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**Road vehicles - Recyclability and recoverability rate -
Requirement and calculation method**

道路车辆 可再利用率 and 可回收利用要求及计算方法

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Table of Contents

Foreword	3
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Symbols.....	7
5 Requirements for vehicle recyclability and recoverability rate	8
6 Calculation method of vehicle recyclability and recoverability rate	8
Appendix A (Normative) Data sheet	13
Appendix B (Informative) Calculation process	15
Appendix C (Normative) Proven recycling technology	16

Road vehicles - Recyclability and recoverability rate - Requirement and calculation method

1 Scope

This document stipulates the symbols for the recyclability rate and recoverability rate of road vehicles, the requirements and calculation methods for the recyclability rate and recoverability rate of complete vehicles.

This document is applicable to newly produced category M₁ and category N₁ vehicles; other vehicles shall refer to it.

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, for dated reference documents, only the version corresponding to the date applies to this document; for undated reference documents, the latest version (including all amendments) applies to this document.

GB/T 3730.2-1996 Road vehicle - Masses - Vocabulary and codes

GB/T 26988 Marks for recoverability of automobile parts

GB/T 26989 Automobile recovery - Terminology

GB/T 33460 Specifications for compiling dismantling manual of end-of-life vehicles

GB/T 34490 Recycled sintered neodymium iron boron permanent magnets

QC/T 797 Material identification and marking of automotive plastic, rubber and thermoplastic elastomer parts

3 Terms and definitions

The terms and definitions as defined in GB/T 3730.2-1996 and GB/T 26989, as well as the following terms and definitions, apply to this document.

3.1

All mass units are expressed in kilograms, accurate to 2 decimal places.
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5 Requirements for vehicle recyclability and recoverability rate

5.1 Requirements for vehicle recyclability rate

The recyclability rate of categories M_1 and N_1 vehicles shall not be less than 85%.

5.2 Requirements for vehicle recoverability rate

The recoverability rate of categories M_1 and N_1 vehicles shall not be less than 95%.

6 Calculation method of vehicle recyclability and recoverability rate

6.1 General

6.1.1 The calculation of the recyclability rate and recoverability rate of the entire vehicle shall be based on the vehicle material data, which is collected from the supply chain and the proven recycling technology.

6.1.2 Plastic, rubber, thermoplastic elastomer parts shall have the material type marked on the surface of the part, in accordance with the requirements of QC/T 797. For parts of other material types, it shall have a recoverability mark on the outer surface in accordance with the provisions of GB/T 26988; or it shall describe the technical information such as the recoverability and recovery technology of the parts in the technical documents, such as the scrapped vehicle dismantling instruction manual. The preparation of the scrapped vehicle dismantling instruction manual shall meet the requirements of GB/T 33460.

6.1.3 The recyclability rate and recoverability rate of the vehicle are calculated through the following four stages:

- a) Preprocessing;
- b) Dismantling;
- c) Metal separation;
- d) Disposal of non-metallic residues.

6.1.4 m_P , m_D , m_M can be obtained in the calculations of 6.1.3a), 6.1.3b), 6.1.3c), respectively. The m_{Tr} and m_{Te} can be determined in the 6.1.3 d) stage (see 6.3.4). The

data expression method for calculating the vehicle recyclability rate and recoverability rate shall comply with the provisions of Appendix A; the graphical expression method can refer to Appendix B.

6.2 Classification of materials

6.2.1 Divide all materials making up the vehicle into the following 7 categories:

- a) Metal;
- b) Polymers (excluding rubber);
- c) Rubber;
- d) Glass;
- e) Liquids [including fuel, engine oil, transmission oil, gearbox (including differential and transfer case) oil, power steering oil, coolant, brake fluid, shock absorber oil, air conditioning refrigerant, windshield cleaning fluid, hydraulic suspension fluid, etc.];
- f) Improved organic natural materials such as leather, wood, cardboard, cotton wool fabrics;
- g) Other parts and/or materials that cannot be classified in detail (such as compounds, electronic components, electrical equipment).

6.2.2 According to the data sheet in Appendix A, record statistics and determine the total mass of each type of material.

6.2.3 The classification of materials can be carried out when calculating the mass of materials at each stage specified in 6.3.

6.3 Determination of m_P , m_D , m_M , m_{Tr} , m_{Te}

6.3.1 Preprocessing - Determine m_P

6.3.1.1 The parts and/or materials processed in the pre-processing stage mainly include:

- a) All liquids;
- b) Batteries (including lead-acid batteries, lithium-ion batteries, metal hydride nickel batteries, fuel cells, etc.);
- c) Engine oil filter;
- d) Pressure fuel tanks (including liquefied petroleum gas tanks, compressed natural gas tanks, hydrogen storage tanks, other gas fuel tanks, etc.);

e) Tires;

f) Catalytic system (including catalytic converter, SCR selective catalytic system, DPF diesel exhaust particle trap, etc.).

6.3.1.2 Parts and/or materials described in 6.3.1.1 are considered reusable or recyclable.

6.3.1.3 According to Appendix A, record the total mass of parts and/or materials in 6.3.1.1, to determine m_P .

6.3.2 Disassembly - Determine m_D

6.3.2.1 Based on the principles listed in 6.3.2.2 ~ 6.3.2.7, determine other parts on the vehicle that are considered to be reusable or recyclable.

6.3.2.2 During the disassembly stage, parts that are considered to be reusable and/or recyclable shall be disassembled. The disassembly of parts shall be evaluated, through the following aspects:

- a) The location of the parts on the vehicle is accessible;
- b) The fastening method of parts has disassembly technology.

6.3.2.3 When determining the recyclability of parts, the safety and environmental requirements for recyclable parts shall be met. Parts that do not meet the safety and environmental requirements are considered non-reusable.

6.3.2.4 Parts and/or materials that meet the disassembly requirements of 6.3.2.2 and meet the following conditions can be considered recyclable:

- a) The material composition of metal parts or non-metal parts has been marked, in accordance with GB/T 26988 or QC/T 797, and/or the material type and recyclability information are described in the scrapped vehicle dismantling manual;
- b) The material type of non-metallic parts has proven recycling technology for automotive non-metallic materials listed in Appendix C.

6.3.2.5 Parts listed in m_D shall meet the following requirements at the same time:

- a) Parts or materials meet the disassembly requirements specified in 6.3.2.2;
- b) The disassembled parts can be reused or meet the conditions for recycling specified in 6.3.2.4.

6.3.2.6 Based on the principles mentioned in 6.3.2.5, determine the scope of disassembled parts, such as front bumper skin, door sill exterior panels, door sill interior panels, A/B/C pillar linings, window glass, windshield glass etc.

6.3.2.7 After determining the list of reusable and/or recyclable parts in the disassembly stage, record statistics and determine the total mass m_D of the parts.

6.3.3 Metal separation - Determine m_M

6.3.3.1 The metal separation stage mainly considers all metal parts not considered in the two stages of preprocessing and disassembly. All metal parts are considered to be recyclable.

6.3.3.2 Statistically record the mass of the metal parts still remaining in the vehicle after the preprocessing and disassembly stages. Determine m_M .

6.3.4 Treatment of non-metallic residues - Determine m_{Tr} and m_{Te}

6.3.4.1 The remaining other materials (i.e., materials not considered in the preprocessing, disassembly, metal separation stages) are non-metallic residues.

6.3.4.2 At this stage, the residual non-metallic recyclable materials or these materials and residual non-metallic recyclable materials may be considered.

- a) The material composition of non-metal parts has been marked in accordance with GB/T 26988 or QC/T 797; and/or the material type and recoverability information are described in the scrapped vehicle dismantling manual. At the same time, the material mass m_{Tr} that can be reused is determined, based on the proven recycling technology in Appendix C.
- b) In non-metallic residues, the material mass corresponding to the energy recovery portion can be determined as m_{Te} .

6.4 Calculation of vehicle recyclability and recoverability rate

6.4.1 Vehicle recyclability rate

Use formula (1) to calculate the vehicle recyclability rate R_{cyc} (expressed as mass fraction):

$$R_{cyc} = \frac{m_P + m_D + m_M + m_{Tr}}{m_V} \times 100\% \quad \dots\dots\dots (1)$$

6.4.2 Vehicle recoverability rate

Use formula (2) to calculate the vehicle recoverability rate R_{cov} (expressed in mass fraction):

$$R_{cov} = \frac{m_P + m_D + m_M + m_{Tr} + m_{Te}}{m_V} \times 100\% \quad \dots\dots\dots (2)$$

6.4.3 Data recording requirements

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