

**TPMS - ETRTO information on an article published by the European Rubber Journal**

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# Not all pressure monitoring systems are created equal

A high-powered report studied the problem of pressure variability in tyres on real vehicles. It set out to measure the scale of the problem and suggest ways to fix it. One surprising conclusion was that not all tyre pressure monitoring systems are equally effective.

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A high-powered report has concluded that indirect tyre pressure monitoring systems (TPMS) are at best useless, and under some circumstances, worse than useless.

In cars fitted with the indirect TPM systems, tyre condition was, on average, slightly worse than in cars fitted with no tyre pressure monitoring system. By contrast, cars fitted with direct tyre pressure monitoring systems showed substantially fewer under-pressure tyres than any other vehicles.

The GRRF TPMS Task Force, which represents car makers (through OICA), component suppliers (through CLEPA), tyre makers (through ETRTO) and transport officials, presented its data to interested parties in June, but the report has recently been made public on the UNECE website.

Chapter 2.2 of the report gives the results of a study by The Dutch Ministry of Transport (RDW). RDW ran a survey on some 9000 vehicles, of which nearly 6000 could be identified by vehicle identification number. 5000 of these had no TPM system, 486 had a direct TPM system and 174 had an indirect TPM system (mainly BMW and Audi). The population of tyres under inflated by at least 0.5 bar was around eight percent where no tyre pressure monitoring system was present, but that rises to nine percent on vehicles fitted with indirect TPM systems. The equivalent figure was just two percent in vehicles fitted with direct TPM systems.

Other data presented in the report shows that the presence of an indirect TPMS has virtually no effect on the condition of tyres on vehicles fitted with this system, compared with the absence of a TPMS system. The main exception to this is where pressure is down by 0.5 bar, the indirect systems were significantly worse than no TPMS system at all.

Where pressure thresholds were set appropriately, the presence of a direct TPM system showed marked improvements in tyre condition and hence both safety and fuel consumption.

The report aimed to show first what the state of vehicles was in relation to tyre inflation pressure; then to measure the effect of different types of TPMS solution. Another aim was to

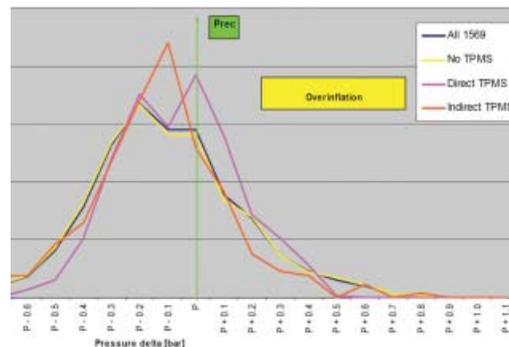
define 'under-inflation' and agree a set of values which could be used to discuss the problem and its solutions. Finally, once the cost to vehicle manufacturers had been calculated, the cost-benefit analysis was to be prepared.

The group looked at pre-existing data on tyre inflation. This included a series of studies in the UK, France and the Netherlands of about 200 vehicles each; an 8000-vehicle study by Bridgestone in 19 European countries; a further 8000-vehicle study in The Netherlands by RDW and a smaller study (420 vehicles) in Japan. In the larger Netherlands study, about 5600 of the 8000 vehicles could be identified by their vehicle identification numbers. This enabled the researchers to identify what type of TPMS was fitted, if any.

As part of their conclusions, the group said data gathered by Michelin could be confirmed as representing the true state of tyre pressure in France, the Netherlands and the UK. Each of these was based on a survey of around 2000 vehicles. The group also concluded that the state of Japanese vehicles could be represented by data from JASIC following a survey of just 420 vehicles.

Data was presented both as the accumulated data per wheel across all vehicles and as the worst wheel per vehicle.

These data sets were analysed and compared. The group found that the



Distribution of tyre pressure per wheel [based on Dutch survey Autumn 2007 by Bandopspanning - sample size 1569 cars - Cars with direct TPMS 151 -with indirect TPMS 66 - without TPMS 1352]

Bridgestone data appeared to substantially over-estimate the amount of under-inflation compared to the other data sets, so these were discarded and the remaining data sets amalgamated to give the data below.

The two sets of data above show that the vehicles fitted with indirect TPMS performed little better, it at all better than those vehicles which did not have a TPM system fitted. Both sets of data show that the direct TPMS was not effective at pressures up to 0.3 bar under-inflation, but became significantly more effective when the pressure dropped below that figure, with substantially fewer tyres under pressure by over 0.5 bar than in any of the other groups.

Plotting the pressure distribution according to type of TPMS fitted also revealed that the vehicles fitted with direct TPMS performed better than the other groups. Data on vehicles fitted with indirect TPMS was not conclusive.

The group suggested that the direct TPMS systems had been set to a pressure differential of 0.4 bar, which explained the lack of differentiation at 0.3 bar and the major improvement at 0.5 bar.

The group went on to study the effect of under-inflation on fuel consumption and concluded that the saving would vary according to the threshold setting on the TPMS.

## Conclusion: across Europe and Japan

These were not the only savings, however. The group went on to study the effects of under-inflation on tyre wear.

Tyres which are under-inflated wear more quickly, with a 10 percent loss of pressure corresponding to almost 10 percent loss of life, with the effect magnified up to about 40 percent under-inflation. By that stage, the tyre's life expectancy is only 30 percent of full inflation, and the effect is reduced as more pressure is lost.

Overall, said the researchers, the average improvement in tyre life due to the presence of effective TPMS would be about 11 percent.

### FIRST DATA SET (NETHERLANDS)

	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 %

### SECOND DATA SET (NETHERLANDS)

	Overall (1569)	Without tpms	With Direct tpms	With Indirect tpms
At least 1 tyre Under inflated by 0.3 bar and more	35%	35.9%	27.4 %	30.5%
At least 1 tyre Under inflated by 0.5 bar and more	16%	17.2%	5.1 %	13.2 %
% wheels under inflated by 0.3bar and more	21 %	21.7 %	12.8%	21 %
% wheels under inflated by 0.5bar and more	7.4 %	7.8 %	2.2 %	8.8%

### TPMS BENEFITS

Threshold (bar from Prec)	0.3 bar	0.4 bar	0.5 bar	0.6 bar
range from:	0.3% to 2.1%	0.2% to 1.8%	0.1% to 1.6%	0.1% to 1.3%