Retrofit Heavy Duty Dual Fuel

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Bruxelles

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State of the art

New heavy duty dual fuel (HDDF) vehicles (s.c. OEM's):

- R49 amendments completed (Euro VI recently published, Euro V under WP29 approval).

HDDF retrofitted vehicles:

- GRPE agreed to develop a brand new ECE/ONU regulation;
- a long brainstorming have been carried out since the GFV informal workshop in December 2012;
- retrofit industry calls for the definition of a draft legal text asap also to restore a level playing field between the two sectors;
- AEGPL has already presented a first draft at the 26th GFV session (May 2013), a new version will be submitted to the GFV of next September 12.

New HDDF Retrofit Regulation Scope

The scope covers different approvals for different applications:

1. Approval of a HDDF retrofit system;

2. Approval of retrofitted HDDF engines as separate technical unit (as requested by OICA).

Intended to be fitted in:

A. Road heavy duty vehicles;

B. Other applications (agricultural, non road, stationary …)

	Road HDV	**Non-road HD applications**
HDDF retrofit systems	*covered*	*both OEM and retrofit provisions to be defined*
Retrofitted HDDF engines	*covered*	*both OEM and retrofit provisions to be defined*

New Retrofit Regulation Structure

The structure of the draft regulation is modular.

- Each module (annex) will contain specific requirements and testing procedures for the different approvals & applications.
- This is in favor of readability and to facilitate the regulation updating through the addition of new further module (approvals & applications).

Currently, only two annexes have been planned:

- Annex 1: requirements and test for HDDF retrofit systems (already drafted)
- Annex 2: requirements and test for HDDF retrofitted engines (to be defined)

Further annexes: other approvals & applications.
Communication forms in appendixes to each annex.

HDDF Retrofit Systems Key Points

Main provisions:

- **Euro stages: only Euro IV and later** engines covered by the new regulation (older engines could raise technical difficulties).
- **Operational modes:** after the installation of the retrofit systems the vehicle shall be able to run on dual fuel mode as well as on (pure) diesel mode: **only dual fuel types 'B' allowed**.
- **Engine family:** emission tests shall be carried out on one o more engines **(parent engines)** of an engine family sharing pre-defined criteria features *("engine manufacturer" criteria not applied to engines pursuant to emission stages no longer in force);*
- **Application range:** approvals may be extended to engines differing from the parent engine for one or more criteria features, by performing additional tests on one representative engine, possibly with simplified procedures (for example **PEMS**).

Tests for Retrofit Systems: Emissions

Key principles:

In general, an engine equipped with HDDF retrofit systems shall comply with the “engine baseline emission stage” (emission limits for the stage to which the original vehicle was approved), tested with the same applicable procedures.

However, engines originally approved according to emission stages no longer in force, may benefit from some simplification *(it must be taken into consideration that may not be possible to find test engines which perform like new ones).*

Proposals:

For Euro stage in force (Euro VI) limits and procedures for HDDF retrofit systems will be the same as OEM DF.

For Euro stages no longer in force (Euro V and Euro IV) HDDF retrofit systems shall have the opportunity of:

- excluding CH4 from pollutants, including CH4 in CO2 official figure, otherwise the installation of a controlled catalyst will make retrofit systems not economically affordable.
- take into account also in DF mode any discrepancies between actual test results and baseline emission limits in diesel mode.

Tests for Retrofit Systems – Emissions

Even if the manufacturer decide not to use the previous simplifications, a flat HC limit during ETC cycle is desirable for Euro IV and Euro V engines in DF mode:

- the possibility to measure THC in place of NMHC (using the same limits of NMHC) is not mandatory, conversely is an exception to main rule (par. 5.2.2.1. of R49 rev.5)
- CH4 and NMHC limits should be applied in DF mode for any GER.

OBD:

It's not possible to comply with 'procedural' requirements of OEM OBD, for example no more than one MIL indicator is allowed.

Then retrofit systems shall perform a switch back to diesel mode (always possible because only 'B' DF types are allowed) in case of a detected malfunction.

A clear indication of this situation could be given to driver using other means than MIL.

The main OBD purposes - prevent the exceeding of emissions and communicate to the driver the relevant malfunction - is preserved: the vehicle remains under the control of diesel OBD in diesel mode.

The return in DF mode is forbidden until the cause of the malfunction is eliminated.

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Thank You

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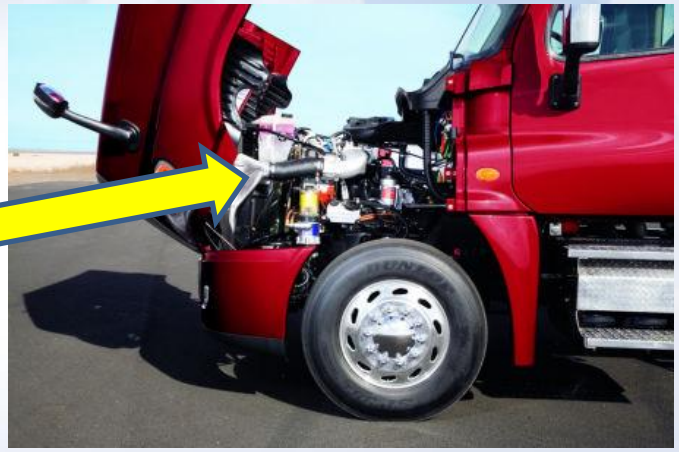
HDDF Retrofit Systems

A Dual fuel retrofit system consists of a set of components, including:

- Pressure regulator
- Sensors and actuators
- Electronic control unit
- Fuel tank

These retrofit systems shall be installed on registered vehicles, allowing (after the installation) the operation in both pure diesel and dual fuel modes.



HDDF RETROFITTED ENGINES

A retrofitted Dual fuel engine is a diesel engine equipped with additional components capable to run on both diesel and dual fuel mode.

The retrofitted engine should be approved as a separate technical unit and it should be fitted into heavy duty vehicles by the same or by another manufacturer.