CITA webinar

Brussels , 19th of October 2022

Effect of Periodic Technical Inspections of Vehicles on Traffic Accidents in the Slovak Republic (Part II.)

Jaroslav Olexa, Head of Supervision Department, TESTEK, a.s.
Juraj Hudec, Head of Supervision Department, MOT

Who is responsible for supervision in Slovakia?

until May 2018:

- **Ministry of Transport** and Construction of the Slovak Republic (supervision department)
- **local authorities** (transport department of district offices /approximately 50 departments/)
- TESTEK, a.s. was in position of an ***expert consultant*** during supervisions (since 2004) done by state authorities, employees were members of the control groups

since May 2018:

- **Ministry of Transport** and Construction of the Slovak Republic (supervision department)
- **local authorities** (transport department of district offices /approximately 50 departments/)
- **technical service** for technical vehicle inspection (TESTEK, a.s.)
  - supervision department
  - accredited inspection body - type „C“ according to ISO/IEC 17020: 2012
  - certified according to ISO 37001
  - auditors do not perform equipment checks (functionality and calibration) and facilities (another department of TESTEK, a.s.)

How to supervise the PTI in an efficient way?

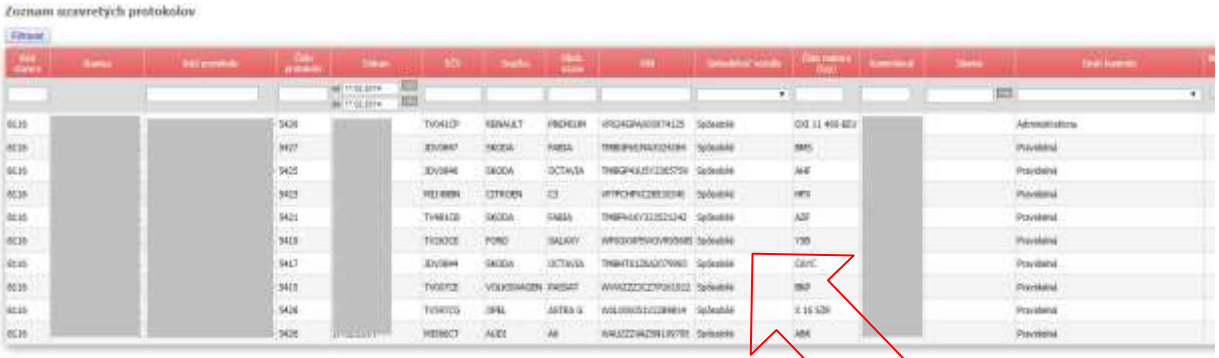
	Re-inspection	Data Analysis	Mystery Shopping
efficiency	*access to a limited number of PTIs*	*access to every PTI*	*no access to real PTIs, testing only simulated cases in limited number of facilities*
personal costs	*high number of qualified re-inspectors*	*lower number of qualified supervisors*	*high number of "mystery shoppers"*
technical means	*IT system, mobility of re-inspectors*	*IT system, HW / SW, data transfers, cameras etc.*	*IT system, frequently changed vehicles with defects*
scope	*every inspecting item (including corrosion, excessive play etc.)*	*measured data and items visible on video (essential items like brakes, lighting, emissions etc.)*	*limited number of defects in certain inspecting items; the driving safety of the prepared vehicle must be considered*
psychologic impact	*high but limited on the inspected facility*	*extremely high in the beginning („big brother is watching you" effect) but fading (inspectors are getting used to cameras), later limited on the inspected facility*	*high but limited on the inspected facility*

CCTV cameras

Why CCTV cameras?

- until 2013 **common practice** – „inspection“ without vehicle

system (database)

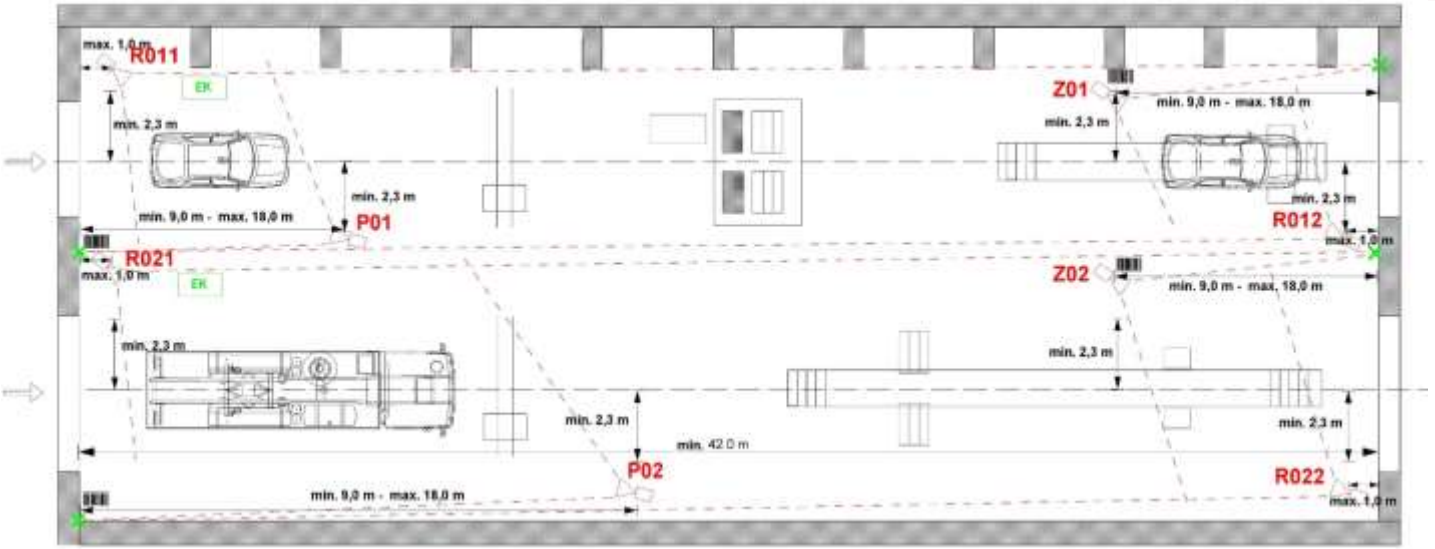


PTI lines

CCTV cameras

since 2018: significant changes in configuration

- **entry** and **exit** cameras with automated recognition of licence plate
- **two overview cameras** /mandatory to cover 100 % of the PTI line/
- example: two (and more) lines PTI station



R011, R012, R021, R021 – overview cameras
P01, Z01, P02, Z02 – entry and exit cameras

CCTV cameras

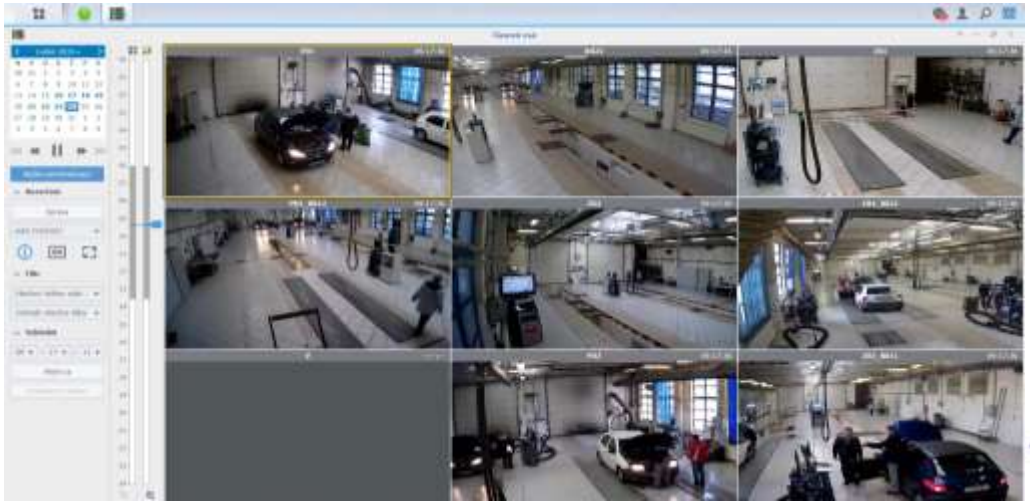
since 2018:

- video footage from the inspection is **stored locally** on hard disk for **2 years** and **is accessible** for supervision authorities - locally but also via **remote administration** (5 different CCTV suppliers)

PTI station **must:**

- allow the establishment of **permanent remote electronic access** to a video stored locally on the server of the PTI station

Example of remote access:



The **whole inspection** process is covered by cameras (necessary condition if the supervision should be done by video analysis).

Duties of the PTI station

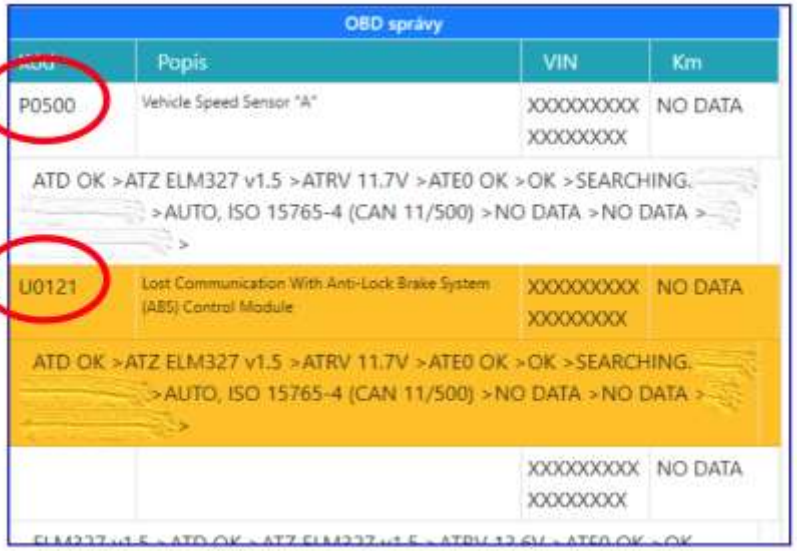
Smart devices in the process of PTI (since 2020)

- **scanning** and transferring data from OBD (first reg. 2012 and further)
- **mobile application** for deceleration measurement (mandatory)
- scan (shoot) the vehicle's **VIN + mileage** (to exclude bringing identical vehicles for PTI), pictures **marked** with the GPS coordinates
- a set of **mandatory** photos + photos from cameras

Duties of the PTI station

OBD (OBFCM) data reading (OBD since 2020, OBFCM in progress

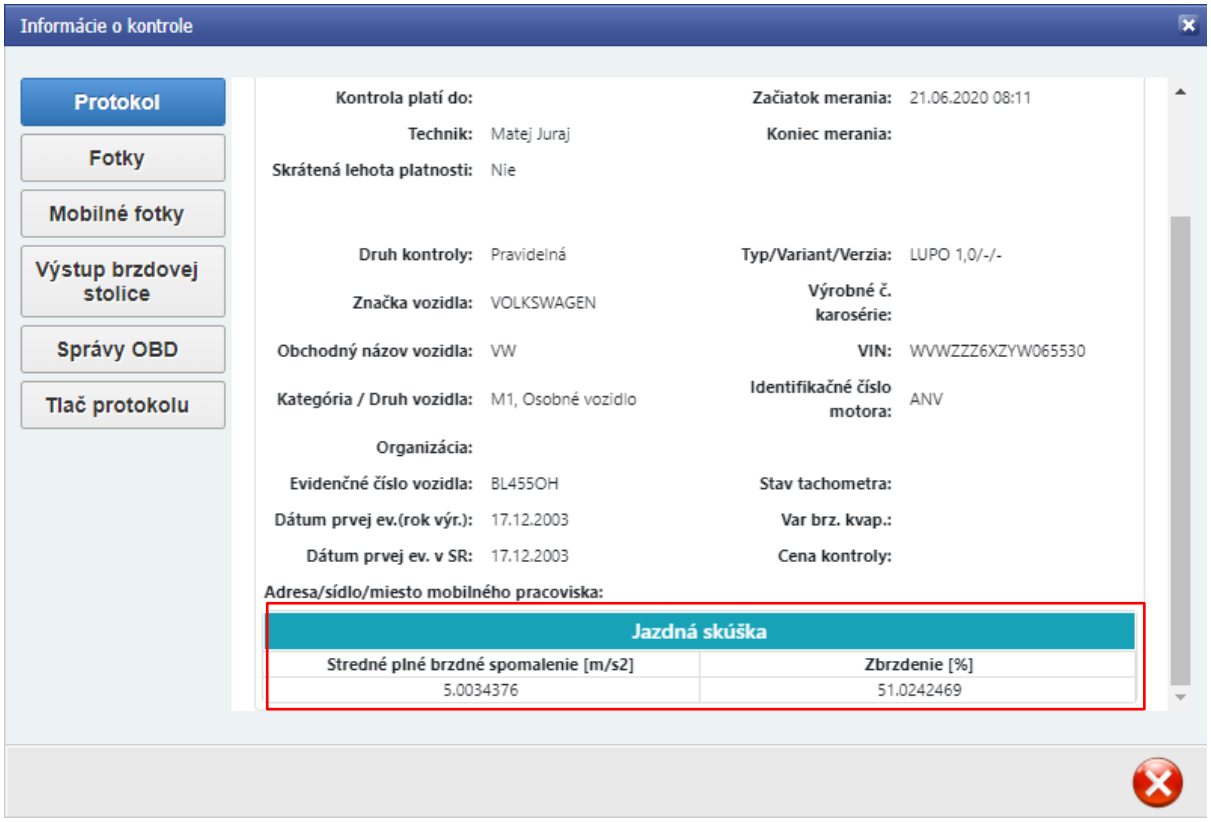
- in case of **loading** error codes relevant from the point of view of the technical inspection (not emission), the information system automatically **marks** them and **assigns** the corresponding defect, the technician is **notified** visually in the OBD tab of the report, and the corresponding defect is automatically **entered** into the inspection report



The information system

Driving test: for 4WD vehicles brake test

since 1th of January 2021: mobile application for measuring deceleration (DX meter)

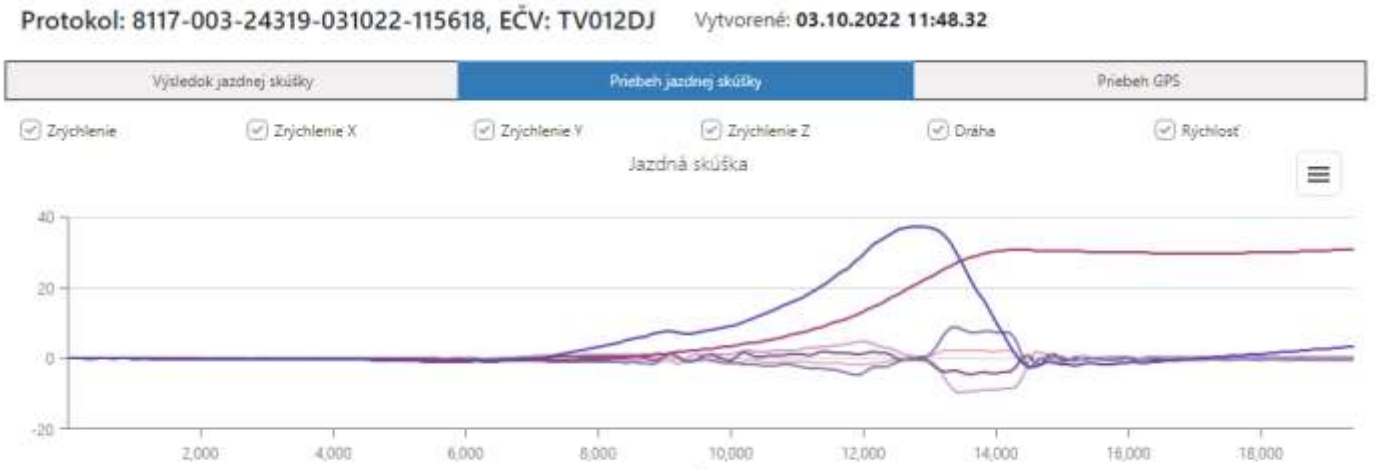


Supervision of PTI in Slovakia

The information system

Driving test: for 4WD vehicles brake test

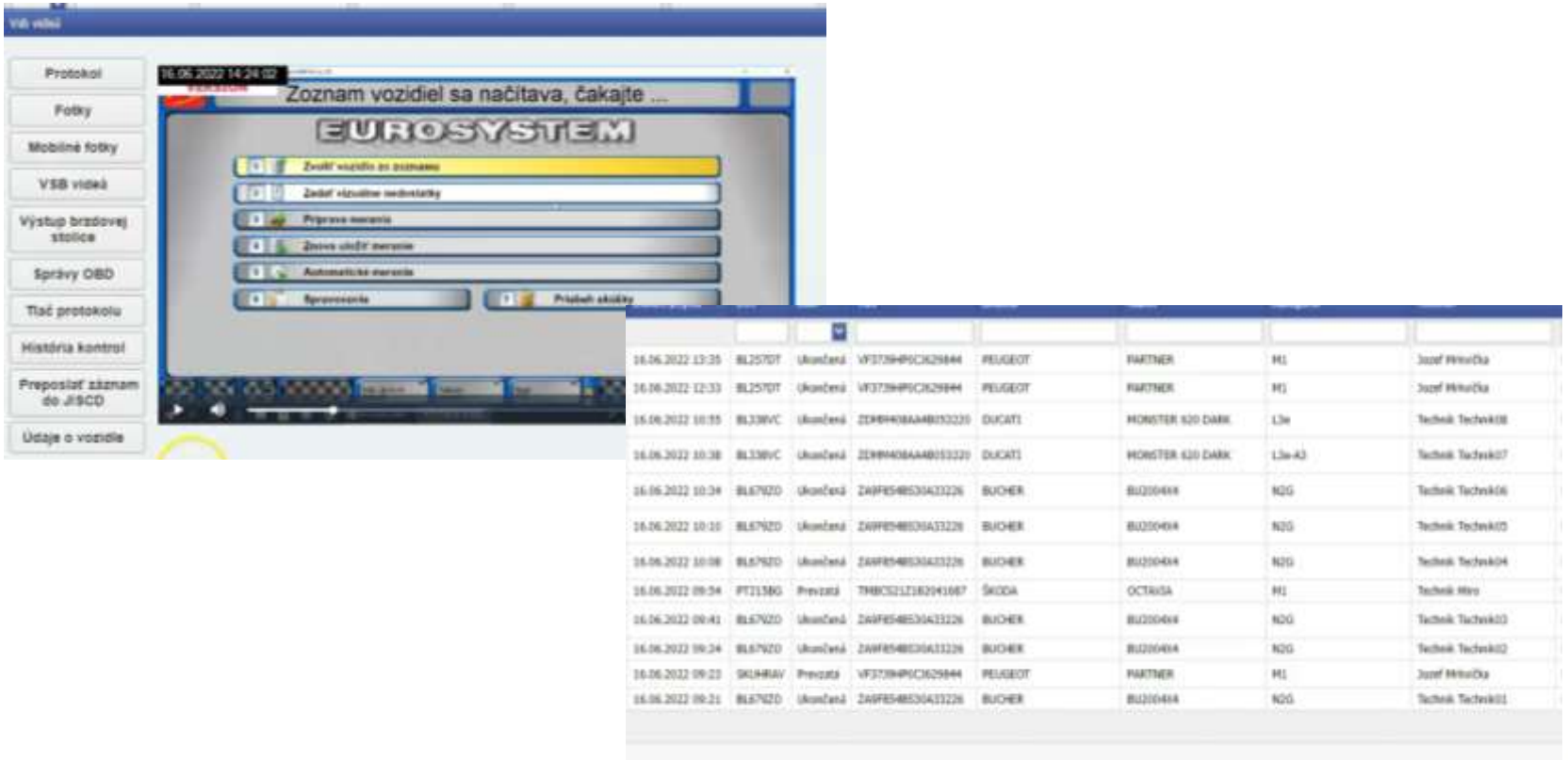
Results in IT system: deceleration graphs, GPS map



The information system

Recording of the brake test monitor (since 2022):

video sample in the IT system



possibility to see also not transmitted measurements

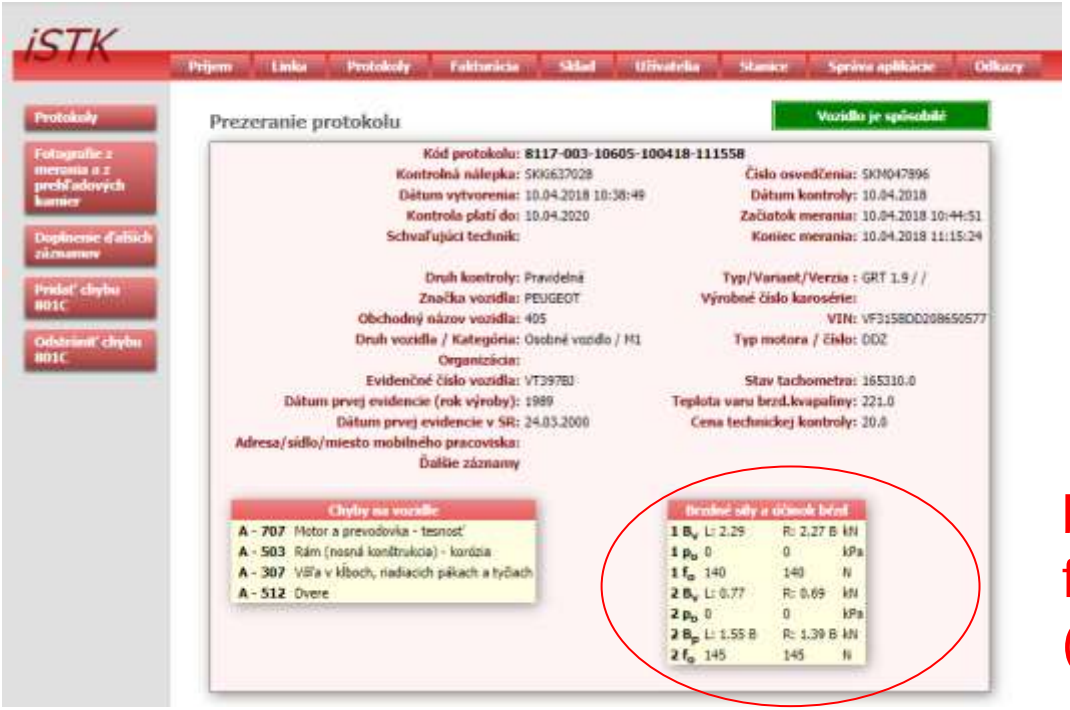
What is important during the PTI?

20th of August 2022, Türkiye, 19 dead, brake failure

https://www.theguardian.com/world/2022/aug/20/at-least-32-people-killed-in-turkey-in-separate-road-accidents

The information system

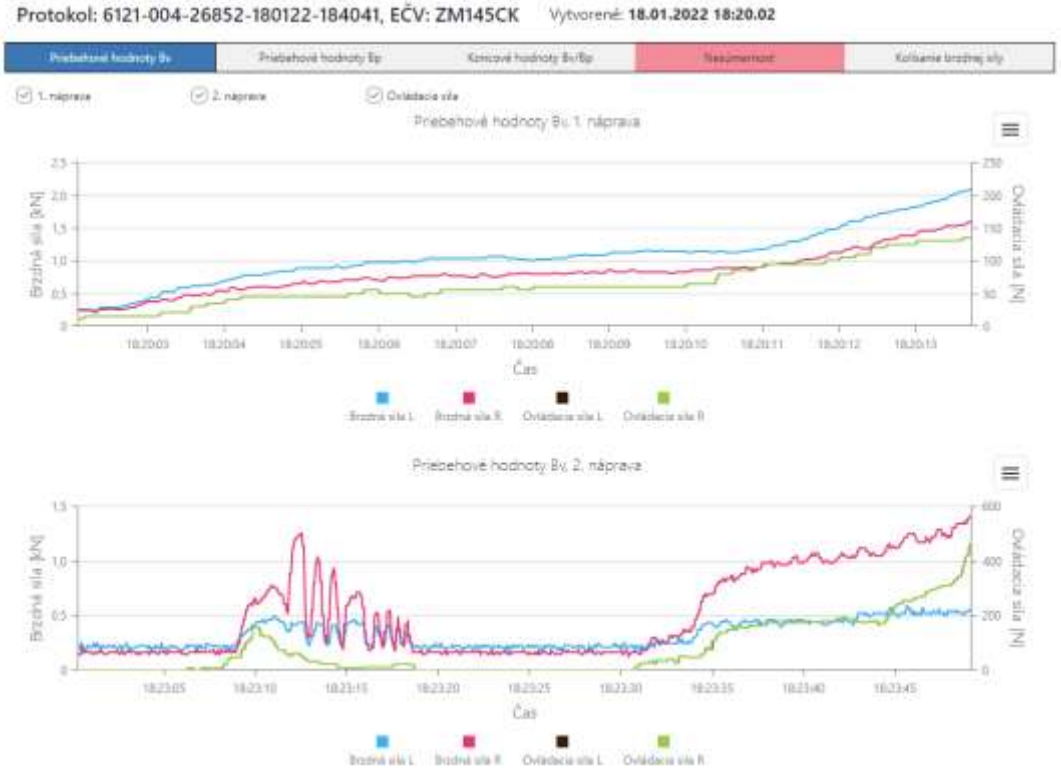
AIS TK – information system for PTI stations and supervision authorities (old version) – since January 2009 **automated recording and data transfer** of measured braking force, pedal force and air pressure



braking data – only final values available (to 2016)

Information system

CIS TK – information system for PTI stations and supervision authorities **<u>extended</u> data transfer** (since February 2016)



breaking data – **final** values plus **intermediate** values + **asymmetry** and braking force **fluctuations** + pedal **force** respectively air **pressure**

The information system

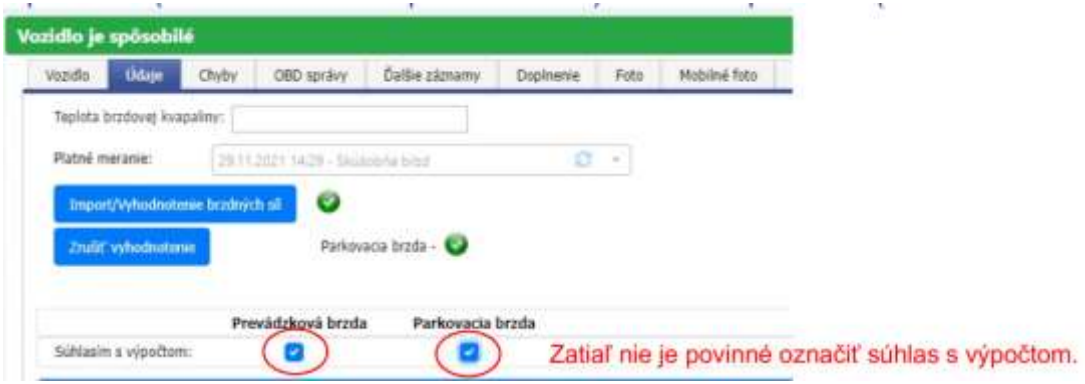
CIS TK – since February 2016 **extended data transfer**

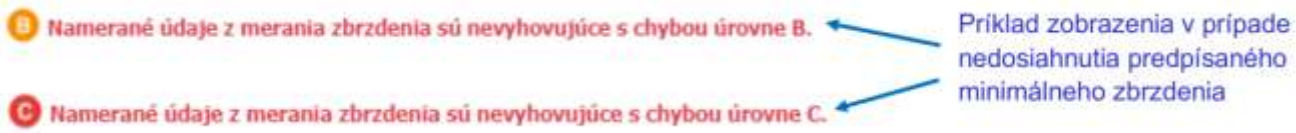
Scope of transferred data:

- values of **brake force** and **pedal force** (hydraulic systems) or **air pressure** (pneumatic systems) from the whole **service brake** test measurement (at least 30 seconds) recorded with sampling frequency 10 Hz
- values of **brake force** from the whole **parking brake** test measurement (at least 5 seconds) recorded with sampling frequency 10 Hz
- **pressure** in every brake circuit (pneumatic systems)
- information about the reaching of **wheel lock** during measurement (for service brake and for parking brake)
- brake force **fluctuation** (ovality, for service brake only)
- **passive resistance** value – self inflicted braking effect without any activation of the brake pedal
- **maximum difference** between the brake force on the left and right side of the axle (i.e. continuous **asymmetry**)
- **difference** between the brake force on left and right side of the axle **at the maximum brake forces measured** (i.e. final asymmetry)

The information system

Automatic calculation of the **braking ratio** of the service and parking brake (since 2022)





B – major defect (1.2.2.1 or 1.4.2.1 according to directive No. 2014/45/EU)

C – dangerous defect (1.2.2.2 or 1.4.2.2 according to directive No 2014/45/EU)

Based on the transferred data from brake tester, automatic calculation of brake efficiency **for technicians** but also **for the supervision department** (automatic indication of incorrect evaluation).

Data mining

Data analysis (since 2018): risk criteria (preparation phase for supervision)

- number of inspections per inspector
- number of inspections per PTI station
- percentage of temporary roadworthy and not roadworthy vehicles per PTI station/per technician
- average duration of inspection per PTI station/per technician
- percentage of not evaluated vehicles
- an increase/decrease of the observed criteria over time (time comparison)

Data mining

Suspicious checks module (since 2020): automatic indication of suspicious facts

based on data transmitted and stored in the IT system

Technical (data from brake tester) and **non-technical** (for instance length of inspection) parameters

Non- technical:

- the same technician as in the previous inspections
- repeated inspection shortly after the regular inspection
- inspection during the weekend
- early morning (evening) inspection
- quick inspection of light vehicles
- quick inspection of heavy vehicles
- long waiting time
- vehicle from another district
- technician with low roadworthiness

Technical

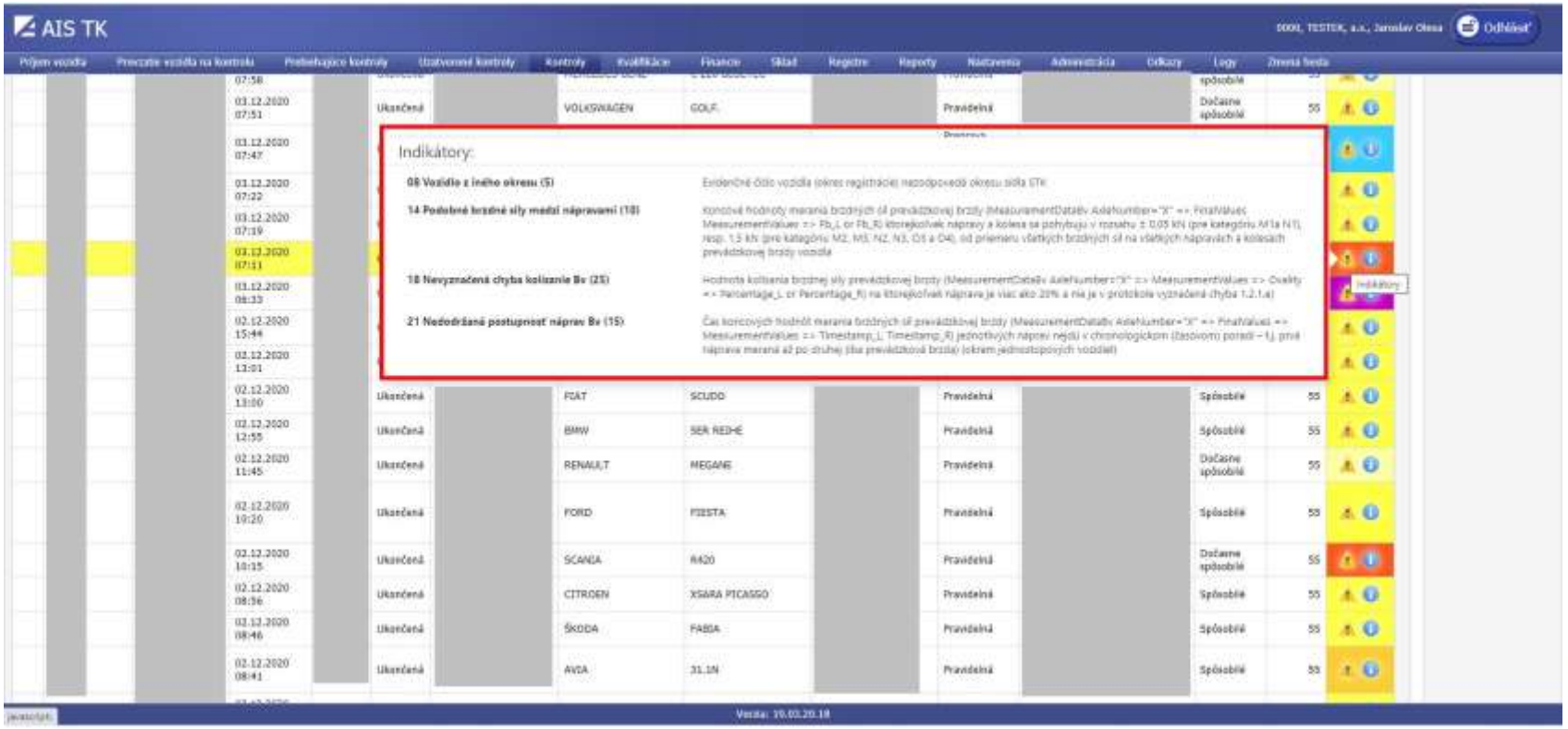
- long measurement time between axles - service brake
- short measurement time of service brake (under 10 s.)
- short parking brake measurement time (under 5 s.)
- long service brake measurement time (over 50 s.)
- similar braking forces between axles
- cut off service brake measurement – beginning of measurement
- cut off service brake measurement – end of measurement
- air pressure below 30% (air pressure brakes)
- unmarked deficiency asymmetry of brake force (item 1.2.1.b)
- unmarked deficiency fluctuation of brake force (item 1.2.1.e)
- unmeasured fluctuations of brake force
- parking brake measured simultaneously on both wheels
- axle measurement sequence not in order
- insufficient braking ratio - driving test
- long parking brake measurement time
- sharp increase in braking forces
- unjustified measurement procedure in 4WD mode
- insufficient force on the brake pedal (light vehicles)
- missing data from on-board diagnostics OBD
- insufficient braking ratio - service brake
- Insufficient braking ratio - parking brake

Data mining

Suspicious checks module: automatic indication of suspicious facts

Result seen in the IT system in form of „**traffic lights**“ and the „**risk score**“

Possibility of filtering according to risk criteria and other data in the system (technician, PTI station, period, etc.)



Video analysis

Data **recorded** and **transferred** from the roller brake tester:

the beginning and the end of the rear axle (service brake) measurement: 09:53:29 to 9:53:39 AM

AxleNumber	ns1:Fb_L	ns1:Fb_R	ns1:PercentageAsymmetry	ns1:Fo_L	ns1:Fo_R	ns1:Pb	ns1:PbMax	ns1:Timestamp_L	ns1:Timestamp_R
2	0,13	0,16		0	0			2017-10-25T09:53:29.628	2017-10-25T09:53:29.628
2	0,14	0,15		0	0			2017-10-25T09:53:29.678	2017-10-25T09:53:29.678
2	0,12	0,16		0	0			2017-10-25T09:53:29.728	2017-10-25T09:53:29.728

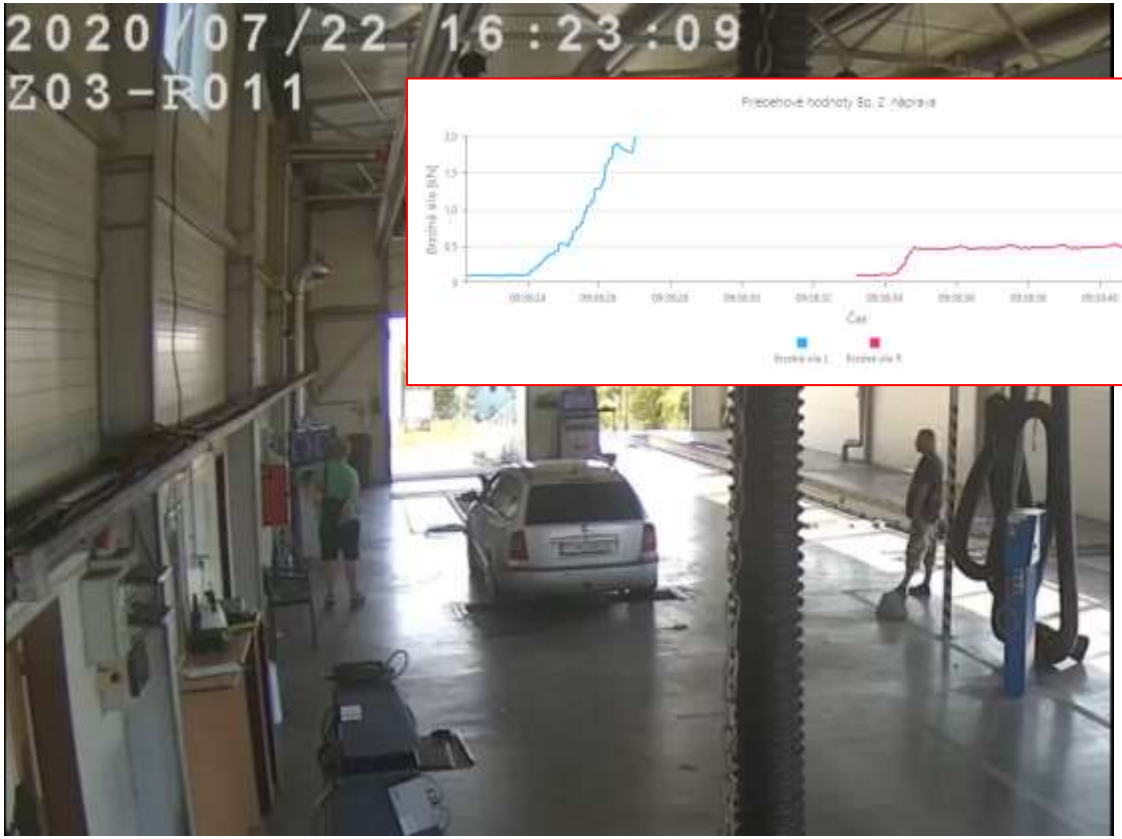
AxleNumber	ns1:Fb_L	ns1:Fb_R	ns1:PercentageAsymmetry	ns1:Fo_L	ns1:Fo_R	ns1:Pb	ns1:PbMax	ns1:Timestamp_L	ns1:Timestamp_R
2	1,19	1,02		185	185			2017-10-25T09:53:39.778	2017-10-25T09:53:39.778
2	1,2	1		185	185			2017-10-25T09:53:39.828	2017-10-25T09:53:39.828
2	1,21	0,99		180	180			2017-10-25T09:53:39.878	2017-10-25T09:53:39.878

During the alleged measurement of the rear axle **on the roller brake tester there is actuallly the front** axle being tested!

Video analysis

„Specific" methods of influencing the result

Why is the client **standing behind** the vehicle during the measurement?



Insufficient number of cooperating persons (third brake light)...

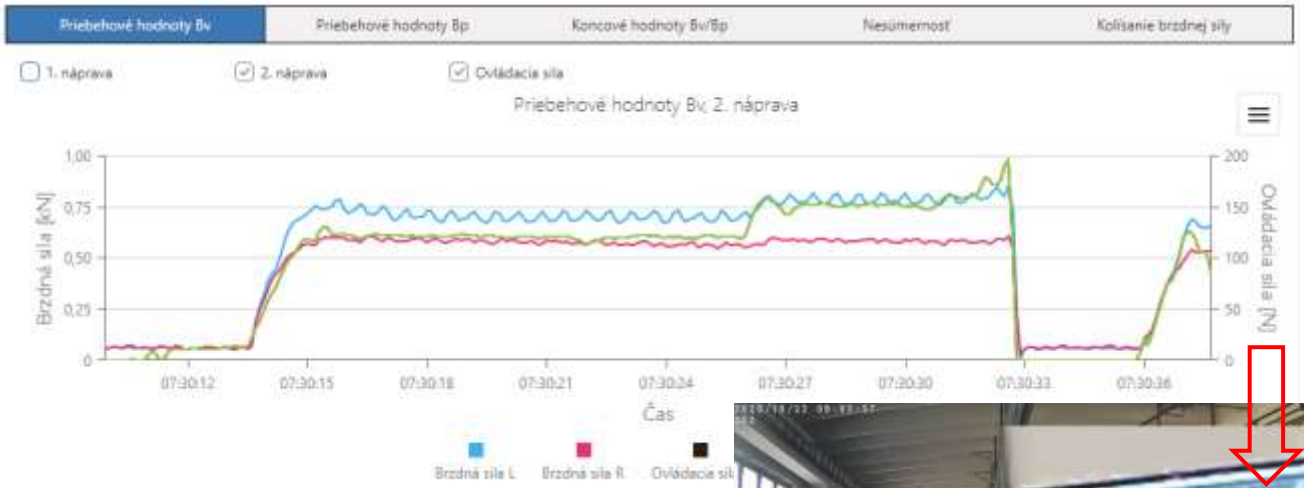
Video analysis

Specific forms of influencing the brake measurement outcome:

Why does the technician have **two different kinds** of shoes on his feet? The technician went in the dressing room (during the measurements), but **changed** only one shoe ...

Video analysis

Why doesn't the technician measure the braking forces up to the **wheel lock** or **maximum permissible pedal force** 490N?

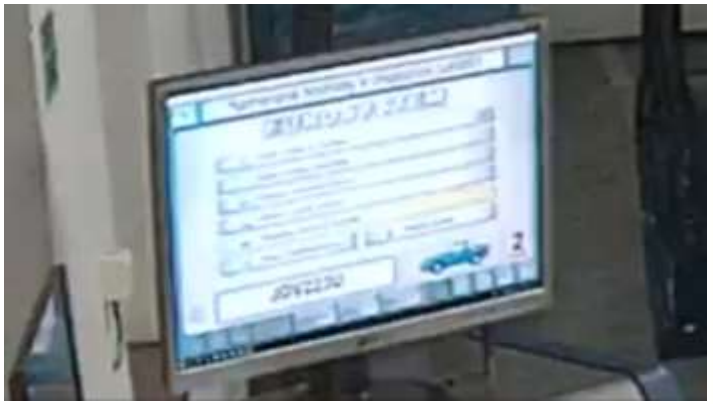


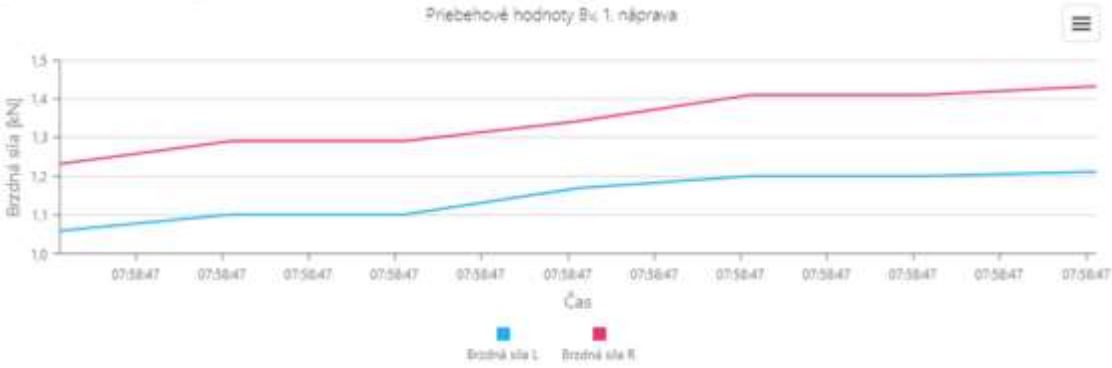
At a higher braking force (pedal force), the asymmetry of the brake forces (left and right wheel) **is indicated on the** brake tester

Video analysis

Various types of **incorrect (fraudulent)** measurements on the brake tester

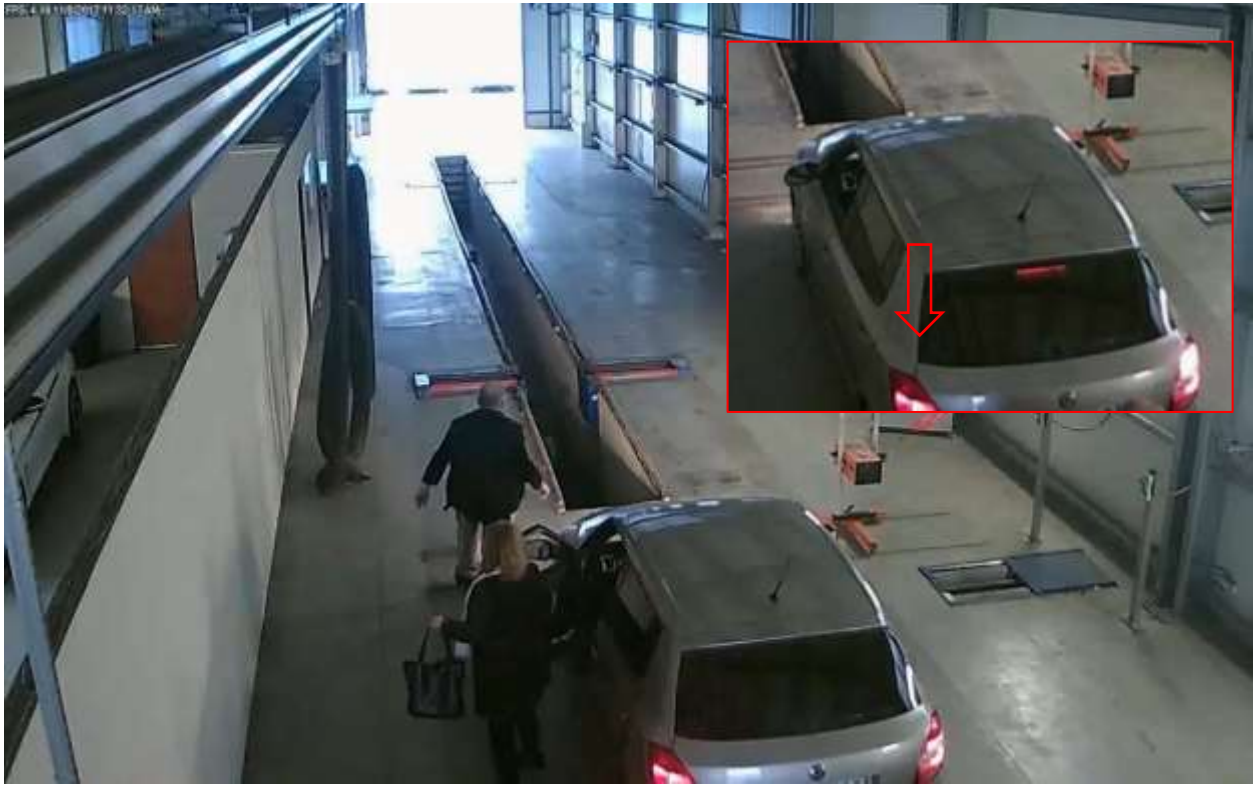
cropped measurement, super **short** and cropped measurement





Video analysis

The vehicle owner is **constantly standing**, respectively **walking** behind the vehicles while the vehicle is inspected on the brake tester.. why?



An attempt to **hide** a serious vehicle defect (dysfunctional left rear brake light).

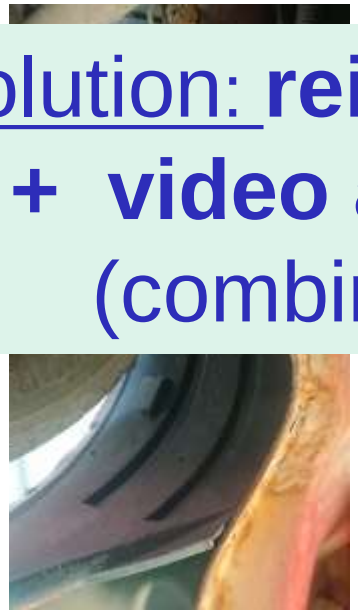
(in the picture: the moment when the brake pedal is pressed during the light inspection)

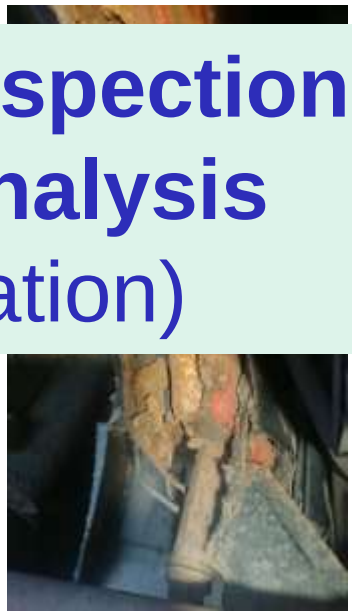
Next steps

What is not visible on the cameras?

Vozidlo je spôsobilé vehicle roadworthy...

Kód protokolu:	[redacted]-012-11649-220922-092544 (ID: 20716193)		
Kontrolná nálepka:		Číslo osvedčenia:	SKT332547
Dátum vytvorenia:	22.09.2022 08:55	Dátum kontroly:	22.09.2022
Kontrola platí do:	22.09.2024 09:25	Začiatok merania:	22.09.2022 09:00
Technik:	[redacted]	Koniec merania:	22.09.2022 09:21
Skrátená lehota platnosti:	Nie		

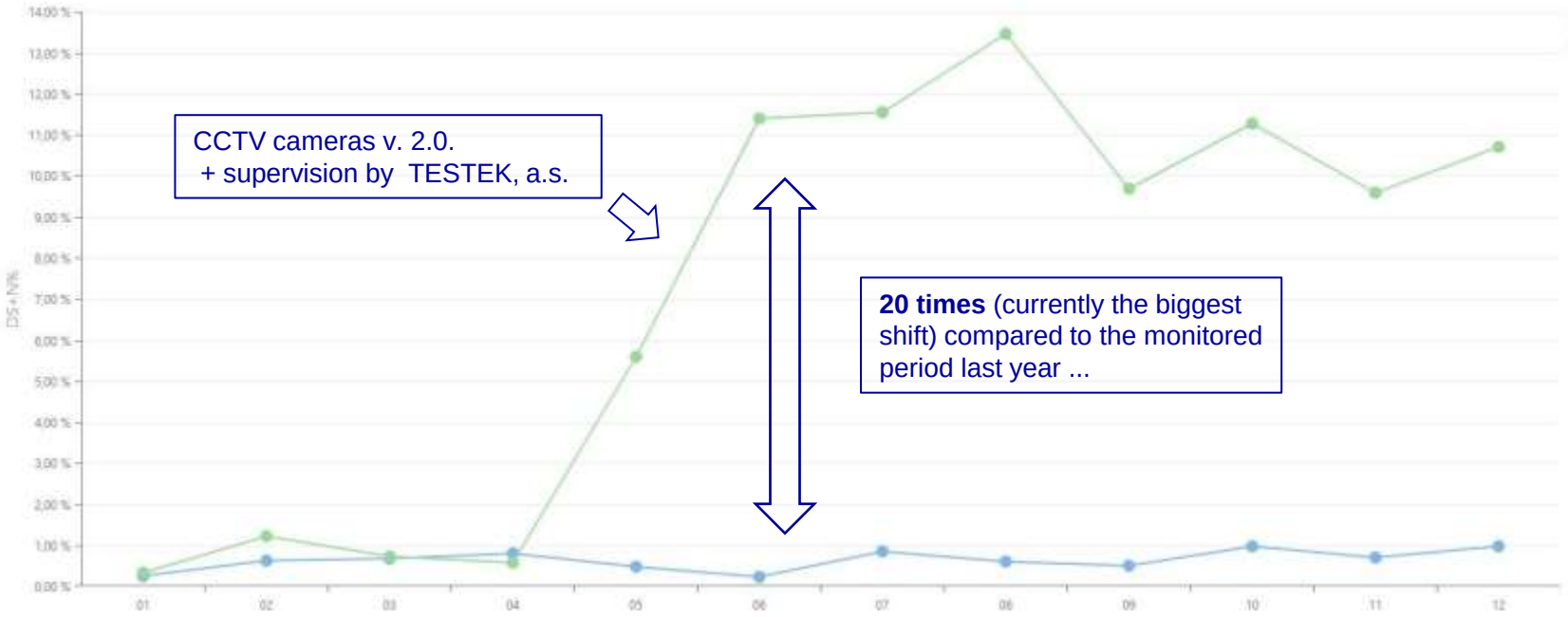




solution: **reinspection + video analysis** (combination)

Consequences

number of defects 2019 in comparison with 2018 (PTI station **with supervision,** extreme example...)



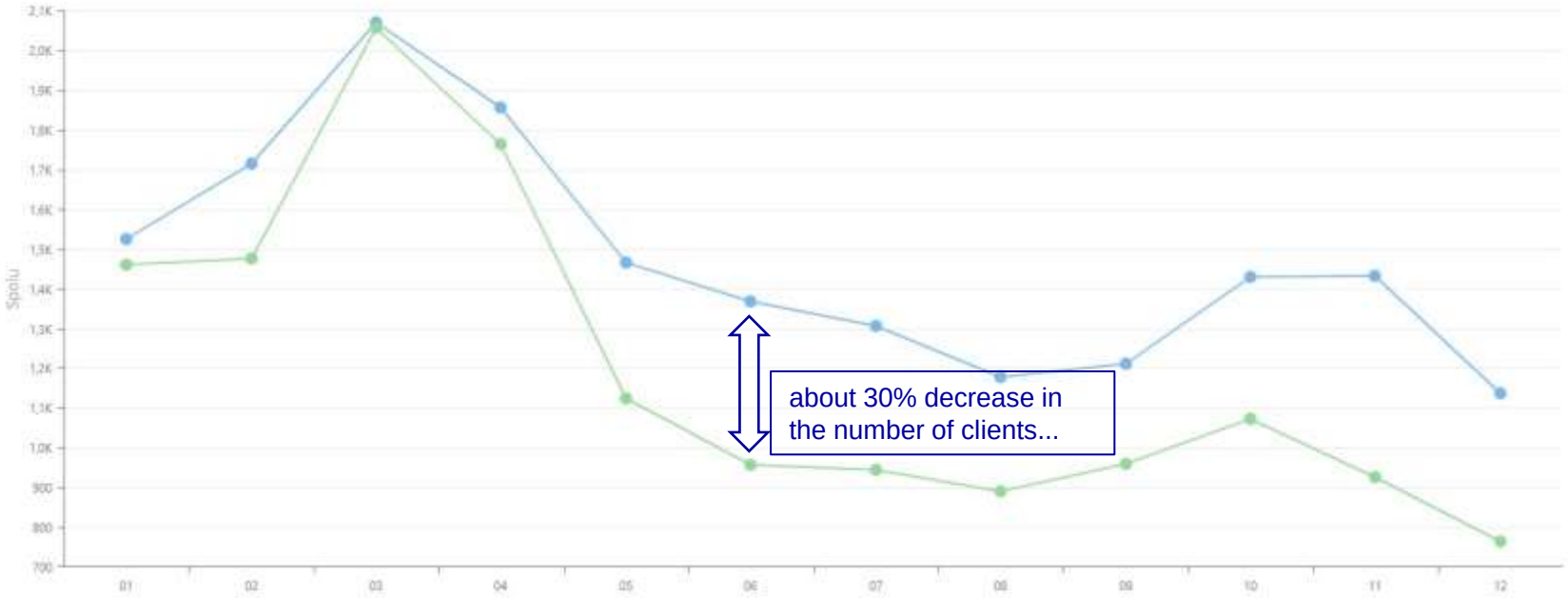
green: not roadworthy + temporary roadworthy (2019)

blue: not roadworthy + temporary roadworthy (2018)

Consequences

Number of performed inspections 2019 in comparison with 2018 (example of one particular PTI station)

Does supervision **ensure** greater **competitiveness** in the environment of PTI providers?

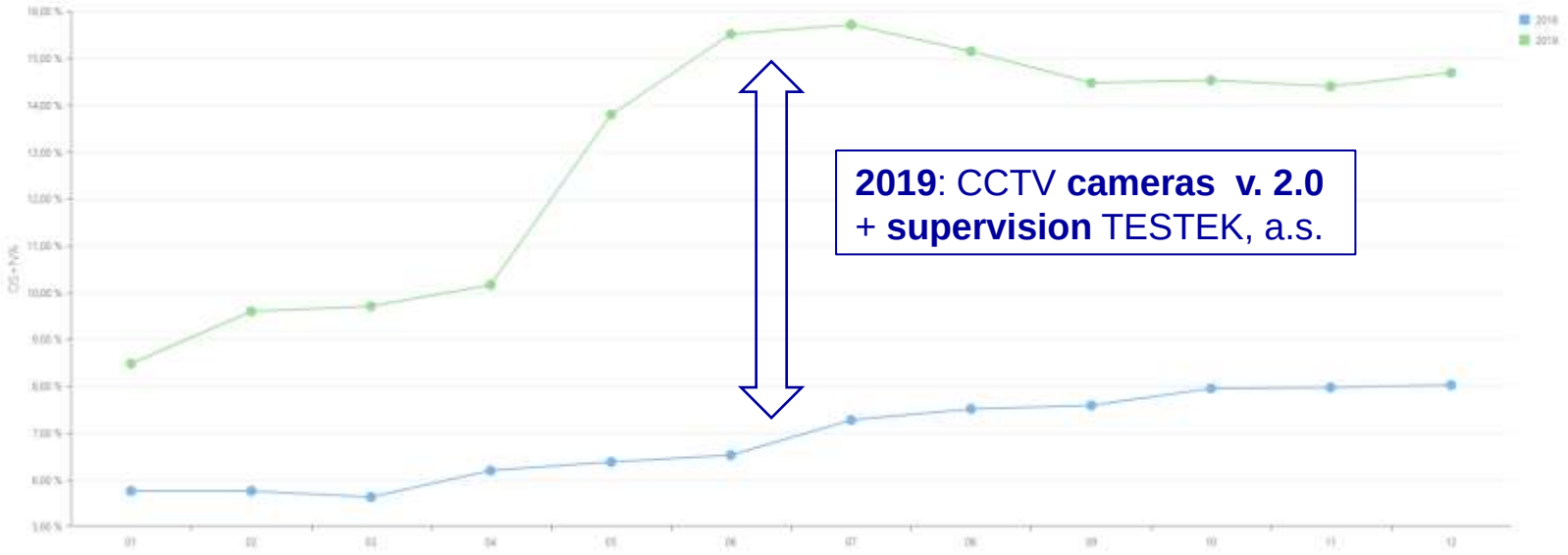


green: inspections performed (2019)

blue: inspections performed (2018)

Consequences

number of defects 2018 – 2019 (monthly)

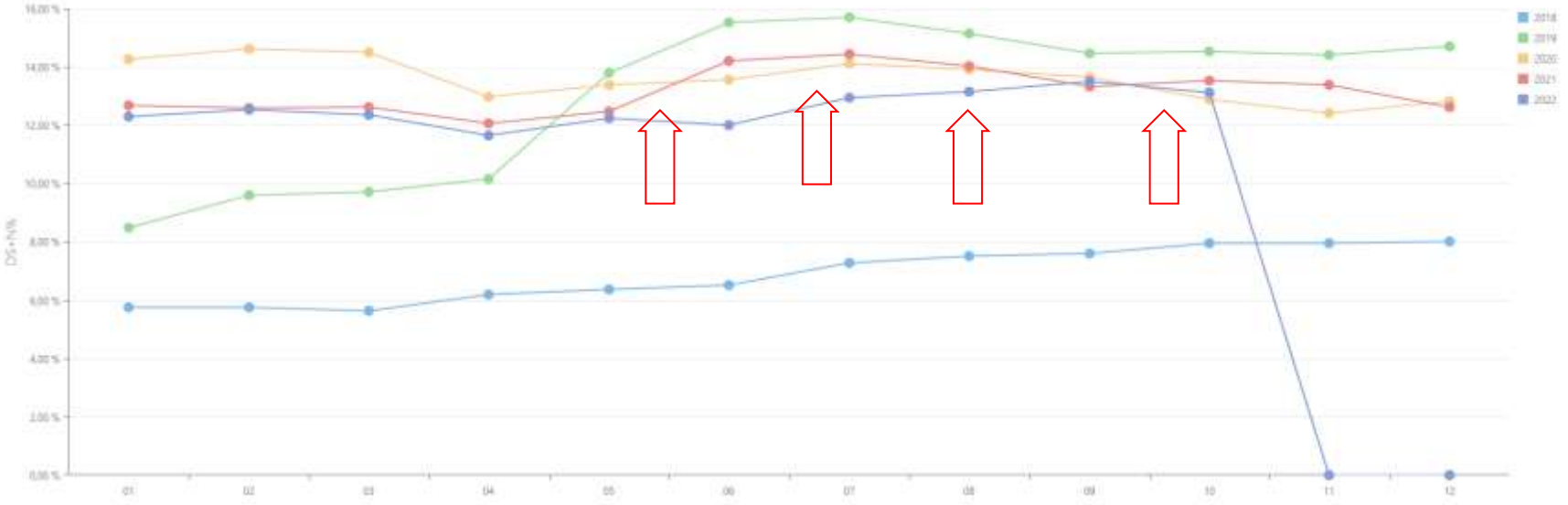


green: not roadworthy + temporary roadworthy (**2019**)
blue: not roadworthy + temporary roadworthy (**2018**)

Consequences

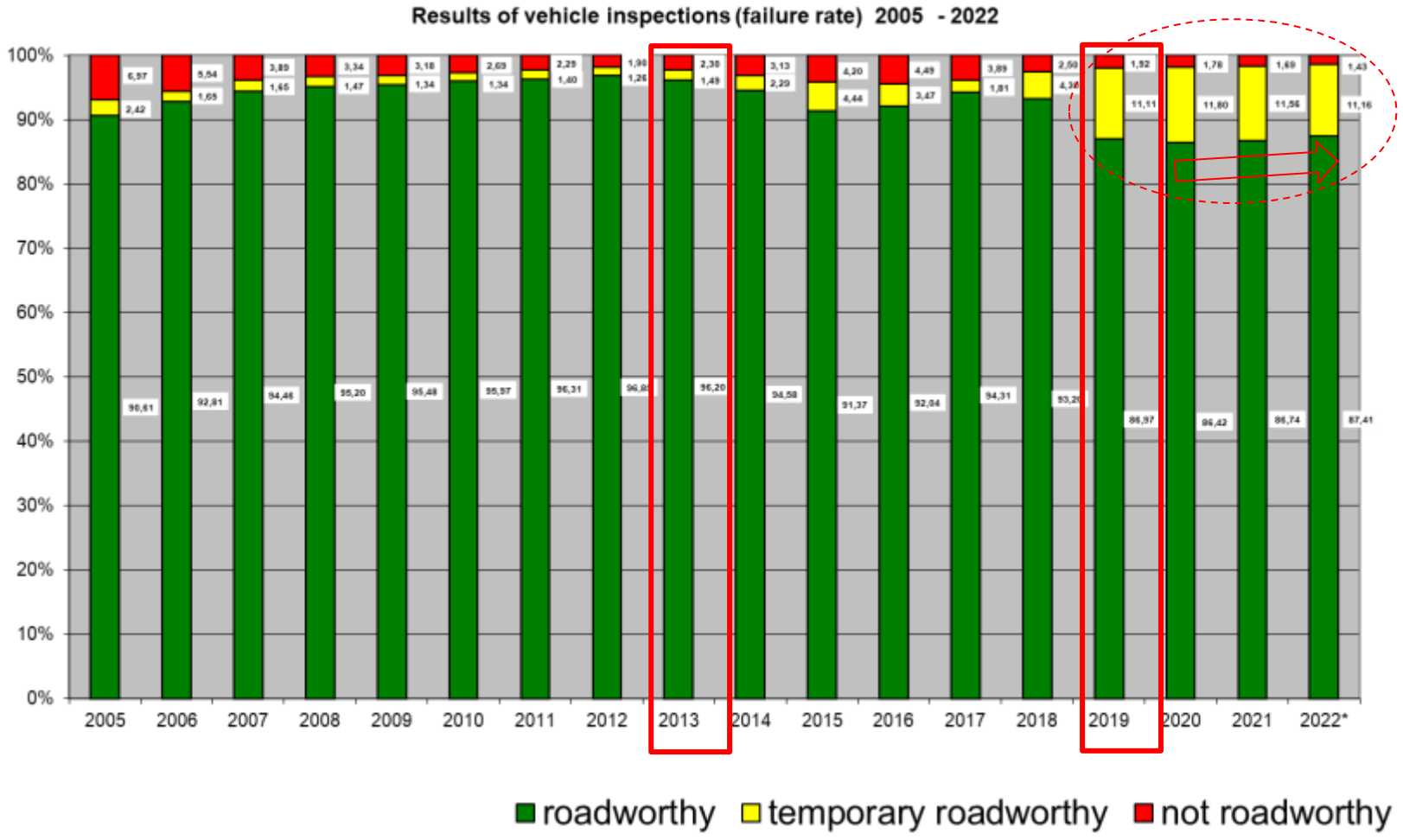
number of defects 2018 – 2022 (monthly)

2022: rejection rate is slowly **falling...**
Do we have a **better** fleet?



Consequences

number of defects since 2005 to 2022 (October 2022)



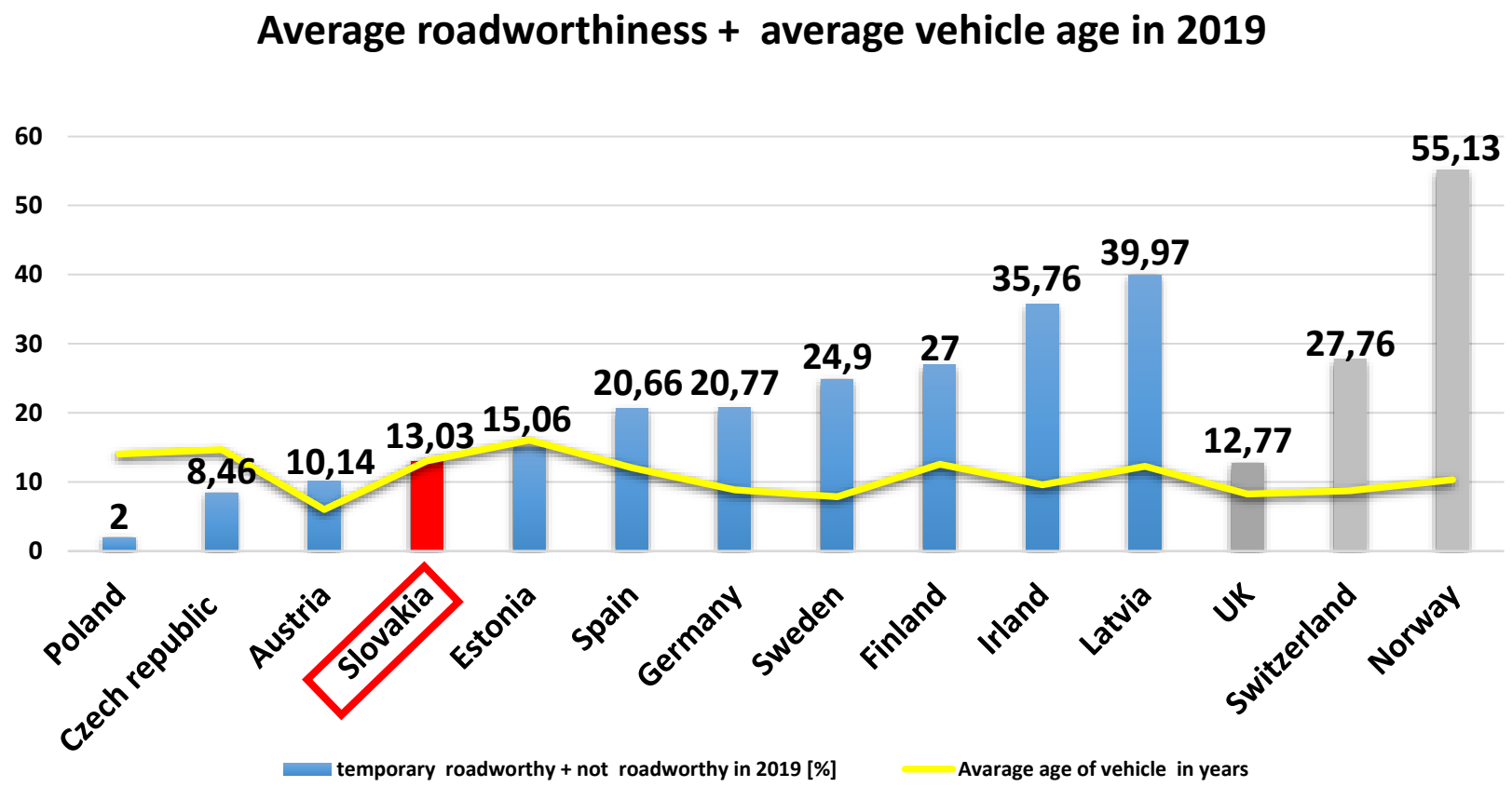
Why is the rejection rate falling?

- "Pre-measurement" of vehicles **in the brake tester** (also **emission** tester) - recently a common and usual phenomenon at PTI stations

an ordinary morning at a PTI station...

What is an average roadworthiness in the EU?

Do we have a better fleet or an imperfect PTI system?



source: *Ministry of Transport and Construction of the Slovak Republic*
note: in Slovakia figures do not contain results of emission inspections

Future steps

- **continuing with** the video analysis (still data mining way of supervision)
- more often **reinspections** and mystery **tests** (as a second and third accredited supervision method)
- personnel **strengthening** of the supervision department - external **branch office**
- **preventive activities** – lecturing activities for technicians and PTI owners

THE END

Thanks for your attention

Questions?

Jaroslav Olexa
Head of supervision department
GSM: +421 903 648 732
e-mail: jaroslav.olexa@testek.sk
Skype: jaro_olexa