

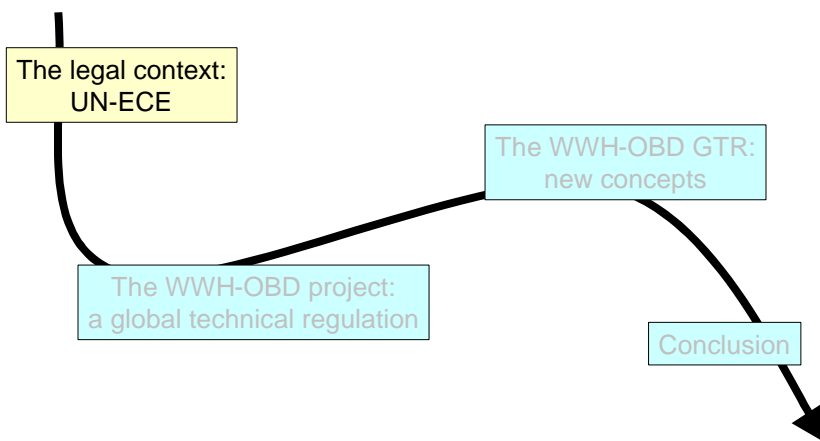


WWH-OBD :

a global technical rule
for emission related OBD systems
of Heavy-Duty Diesel engines

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WWH-OBD: a Global Technical Regulation for emission related OBD of On-Road Heavy Duty Diesel Engines



*WWH-OBD - legal context
the UN-ECE 1998 agreement*

✦ **Purpose of the agreement**

"To establish a process for promoting the development of global technical regulations [GTR] ensuring high levels of safety, environmental protection, energy efficiency and anti-theft"

✦ **Contracting parties**

[Status June 2005] 24 countries / regions, incl. EU and several EU member states, USA, Japan, Canada, South Africa, Russian Federation, & China

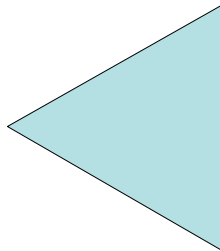
✦ **Enforcement of the OBD GTR**

[art. 7.1.] "A Contracting Party that votes in favour of establishing a global technical regulation [...] shall be obligated to submit the technical Regulation to the process used [...] to adopt such a technical Regulation into its own laws or regulations and shall seek to make a final decision expeditiously."

*WWH-OBD - legal context
Three emission related GTRs for On-Road Heavy Duty Engines*

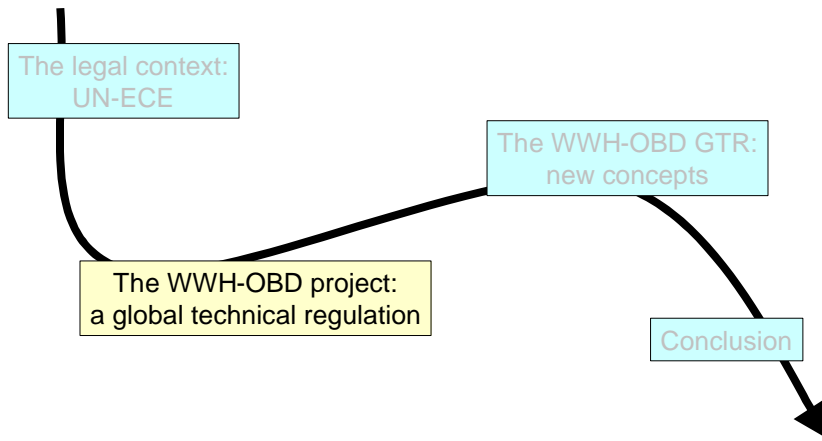
✦ **WWH-OBD**
World-Wide Harmonised
OBD provisions
sponsor country: USA

✦ **WHDC**
Harmonised
emission duty cycle
& testing process
sponsor country: EU



✦ **oce**
Harmonised
"off-cycle" requirements
sponsor country: USA

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Original scope and project management

- ✿ **WP29 (World Forum for Harmonization of Vehicle Regulations) decided in November 2001 a GTR will be made, dealing with "On Board emission Diagnostic systems for Heavy duty vehicles and engines".**
It will concern Diesel fuelled compression ignition engine systems
- ✿ GRPE (Group of Rapporteurs on Pollution and Energy) was given the task to draft this GTR
- ✿ A GRPE informal group, named WWH-OBD, has been created for that purpose
 - ✿ Chairmen: Mr. ODAKA & Mr. NARUSAWA, both NTSEL (Japan)
 - ✿ Secretary: Mr. RENAUDIN, OICA/ISO

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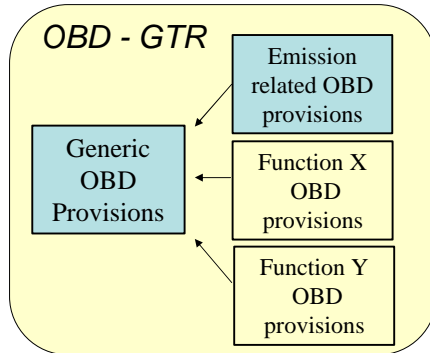
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Further request from WP29: "extended OBD"

- ✦ **WP29 (AC3) decided in November 2003 the GTR will be structured in such a manner as to enable its future extension to other functions of the vehicle.**

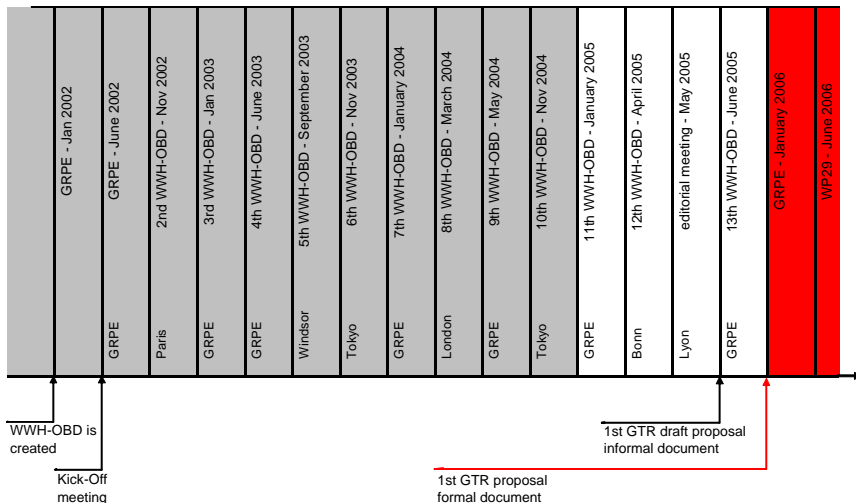
Note:
 The scope has not been modified
 (emission related
 / Heavy Duty Diesel vehicles)

- ✦ **A modular structure has been proposed To address this new request**

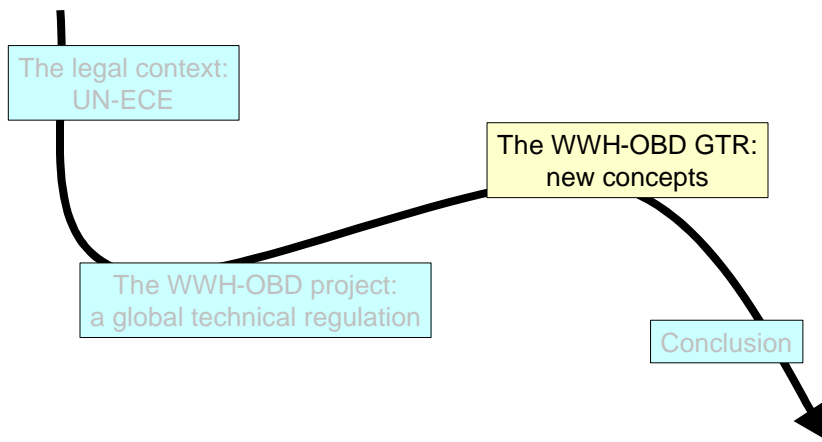


WWH-OBD - time plan

time-schedule overview



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*WWH-OBD – technical scope
the engine-system*

The “engine system” means the engine as configured on a test-bench during the "engine" certification process. It includes:

- ❖ the engine’s electronic management controller(s)
- ❖ the exhaust after-treatment system(s)
- ❖ any emission related component in the exhaust system which supplies input to, or receives output from, the engine’s electronic management controller(s); and
- ❖ the communication interface (hardware and messages) between the engine’s electronic management controller(s) and any other powertrain or vehicle control unit if the exchanged information has an influence on the control of emissions.

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*WWH-OBD – OBD recorded information
Road-worthiness checks: a major focus*

- ✚ Improving the possible usage of OBD information for Road-Worthiness purposes (road-side checks and periodic inspection) has been considered as one of the major targets.
- ✚ The Road-Worthiness provisions themselves are not part of the GTR (that is limited to design rules)
- ✚ The GTR specifies only the most suitable way OBD recorded information shall be available upon off-board request for possible Road-worthiness checks as follows:
 - ✚ *Use Case 1: information about the engine state
A typical use of this information package may be Roadside checks performed by enforcement authorities*
 - ✚ *Use Case 2: Information about emission related malfunctions
A typical use of this information package may be Periodic inspection by enforcement authorities.*
 - ✚ *Use Case 3: Information for diagnosis and repair
A typical use of this information package may be Diagnostic servicing of the vehicle / engine.*

*WWH-OBD – OBD recorded information
The off-board communication*

- ✚ **Today** ISO 15765 and 15031 series of standards are used for OBD purposes all around the world (they are mandatory for LDV-OBDD)
- ✚ **Today** SAE J1939 series of standards is broadly used all around the world for off-board communication with on-road and off-road HD-engines
- ✚ **For WWH-OBDD** ISO has been requested to develop a new series of standards off-board communication
 - ✚ This new series of standards shall enable the manufacturers to select their standardised internal communication protocol.
 - ✚ This new series of standards shall enable a single scan-tool to communicate with the OBD system on-board the vehicle, whatever will be the selected internal protocol

WWH-OBD – monitoring requirements 3 types of monitoring

- ✿ **“Component Monitoring”** that consist of monitoring
 - ❏ Electrical circuit failure
 - ❏ Rationality failure (input component or signal)
 - ❏ Functionality failure (output component or signal)

- ✿ **“Performance threshold monitoring”** that consists of monitoring parameters that are not correlated to emission thresholds.
Example: differential pressure in case of DPF monitoring

- ✿ **“Emission threshold monitoring”** that consists of:
 - ❏ Direct emissions measurement via a tailpipe emission sensor(s) and a correlation model to actual emissions;and/or
 - ❏ An indication of an emissions increase via correlation of computer input/output information to actual emissions.

WWH-OBD – monitoring requirements type of monitoring selection

Depending on the type of technology and/or the type of malfunction:

- ❏ The monitoring technique may be Emission Threshold Monitoring, Performance monitoring, or Component monitoring.
- ❏ Performance monitoring or component monitoring can be preferred to emission threshold monitoring. In that case, the monitoring technique shall be shown by the manufacturer to be robust, timely and efficient.

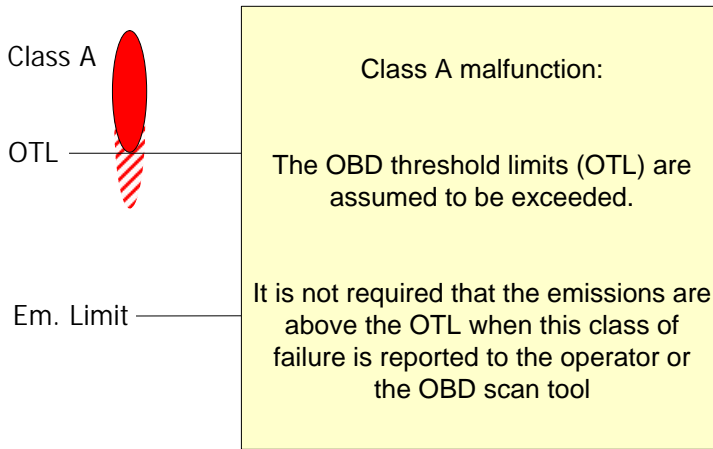
WWH-OBD – OBD recorded information The wireless communication

- ✿ A tentative to incorporate provisions concerning wireless communication of OBD recorded information occurred in the drafting process
- ✿ This tentative failed for the following reasons:
 - ✦ The development of a wireless standard was not compatible with the given time-frame.
 - ✦ There were missing politically agreed terms of reference (e.g. on the communication range, on the wireless communicated data-set, or on how to address confidentiality)
- ✿ Nevertheless, ISO has structured its new series of standards as to enable a future extension to wireless off-board communication.

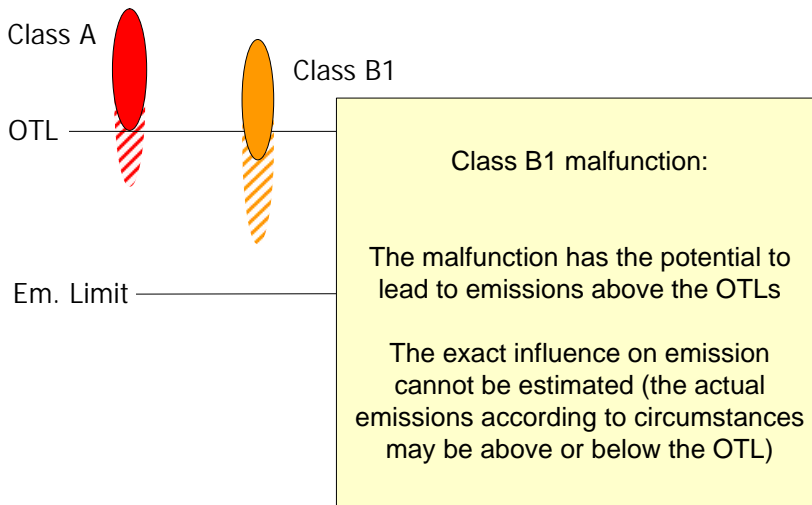
WWH-OBD – the failure classification concept

- ✿ One of the major purpose of the WWH-OBD GTR has been to address in the most appropriate way the use of the OBD system for road side checks and periodic inspections.
- ✿ For that reason a new concept has been introduced that classifies the malfunctions by considering both the level of magnitude of the failures and the reliability of the diagnosis:
 - ✦ Failures that need immediate repair due to their high emission impact
 - ✦ Failures that only have the potential to lead to non acceptable emissions and therefore may wait for the accomplishment of the vehicle mission before being investigated
 - ✦ Failures having an emission impact below the regulated OBD threshold limit value
 - ✦ Failures of a so low emission impact that, when tested the affected engine would remain conform to the emission legislation.

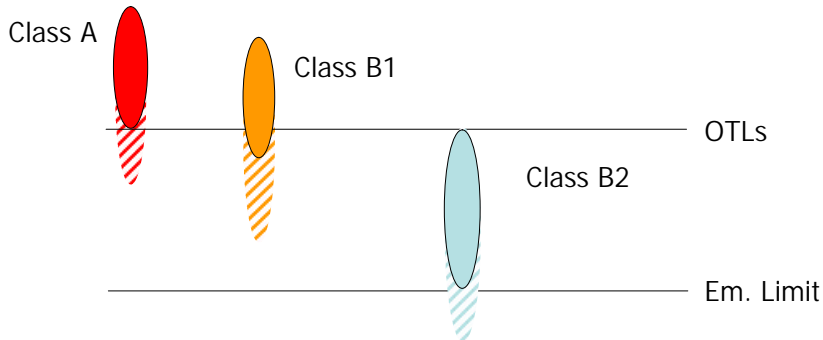
*WWH-OBD – the failure classification
Class A failures*



*WWH-OBD – the failure classification
Class B1 failures*

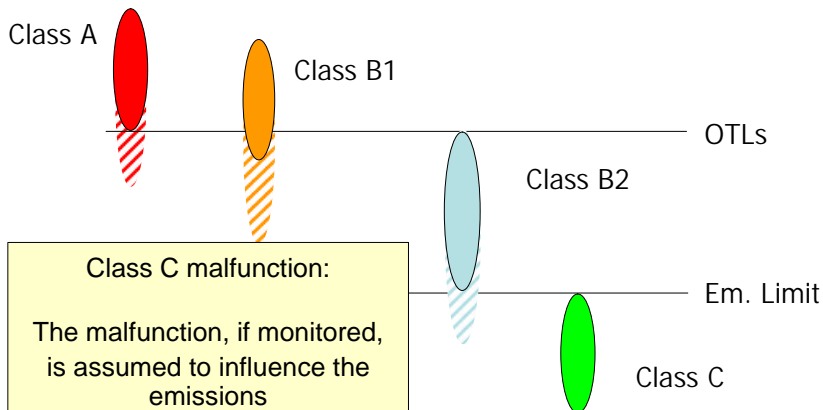


*WWH-OBD – the failure classification
Class B2 failures*



Class B2 malfunction:
The malfunction, according to circumstances, is assumed to influence the emissions but not to a level that exceeds the OTL

*WWH-OBD – the failure classification
Class C failures*



Class C malfunction:
The malfunction, if monitored, is assumed to influence the emissions but to a level that would not exceed the regulated emission limits.

*WWH-OBD – information of a failure occurrence
3 levels to light the MI ON*

✚ **Continuous MI**

The MI is continuously ON during operation

- Class A failure
- Class B1 failure not repaired since 200 hrs.

✚ **60s - MI**

The MI is ON during 60s at key-ON

- Class B1 (< 200 hrs) and B2 failures

✚ **On-demand MI**

The MI is ON on-demand until the engine is started

- Class C failures

*WWH-OBD – information of a failure occurrence
Discriminatory vs non-discriminatory display*

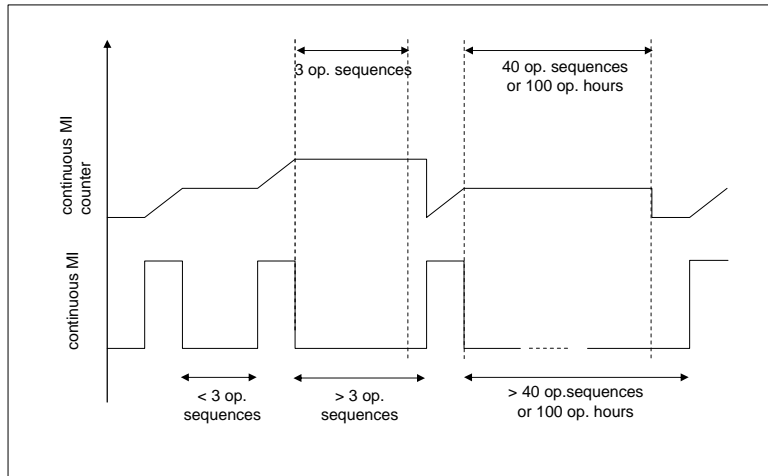
✚ **Normal, discriminatory display (summary)**

- ❖ A continuous-MI means that maintenance is immediately necessary
- ❖ A 60s-MI means there is a doubt concerning the diagnosis (class B1 failures). A sufficient lead-time is left to the driver to accomplish its mission
- ❖ An on-demand MI permits access to "acceptable" failures (class C failures)

✚ **Non-discriminatory display**

- ❖ The continuous-MI applies for any class of failure.
- ❖ The aim is to satisfy authorities that do not consider using the OBD alert system to discriminate the possible degrees of degradation on-board a vehicle.

WWH-OBD – the counters system the continuous MI counter

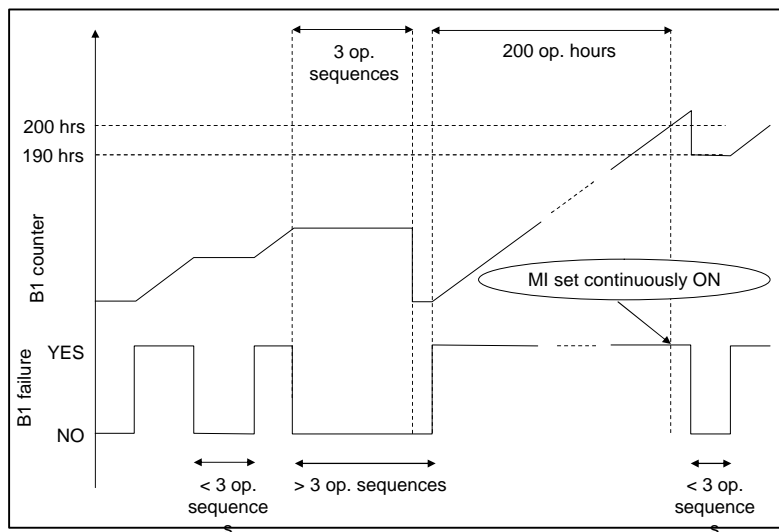


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WWH-OBD – the counters system the B1 counters

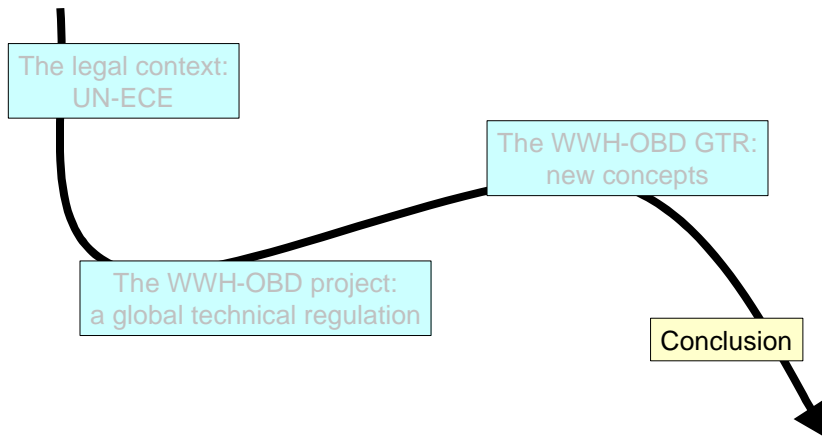


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WWH-OBD - conclusion

- ✿ Further to the UN-ECE 1998 agreement, a global technical rule has been developed that regulates the emission related OBD systems of Heavy Duty Diesel engine and vehicles.
- ✿ This GTR is intended to be adopted in June 2006. The USA are the sponsoring country, while the drafting group is chaired by Japan
- ✿ One of the major purpose has been to address in the most appropriate way the use of the OBD system in road-worthiness management (road side checks and periodic inspections).
- ✿ For that reason a new concept has been introduced that classifies the malfunctions by considering both the level of magnitude of the failures and the reliability of the diagnosis.

References

- ✦ Text of the 1998 agreement:
<http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29glob/globale.pdf>
- ✦ Status June 2005 of the 1998 agreement:
<http://www.unece.org/trans/doc/2005/wp29/WP29-136-01e.pdf>
- ✦ Proposal for an HDV-emission related GTR
<http://www.unece.org/trans/doc/2003/wp29/TRANS-WP29-AC3-01e.pdf>
- ✦ Terms of reference
<http://www.unece.org/trans/doc/2002/wp29grpe/TRANS-WP29-GRPE-43-inf04.pdf>