

WECODUR® - the Low Emission Brake

Standardization bridging the gap to EURO7 fulfillment

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WECODUR® technology for the low emission brake

HPL Technologies GmbH

Founded 2018 as a spin-off on the RWTH Aachen Campus

- ⇒ Industrialization of high-speed laser cladding for automotive production
- ⇒ Material development for dedicated applications (e.g. rotor coatings)



Rotor coatings,
Tribo systems

Material science,
alloy development

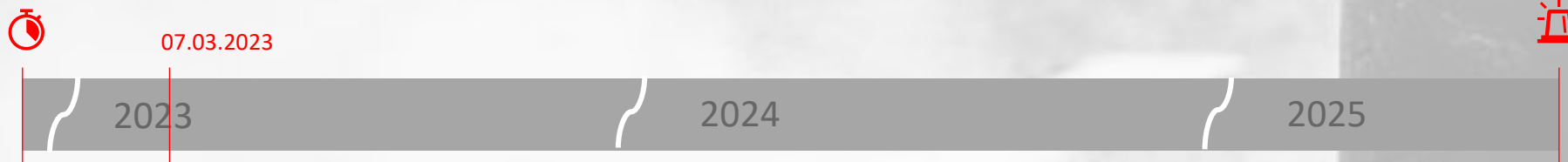


Serial process
technology and QA



RWTH Campus GmbH

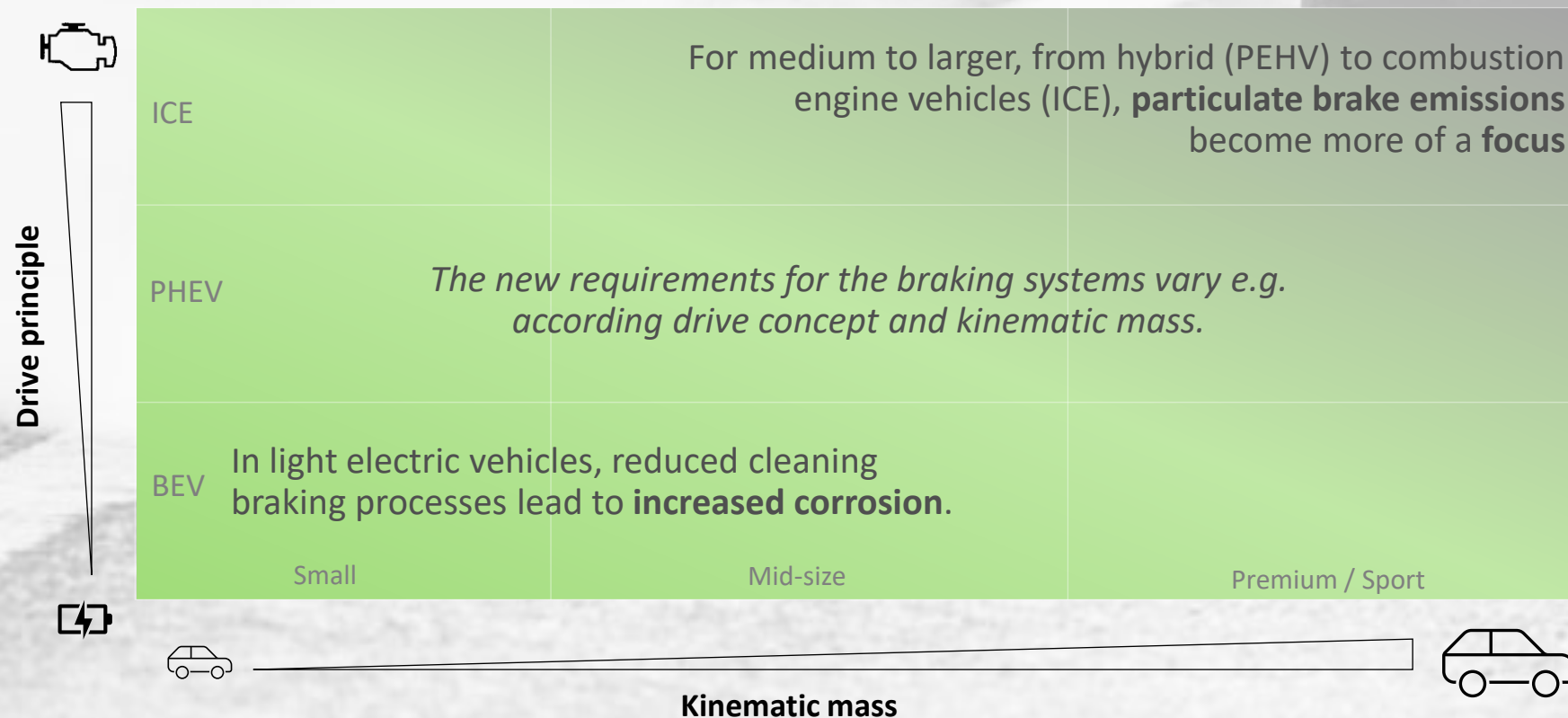
EURO7 regulation poses risks for vehicle manufacturers



- EURO7
- Draft: 10.11.2022
- Regulation < 7 mg/km PM10
- Due date 01.07.2025
- all types

➡ Considerable time bottleneck with the risk of not achieving homologation in time

The new requirements for the braking systems are various



Different solutions for the reduction of particulate matter possible

Modification	Fine dust reduction	Weight reduction	Damping behavior	Initial design effort	Costs per vehicle	Running costs
Pad modification (NAO)	✓	-	-	-	-	-
Recuperation (e-drive)	✓ ✓	-	-	-	-	✗
Drum brakes	✓ ✓ ✓	✗	✗	✗	-	-
Filter systems	✓ ✓	✗ ✗	-	✗	✗	✗
Harder brake rotor alloys	✓ ✓	✓	✗	✓	✗ ✗	✓
Nitro-Carburizing	✓	-	-	✓	✗	✓
Hard coated brake rotors	✓ ✓ ✓	✓ ✓	✓	✓	✗	✓

Standardization required for risk-minimized & short-term industrialization!

Car manufacturer (OEM)

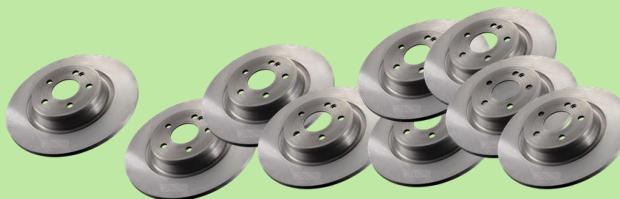


What is required

Homologation-capable tribosystems !



**Brake disc producer
(OEM, Tier 1, Tier 2)**



Standardized pads & coating systems



Machine tool supplier



Auxiliary
process x



Cladding



Finishing



Washing



Measuring



**Standardized
production technology**

WECODUR® standardization for risk-minimized & short-term industrialization!



WECODUR® production technology for large-scale automotive production



Standard brake disc



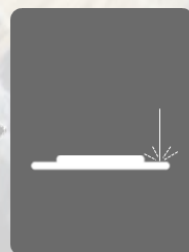
WECODUR® coating



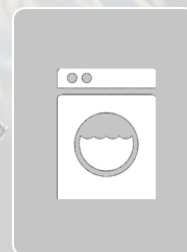
Cooling



Finishing



Wear Marking



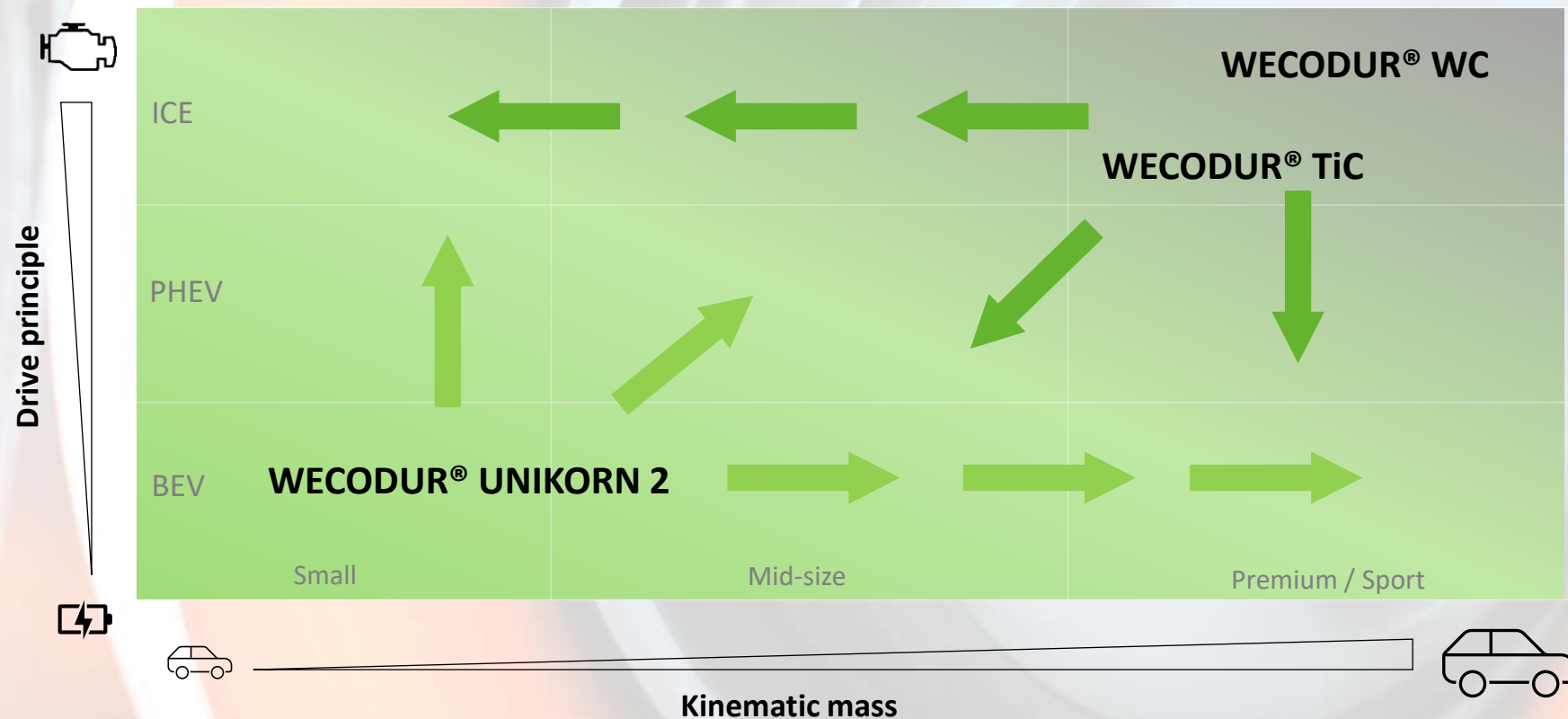
Washing



Measuring

Buffer /
Geomet

WECODUR® coating systems for different requirements



Dedicated material development for tribo coating systems for different requirements

Dual layer WECODUR® TiC40

Ni-free*

After cladding (before finishing)

WECODUR®

- High performance solution * in friction layer
- Externally added Titanium carbides
- Enhanced matrix material development
- Long-term corrosion protection

Single layer WECODUR® Unikorn2

Ni-free

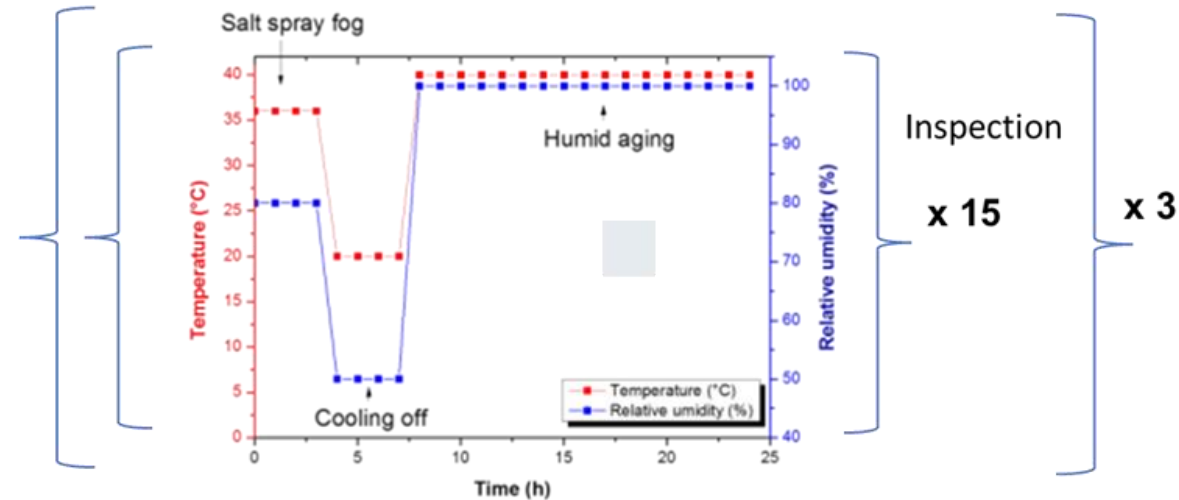
After cladding (before finishing)

WECODUR®

- Medium wear resistance
- Long-term corrosion protection
- No addition of carbides required
- For BEV also (e.g. as alternative to FNC)

Salt spray test - comparison of rotors with WECODUR® UNIKORN2 and FNC treatment

- Volkswagen test procedure
- Daily disc rotation, 180° both at wheel direction level and as Rotation (z), to have better saline fog and uniform saline condensate distribution



WECODUR® clad rotor shows higher corrosion resistance on friction face against FNC

Rotors after 15 d clima
chamber and cleaning



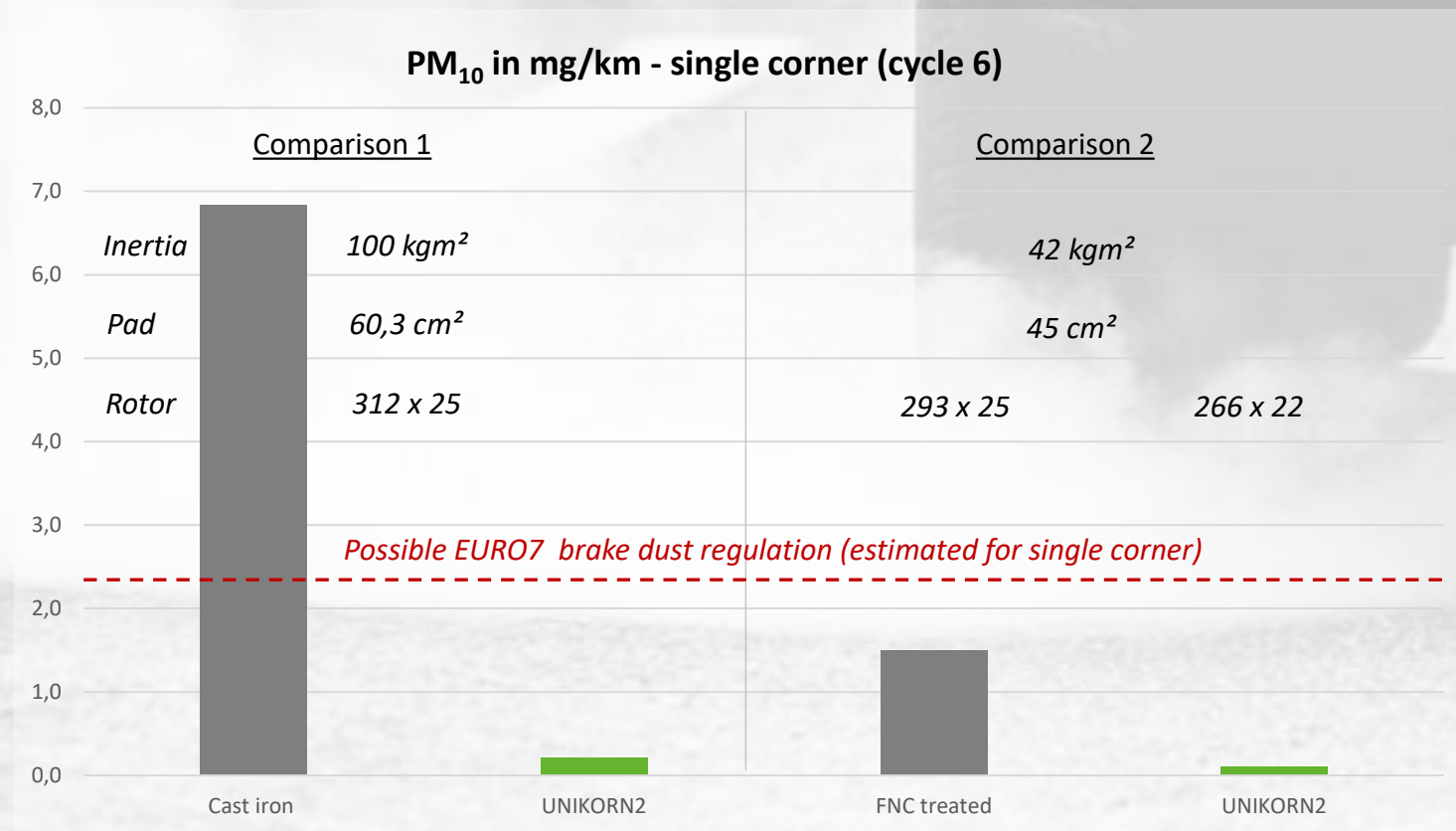
Ferritic Nitro-Carburizing (FNC)



Single layer WECODUR® UNIKORN2

WLTP comparison tests show high finest reduction of laser-cladded UNIKORN2 rotors

- PM₁₀ comparison corner test with two different inertias
- Cast iron conducted with serial pad (lower steel)
- All other rotors conducted with **high performance NAO** (hybrid material GA5900)
- FNC treated rotor still below regulation limit at low inertia
- Single layer (UNIKORN2) shows **fine dust reduction of >> 90% PM₁₀**



Thank you for your attention!



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