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**Guides for energy efficiency assessment
of hot rolling process**

热轧工序能效评估导则

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Guides for energy efficiency assessment of hot rolling process

1 Scope

This Standard specifies the terms and definitions, basic principles, assessment procedures, boundary and energy consumption statistical range, baseline energy consumption, actual energy consumption, energy efficiency index, energy efficiency analysis, and energy efficiency optimization measures for the energy efficiency assessment of hot rolling process.

This Standard applies to energy efficiency assessment and energy saving potential analysis of hot rolling process in iron and steel enterprises.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB 17167 General principle for equipping and managing of the measuring instrument of energy in organization of energy using

GB/T 21368 Specification for equipping and managing of measuring instrument of energy in the iron and steel industry

GB/T 23331 Energy management systems - Requirements

GB/T 28924 Guides for calculating energy efficiency index of an iron and steel enterprise

YB/T 4662 Steel slag - Determination of potassium oxide and sodium oxide content

3 Terms and definitions

The terms and definitions defined in GB/T 23331, GB/T 28924, and YB/T 4662 apply to this document.

6 Boundary and energy consumption statistical range

6.1 Process boundary division

The boundary of hot rolling process starts from the input of raw materials (casting blank), energy, and energy-consumed medium, and ends with the output of final product (rolled material) and steam for external supply.

See Appendix A for the boundary division of hot rolling process.

6.2 Energy consumption statistical range

The energy consumption statistical range of hot rolling process is as follows:

- a) Hot rolling production process, including raw material preparation, heating, rolling, cooling, and finishing, etc.;
- b) Contain auxiliary production systems such as machine repair, inspection, testing, measuring, transportation, production management and dispatching systems, heating or cooling, lighting, warehousing;
- c) Contain the amount of loss of various energies in hot rolling process interface.

The above-mentioned energy consumption statistical range shall deduct the steam recovered and externally-supplied; and does not include the energy consumed by facilities for life purposes (such as canteen, lounge, etc.) which are not related to production.

7 Baseline energy consumption

7.1 Baseline conditions

7.1.1 Baseline conditions are a number of measurable factors which have a greater impact on the baseline energy consumption; and can be classified into objective factors and subjective factors.

7.1.2 The objective factors refer to factors which are affected by the inherent conditions outside the process boundary and are not controllable within the process. They mainly refer to raw material conditions, product conditions, geographical environment, climate temperature, etc.

7.1.3 The subjective factors are factors related to the enterprise's own management level, technical equipment level, operation level, etc. Through the ways such as technical equipment optimization and management level

Field data acquisition includes but is not limited to the following contents. The process parameters shall take the data under stable production conditions. The amount of change shall take the average of statistical reporting period:

- a) Yield information, including production scale, quantity of qualified products during the statistical reporting period, etc.;
- b) Raw material conditions, including raw material cross-section specifications, steel grade, composition, etc.;
- c) Product conditions, including product type, specifications, dimensions, etc.;
- d) Consumption situation of energy and energy-consumed medium, such as consumption of circulating water, electricity, compressed air, nitrogen, natural gas, coal gas, etc.;
- e) Energy recovery situation, such as steam recovery amount, pressure, temperature, etc.;
- f) Parameters of main energy-consumed units and important energy-consumed equipment, such as the main parameters of heating furnace, rolling mill, water treatment, and other systems;
- g) Ambient temperature.

8.2 Principles of value selection for the coefficient for conversion of energy and energy-consumed medium into standard coal

8.2.1 The fuel energy actually consumed by the energy use organization shall, based on its low calorific value, be converted into the standard coal quantity. For those non-actually measured, refer to Table B.1 in Appendix B.

8.2.2 Steam shall, based on its enthalpy value, be converted into standard coal quantity. Refer to Table B.2.

8.2.3 For the conversion of energy-consumed medium into standard coal, refer to Table B.3.

8.2.4 The conversion relationship between standard coal and heat is $1 \text{ kgce}=29307.6 \text{ kJ}$.

8.2.5 The coefficient for conversion of electric power into standard coal takes the equivalent value, i.e., $1 \text{ kW} \cdot \text{h}=0.1229 \text{ kgce}$.

8.3 Actual energy consumption

The actual energy consumption shall be calculated according to formula (3):

regulations, policies, and mandatory standards;

- b) Whether backward processes and equipment which are prohibited or eliminated by explicit order are used;
- c) Use situation of new energy saving processes, new technologies, and new products recommended by the state and industry.

10.2 Energy measuring instrument equipping and monitoring analysis

Energy measuring instrument equipping and monitoring analysis shall include but is not limited to the following:

- a) According to the requirements of GB 17167 and GB/T 21368, analyze the scientific and rationality of the equipping plan for energy measuring instrument in the hot rolling process;
- b) The energy use state of hot rolling process can be monitored by referring to GB/T 15316.

10.3 Energy efficiency level analysis

The energy efficiency level analysis shall include but is not limited to the following:

- a) Energy efficiency analysis of hot rolling process;
- b) Energy efficiency analysis of important equipment. GB 18613, GB 30254, GB 19761, GB 19762 can be referred to;
- c) Energy unit consumption analysis;
- d) Energy management analysis. GB/T 30258 can be referred to;
- e) Rationality analysis of electricity usage. GB/T 3485 can be referred to;
- f) Rationality analysis of heat usage. GB/T 3486 can be referred to;
- g) Energy saving potential analysis and energy system optimization. GB/T 30715 can be referred to.

11 Energy efficiency optimization measures

The hot rolling process can use, but not limited to, the following energy efficiency optimization measures:

- a) Improve energy management and process operation levels;

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