EEC) No 3820/85 and (EEC) No 3821/85.
- [6] Commission Regulation (EC) No 1360/2002 of 13 June 2002 adapting for the seventh time to technical progress Council Regulation (EEC) No 3821/85 on recording equipment in road transport.
- [7] Regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs for road transport and repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonization of certain social legislation relating to road transport.
- [8] Sel, M., & Karaklajic, D. (2014). Internet of Trucks and Digital Tachograph–Security and Privacy Threats. In *ISSE 2014 Securing Electronic Business Processes* (pp. 230-238). Springer Vieweg, Wiesbaden.
- [9] Regulation (EC) No 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonization of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) 2135 / 98 and repealing Council Regulation (EEC) No 3820/85.
- [10] Prasolek, L. (2016). Transport: Jak ograniczyc manipulacje przewoznikow w urzadzeniach pomiarowych, <http://www.rp.pl/arttykul/1101050-Transport--Jak-ograniczyc-manipulacje->

przewoznikow-w-urzedzeniach-  
pomiarowych.html#ap-1.

- [11] Robb, M.J. & Mansfield, N. J. (2007). Self-reported musculoskeletal problems amongst professional truck drivers. *Ergonomics*, 50(6), pp.814-27.
- [12] Raffler, N., Ellegast, R., Kraus, T., & Ochsmann, E. (2016). Factors affecting the perception of whole-body vibration of occupational drivers: an analysis of posture and manual materials handling and musculoskeletal disorders. *Ergonomics*, 59(1), pp. 48-60.

Date submitted: 2017-08-18

Date accepted for publishing: 2017-09-27

---

**Mateusz Sudowski**  
**Poznan University of Technology, Poland**  
**mateusz199116@wp.pl**

**Beata Mrugalska**  
**Poznan University of Technology, Poland**  
**beata.mrugalska@put.poznan.pl**

