

New European standardised method for measuring particle and carbon dioxide pollution in the vehicle cabin of tyre wear emissions

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Summary

- New standardised method makes characterising HVAC performance tractable
- Relatively short, practical test
- In real-world conditions, with wide boundaries
- To allow comparison of filters, HVAC systems and vehicles
- Repeatability shown for PN ingress
- Firm methodological platform for inclusion of additional pollutants



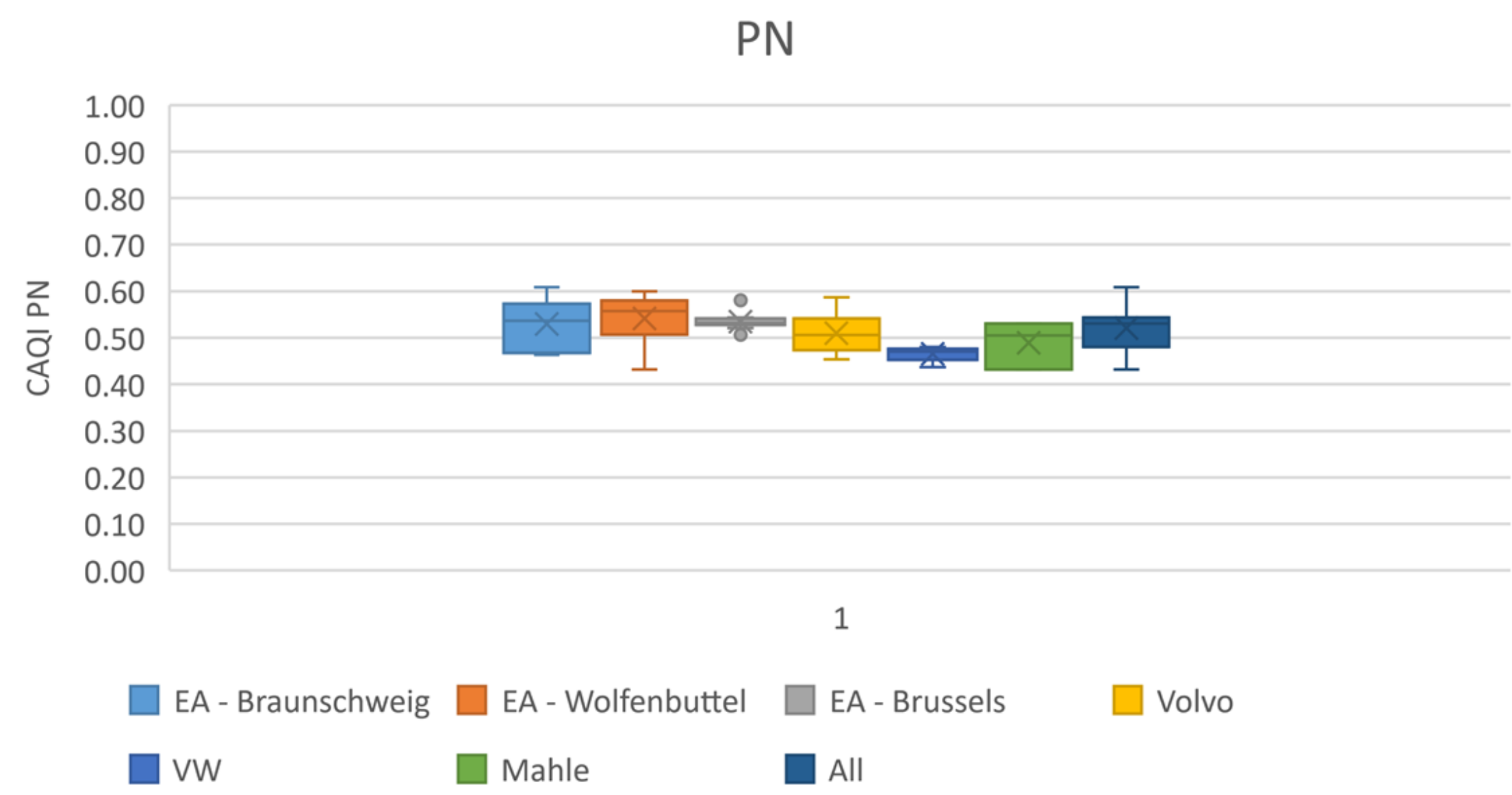
Pollution in the cabin

- Very limited regulation – mainly health and safety at work in Europe
- Issue is particle ingress through heating, ventilation and air conditioning (HVAC) system via filter
- Typical ambient particle concentrations measured around roadways: 22,901 #/cm³ in Los Angeles; 43,312 #/cm³ near Oxford, UK
- No limits for PN; typical rural background of 2,610 #/cm³
- Using recirculation mode to stop ingress leads to carbon dioxide build-up

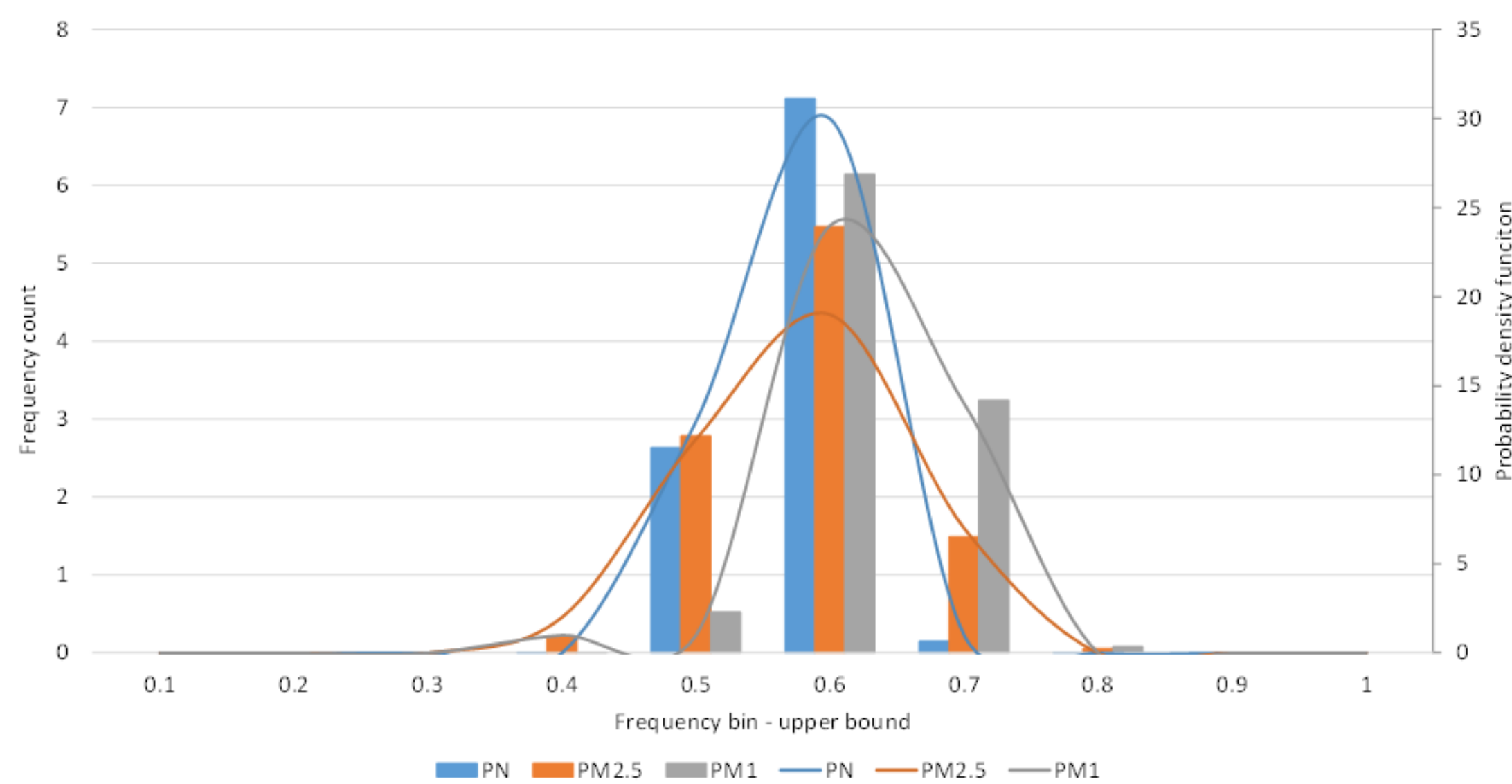


Repeatability

- Volkswagen Golf
- GRIMM miniWRAS equipment
- 6 different locations: Germany, Sweden, Belgium
- 4 different testers; 3 vehicle OEMs




| | FRESH | | | | | PN CAQI |
|-------------------|---------|---------------|----------------|----------------|---------------|---------|
| | Repeats | Test duration | Max PN outside | Avg PN outside | | |
| EA - Braunschweig | 9 | 1800 +/- 0 | 106000 | 3774 +/- 1665 | 0.53 +/- 0.05 | |
| EA - Wolfenbuttel | 8 | 1800 +/- 0 | 225600 | 2409 +/- 1088 | 0.54 +/- 0.05 | |
| EA - Brussels | 13 | 1776 +/- 58 | 95110 | 5162 +/- 1029 | 0.53 +/- 0.02 | |
| Volvo | 7 | 1800 +/- 0 | 46770 | 2247 +/- 962 | 0.51 +/- 0.04 | |
| VW | 5 | 1476 +/- 329 | 77240 | 6149 +/- 4620 | 0.47 +/- 0.02 | |
| Mahle | 3 | 1800 +/- 0 | 93160 | 8603 +/- 3830 | 0.49 +/- 0.05 | |



Key concept: ratio of average inside to outside particle concentration converges to repeatable value for given vehicle set-up

CEN/TS 103Real drive test method for collecting vehicle interior air quality data



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1 FOR INFORMATION

2 SUBJECT

Draft CWA Real drive test method for collecting vehicle interior air quality data – Final version for publication

$$CAQI_i = \frac{\int_0^t C_{i,cabin} dt}{\int_0^t C_{i,outside} dt}$$



Experimental set-up

- Stainless steel, forward-facing exterior sample inlet
- Head-height sample point between vehicle headrests
- 1" diameter satisfies isokinetic sampling up to 2µm at 80km/h

CWA17934 – essentials

- Urban driving 30-50 km/h; max speed 80 km/h
- Test duration 30-120 minutes
- No rain, fog or snow
- New filters aged 100 km
- Mean external PN concentration 5-100k #/cm³
- Ambient temperature 5-25 degrees Celsius
- Correlation slope 0.8-1.2, r²≥0.98