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Technical specifications of diesel/methanol dual-fuel engine

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1 Scope

This document specifies the technical requirements, test methods, inspection rules and markings, packaging, transportation, storage of diesel/methanol dual-fuel engines.

This document applies to automotive diesel/methanol dual-fuel compression ignition engines (hereinafter referred to as dual-fuel engines).

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. Among them, for dated reference documents, only the version corresponding to that date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to this document.

GB/T 1147.1 Small and medium power internal combustion engines - Part 1: General requirements

GB/T 1859.1 Reciprocating internal combustion engines - Measurement of sound power level using sound pressure - Part 1: Engineering method

GB/T 6809 (all parts) Reciprocating internal combustion engines - Vocabulary of components and systems

GB 7258 Safety specifications for power-driven vehicles operating on roads

GB/T 9969 General principles for preparation of instructions for use of industrial products

GB 14023 Vehicles, boats and internal combustion engine - Radio disturbance characteristics - Limits and methods of measurement for the protection of off-board receivers

GB/T 14097 Reciprocating internal combustion engines - Limit values of emitted noise

GB 17691 Limits and measurement methods for emissions from diesel

The ratio, of oil consumption TO equivalent fuel consumption, for a dual-fuel engine, under rated operating conditions.

3.7

Methanol supply devices

The component system of a dual-fuel engine, that injects methanol into the intake main or intake manifold or engine cylinder, at a certain pressure, which generally include a methanol rail and a methanol injector.

3.8

Single point injection

A methanol supply mode, where there is only one methanol injection position for dual-fuel engines AND it is shared by multiple cylinders.

3.9

Multi-point injection

A methanol supply mode, where each cylinder of the dual-fuel engine has a methanol injection device AND each injection device can be independently controlled.

4 Technical requirements

4.1 General requirements

4.1.1 The dual-fuel engine shall be manufactured, in accordance with the product drawings and technical documents, which are approved by the prescribed procedures.

4.1.2 Dual fuel engines and their parts and components shall comply with relevant national standards, industry standards, the provisions of this document.

4.1.3 The manufacturer shall provide the main specifications and parameters of the dual-fuel engine, which are listed in Appendix A, in the technical documents, as well as other necessary technical indicators.

4.1.4 The diesel, which is used in dual-fuel engines, shall meet the requirements of GB 19147. The methanol shall meet the requirements of relevant standards for automobile methanol fuel. Manufacturers shall make recommendations for fuel specifications, in accordance with Appendix A.

4.1.5 The technical indicators of dual-fuel engine oil shall meet the requirements

of the relevant standards for methanol automobile engine oil. The manufacturer shall clearly specify the recommended oil designation, oil change interval, change interval of oil filter element.

4.1.6 The manufacturer shall put forward recommended requirements, for the system installation of dual-fuel engines.

4.1.7 When the dual-fuel engine is switching between different fuel operating modes, the switching process shall be safe, smooth, disturbance-free.

4.1.8 The electrical equipment of dual-fuel engines shall meet the requirements of QC/T 413.

4.1.9 The dual-fuel engine shall be free of air leakage, water leakage, oil leakage, alcohol leakage.

4.1.10 The appearance, assembly adjustment mass, cleanliness of the dual-fuel engine shall meet the requirements of the enterprise's product design drawings and process documents.

4.1.11 The surface painting of dual-fuel engines shall meet the requirements of QC/T 484.

4.1.12 The starting performance of dual-fuel engines shall meet the “passing” requirements, for diesel engine's starting performance scoring in GB/T 18297.

4.1.13 The oil/fuel consumption ratio of dual-fuel engines AND the maximum piston air leakage under full load, shall meet the requirements of GB/T 19055.

4.1.14 The blending ratio of diesel and methanol, for dual-fuel engines, shall be implemented in accordance with the product standards of the manufacturer. It shall not be changed after leaving the factory.

4.2 Consistency requirements

The tolerance of the dual-fuel engine's rated power, maximum torque, minimum equivalent specific fuel consumption rate shall meet the requirements of GB/T 18297, during type inspection and production consistency inspection.

4.3 Reliability requirements

The overall reliability level of the dual-fuel engine shall meet the "pass" requirement for reliability assessment, in GB/T 19055.

4.4 Durability requirements

The service durability of dual-fuel engines shall meet the requirements of QC/T 471.

5.3 The reliability test of the dual-fuel engine shall be carried out, in accordance with the provisions of GB/T 19055.

5.4 The test methods for the rated power and maximum torque of the dual-fuel engine shall be carried out, in accordance with the provisions of GB/T 17692.

5.5 For the measurement of fuel consumption of dual-fuel engines, it shall use two independent flow measuring devices, to measure diesel consumption and methanol consumption, respectively. Among them, the alcohol-related parts of the device, which are used to measure methanol consumption, shall have the ability to resist methanol corrosion.

5.6 The test method for the minimum equivalent specific fuel consumption rate of the dual-fuel engine shall be implemented, in accordance with the provisions of GB/T 18297.

5.7 The measurement of the oil/fuel consumption ratio of the dual-fuel engine AND the maximum piston air leakage, under full load, shall be carried out, in accordance with the provisions of GB/T 18297.

5.8 The type inspection items and methods of dual-fuel engines shall be implemented, in accordance with the relevant requirements of QC/T 526.

5.9 For dual-fuel engines or vehicles which are equipped with dual-fuel engines, the pollutant (including unburned methanol and formaldehyde) emission test shall be conducted, in accordance with GB 17691 or GB 18352.6, as well as the relevant national standards for methanol vehicle emissions.

5.10 For dual-fuel engines or vehicles which are equipped with dual-fuel engines, the relevant tests of the on-board diagnostic (OBD) system shall be conducted, in accordance with GB 17691 or GB 18352.6, as well as the relevant national standards for methanol vehicle emissions.

5.11 The noise measurement of dual-fuel engines shall be carried out, in accordance with the provisions of GB/T 1859.1.

5.12 For vehicles, which are equipped with dual-fuel engines, the test of radio disturbance characteristic shall be carried out, in accordance with the provisions of GB 14023.

6 Inspection rules

6.1 Type inspection

6.1.1 Type inspection shall be carried out, in accordance with the provisions of QC/T 526, for any of the following conditions:

a) New products;

b) The product has a major improvement (that is, for the improved dual-fuel engine, the rated speed is increased by more than 10%, as compared with the original model, OR its rated power is increased by more than 15%, as compared with the original model);

c) There are major changes in product structure;

d) The product subject to trans-plant production.

6.1.2 When all items of the engine type inspection meet the requirements, it is judged as qualified for the type inspection. If one item does not meet the requirements, the engine's type inspection is determined to be unqualified.

6.2 Exit-factory inspection

6.2.1 The dual-fuel engine can only be exit-factory, after passing the exit-factory inspection, in accordance with the provisions of national standards, industry standards or enterprise standards; AND being issued with the product quality certificate by the relevant quality inspection department of the manufacturer.

6.2.2 The inspection items shall include but not limited to the following:

a) Visual inspection (assembly integrity, assembly quality);

b) The tightness of diesel/methanol supply system, lubrication system, cooling system;

c) Start-up test;

d) Working stability test under rated conditions;

e) Operation mode switching test;

f) The assembly adjustment inspection of the whole machine is carried out in accordance with the exit-factory technical requirements of the manufacturer, mainly including: hot test run-in, gap inspection, abnormal noise inspection, technical adjustments, etc.

6.3 Sampling inspection of quality

The sampling inspection of quality of dual-fuel engines shall be carried out, in accordance with the provisions of QC/T 901.

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