

**Saving lives, fuel and CO2**  
*Why the EU should set stringent standards for  
tyre pressure monitoring systems*

*October 2009*



## About Transport & Environment

Transport & Environment's mission is to promote transport policy that is based on the principles of sustainable development. That means minimising the use of energy and land and reducing harmful impacts on the environment and health while maximising safety and guaranteeing sufficient access for all.

The work of our Brussels-based team is focused on the areas where European Union policy has the potential to achieve the greatest environmental benefits. Such policies include technical standards for vehicle fuel efficiency and pollutant emissions, environmental regulation of international transport including aviation and shipping, European rules on infrastructure pricing and environmental regulation of energy used in transport.

Naturally our members work on similar issues with a national and local focus. But their work also extends to public transport, cycling policy and other areas largely untouched by the EU. Transport & Environment's role in this context is to bring our members together, adding value through the sharing of knowledge and campaigning strategies.

Established in 1990, we represent around 50 organisations across Europe, mostly environmental groups and sustainable transport campaigners.

We are politically independent, science-based and strictly not-for-profit.

## Introduction

More than 90% of European motorists drive with one or more tyres underinflated, and 12% drove cars with tyres in danger of failure . This is a problem in many respects. It poses significant safety risks (9% of fatal accidents on motorways are related to tyre failures), it wastes billions of litres of fuel and around 10 MT excess CO2 emissions, and wears out tyres more quickly.

Tyre pressure monitoring systems (TPMS) that warn the driver of incorrect tyre pressures can largely put an end to this. Therefore the recently adopted EU's General Safety Regulation prescribes that 'accurate' systems should be fitted to new cars as of 2012. Negotiations are now ongoing amongst regulators on what this exactly means. There is a wide variation in performance of different systems, so prescribing high standards for accuracy and detection time is paramount.

This briefing describes how the regulatory body UN-ECE in Geneva has arrived at too loose prescriptions, and why and how the EU should therefore act correctively over the coming weeks. The briefing concludes that the EU should

- Take back responsibility from UN-ECE for setting TPMS performance criteria;
- Set a maximum detection time limit of 10 minutes for deflation;
- Set an accuracy threshold of 0.3 bar;
- Set a maximum tolerance for measurement inaccuracy of 3 kPa (0.03 bar).

These criteria would ensure that all the TPMS criteria set by the General Safety Regulation would be met, and that systems fitted would deliver the intended safety, environmental and economic benefits.

## Legislative context and procedure

A decision is to be taken before the end of this year on the accuracy of TPMS to be mandatorily fitted to new cars for sale in Europe from 2012. The level of accuracy will determine how quickly drivers are alerted to a pressure loss in one or more tyres which means they are wasting fuel, causing extra emissions and tyre wear or compromising safety.

The recently adopted EU General Safety Regulation (GSR)<sup>1</sup>, Article 9 requires that all new cars are fitted with tyre pressure monitoring systems from 2012.

*"Article 9: 2. Vehicles in category M1 shall be equipped with an **accurate** Tyre Pressure Monitoring System **capable of giving, when necessary, an in-car warning** to the driver when a **loss of pressure occurs in any tyre**, which is in the **interests of optimum fuel consumption and road safety**. Appropriate limits in the technical specifications shall be set to achieve this, which shall furthermore allow for a **technology-neutral** and **cost-effective** approach in the development of accurate Tyre Pressure Monitoring Systems."*

Clearly, the intention of the GSR is to improve road safety and reduce fuel consumption and emissions. The effectiveness of TPMS however hinges on their accuracy, which is to be decided as part of the technical details 'implementing regulations' to the GSR, decided by 'comitology' (closed-room sessions by the European Commission and Member State experts). In turn, this decision has been referred to the UN-ECE Working Party on Brakes and Running Gear (GRRF), which had already begun working on UNECE Regulation No. 64. The UNECE's overarching committee on vehicle harmonization, WP.29, is due to decide on a proposal from the GRRF in their next session on 10-13 November 2009.<sup>2</sup>

Currently, Reg. 64, Annex 4 provides for testing systems which alert to deflated or underinflated temporary use spare tyres (run flat warning system), from the perspective of detecting rapid pressure loss for safety purposes. The reduction of fuel consumption or CO<sub>2</sub> emissions is not currently the intended purpose.

The European Commission and Member States will meet beforehand, on 20 October 2009, at a comitology meeting of the 'Technical Committee on Motor Vehicles' (TCMV), to discuss a common EU position.

Below we run through the critical provisions of Article 9.2 one by one.

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<sup>1</sup> Regulation (EC) No. 661/2009 of the European Parliament and of the Council [T&E emphasis] <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:200:0001:0024:EN:PDF>

<sup>2</sup> WP29 agenda: <http://www.unece.org/trans/doc/2009/wp29/ECE-TRANS-WP29-1078e.pdf>

## Accurate ?

### 0.3 bar threshold plus maximum 0.03 bar for measurement inaccuracies is feasible

The current UN-ECE proposal for an accuracy threshold of 20% below warm pressure (ca. 0.4 bar below cold pressure), fuel consumption and CO<sub>2</sub> reduction can be expected up to 1.8%. An accuracy of 0.3bar would save an additional 0.4%, taking total savings to approximately 12 MT.<sup>3</sup>

T&E is very concerned that proposals to increase the allowances to compensate for measurement inaccuracies are intended to weaken the alert threshold, and will therefore decrease the safety and environmental benefits.

The OICA proposal to give allowances of 15-25kPa (0.15-0.25 bar) in addition to 20% deflation below the warm pressure would decrease the CO<sub>2</sub> reduction benefits by 25-40%. Even more importantly, such a weakening of the accuracy level could permit less accurate indirect systems, which as shown in the research could even lead to an increase in CO<sub>2</sub> emissions and give drivers a false sense of security.

With regard to the accuracy of test instruments, there is no justification for an allowance of 5kPa or above, given that pressure gauges used by test authorities are much more accurate than commercial equipment. Clearly the allowance must be minimized. An allowance of 3kPa is the absolute maximum that would be acceptable, across the complete range of models and pressures. 3kPa is already used in ISO WG12 for the ISO TPMS standard ISO 21750 and there are no grounds to weaken this further.

## ‘Optimum fuel consumption and road safety’?

### ‘Direct’ systems offer superior performance to ‘indirect’ systems

There are two types of TPMS: so-called ‘direct’ and ‘indirect’ ones. Direct systems measure the tyre pressure with sensors. Indirect ones detect pressure loss not from direct measurement but from other, indirect, signals such as differences in rotation speed of tyres (underinflated tyres rotate more quickly).

The GRRF set up a task force on TPMS, which concluded that the most detailed and accurate data on TPMS in use, from two Dutch studies including over 8,000 vehicles shows that potentially dangerous levels of underinflation (0.5 bar and more) occur more often in vehicles with indirect TPMS than in vehicles without any TPMS at all: Direct TPMS systems prevented some 95% of cases of dangerous pressure loss<sup>4</sup>.

NL 1<sup>st</sup> data set:

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<sup>3</sup> <http://www.unece.org/trans/doc/2009/wp29/ECE-TRANS-WP29-2009-129e.pdf>  
<http://www.unece.org/trans/doc/2009/wp29/ECE-TRANS-WP29-2009-129c1e.pdf>

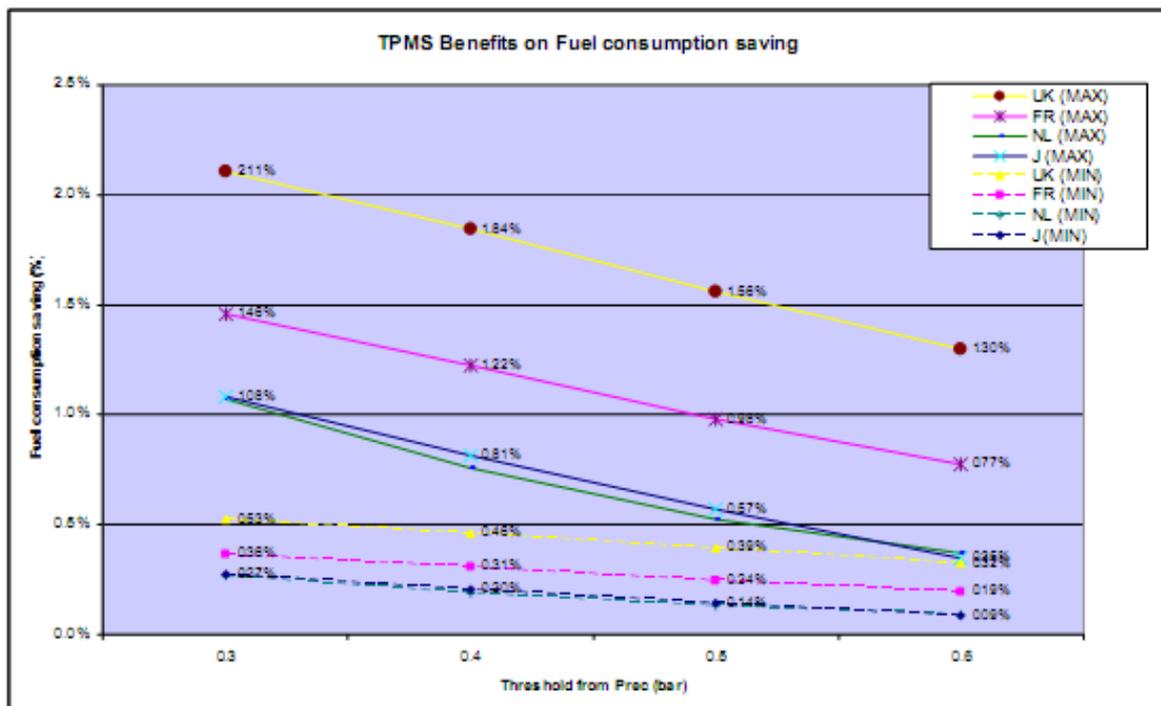
<sup>4</sup> GRRF TPMS task force conclusions, 16 June 2008.  
<http://www.unece.org/trans/doc/2008/wp29grrf/TPM-03-02r1e.pdf>

	Overall (1569)	Without TPMS	With Direct TPMS	With Indirect TPMS
At least 1 tyre Under inflated by 0.3 bar and more	47.7 %	49.3 %	35 %	44 %
At least 1 tyre Under inflated by 0.5 bar and more	18.2 %	19.5 %	5.3 %	21.2 %
% wheels under inflated by 0.3bar and more	29.5 %	30.7 %	19.4 %	29.6 %
% wheels under inflated by 0.5bar and more	8.6 %	9.2 %	2.3 %	11.4%

NL 2<sup>nd</sup> data set:

	NL data with details ( 6492)	Without TPMS ( 5797)	With Direct TPMS ( 519)	With Indirect TPMS ( 176)
At least 1 tyre Under inflated by 0.3 bar and more	35.3%	36.3%	26.4%	30.7%
At least 1 tyre Under inflated by 0.5 bar and more	16.3%	17.4%	5.0%	13.6%
Population underinflated P < 0	63.3%	63.5%	59.0%	70.3%
% wheels under inflated by 0.3bar and more	21.0%	21.8%	12.5%	21.3%
% wheels under inflated by 0.5bar and more	7.4%	7.9%	2.1%	8.8%

These large-scale test irrefutably demonstrate that direct systems offer superior performance, and even that it is questionable whether indirect systems help prevent dangerous pressure losses at all. An explanation for this latter conclusion is that drivers might experience a false sense of security, so that they check their tyre pressure even less regularly than drivers without any system at all.



Source: GRRF TPMS task force conclusions, p. 14.

The GRRF task force report also clearly shows that substantial reduction in tyre wear can be expected from the most accurate systems. A reduction of wear of up to 12% on average would be beneficial in terms of reduced use of scarce resources, reduced particulate pollution and offer savings to consumers.

## ‘Technology neutral’ ?

### **Performance standards do not prescribe technology**

Specification of minimum accuracy and performance levels is an intrinsically technology-neutral approach. Whilst the Regulation does not stipulate one particular kind of technology or equipment required (direct or indirect systems), it is essential that a minimum level of accuracy is met to ensure that TPMS equipment is fit for the dual purpose envisaged – improving road safety and optimizing fuel consumption.

It is not acceptable to use ‘technology neutrality’ as an excuse to weaken the performance criteria, thus compromising safety and potentially increasing fuel consumption and CO<sub>2</sub> emissions. For example, the stringency of the ‘Euro’ air pollution standards for vehicles also implicitly exclude many possible emission reduction technologies that are not good enough. Nobody would claim the Euro standards are therefore technology prescriptive.

## ‘Cost effective’ ?

### **Even without counting environmental and safety benefits, direct TPMS systems deliver net benefits, not costs**

It is essential to keep in mind that accurate TPMS systems will require upfront investment, but will have a payback in lower fuel consumption and lower wear and tear of tyres.

Currently, direct systems cost around €25, whereas indirect systems cost around €8. As seen before, it is questionable whether indirect systems save any fuel at all. Direct systems, however, can reduce fuel consumption by approximately 2%. A typical car will use approximately €20,000 of fuel over its lifetime. A 2% saving hence means roughly €400 fuel cost savings to the consumer. Even pre-tax fuel cost savings (used in socio-economic cost benefit assessments) leads to at least €60 lifetime fuel savings per car. On top of that come cost savings from lower wear and tear of tyres.

This means that even strictly economically speaking (i.e. leaving out environmental and safety benefits), direct TPMS systems lead to benefits, not costs. Counting in environmental and safety benefit obviously makes this conclusion even stronger.

## ‘Capable of giving, when necessary, an in-car warning’ ?

### **Detection time should be 10 minutes, not 60**

The UN ECE proposes a detection time of 60 minutes cumulative driving time. This is far too long; it means that drivers could undertake *several* journeys on unsafe tyres

before getting any warning, which is clearly unacceptable. In any case, we are concerned about how cumulative journeys could reliably be accounted for in a verifiable and repeatable test procedure.

The maximum time until the driver is alerted to pressure loss should be as short as possible based on the performance of the current best-available-technology. The detection time mandated in the US regulation is 20 minutes. Europe must not accept anything weaker than this.

T&E supports a detection time of 10 minutes, given that a large proportion of car journeys cover only very short distances. Accurate systems can detect pressure loss within a matter of seconds, and with a 10 minute threshold to verify diffusion losses, the risk of false alarms is extremely limited.

## What the EU should do

- Take back responsibility from Geneva for setting TPMS performance criteria;
- Set a detection time limit of 10 minutes for deflation;
- Set an accuracy threshold of 0.3 bar;
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## UNECE regulation - general background

The United Nations Economic Commission for Europe (UNECE) sets product standards for vehicles under Working Party 29: World Forum for Harmonisation of Vehicle Regulations. WP29 is supported by several technical working parties (*groupes rapporteurs*), which largely consist of technical experts specialized in particular fields:

- GRPE: Working Party on Pollution and Energy
- GRSG: Working Party on General Safety Provisions
- **GRRF: Working Party on Brakes and Running Gear**
- GRE: Working Party on Lighting and Light Signalling
- GRSP: Working Party on Passive Safety
- GRB: Working Party on Noise

The working parties make recommendations, including test procedures and limit values, which are passed up to WP.29, and further up to the committee on the 1958 Agreement, where recommendations are put to vote.

The working parties consist of national delegations and non-governmental organisations from industry, standardisation bodies (e.g. ISO) and other stakeholders. T&E gained NGO special consultative status in 2006. Technical experts on the working parties are expected to give recommendations on the basis of technical expertise rather than national preferences or commercial interests. However, national

delegations often include automotive industry employees (e.g. a Ferrari representative is part of the Italian delegation, Saab for Sweden), and experts from test houses and type-approval authorities. Test house and type-approval experts (privatised or semi-privatised in most countries) in practice often support the position of their customers, the automotive industry, especially those from car producing countries.

WP29 works according to the principles of the '1958 Agreement', which provides procedures for establishing uniform standards regarding new motor vehicles and equipment and for reciprocal acceptance of approvals for vehicle parts, systems and equipment issued under Regulations issued under this agreement.

As of 2007, there are 47 contracting parties to the 1958 Agreement, including all 27 EU Member States. Other contracting parties include: the European Community, Japan, Australia, South Africa and New Zealand. 125 UNECE Regulations are annexed to the Agreement. Voting takes place in committees on the Agreements. It is worth noting that the EC represents 27 votes for the Member States, and therefore has a de facto decisive majority.

Around 30 "NGOs" are accredited to participate in the activities of WP.29, of which the overwhelming majority are automotive and fuel industry associations:

OICA – International Organisation of Motor Vehicle Manufacturers

IMMA – International Motorcycle Manufacturers Association

CLEPA – European Association of Automotive Suppliers

ETRTO – European Tyre and Rim Manufacturers Association

CONCAWE – Oil companies European Organisation for Environment, Health and Safety

## For further information, please contact:

Nina Renshaw, Policy Officer

[nina.renshaw@transportenvironment.org](mailto:nina.renshaw@transportenvironment.org), +32 (0)2 893 0844