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Industrial furnaces and associated processing equipment — Method of measuring energy balance and calculating efficiency —

Part 3: Batch-type aluminium melting furnace

Fours industriels et équipements associés — Méthode de mesure du bilan énergétique et de calcul de l'efficacité —

Partie 3: Fours de fusion dormant pour l'aluminium

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 13579-3 was prepared by Technical Committee ISO/TC 244, *Industrial furnaces and associated thermal processing equipment*.

ISO 13579 consists of the following parts, under the general title *Industrial furnaces and associated processing equipment — Method of measuring energy balance and calculating efficiency*:

- Part 1: *General methodology*
- Part 2: *Reheating furnaces for steel*
- Part 3: *Batch type aluminium melting furnaces*
- Part 4: *Furnaces with protective or reactive atmosphere*

Introduction

All calculations within this standard are based on the location of equipment at the reference conditions.

NOTE For equipment intended to be installed other than the sea level the impact of the elevation should be calculated for that location.

Symbols used in this part 3 of this standard and all the annexes attached, together with their meanings and units, are given in Annex A.

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Industrial furnaces and associated processing equipment — Method of measuring energy balance and calculating efficiency —

Part 3: Batch-type aluminium melting furnace

1 Scope

This Part 3 of ISO 13579 specifies general methodology of measuring energy balance and calculating efficiency of the process involving batch type aluminium melting furnaces as designed by the furnace manufacturers. This general methodology includes:

Measurement methods,

Calculations (general calculation) and

Evaluation report.

This standard is excluding any efficiencies related to the process itself outside of the batch type aluminium melting furnaces.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 13574, Industrial furnaces and associated thermal processing equipment — Vocabulary

ISO 13579-1, Industrial furnaces and associated thermal processing equipment — Method of measuring energy balance and calculating efficiency — Part 1: General methodology

3 Terms and definitions

The terms and definitions used in this part of Standard is defined in ISO 13574, Industrial furnaces and associated thermal processing equipment — Vocabulary.

4 Basic principles

4.1 General

Area of energy balance measurement shall be determined.

In principle, exclude energy consumed by external product loading vehicles such as fork lifts from the area of energy balance.

NOTE An example of determination of the area of energy balance measurement of a batch type aluminium melting furnace is shown in Figure 1.

The following aspects shall be included in the energy balance measurement:

- a) Energy input;
 - "Fuel equivalent energy" as specified in 4.2.2;
 - "Other energy input" as specified in 4.2.3;
- b) Energy output;
 - "Thermal energy output" as specified in 6.2.5;
 - "Energy used in electrical auxiliary equipment" as specified in 6.2.6;
 - "Energy for generation of utilities" as specified in 6.2.7;
 - "Electrical generation loss" as specified in 6.2.8.

Determine energy input and energy output which goes into and comes out of the area of energy balance based on the measurement data.

The total energy input into the area shall balance the total energy output from the area.

Result of energy balance measurement is required to be summarized into energy input and energy output in an energy balance sheet with necessary information such as equipment summary, measurement condition and measurement data.

Thermal energy balance and electrical generation may be created as subcategories. See 6.3 and 6.4.

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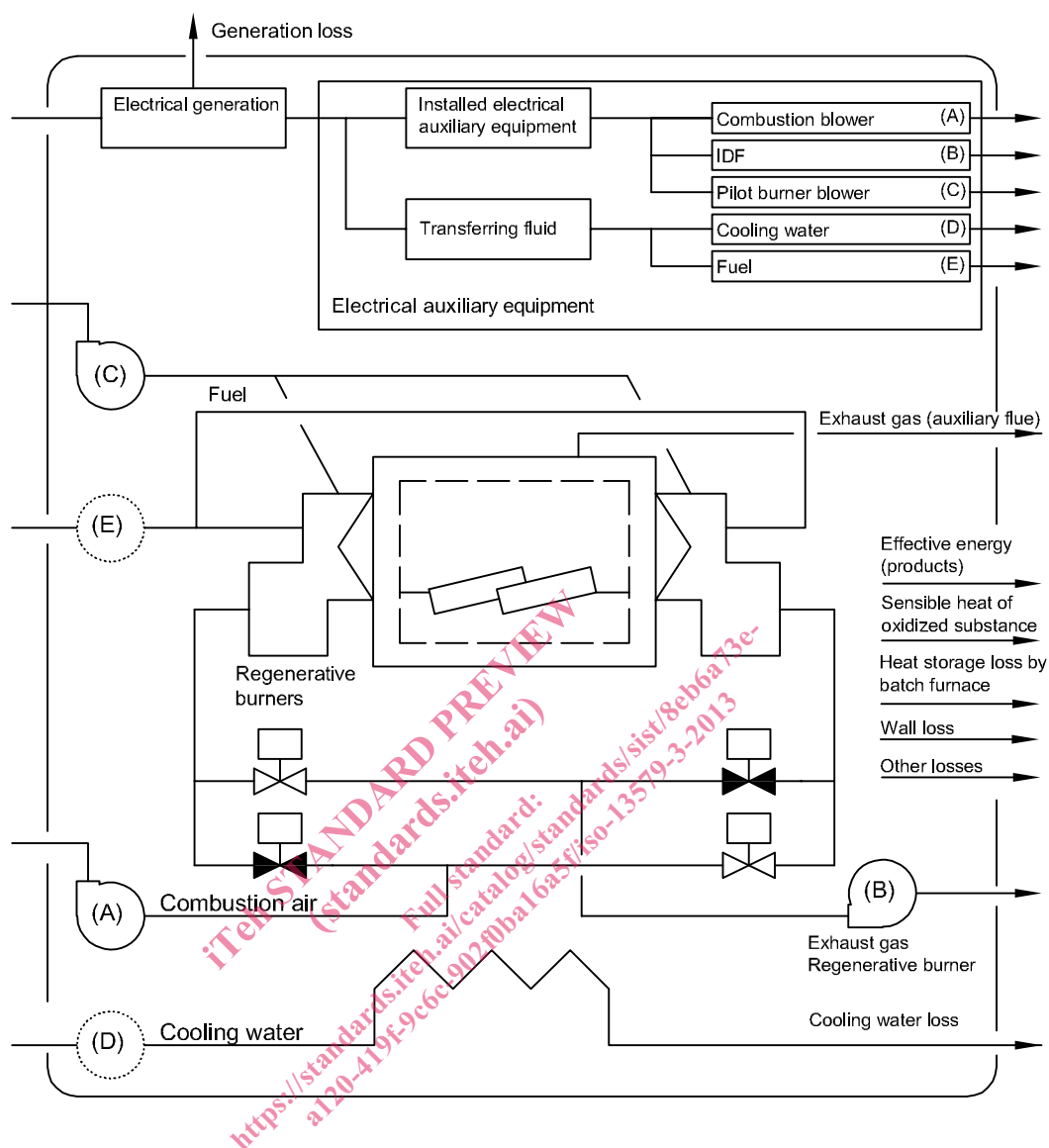


Figure 1 — Example of determination of the area of energy balance measurement of batch type aluminium melting furnaces

4.2 Sankey diagram

As specified in ISO/CD 13579-1 4.2.

4.3 Process Heating Assessment Survey Tool (PHAST)

As specified in ISO/CD 13579-1 4.3.

5 Basic condition of measurement and calculation

5.1 State of furnace

Subject furnaces shall be in the normal operation and, the temperature cycle and through put shall be as considered in the design calculation.

Nominal operation condition is generally based on nominal condition stipulated in the specification. But in the case of no specified condition it may be defined by supplier e.g. 2/3 of design throughput.

Melting rate influences efficiency, but in this part of ISO 13579, melting rate is assumed generally 300 to 500 kg/m²h since furnace temperature is usually around 1200 °C. As far as the melting rate is in the range, melting rate does not have a significant effect on energy efficiency. When melting rate is quite different from the range, it should be taken into account and mentioned.

5.2 Duration of measurement

As specified in ISO/CD 13579-1 5.2.

5.3 Unit of specific energy intensity

As specified in ISO/CD 13579-1 5.3.

5.4 Reference condition

As specified in ISO/CD 13579-1 5.4.

5.5 Unit of volume

As specified in ISO/CD 13579-1 5.5.

5.6 Fuel

As specified in ISO/CD 13579-1 5.6.

6 Type of energy used in this standard

6.1 General

Energy evaluated in this standard and their symbols are specified in this clause.

All energy shall be expressed in kJ/t products unless otherwise specified.

NOTE The types of energy specified in this clause are summarized in the Table 1.

6.2 Energy balance

6.2.1 Total energy input

6.2.1.1

Total energy input E_{input}

As specified in ISO/CD 13579-1 6.2.1.1.

6.2.2 Fuel equivalent energy

6.2.2.1

Fuel equivalent energy E_{fe}

As specified in ISO/CD 13579-1 6.2.2.1.