MobilityNotes & MAHLE

Conference Summary
SAE 2025 EU OBD

March 13-15, 2025, Porto, Portugal

Thanks to MAHLE Powertrain for this comprehensive summary

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MAHLE Powertrain is an engineering services company specializing in the design, development, testing, integration and control of all propulsion systems, including advanced internal combustion engines, electrified powertrains, hybrid and battery systems and alternative fuels.

As a recognized expert in these fields, MAHLE Powertrain conducts extensive research into new technologies to develop cost-effective, production feasible solutions for enhanced efficiency, improved fuel economy and lower emissions.

MAHLE Powertrain has significant experience in delivering OBD diagnostic projects worldwide for its global customer base and its OBD experts have pulled together this summary of the SAE OBD conference.

DAY 1

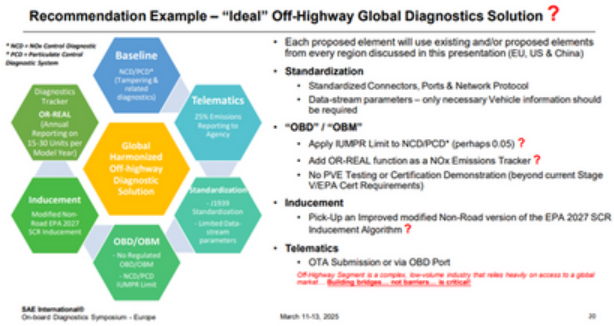
Session 1

GM gave a worldwide regulation update, taken from the current SAE technical standard J3248_202412, providing an overview of the current and known future updates to global OBD regulation. Too much information to be summarized here!

The full SAE technical standard on global OBD regulations is available here (SAE subscription required

Cummins and GM gave a presentation on the desire for global OBD regulation harmonization as we are seeing OBD regulation divergence especially on the future LDV OBD regulation. Examples given of the current differences between the major regulations for LDV, HDV, NRMM

Recommendation proposed for a NRMM Global harmonised diagnostic solution

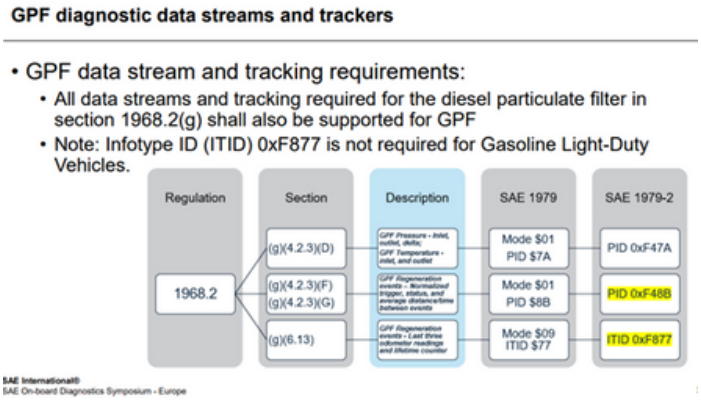


Session 2

CARB gave a presentation on the LDV OBD updates and the Omnibus amendments for LDV's:

- Diagnostic requirements for sensors with similar functions: Any sensor that is part of an emissions relevant diagnostic must be monitored for failure and is MIL relevant even if the failure of the individual sensor is emissions neutral

- LD Omnibus regulation
  New readiness status using a special denominator to potentially help customer get through a smog check for infrequent running diagnostics
  Delay to MY2029 for GPF IUMPR (3 year delay)
- GPF tracking requirement within SAE 1979-2



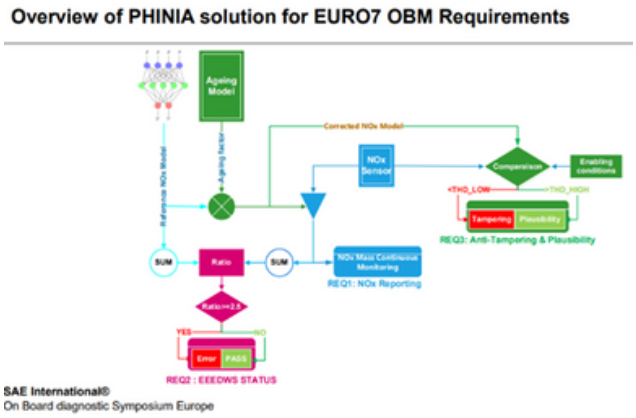
RA consulting and KIT gave a presentation on anomaly detection such as vehicle tampering, system problems, performance drops and change in driving environment. This is analyzed from OBD snapshot data and detecting anomalies which are outside of clusters generate from dimension reduction. Two application proposals were cited: (1) An extension to the existing J1699-3 test & (2) CA Clean truck program on top of the periodic OBD snapshot.

Figure adapted from the ANL study

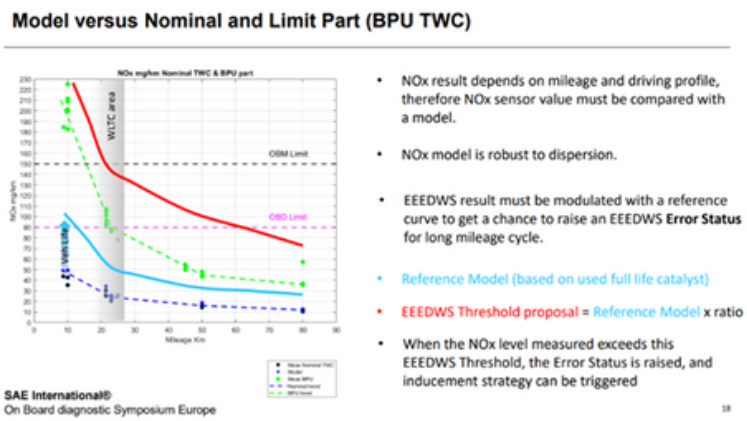
Hyundai gave an interesting presentation on anomaly detection which is motivated by the pinpointing issue associated with the introduction of OBM with EURO7. Method proposed is using an Autoencoder neural network for anomaly detection. This has been successfully embedded onto engine ECU however impact of computing power requirement for Autoencoder model may require ECU hardware update (MPT opinion) to keep within ECU resource limits. This model was limited to 20-25 inputs/outputs which is the limit to the number of components assessed by model. Additional inputs/outputs will increase the ECU computational load of the model.

Session 3

PHINIA gave an overview of their solution to meet the requirement of EU7 OBM requirements, utilizing neural network techniques to model the engine out and aftertreatment of the system. Showed a <30% modelling error at tailpipe, however stressed that there was no underestimation of the model output which is directionally correct for the EU7 OBM legal requirement.

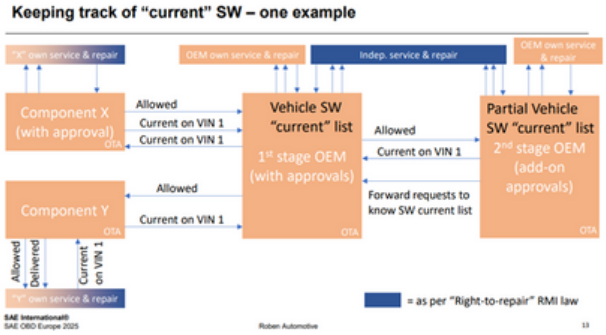


Data collection only performed on one vehicle and with only 4k catalyst and FUL catalyst did not have any consideration for the impact of different vehicles /fuels/aging of other components of the vehicle which will add potential error conditions to the model

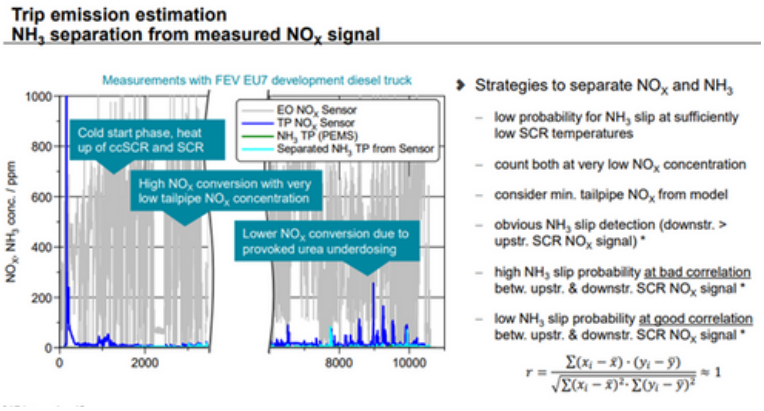


An interesting point raised about the EEEDWS threshold proposal is that the NOx emissions in g/km will change relative to the distance driven for the drivecycle. For a short drivecycle the emissions would be >EEDWS limit but longer drivecycles the emissions <EEDWS limit. 30-40 parameter inputs to the model to achieve the accuracy discussed. This raises a potential issue of excess computational load when running this on an engine ECU

Roben Automotive gave a Holistic view of the regulations for antitampering and methods of software updates via Regulation 156. Highlighted the challenge of traceability of the software that is installed on the vehicle with the current capability of OTA updates, this becomes a significantly larger challenge for multistage vehicles.



Overview provided on the EURO7 requirements and how this compares to the current UNR 155 requirements. Concerns highlighted about the possibility of disconnecting vehicles that are no longer safe to connect to the OEM backend. This removal of the vehicles from OEM backend will not be allowed as part of EURO 7 as it is currently written



FEV presented an overview of EU7 and OBM for HDV applications and highlighted the challenge of OBM requirements for measuring and modelling the NH3 and NOx emissions of HDV applications. A novel method for separating the NOx and NH3 measurement from the data from the single NOx sensor was presented.
Also presented was a detailed overview on the inclusion of the OBD diagnostics into the OBM requirements to ensure pinpointing of hardware to replace when EEEDWS is activated

Session 4

Possibly the most anticipated presentation at the conference was from the EU Commission on the status of OBM

Overview provided the next steps, the adoption timeline was as of the conference 3 weeks behind schedule, from the AGVES meeting on 9th April the OBM implementing act is going to be late for the TCMV vote on 6th May. Therefore, there is potential risk for adoption date of EU7 1st implementing rules being missed by EU Commission.

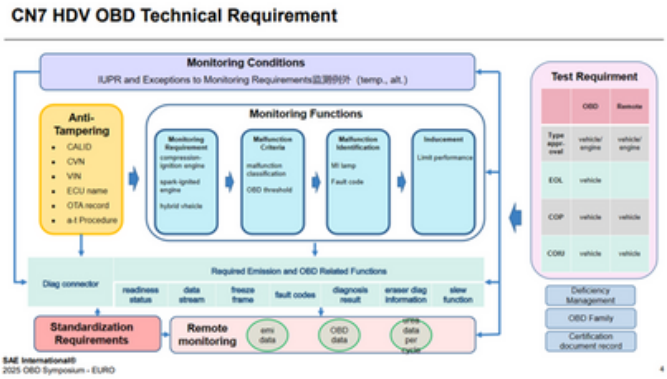
On question about dispensation for OBM driver display that has been a big AGVES topic for OEMs and not been answered to date: Display of NOx and fuel consumption trip data for very short trips will potentially skew driver display of last trip giving potential issue for vehicle sales. Dispensation for very short drives included in latest draft to show emissions in grams rather than g/km.

Figure adapted from the ANL study

DAY 2

Session 5

VECC gave a detailed overview of the China 7 proposal for HDV applications. China is expecting this to be the toughest HDV OBD regulation globally with significant step from CH6 to CN7, with particular focus on remote monitoring and anti-tampering



There were several LDV questions from the audience (the regulation is in draft so final legislation may differ from information below):

- Lambda 1 requirement for LDV gasoline? No, but tough CO limits on CN7 RDE
- J1979-2 requirement for LDV? Yes for LDV, J1979-2 and Classic for HDV
- OTA emissions required for LDV? Yes but no EEDWS

Session 6

Volvo gave an interesting presentation on HPC's and SOVD and the impact on OBD. This was defining the challenges of software defined vehicles meeting the OBD requirements that are not keeping up with the communication technology developments. This discussion was framed around ICE software defined vehicles rather than ZEV applications due to the differing OBD requirements. This is an area that regulators and OEM's will have to work together to ensure a joined-up approach to enable certification of OBD on SVD's

Toyota and Paccar gave a detailed update on the ongoing work within the SAE regulatory development for J1979, J1699 and J1978. There is significant work ongoing to cover the developing regulatory requirements within EU7, EPA27 and CN7

Session 7

GM presented an overview of best practice for calculation of BPU and WPA and why this is important from a diagnostic point of view. He covered points within the regulation (LDV Diesel NOx sensor diagnosis) where there is WPA and BPU defined but no grey space which is always going to be present in this type of assessment, update should be made to the regulation in his view.

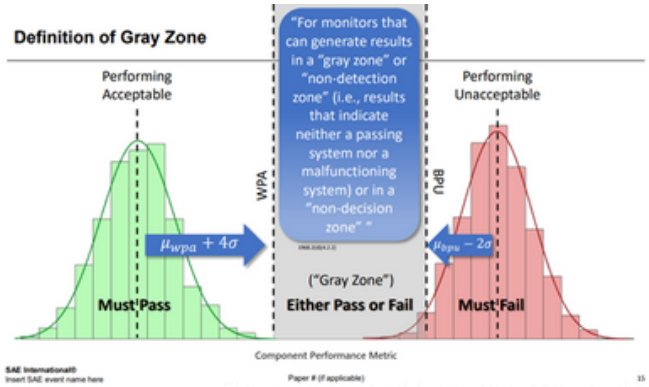
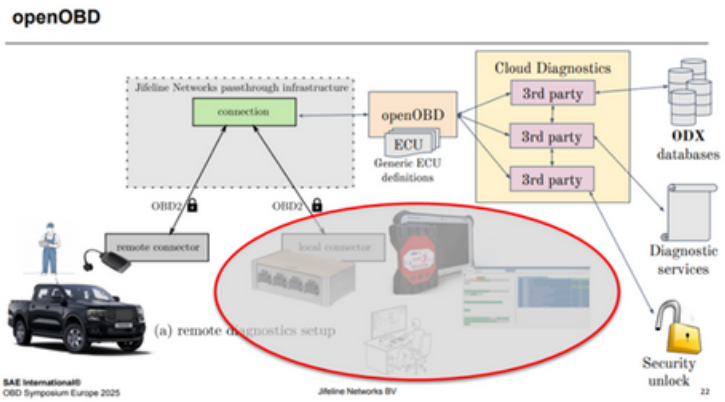


Figure adapted from the ANL study



Jifeline Networks gave a presentation on the challenges of modern vehicle diagnostics at independent garages and the sheer number of diagnostic tools required from different OEM's. The business provides remote access to these tools over a secure connection to independent garages for a subscription. Proposals were made to reduce complexity and re-introduce compatibility between OEM's and remove all the 3rd party tools and host the information online

Emisense Technologies gave a presentation of their latest PM sensor and an overview of the technology behind it. This hardware has been picked up by a global tier 1 supplier and will be producing 1st samples in 2026 and aim for series production for MY29 implementation. Static and dynamic accuracy of the hardware looked impressive however the device must be calibrated to individual combustion systems and likely each vehicle application of combustion system.

Session 8

Volvo gave a second presentation on inducement requirements for the main markets EU6, EU7, CARB, and for different vehicle types LDV, HDV, NRMM with very good diagrammatical representations.

Toyota gave a very detailed overview of the growth of OBD into different parts of the vehicle architecture. Discussion on the inclusion of air conditioning into OBD diagnostic requirements, especially in the ZEV area for battery cooling the requirements are linked to the propulsion related parts (PRP) regulation. With the inclusion of heat pump systems there is additional A/C hardware being drawn into the PRP requirement. Useful CARB official guidance on this topic was shared in the presentation, and is found here

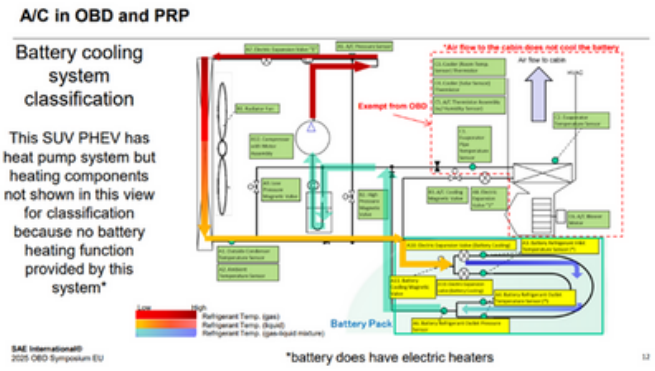


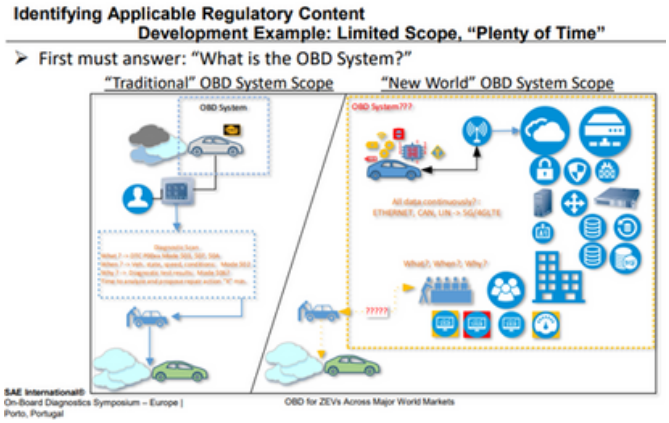
Figure adapted from the ANL study

DAY 3

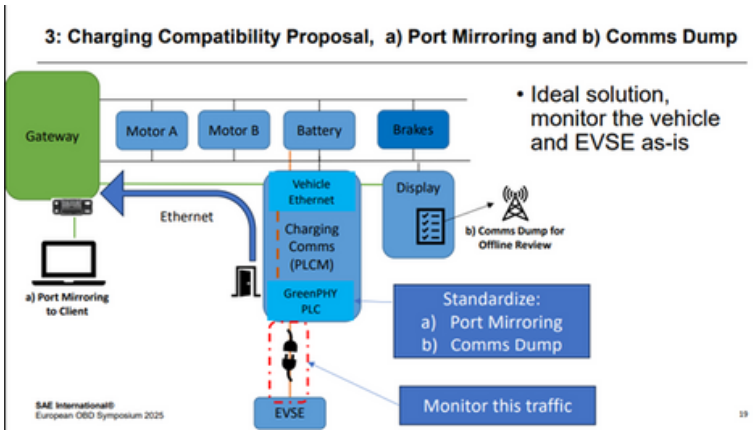
Session 9

CARB presented upcoming OBD amendments aligning with EPA's 2027 NOx standards. Key updates include revised durability aging protocols, adoption of new engine test cycles, and added data stream parameters for both compression- and spark-ignition engines. Changes aim to improve monitoring accuracy while easing manufacturer burden, such as adjusted NOx sensor test criteria and expanded readiness completion rules. CARB also introduced new templates for OBD submissions, required from 2027. For 2026 MY engines, a phase-in of Catalyst Warm-Up Strategy (E-Cats and CSERS) and keep warm strategies will begin. Final point made on NRMM Tier 5 rulemaking board meeting which has been delayed to 2026

Rivian & VW Group Technologies discussed how OBD is evolving for zero-emission vehicles (ZEVs) across the U.S., EU, and China. While traditional OBD focuses on tailpipe emissions, ZEV regulations now shift toward monitoring battery health, propulsion system faults, and vehicle safety features. China's upcoming "China 7" standards may lead global efforts, while U.S. and EU frameworks still differ in scope. The talk highlighted the complexity of achieving regulatory harmony in a rapidly changing landscape.



Session 10



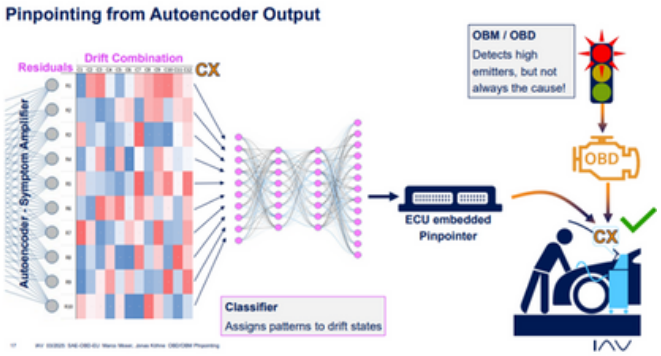
GM shared updates on global regulatory harmonization for ZEV diagnostics, focusing on energy tracking and charging system transparency. UN GTR 22 and CARB ACC2 are defining standards for monitoring non-propulsion energy (NPE) and V2X energy flow. The need for standardized diagnostics between EVs and chargers was discussed, and expansion of J1979-3 and SOVD over PLC for better fault transparency proposed. The session emphasized the importance of traceable, real-time energy data to ensure compliance and customer satisfaction, especially as vehicle-to-grid features become more common.

Figure adapted from the ANL study

Session 11

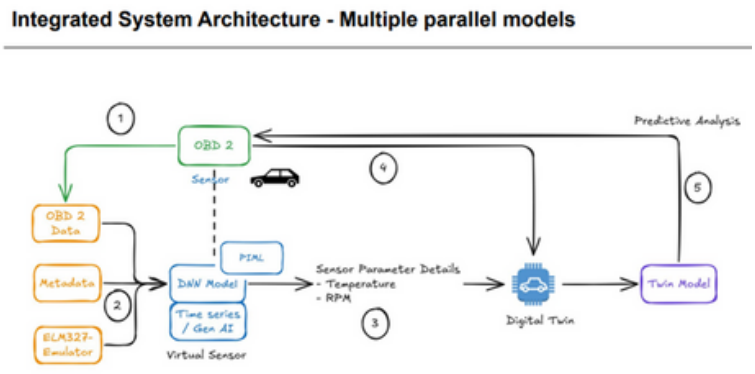
FPT presented a telematics-based diagnostic approach used by FPT Industrial to improve uptime and maintenance planning for heavy-duty vehicles. By analyzing high-frequency engine data, the system supports failure prediction and root-cause analysis. Key metrics include fuel consumption efficiency, acceleration patterns, and torque variation - all used to create driver behavior scores and mission efficiency profiles. This approach allows earlier fault detection and optimized servicing, reducing downtime and increasing vehicle lifecycle performance.

IAV introduced a machine learning solution using autoencoders to detect component drift in emissions systems, even when standard OBD thresholds aren't triggered. By comparing real-time system behavior with trained "normal" data, the AI detects anomalies and amplifies diagnostic signals. This is particularly useful in identifying sensor degradation over time.



Although pinpointing exact causes remains complex, the system enhances EU7 and OBM readiness by offering more granular fault insights. This is a similar approach as discussed by Hyundai on day 1 of the conference

Jessica Dapelo Enterprises promoted the Zero Trust model as a foundational approach to automotive cybersecurity. With over 75% of vehicles expected to be internet-connected by 2030, she emphasized "never trust, always verify" as key. The approach includes continuous monitoring, multi-factor authentication, OTA update security, and strict access control. Dapelo also aligned the strategy with ISO 21434 and UNECE WP.29 requirements, encouraging OEMs to adopt proactive, system-wide cyber protections.



Zalando SE showcased how combining digital twin technology with virtual sensors can enhance OBD systems for predictive maintenance and emissions compliance. These models use real-time data and physics-informed AI to simulate vehicle behavior and detect faults early. For example, coolant or NOx issues can be flagged before hardware fails, enabling timely intervention.

The system bridges diagnostic data with business impact by reducing downtime and improving service planning.

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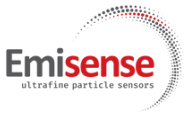

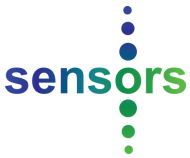

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