GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 27.010

CCS F 01

GB 32051-2024

Replacing GB 32051-2015

Norm of energy consumption per unit production of titanium dioxide and iron oxide pigments

钛白粉和氧化铁颜料单位产品能源消耗限额

Issued on: April 29, 2024 **Implemented on: May 1, 2025**

Issued by: State Administration for Market Regulation;
Standardization Administration of PRC.

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Norm of energy consumption per unit production of titanium dioxide and iron oxide pigments

1 Scope

This document specifies the grades of allowance values, technical requirements, statistical scope and calculation method for the energy consumption per unit products of titanium dioxide and iron oxide pigments (referred to as energy consumption).

This document is applicable to the calculation and assessment of energy consumption of production enterprises of titanium dioxide produced by the sulfate process with ilmenite, titanium concentrate or acid-soluble titanium slag as the main raw materials, titanium dioxide produced by the chloride process with natural rutile, artificial rutile or high-titanium chloride slag and chlorine as the main raw materials, and iron oxide pigments with scrap iron, ferrous sulfate, nitric acid and sulfuric acid as the main raw materials, as well as the energy consumption control of new projects and renovation and expansion projects.

This document is not applicable to the hydrochloric acid method for the production of titanium dioxide chloride and the low-grade blast furnace titanium-containing slag low-temperature titanium dioxide chloride production process.

2 Normative references

The provisions of the following documents constitute the essential clauses of this document through normative references in this text. Among them, for referenced documents with dates, only the versions corresponding to the dates are applicable to this document; for referenced documents without dates, the latest versions (including all amendments) are applicable to this document.

GB/T 1706 Titanium dioxide pigments

GB/T 1863 Iron oxide pigments

GB/T 2589 General rules for calculation of the comprehensive energy consumption

GB/T 12723 General principles for establishing allowance of energy consumption per unit throughput

3 Terms and definitions

The terms and definitions defined in GB/T 12723 and the following apply to this document.

3.1 comprehensive energy consumption of titanium dioxide

During the reporting period, the total amount of various energy actually consumed in production within the titanium dioxide production boundary.

3.2 comprehensive energy consumption per unit products of titanium dioxide

The comprehensive energy consumption of titanium dioxide (3.1) expressed by per unit of throughput.

3.3 comprehensive energy consumption of iron oxide pigments

During the reporting period, the total amount of various energy actually consumed in the production within the iron oxide pigment production boundary.

3.4 comprehensive energy consumption per unit products of iron oxide pigments

The comprehensive energy consumption of iron oxide pigments (3.3) expressed by per unit of throughput.

4 Grades of allowance values of energy consumption

4.1 Grades of allowance values of titanium dioxide energy consumption

The grades of allowance values of titanium dioxide energy consumption are as specified in Table 1, among which Grade 1 has the lowest energy consumption.

4.2 Grades of allowance values of energy consumption of iron oxide pigments

The grades of allowance values of energy consumption of iron oxide pigments are in

accordance with the provisions of Table 2, among which Grade 1 has the lowest energy consumption.

5 Technical requirements

5.1 The energy consumption limit values for existing titanium dioxide and iron oxide pigment manufacturers shall comply with the Grade 3 requirements in Table 1 and Table 2 respectively.

5.2 The energy consumption access values for new construction or renovation and expansion of titanium dioxide and iron oxide pigment manufacturers shall comply with the Grade 2 requirements in Table 1 and Table 2 respectively.

6 Statistical scope and calculation method

6.1 Statistical scope

6.1.1 General provisions

The comprehensive energy consumption of titanium dioxide and iron oxide pigment products shall include the energy consumption of the production system, the energy consumption of the auxiliary production system and the energy consumption of the ancillary production system. The statistics and accounting of energy consumption shall include all production links, auxiliary production and ancillary production systems, and shall neither be repeated nor omitted.

6.1.2 Energy consumption of production system

6.1.2.1 Energy consumption of titanium dioxide production system

The energy consumption of all processes from the titanium raw materials (ilmenite, acid-soluble titanium slag, natural rutile, artificial rutile or titanium chloride slag, etc.), raw materials such as sulfuric acid or chlorine, and energy such as steam, water,

electricity, and natural gas entering the production process after calculation to titanium dioxide finished products being packaged and transported to the warehouse.

a) Energy consumption of production system of titanium dioxide by sulfuric acid method: Energy consumption of all equipment and processes involving in the entry of titanium raw materials (ilmenite, titanium concentrate and acid-soluble titanium slag, etc.) and sulfuric acid into production, the acidolysis, purification, concentration, hydrolysis, water washing, calcination, post-treatment and other main processes, and the packaging and transportation to the warehouse of the finished products.

b) Energy consumption of production system of titanium dioxide by chloride process: The energy consumption of all production processes including the reaction of titanium raw materials (natural rutile, artificial rutile or high titanium chloride slag) and petroleum coke with chlorine or chlorine returned from oxidation in a chlorination furnace to generate titanium tetrachloride, the obtaining of refined titanium tetrachloride from the purification and refinement of titanium tetrachloride, the production of titanium dioxide semi-finished products from refined titanium tetrachloride being oxidized with high-temperature oxygen in the gas phase, the post-processing, coating, water washing, filtering, drying, and air flow pulverization of titanium dioxide semi-finished products, and final packaging into finished products for storage.

6.1.2.2 Energy consumption of iron oxide pigment production system

The energy consumption of all processes from the raw materials such as scrap iron, ferrous sulfate, nitric acid, sulfuric acid and water, and energy such as steam, electricity and natural gas enter the production process after metering to the packaging and transportation of the finished iron oxide pigment to the warehouse.

6.1.3 Energy consumption of auxiliary production systems

The energy consumption of auxiliary production systems shall include the energy consumption of technological processes, facilities and equipment serving the production system, mainly the energy consumption of power supply, machine repair, water supply, gas supply, heat supply, refrigeration, instrument repair, lighting, warehouses and raw material sites within the factory, as well as safety, environmental protection, energy-saving and other facilities.

6.1.4 Energy consumption of ancillary production systems

The energy consumption of the ancillary production system shall include the energy consumption of the production command system (factory headquarters) specially configured for the production system and the departments and units within the factory that provide production services, mainly facilities such as the dispatching room, office,

operation room, control room, lounge, changing room, bathhouse, central control analysis, product inspection, and maintenance.

6.1.5 Recycled energy

The recycling of the waste heat, waste energy and chemical reaction heat generated in the production boundary of titanium dioxide and iron oxide pigments are not included in the energy consumption. For the recycling by devices outside the boundary area that are recycled and utilized, the actual energy sent out shall be deducted from the energy consumption within the boundary area. The processes of producing sulfuric acid products such as sulfuric acid from sulfur and pyrite do not fall under the category of titanium dioxide production processes, and their energy consumption is not included in the comprehensive energy consumption of titanium dioxide. The energy consumption of the waste acid concentration process in the titanium dioxide production process is included in the comprehensive energy consumption per unit products of titanium dioxide, but it is separately counted in the energy consumption statistics process and not subject to assessment.

6.2 Calculation method

6.2.1 The calculation of comprehensive energy consumption shall comply with the provisions of GB/T 2589.

6.2.2 The calorific value of various energy sources is converted into a unified unit of measurement, kilograms of standard coal equivalent (kgce). The calorific value of various energy sources is based on the calorific value actually measured by the enterprise during the reporting period. If there is no actual measurement condition, the reference standard coal coefficients of various energy sources given in Appendix A or Appendix B shall be used for conversion.

6.2.3 The comprehensive energy consumption (E) of titanium dioxide and iron oxide pigment products is calculated according to formula (1):

$$E = \sum_{i=1}^{m} (e_i \times K_i) - \sum_{j=1}^{n} (e_j \times K_j) \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

Where:

E -- Comprehensive energy consumption of titanium dioxide and iron oxide pigment products, in kilograms of standard coal equivalent (kgce);

m -- The number of energy types input;

e_i -- the physical quantity of the i-th energy consumed in the production of titanium dioxide and iron oxide pigment products, in kilograms (kg);

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