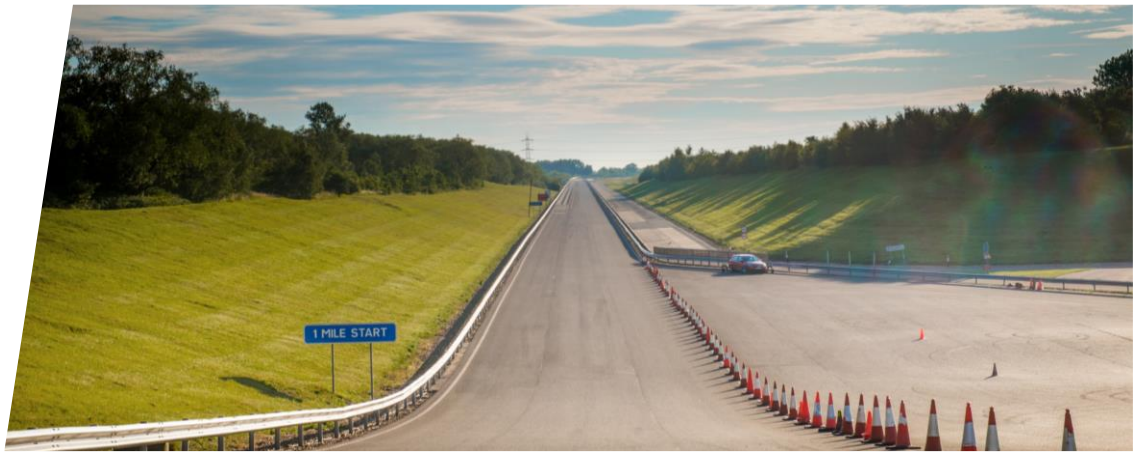


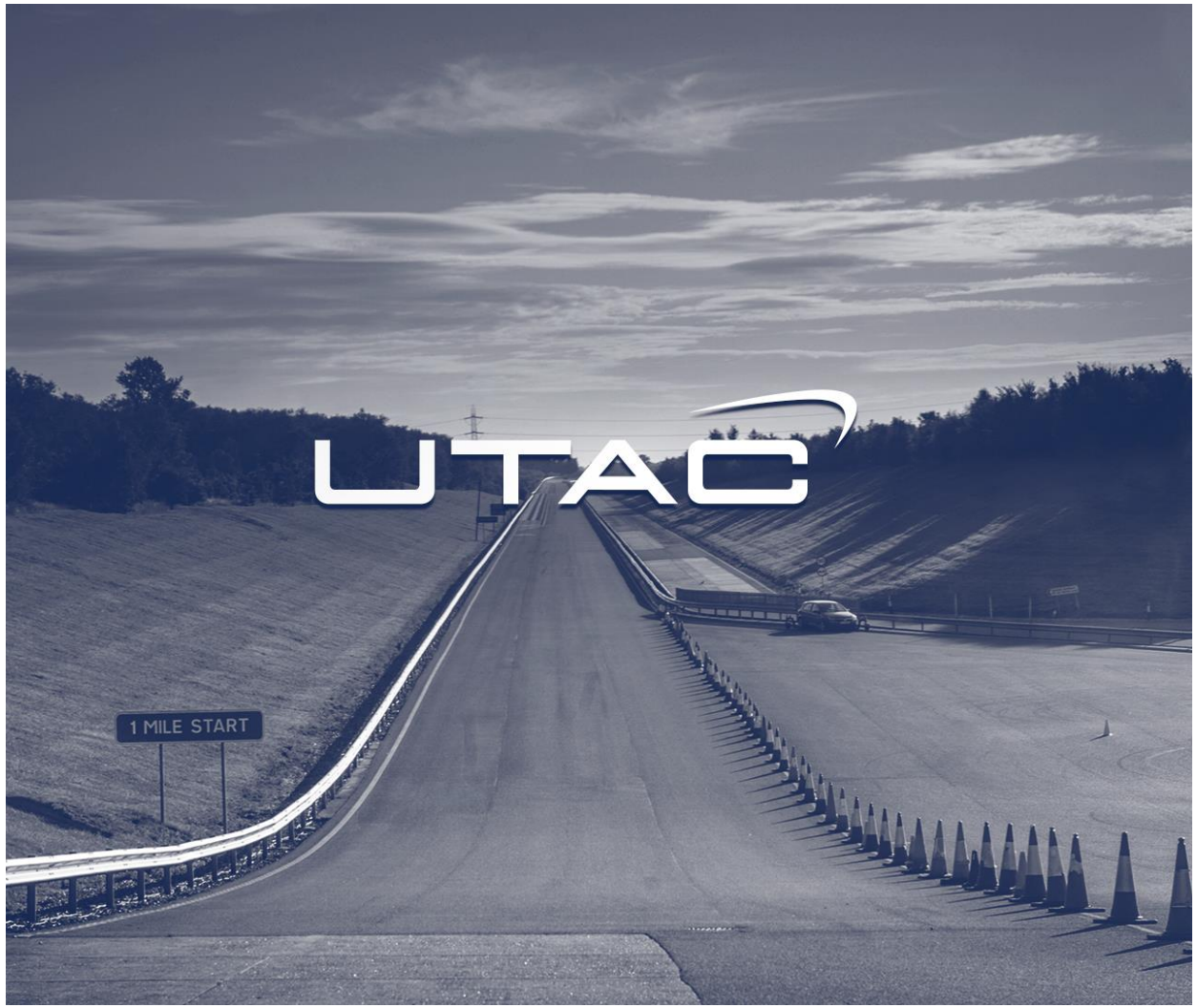

# Tyre Abrasion Study for ACEA

Maëlle Dodu – Tyre Expert

*GRBP TF TA Session 15*

# CONTENTS

- Tyre Abrasion Study Overview
- WP1 – Literature Review
- WP3 – Real Life Testing
- Next Steps



# TYRE ABRASION STUDY OVERVIEW

- Scope:
  - Theoretical and experimental study of influencing factors on tyre wear / abrasion.
- Objectives:
  - Review GRBP TF TA tyre abrasion requirements proposal: test method, interdependency evaluations, etc,
  - Quantify differences in tyre wear / abrasion in relation to vehicle type (ICE vs BEV),
  - Quantify possible differences between OE and Aftermarket tyres by testing tyres with different label values.
- Work Packages & Timing:

| Work Packages | | Timing |
|---|---|---|
| WP1 | Literature Review | Jun-23 (completed) |
| WP2 | EPREL Tyre Database Analysis | Aug-23 (ongoing) |
| WP3 | Real Life Testing | Aug-23 (ongoing) |
| WP4 | Test Results Analysis | Sept-23 |
| WP5 | Presentations to GRBP/GRPE:<br>- Interim report:<br>- Final report: | <br><br>GRBP 78th session<br>GRPE 90th session / GRBP 79th session |

# WP1 – LITERATURE REVIEW - SCOPE

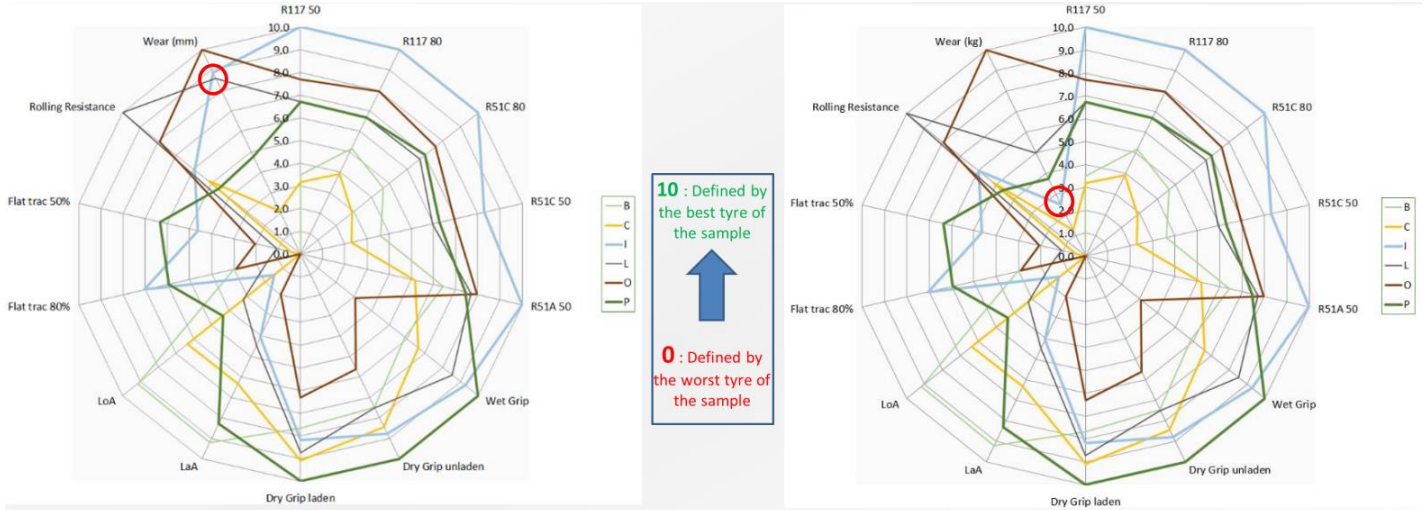
- Tyre abrasion and mileage for:
  - C1, C2 & C3 tyres,
  - Summer & 3PMSF tyres.
- Aspects considered:
  - Driving behaviour influence on tyre wear / abrasion,
  - Vehicle design influence on tyre wear / abrasion,
  - Tyre performances interdependency,
  - Tyre wear / abrasion testing,
  - Tyre & Road Wear Particles (TRWP) emissions.
- Review included, but was not limited to, relevant studies presented in GRBP TF TA.

# WP1 – LITERATURE REVIEW - FINDINGS

- Main influencing parameters with regards to tyre wear /abrasion reviewed in terms of:
  - Vehicle design: increased tyre wear expected with BEV vs ICE, due to:
    - Increased weight (current BEV weight estimation: ICE + 20-25%),
    - Higher level of instantaneous torque,
    - Regenerative braking system.
  - Driving conditions: longitudinal and lateral accelerations more critical than speed alone.
  - Road surface,
  - Ambient weather conditions.

# WP1 – LITERATURE REVIEW - FINDINGS

- Tyre performances interdependency:
  - Tyre wear / abrasion vs rolling resistance: good level can be achieved for both performances, depending on:
    - Strategy chosen during tyre development,
    - Tyre category considered (ie: eco vs high performance / sport).
  - Tyre wear / abrasion vs rolling noise: good level can be achieved for both performances, depending on:
    - Strategy chosen during tyre development,
    - Tyre category considered (ie: eco vs high performance / sport).
  - Tyre wear / abrasion vs safety: challenging to achieve good level for both performances:
    - Investments required in development and implementation of innovative technical solutions.




*Spider diagram with absolute measurement of groove depth evolution*

*Spider diagram with absolute measurement of weight evolution*

(UTAC, TA-03-04 OICA GRBP-75-19-Rev.1)

# WP1 – LITERATURE REVIEW - FINDINGS

- TRWP emission:
  - Very complex vs tyre wear / abrasion studies,
  - Testing methodologies: challenges to generate, collect and quantify TRWP over the relevant particles size range in a representative and accurate way,
  - Particle size distribution: increased driving severity leads to increased share of fine and ultrafine particles.
- Tyre wear / abrasion & TRWP information availability:
  - C1 tyre: information available but limited number of studies found on BEV influence on tyre wear / abrasion and tyre performances interdependency,
  - C2 tyre: limited information available,
  - C3 tyre: scarce information available.

# WP3 – REAL LIFE TESTING

- Objectives:
  - Quantify differences in tyre wear / abrasion in relation to:
    - Vehicle type: ICE vs BEV,
    - Tyre type: OE vs aftermarket tyres with different label values.
- Vehicles selection:
  - Scope: BEV & ICE vehicles from same model platform,
  - Vehicles: BMW iX1 xDrive (BEV) vs BMW X1 (ICE).
- Tyres selection:
  - Scope: C1 summer tyres,
  - Tyre size: 245/45R19 102 Y,
  - Tyre labels (rolling resistance / wet grip):
    - AA (aftermarket, best label combination available),
    - AB (OE homologated),
    - BA (OE homologated),
    - CA (aftermarket, best-selling),
    - DB (aftermarket, worst label combination available),
  - Tyres tested before tyre wear test to check wet grip and rolling noise label values.

# WP3 – REAL LIFE TESTING

- Circuit:
  - Open road circuit around UTAC Mortefontaine site (Northern France),
  - Compatible with BEV range & charging constraints,
  - Specifications as close as possible to TADG-ORV Test Method proposal.
- Test Method:
  - 1 double convoy: 3 + 3 vehicles to limit test time & cost,
  - Total running distance: 15,000km (8 weeks),
  - Measurement parameters: tyre tread depth and mass loss,
  - Test procedure as close as possible to TA DG-ORV Test Method proposal.
- Timing:
  - Test start: beginning of July 2023,
  - Test expected end: end of August 2023.

| Circuit characteristics | |
|---|---|
| Length (km) | 390 |
| City (km / %) | 59 km / 15 % |
| Road (km / %) | 195 km / 50 % |
| Highway (km / %) | 137 km / 35 % |
| Average speed (km/h) | 93,13 |
| Standard deviation speed | 32 |
| Standard deviation longi accel ($m/s^2$) | 0,68 |
| Standard deviation lat accel ($m/s^2$) | 0,87 |

# NEXT STEPS

- WP2 – EPREL Tyre Database Analysis:
  - Analysis and report to be completed mid-August 2023.
  - Conclusions to be included in study presentation to GRBP 78th session.

- WP3 – Real Life Testing:
  - Testing to be completed end of August 2023.
  - Testing update to be included in study presentation to GRBP 78th session.

- WP4 – Test Results Analysis:
  - Analysis to be completed mid-September 2023.
  - Conclusions to be included in study final report presentation to GRPE 90th session / GRBP 79th session.

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