TPMS
Tyre Pressure Monitoring Systems

OICA position

Summary

1. Current state of the art
2. Base for suitable performance requirements
3. OICA proposal
4. Open issues
5. Conclusion

Current state of the art

➢ Direct TPMS (pressure sensors in wheels)

- Pros: Precise pressure measurements if correctly maintained
- Cons: High rate of customer complaints (false-alerts, damaged sensors, etc.)
- Costs: ca. 52 € per vehicle (in 2014) + additional maintenance cost over vehicle lifetime (winter tyres, replacement sensors, etc.)

➢ Indirect TPMS (uses existing on-board information, e.g. ABS/ESC, without additional sensors)

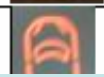
- Pros: Efficient puncture detection, robust against RF influences, maintenance-free over vehicle lifetime
- Cons: Less precise, especially for 4 tyres, absolute pressure measurement needs correct reset
- Costs: ca. 8 € per vehicle (in 2014), no maintenance cost over vehicle lifetime

How have current systems been designed?

- Optional TPMS introduced as driver aid
- Specific pressure thresholds and warning delays are a result of manufacturer's experience:
  - system capability (technical efficiency)

  vs
  - user acceptance

Costumer Satisfaction

Month of complaint	Summary of complaint (*what* annoyed?)	TPMS (*D*irect / *I*ndirect)	HMI description ('*X*')				Alerts (*Y*ellow, *R*ed, '*X*')			TPMS settings		Pressu check ('*OK*'
			1-lamp	2-lamp	veh. sketch	+4 pr. readings	Pressure alarm colour?	Pressure alarm flash?	malfunc blink?	margin ΔP_{min}	delay Δt_{max}	
4%	Replacement of Valve (mainly) : - Valve broken when we change the tire - The use of sealant bottle	Direct				It depends of vehicle Yes or No		Pressure OK			8 min	OK
1%	Incomprehension of the customer (mainly problem) : lamp stay-on after re-inflating the tire)						*Y*ellow	Pressure tire to be straightened		0,4 bar	1 min	
	When there is a slow leak (2,6 mb/min)							It depends of the level of the leak, of the system, There are different messages				
							*R*ed	Hardly under inflating or flat tire	Alert	0,6 bar	1 min	
	When there is a fast leak (17 mb/min)						*R*ed	Hardly under inflating or flat tire	Alert	0,6 bar		
							*Y*ellow	Modify the pressures "pressure to be adjusted"		0,4 bar under the Recommended pressure high speed	3 min In rolling on the highway speed	
						One Pressure absent or no pressures		Tire sensor to be controlled			10 min maxi	
						All pressures absent		4 faulty or badly learnt sensors			10 min maxi	

Customer demands to disable TPMS

Fichier Edition Affichage Favoris Outils ? | Adresse http://www.clubtouareg.com/forums/f43/possible-new-procedure-disable-tpms-15985.html | OK

Précédente | Rechercher | Favoris | Média

CLUBTouareg.com
Drivers Found. Mud Wanted.

Club Touareg Forums > Club Touareg Community > General Touareg Discussion
Possible NEW procedure to disable TPMS

User Name | User Name | Remember Me?
Password | Log in

09-01-2007, 11:03 AM #1

TrueSquare
New TN User

Join Date: Sep 2007
Location: USA
Posts: 7
Trader Rating: (0)

Disable TPMS

How can you disable the tire pressure monitoring system? I have new wheels a would rather leave the sensors in the original wheels.

2008 Xb

Thread Tools | Search this Thread | Display Modes

10-01-2007 #1

aircooled
Touareg Addicted Admin

Join Date: Dec 2003
Location: Evergreen, CO
Posts: 1,387

Possible NEW procedure to disable TPMS

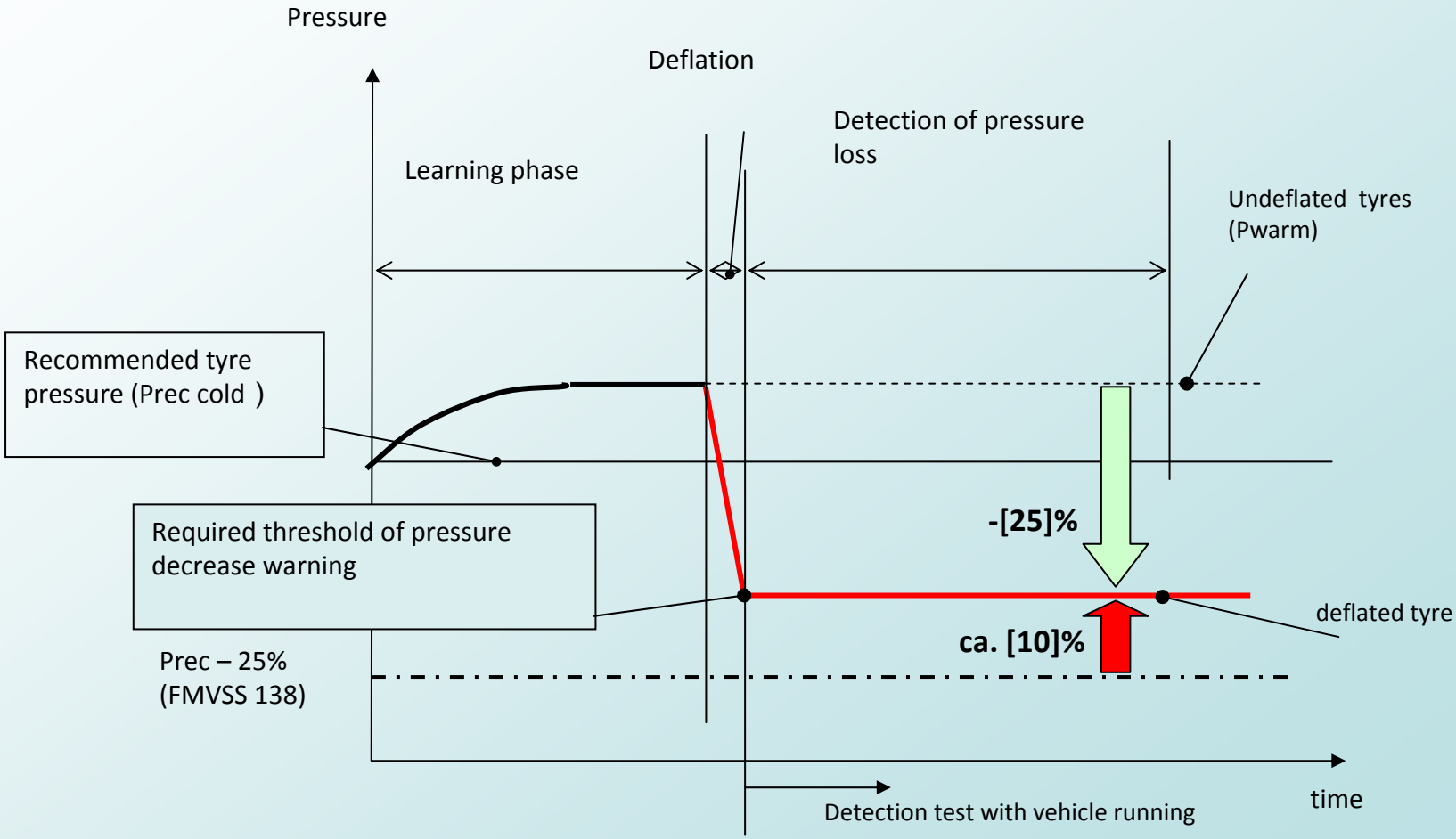
Folks, I stumbled across this possibly juicy bit of information on Vortex today. Some of you wheels geeks may really like this.

It comes straight from Uwe, owner of Ross-Tech. The following advice is in reference to a poster that was looking for a way to disable the **'not federally mandated'** tire pressure monitoring system (TPMS) in his early model Touareg.

Can someone that is brave enough try these instructions to see if we can make TPMS go away? I'd try, but I no longer have a TPMS vehicle.

TF D-Proposal-Revision Proposal

- Proposed test procedure



TF D-Proposal-Revision Proposal

- Proposed test procedure => impact on threshold

	Case 1	Case 2	Case 3	Case 4	Case 5
Prec cold (kPa)	190	200	220	250	300
Pwarm (kPa)	**220**	**230**	**250**	**280**	**330**
New Threshold "Pwarm -25%" (kPa)	165	172,5	187,5	210	247,5
New Threshold (in % under Prec cold)	**13%**	**14%**	**15%**	**16%**	**18%**

Base for suitable performance requirements

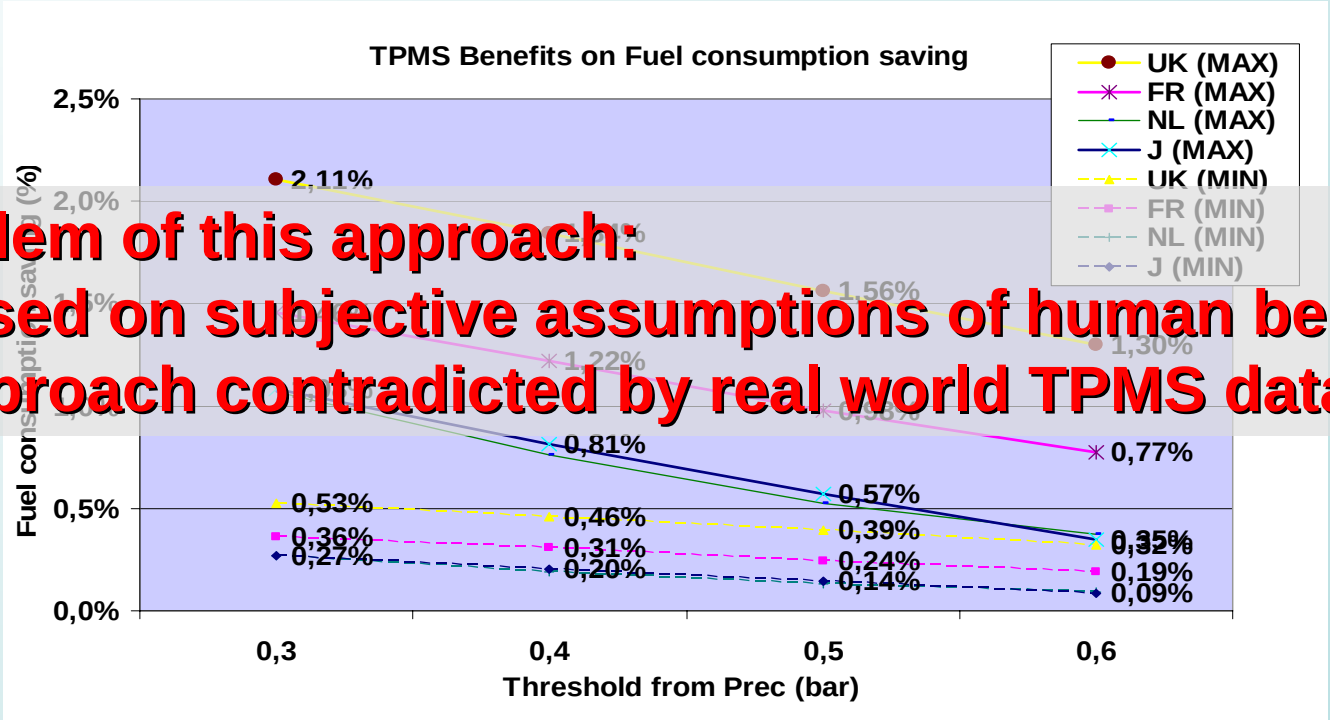
- CO_2 - slow process:
  - Threshold: Pwarm – [25] % (see next slides)
  - Warning within 60 minutes after pressure loss
  - Warning for any combination of wheels with pressure loss
  - Test speed: 60 to 90 km/h
- Safety - fast detection:
  - Threshold: Pwarm – 25 % OR Pwarm <160 kPa
  - Warning within 10 minutes after pressure loss
  - Warning for 1 wheel with pressure loss
  - Test speed: 50 to 130 km/h

OICA position – general

- Priorities:
  - Ensure expected benefits
    - Mandatory limits must meet the safety and CO_2 targets
  - Assure user acceptance and system credibility
    - By appropriate threshold value and warning delay avoiding false alerts and user complaints
  - Prevent cost inflation
    - Base requirements on performance of current systems
    - Economic solutions should be possible
    - Follow-up costs for consumers to be considered
  - Keep technical flexibility
    - **Route A) TPMS for CO_2 and safety**
    - AND
    - **Route B) TPRS for CO_2 + TPMS for safety**

Route A: TPMS for CO_2 (1)

- **What is the influence of the TPMS pressure threshold on the CO_2 benefit?**
- **"Common sense approach":**
  - TPMS will act only on tyres inflated under the TPMS threshold
  - Mandatory TPMS will 'transform' under-inflated tyres into tyres inflated close to Prec
  - Over-inflation would remain unchanged
  - CO_2 benefit linear to pressure threshold

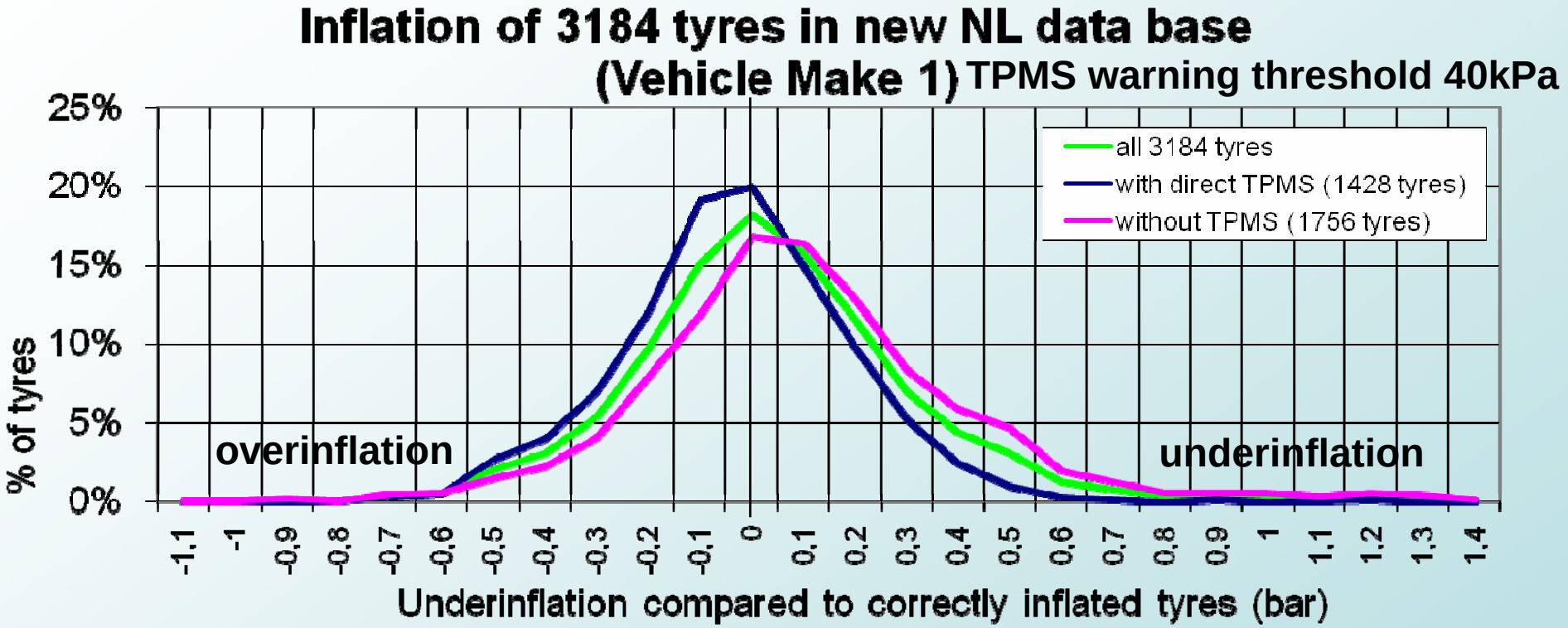


Problem of this approach:

- **Based on subjective assumptions of human behaviour**
- **Approach contradicted by real world TPMS data**

Route A: TPMS for CO_2 (2)

- Real world data shows the following effect of TPMS on CO2:



- TPMS does not cut off underinflation distribution at warning threshold
- It increases the inflation of all tyres (under- and overinflated)
- Several explanations:
  - People may adjust the inflation pressure to higher values than Prec
  - Temperature effects, gauge inaccuracy, human machine interface, etc.
  - With TPMS, people are generally more sensitive to tyre pressure

Route A: TPMS for CO_2 (3)

- Influence of TPMS pressure threshold in real world data

- Example first NL data base (2010 vehicles in total):
  - Make A CO_2 improvement for TPMS (warning threshold **30 kPa**) : **0,39%**
  - Make B CO_2 improvement for TPMS (warning threshold **40 kPa**): **0,48%**

- Example second NL data base (8250 vehicles in total):
  - Make A CO_2 improvement for TPMS (warning threshold **30 kPa**) : **0,50%**
  - Make B CO_2 improvement for TPMS (warning threshold **40 kPa**): **0,55%**
  - Make C CO_2 improvement for TPMS (warning threshold **40 kPa**): **0,16%**

- Systems with a tighter threshold do not bring a higher benefit
- Systems with a tighter threshold are contradictory to driver acceptance
- Most important criterion for efficiency is a **well balanced system between threshold, HMI and driver acceptance**
- Any legal requirement for a given threshold forces vehicle manufacturers to design systems with even tighter thresholds.
- Too severe limits would restrict the application of alternative technologies with better cost/benefit ratio
- TPMS thresholds lower than filling station gauge tolerances will not be accepted by the user

Route A: TPMS for CO_2 (4)

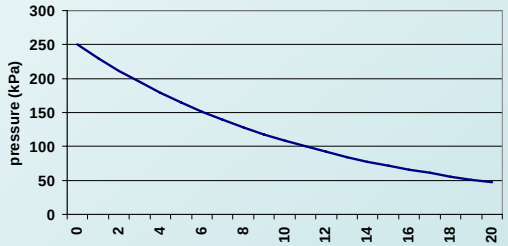
- Increase of fuel consumption is due to relative underinflation (%)
  => we favour a relative requirement (x% under Pwarm)

- Threshold of **Pwarm-25%**
  seems reasonable and is more severe than FMVSS 138 (ca. 13-18% below Prec cold)

Principle of TPRS

- The tyre pressure loss due to tyre permeation varies between 7 and 20kPa per month (see results of Data TF).
- For a given tyre, the pressure loss depends directly on the time and can be calculated by $\mathbf{P = P_0\, e^{\beta t}}$

P = pressure
P_0 = initial pressure
β = permeation rate
t = test time



- A **Tyre Pressure check Reminder System** reminds the driver to check and re-adjust the tyre pressure and to confirm this by a dashboard-control.
- The length of the reminder period shall be defined according to the tyre characteristics. In the actual draft text of the TF D-Prop-Revision, the suggested maximum reminder period is 10 weeks.
- The period can be temperature compensated => **shorter** period when season temperature is **de**creasing and **longer** period when season temperature is **in**creasing.
- The period can also be adapted according to other parameters, e.g. the fuel level in order to incite the driver to check the tyre pressure at the next petrol station stop.
- The benefit of TPRS can be estimated (see following example).

CO2 Benefit of TPRS

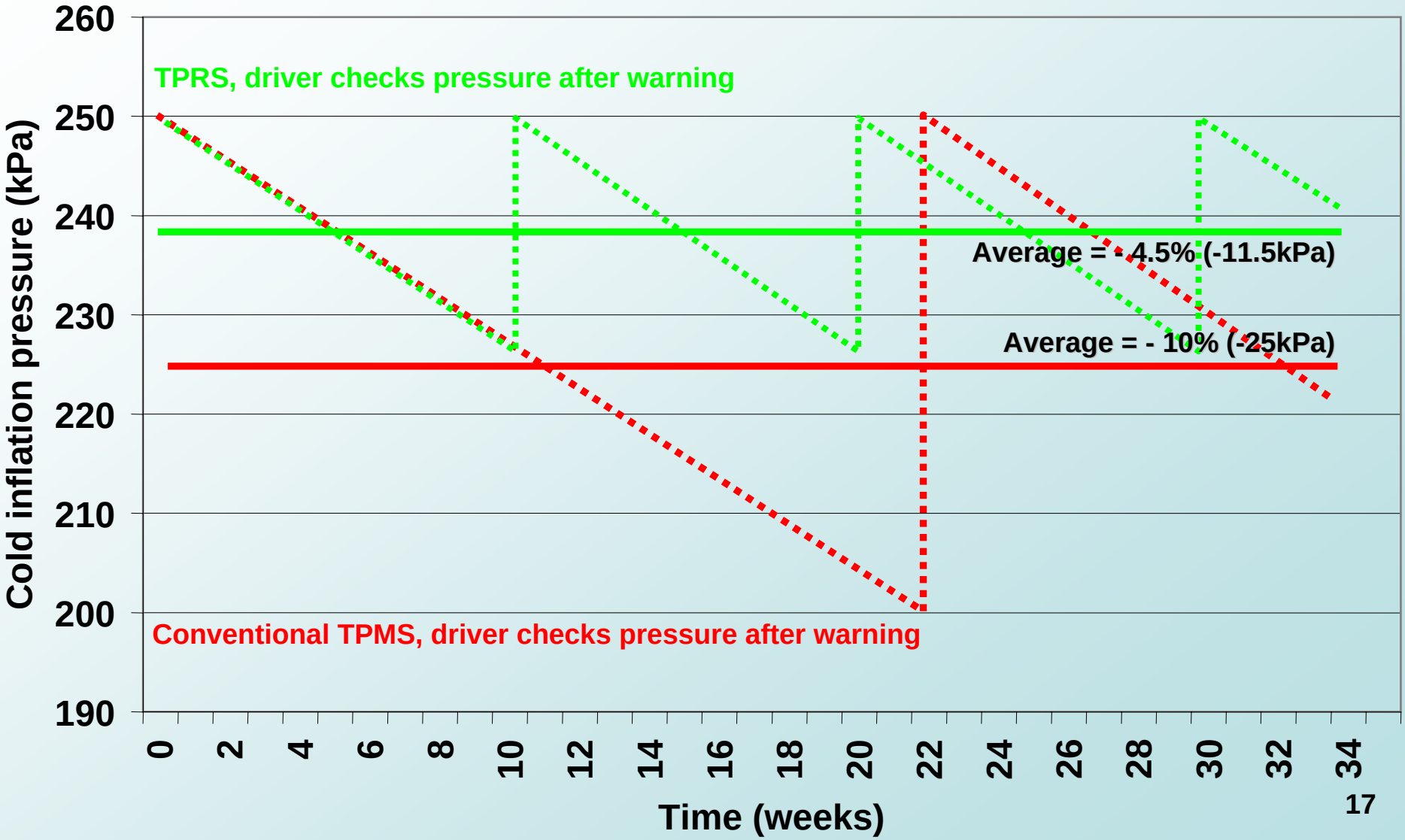
How can TPRS improve CO_2 reduction?

Typical situation:

- Vehicle/Tyre combination with recommended cold inflation pressure of 250 kPa
- Comparison of 2 different systems:
  - Conventional TPMS which monitors all 4 tyres individually with deflation threshold of 20%.
  - TPRS which is not temperature compensated and which alerts the driver 10 weeks after the last tyre check.
- For both systems it is estimated that the driver checks and adjusts the pressure of all 4 tyres after a warning.

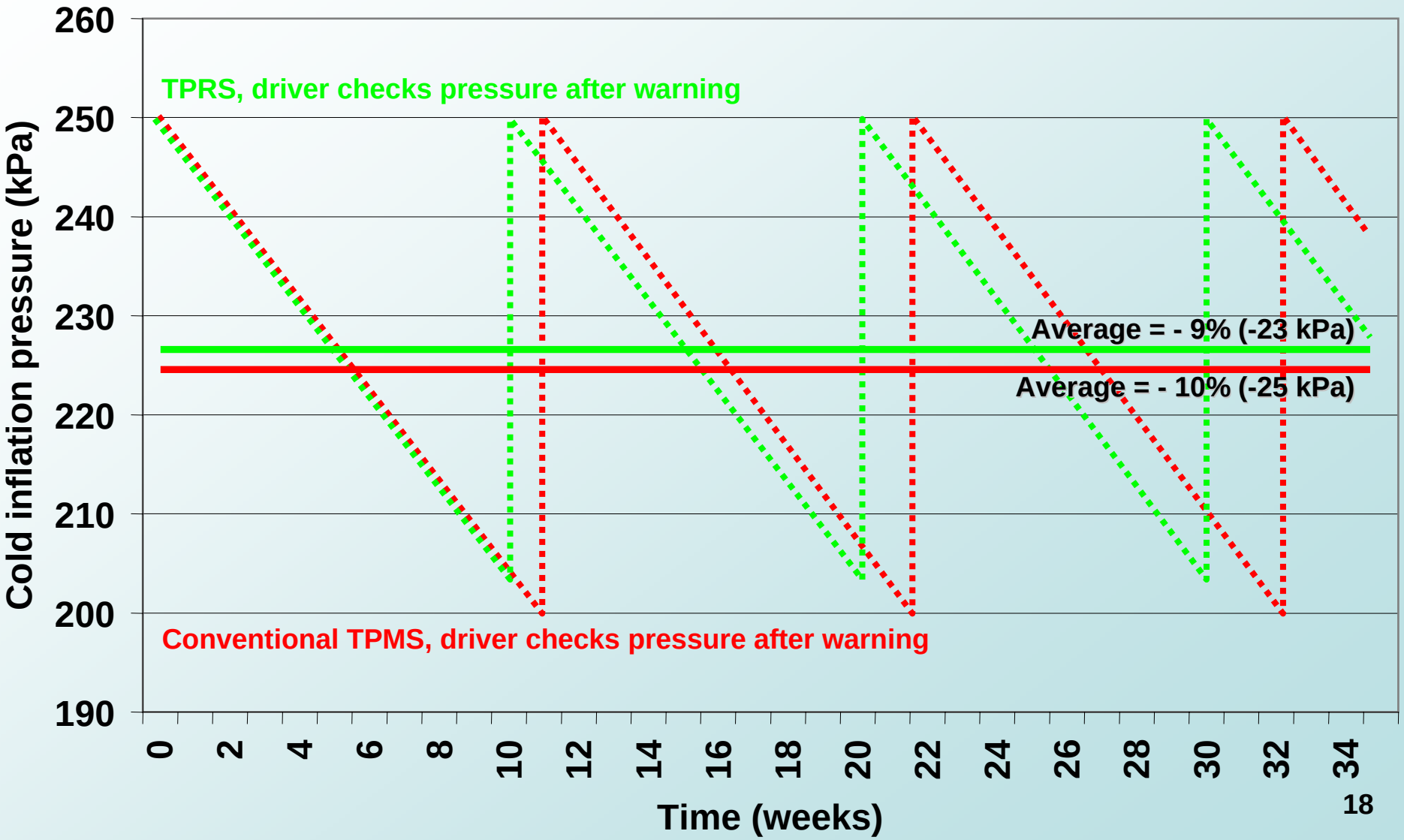
CO2 Benefit of TPRS - **Case 1**

- Tyre with natural loss of 10kPa in 1 months “good tyre”



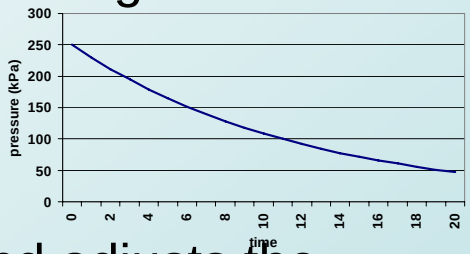
CO2 Benefit of TPRS - **Case 2**

- Tyre with natural loss of 20kPa in 1 months “bad tyre”



CO2 Benefit of TPRS - **Conclusions**

- In both cases of the example, the average tyre pressure is higher when using a TPRS compared to a conventional TPMS:
  - Case 1: underinflation of -4.5% for TPRS, -10% for TPMS
  - Case 2: underinflation of -9% for TPRS, -10% for TPMS



- In consequence, if for both systems the driver checks and adjusts the pressure after a warning, the TPRS has a **higher benefit for CO_2** emissions.
- The fact that tyre permeation over time is not linear but exponential provokes that the **benefit of TPRS is underestimated** in the given example.
- Compared to the example, the reliability of the TPRS alert can still be improved if the TPRS considers **season temperature** changes.

TPRS is a suitable function for CO2 emissions reduction

Open issues (1)

- Radio frequencies: product liability
  - Direct TPMS use radio wave communication between tyre sensors and vehicle receiver
    - Each vehicle needs 4 such sensors
    - Each sensor emits ca. 1 signal per minute (1-6 messages each)
    - European fleet is ca. 250 million vehicles
  - Hence direct TPMS would generate ca. 1 billion signals per minute in Europe (max 6 billion messages)
  - Concern about interferences in saturated traffic
- No global harmonisation of frequency bands

=> Need for design flexibility

Open issues (2)

- Pressure gauge accuracy at service station
  - **Accuracy** must be in any case better than TPMS required accuracy.
  - Need to control compliance with Directive 86/217/EEC

  =>Too tight TPMS threshold will confuse the driver

  => Cost for additional equipment of service stations and maintenance must be considered in global social balance

Open issues (3)

- Responsibility of the driver
  - Neither TPMS nor TPRS can discharge the driver from checking tyre pressure, independently from an eventual system alert.

OICA proposal for TPMS regulation

- Option to the manufacturer:

  - **TPMS for CO_2 and safety**

    OR

  - **TPRS for CO_2 + TPMS for safety**

Conclusion (1)

- It is possible to ensure adequate performance without dictating specific technology
- Keep design flexibility in first UNECE TPMS regulation
- Subsequently, adapt regulation according to practical experience on CO_2 and safety benefits
- OICA proposal considers the needs of all parties:
  - **Governments**
  - **ETRTO**
  - **CLEPA**
  - **OICA**

Conclusion (2)

All stakeholders are considered:

- **Governments**: proposed limits will meet the CO_2 and safety targets
- **ETRTO**: proposed limits will protect the tyre Industry against product liability concerns
- **CLEPA**: mandatory TPMS will accelerate the introduction of TPMS. Non-design-restrictive provisions prevent market distortion.
- **OICA**: design flexibility will
  - ❖permit economic introduction of environmental and safety measures
  - ❖will boost competitiveness of different systems, with no restriction to the benefits