

Dual Fuel in The Netherlands

Workshop Dual Fuel
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Certification of retrofit Dual Fuel

In The Netherlands:

- No certification at the moment
- Test program emissions Dual Fuel
- Mixed results
- Certification is being considered

Test program Dual Fuel

LPG: replacement of diesel fuel limited by knocking and NOx emissions.

CNG/LNG: replacement of diesel fuel limited by methane emissions.

Little replacement during transient operation.

Environmental issues

LPG:

Possible increase of NO_x emissions

Decrease of Particulate emissions

Increase of CO and HC emissions, but probably still below diesel limit values

Little or no decrease of CO₂ emissions.

Environmental issues

CNG/LNG:

Possible decrease of NO_x emissions

Decrease of Particulate emissions

Increase of CO and NMHC emissions, but still below diesel limit values

Substantial CH₄ emissions, consuming all or more than CO₂-benefits

Environmental issues

Overall conclusions:

- Retrofit Dual Fuel has little or no environmental advantages and possible disadvantages.
- Certification appears necessary to prevent deterioration of the environment

Ideas about certification

Options:

Test according to ECE Regulation 49

Pro: well known procedure, accurate measurements.

Contra: little information on real driving emissions, expensive for small series. Sometimes difficult to find a compliant test engine.

Ideas about certification

Options:

Test on the road using PEMS

Pro: well known procedure, reasonably accurate measurements, information on real driving emissions

Contra: expensive for small series, replacement ratio difficult to determine.

Ideas about certification

Options:

Test on the road using SEMS

Pro: inexpensive, suitable for small series, information on real driving emissions.

Contra: procedure still under development; measurement results in g/kg CO₂;

Methane emissions difficult to measure;

Replacement ratio difficult to determine.

Ideas about certification

Possible outcome of the discussions.

- Parent approval of (large) engine family according to R49
- Evaluation of different applications using SEMS.

Ideas about certification

Major unsolved issues

- Determination of replacement ratio
- Measurement of CH₄ using SEMS

Certification criteria

For R49 test:

- Retrofitted engine shall meet R49 limit values for type 2b dual fuel engines.
- CO₂ emissions + CO₂ weighted CH₄ emissions shall not exceed diesel CO₂ emissions

Certification criteria

For SEMS test:

- $\text{CO}_2 + \text{CO}_2$ weighted CH_4 not worse than CO_2 for diesel in case of CNG/LNG

and:

- Either: NO_x in service conformity factor $< 1,5$
- Or: NO_x/CO_2 not worse than diesel

Certification of Dual Fuel

Questions?

Suggestions?